

An anatomical exposition of the structure of the human body / By James Benignus Winslow ... Translated from the French original, by G. Douglas.

Contributors

Winslow, Jacques-Bénigne, 1669-1760.
Douglas, G.

Publication/Creation

London : Printed for N. Prevost, 1733.

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2 vols in 1



ANATOMICAL
EXPOSITION

STRUCTURE

HUMAN BODY

JAMES BENIGNUS WINKLER.

IN TWO VOLUMES.

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VOL. I.

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Vol. I. A*

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BY

JAMES BENIGNUS WINSLOW,
PROFESSOR OF PHYSICK, ANATOMY AND SURGERY
IN THE UNIVERSITY OF PARIS,

MEMBER OF THE ROYAL ACADEMY OF SCIENCES, AND OF
THE ROYAL SOCIETY AT BERLIN, &c.

Translated from the French Original,

By G. DOUGLAS, M. D.

VOL. I.



LONDON:

Printed for N. PREVOST, at the *Ship*, in the *Strand*.

M.DCC.XXXIII.

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MEMBER OF THE ROYAL SOCIETY OF LONDON,
AND OF THE SOCIETY OF MEDICAL PHYSICIANS.
BY
G. DOUGLAS
VOL. I.



LONDON:
Printed by N. & J. Parry, at the 'Star' in the Strand.
MDCCXXXIII.

DEDICATION
T O
Dr. JAMES DOUGLAS.

SIR,

WHAT I here take the Liberty
to offer You, is already more
Your own than Mine. To You
I owe all that I know, not only of the
Science, but of the Style of Anatomy;
and there is not one good Line in this
Translation, which is not the better for
what you have taught Me, or procured
me Opportunities of learning. These
are very great Obligations to a Man re-
solved to live by the Profession of Phy-
sick; but they are very small, when
compared with others that you have
laid me under, without which I should
never have been in a Condition to live
A 2 by

DEDICATION.

by any Profession. Pardon this publick Acknowledgment of Favours which you designed to have kept always secret; and continue to believe me with the utmost Sincerity, Gratitude and Respect,

Your Most Dutiful,

Bow-Lane,
Sept. 5. 1732.

Most Obliged Brother,

G. DOUGLAS.

THE

AUTHOR'S ADVERTISEMENT.

IN room of a Preface which I once intended, the following Advertisement will be sufficient to inform my Readers, concerning the Design and Disposition of this Treatise, and concerning several other particular Circumstances which it is proper they should be acquainted with, before they begin to peruse it.

I intitle this Work, *an Anatomical Exposition of the Structure of the Human Body*, because my Design is simply to relate that Structure, as I have found it by Dissections often repeated, and in different Manners; and because I confine my self intirely to the Human Body. I have not enlarged very much on the Uses of the Parts; I mention those alone, which appear to me to be well founded on the known Structure of the Body; and sometimes I say nothing of them at all, as knowing nothing certain about them. In that Case, I frankly acknowledge my Ignorance, in order to excite others who, perhaps, may be more lucky than I have been; and I design in another Work, to give a fuller Account of these Uses.

I have followed the same general Order which is observed by *Vesalius* in his great Work *de Corporis Humani Fabrica*; beginning by the Bones, and from thence going on to the Muscles, Arteries, Veins, Nerves, Abdomen, Thorax, and Head, together with the Organs of Sensation; and I more willingly pitched upon this Method, because I formerly designed to have published a *Vesalius Renovatus*.

It is for this Reason, that the particular Treatise, which I call a Compendious View, &c. Sect. 7. is placed where, in all appearance, it ought not to be; and that I have been obliged to make this Compendious View, partly a Recapitulation of the Sections that go before it, and partly an Introduction to those that come after.

My great Care has been to follow an easy, simple, and instructive Method, for the sake of Beginners, and of those who have not made any great progress in Anatomy. I never talk of Parts supposed to be unknown, while I describe the rest; and I never begin the particular Description of any Part, without giving first of all a general Idea of it.

THUS

THUS in the Treatise of the Muscles, I confine my self to those which are wholly inserted in Bones, because in the foregoing Sections, I described the Bones. I mention no Muscles fixed in other Organs or Viscera, as for Instance those of the Eye, because that Organ was not described before; and therefore it would be impossible for a Beginner to understand my meaning; especially in naming the particular Portions of the Eye, in which the several Muscles are fixed.

I have observed the same Method through this whole Work, passing always from known Parts, to those that are unknown; and I have shunned, as much as was possible, entering upon particular Descriptions, till I have first communicated general Ideas, as may be seen by the Advertisements inserted in each Section, on this Subject.

It was on this Account, that I placed the Description of the fresh Bones with all that belongs to them, immediately after that of the Sceleton; in doing which, I had chiefly regard to the Muscles wholly fixed in Bones; several of which are not inserted immediately in the Bones themselves, but by the Intervention of a Ligament, Aponeurosis, &c.

I am apt to think I have done a great Service to Beginners, in composing two particular Tables, in order to facilitate the Knowledge of the Muscles; one of which shows at first sight, in how many Bones each particular Muscle is inserted; the other, to how many Muscles each Bone gives Insertion. In the first Table, each Muscle makes a particular Title, under which is a simple Enumeration of all the Bones in which it is fixed: In the second, each Bone makes a Title, under which is placed a List of all the Muscles inserted in it.

THESE two Tables seem to me, to be of very great Use in the Practice both of Physick and Surgery, by teaching in a moment, those who have not been much accustomed to Dissections, to how many several Bones, a wounded or otherwise disordered Muscle is connected; and likewise with how many Muscles a luxated, fractured, or otherwise disordered Bone is connected, especially when for want of Time or of Patience, they have not an Opportunity of consulting the whole Description of the Bone or Muscle concerned.

It is with the same design, that I have in the compendious View, &c. given a short Enumeration of all the external and internal Parts of the Human Body; adding to each Part, a List of the principal Ramifications of Arteries, Veins and Nerves, which in their ordinary Course, have any Relation, Connexion or Communication therewith. I design hereafter to make these Lists more compleat, and to dispose them in a better Order.

As it was my Intention, that this Work should be purely dogmatical, and that the Facts set down in it, should stand intirely on the Credit of my own Observations made on Human Bodies, during many Years past; I resolved not to mention a great Number of Relations, Histories, foreign Circumstances, Disputes, Quotations, &c. which may be proper enough in Treatises containing only particular Inquiries, Observations, Criticisms and such like.

I am however very far from derogating in the least, from the Merit of any of those great Men and faithful Observers, to whom we owe the numerous fine Discoveries that have been made, and the excellent Writings that have been published. On the contrary, I had resolved in a larger Work in *Latin*, to place at the Bottom of the Pages, a Sort of Anatomical Chronology, in order to do justice to the true Discoverers, and to show that we are often deceived in thinking we have found out something new.

I have not divided this Work into Books and Chapters, but only into several Treatises (or Sections) the Titles of which show what they contain; and I have expressed by other particular Titles, the several Parts or Articles belonging to the Subject of each Treatise. I have, for the Ease of the Reader, divided the Text of each Section, into a great many different Paragraphs, and there are likewise smaller Subdivisions, to which I have prefixed a continued Series of Numbers, which facilitates the References, and will make the Quotations from different Editions, uniform.

As I was resolved to have no Figures, but what were drawn from the Life, under my own direction; and as the Impatience of several Persons for whom I have the greatest Respect, would not allow me Time to finish the whole Series of those which I have already caused to be done; I design'd to make them the Subject of another Work, which will contain at least fourscore Folio Plates, with a short Explication of each, in *Latin* and *French*. But I foresee that such a Work will be beyond the power of any one private Person.

In the meantime, my Friends were of opinion that I should point out in the several Books of Anatomy, the Figures which I judged to express each Part of the Human Body in the best manner. But I must frankly own, that I know but a very small number that are proper for a Regular Collection, and even these are imperfect in some parts; and tho' these Imperfections may be of very little bad consequence to good Judges; they may nevertheless make false impressions on the Imaginations of Beginners, as I shall show at a proper time, in a Dissertation on Anatomical Figures in general, and on those of *Casseri-
rius*,

rius, Eustachius, Vidus Vidius &c. in particular; but I know nothing of the *Roman* Edition of seven Figures of the Human Nerves, which *Riolan* commends so much in his Notes on *Veslingius*.

NOTWITHSTANDING all these Reasons, which determined me to publish no Figures at present; several of my Friends having insisted very much on the Necessity of my having at least a few, I was obliged at length, to consent to copy four of *Eustachius's* Plates; and as I left them to the Choice of my Friends, they pitched on those which are here inserted. I caused them to be copied from the *Roman* Originals, explained by the late M. *Lancisi*; and to his Explanations, I have added some of my own.

EUSTACHIUS had directed particular Methods for finding the Places in these Tables which wanted to be explained; but M. *Manget*, who has published the whole, at the end of his *Theatrum Anatomicum*, has marked the Explanations in the common way by Letters and Numbers. This Alteration was approved by *Lancisi*, and I have here retained it; *Eustachius's* Manner not being suited to every Person's Capacity.

I formerly contrived the following Method for making use of those Tables with more ease. I draw Squares of five Degrees, with black Lines, as in the Tables *AA*, *BB*. and afterwards compleat these Lines with a red transparent Liquor, such as the Tincture of *Brazil* Wood, on the Figures themselves. Then on each large black and red Square, I draw twenty little Squares, with a yellow transparent Liquor, such as the Tincture of Saffron, as I have done in the Table *BB*, by pointed Lines. The Use of this Contrivance is to find the upper and lateral Degrees to which the Numbers in *Lancisi's* Explanations correspond.

I design on some other occasion to give the Observations I have made on what the modern Anatomy has discovered to be wanting in these Tables, which must however always continue to be admired by all true and learned Anatomists. The Table *BB* alone was as great a Master-piece at the time when it was done, as the Tables of the Nerves, published by the late famous M. *Vieussens*, still continue to be; for no Person can say that he has hitherto seen any better or any so good.

I write in a close, concise Style, but I have taken all imaginable pains to render it clear and intelligible, and I have shunned all obscure and equivocal Expressions. I have endeavoured after Simplicity as well as Brevity, and I have continually had these two things

in View in composing this Work. For as to Brevity, I considered that the greatest Number of those for whom I write, want only the essential and necessary parts of this Science ; the rest serving only to enhance the Price of my Book, and so to hinder them from buying it.

I studied the other Property of Style, Simplicity, on account of Foreigners, whom I must have obliged very much, by shunning all such Gallicisms as they must be apt to mistake, who are not perfectly acquainted with the Genius of the *French* Tongue. These Reasons will, I hope, obtain my Pardon from those who love a voluminous, more than a concise Stile, and from those also who do not here find all the Politeness of which their own Language is capable.

SEVERAL Years ago I was informed, that if I did not publish my self, what I had said and demonstrated in my Courses of Anatomy, especially in those given at my own House, where I often talk without the least Reserve, I should have the mortification to find that some other Person would do it for me. But nothing of this kind was able to persuade me, either to precipitate a Work, which is always much easier in the hands of Compilers, than in those of the Author ; or not to behave in the succeeding Courses, with my usual Openness of Mind. And I was even so indifferent about this Objection, that I have often corrected with my own Hand, what my Scholars had written during my Lessons and Demonstrations.

AMONG the great Numbers of those who have attended my Courses, I have found but very few that have published as their own, what they learned from me ; and I acknowledge with the utmost Gratitude, the generous Behaviour of many Foreigners, in relating in their Dissertations, what they had heard me say, either at my own House, in the Physick-Schools, or at the Royal-Garden where I was employed by the late great *M. Duvernay*, to teach for twelve Years, his bad State of Health not permitting him to undergo that Fatigue himself.

AND upon this Occasion, I cannot help commending the Sincerity of that Gentleman, who translated Dr. *James Douglas's English Myography* into *Latin*, in declaring in his Notes, that I am the Author of several Things which I had only mentioned by word of Mouth, without having then published them in Print. And this leads me to take notice of another Instance of Sincerity, of a Person, who having collected in Writing, all that he could, during several of my Courses, put the whole into my hands before he left *Paris*, with this Inscription: *Hæc tua sunt.* This Person was *M. L'Archevêque*, a Physician of *Rouen*.

IN the Year 1722, I compos'd a Treatise call'd *Fundamental Anatomy*, and it was for some time before the Examiners appointed for that Purpose; but I afterwards withdrew it and changed it into this which I now publish, which differs very much from the other, both in Method and in Length. There are a great Number of Errata, owing to the Impatience of the Publick, which would not allow me time to revise the Proofs so often as I should otherwise have done. I beg that these Faults may be corrected first of all, that my Expressions may not be mistaken, or Errors be imputed to me, of which I am not guilty.

I conclude by acknowledging with sincere Gratitude, that the late *M. Steno's* Discourse on the Anatomy of the Brain, was the sole original Source, and general Rule of my Conduct in all that I have done in Anatomy; and I have insert'd it in the Description of the Head, believing that I should oblige my Readers by reprinting a Piece which was become very scarce, and which contains a great many excellent Advices how to shun Errors and discover Truth, not only in relation to the Structure and Uses of the Parts, but also in relation to the way of dissecting, and of making Anatomical Figures.



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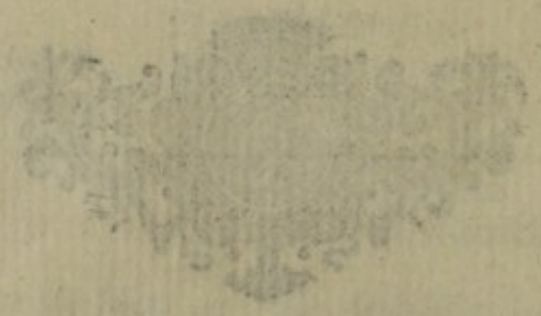
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THE
P R E F A C E.

THE laborious and indefatigable M. *Winslow*, Author of this System of Anatomy, has, in his Advertisement, given us a general View of the Plan and Disposition of his Work. My design in this Preface, is to point out a little more particularly, the Excellencies of the Original, and then to give some account of the Rules I have observed in the Translation.

THIS Work may be considered as consisting of two Parts ; an Enumeration of Phænomena or Matters of Fact, and Conclusions or Inferences drawn from thence concerning the Use or Office of the several Parts of the Body.

THE Order which the Author proposes to follow thro' the whole, is to pass from known Parts to those that are unknown, never to suppose a Part known, or to mention it as such, till it has been previously described, and never to proceed to the particular Description of a Part, till a general Idea has been given of it. This Order he has strictly observed through the whole first Volume ; but it is not so easily discoverable in all places of the second, and especially in the Description of the Arteries, Veins and Nerves ; in tracing the Course of which, he is obliged to mention many other Parts besides the Bones

and Muscles, the only Parts described in the preceding Sections. Perhaps he was of Opinion that had he avoided this breach of his proposed Order, he must have fallen into other greater Inconveniencies.

THE Author's simple, easy, unconstrained and intelligible Method of Expression, adds a very great Beauty to his Work, which is not a little heightened by the continued series of distinct unconnected Numbers, in which each Section is disposed. I have always looked upon the Description of the Human Body, or of any other part of Natural History, as on a Book of Geography; the main Business of which is to relate Observations without Ornament, and in such a simple manner, as that a Person who afterwards views the Countries described, may be put in the easiest and readiest way to see what the Author saw. A laboured Elegancy of Stile, the beautiful Turns of Periods, and a studied Connexion of all the Parts of a Discourse, will undoubtedly render such Descriptions most pleasing to a Reader of a polite and classical Taste; but if he designs to be more than a Reader, and to consider his Author in another light than as a Writer of a Romance, that is, if he designs to have recourse to the Originals from which these Descriptions were taken; he will soon find the difference between the native Simplicity and the additional Ornaments of the descriptive Stile. *Vesalius*, the most elegant Writer in Anatomy since *Celsus*'s time, endeavoured to imitate *Cicero* in his Diction; but were *Cicero* to write a System of Anatomy at this time, he would imitate *Celsus* or *M. Winslow*, and not *Vesalius*.

IN the descriptive Part of this Work the Author has omitted nothing that has hitherto been discovered or verified by himself, during a very long course of Anatomical Inquiries, to which his whole Study, Application and Time have been devoted; and for which his Genius is admirably fitted, his Encouragement has been the greatest and his Opportunities the best that *Europe* can afford. And indeed his main design appears every where to have been what he himself tells us in the Introduction to the History of the Abdomen; to give a full and accurate Description of the Parts of the Human Body, without entering very far into the Animal Oeconomy or Uses of the Parts.

THE general Idea by which he begins the Description of each Part, serves not only for a good Definition, but when joined to what commonly follows concerning the Figure, Substance, Divisions, &c. of that Part, leads us insensibly into the Knowledge of it, and especially lays a Foundation for understanding its true Situation in the Body; a thing of the greatest consequence in Anatomy, and in which our Author has very much surpassed all the Anatomical Writers that have gone before him. This important Branch of what he calls the External Conformation of the Parts, is not only excellently described in this Work, but he has likewise every where cautioned Beginners against the Mistakes that have been or may be committed in Dissections, by describing or delineating the Situation of the Parts from the Parts *extra situm*. And undoubtedly Beginners would do well to render themselves Masters of these more ob-

vious Branches of Anatomy, and especially of the true Situation of the Parts, before they go on to more minute Inquiries, which in order to produce any real Improvement either in Philosophy or Physick, must be built on the former as on their only solid Foundation. This is the Method followed by *M. Winslow*, and no better Example can be proposed for our imitation. No Anatomist has carried the real Knowledge of the inward Structure of the Parts to a greater length; but he never enters upon that Subject, till their external Conformation has been particularly and accurately described. Any tolerable Judge of these matters will hardly be able to keep from laughing, when he hears a young Pretender to Anatomy, talk of making curious Injections, of deciding by means thereof, the Disputes that have arisen concerning the Glandular or Vascular Structure of the Brain, or of unfolding the Mechanism of a Lymphatic Gland, before he knows what Muscles, large Blood-Vessels and Nerves lie on any side of the Arm or Thigh, and what Space they occupy there, in their natural Situation. Great pains have been taken to unravel the Structure of the different Coats of the Stomach, in order to explain the manner of Digestion, by Persons who did not know how the two Orifices of that Viscus are situated with respect to each other; and we have seen those who have spent much time in tracing the different Directions of all the Fibres which compose the Heart, before they knew how the Heart lies in the Thorax, or in what Direction the great Blood-Vessels go out from it.

M. Winslow not only describes the outward and inward Structure of the Parts with the greatest exactness, but

but likewise points out the general ways of managing these Parts in order to see what he describes. This is a Duty incumbent on every candid, diligent Anatomist, as being the readiest way to put others in a condition to examine and confirm his Observations, and to save them the time which must otherwise be unprofitably spent in finding out what they might have been easily taught by the Authors of these Administrations: and I think I may venture to affirm that *Ruyfch* has lost more Reputation among the sincere lovers of the progress of Natural Knowledge, by concealing the Methods and Materials of his Injections, than he has gained by the Discoveries made by them. I am sorry *M. Winslow* has not described his Anatomical Encheiresis at greater length; the Knowledge thereof being the best Introduction to the nicer Parts of Anatomy on which that of the Animal Oeconomy mainly depends. This sort of Encheiresis is what now goes by the name of Experiments, in all the Parts of Natural Philosophy; and the Skill in contriving these Experiments, is what puts the chief difference between an Experimental Philosopher, who invents Methods how to discover Nature; and a Natural Historian who only collects obvious Phænomena, or those which cannot well escape the Eyes, Ears, Fingers, &c. of all who will be at pains to examine them. Observations and Collections of this kind are undoubtedly of use, but it is chiefly by the former that Natural Philosophy has been advanced to that pitch at which it is our Glory now to find it in *Great Britain*. “*Sir Isaac Newton* (says a very great Man) “was sensible that something more than “knowing the Name, the Shape and obvious Qualities of “an Insect, a Pebble, a Plant, or a Shell, was requisite
“ to

“ to form a Philosopher, even of the lowest Rank.....
 “ We all of us remember that Saying, so frequently in
 “ his Mouth, That Natural History might indeed fur-
 “ nish Materials for Natural Philosophy; but however,
 “ Natural History was not Natural Philosophy..... It was
 “ not that he despised so useful a Branch of Learning
 “ as Natural History; he was too wise to do so: But
 “ still he judged that this humble Handmaid to Philo-
 “ sophy, though she might be well employed in amas-
 “ sing Implements and Materials for the Service of her
 “ Mistress, yet must very much forget herself and the
 “ meanness of her station, if ever she should presume
 “ to claim the Throne, and arrogate to herself the Title
 “ of the Queen of Sciences.

BEFORE I leave these Reflections on the descriptive
 Part of this Anatomy, I cannot help mentioning a few
 small Faults into which, I think, the Author has fallen,
 and which he might have avoided. The first consists
 in too frequent comparisons of the Figure, Situation and
 Structure of the Parts of the Human Body, to what
 belongs to other Arts, no less unknown than the Science
 of Anatomy. I can see no necessity for supposing that
 every Person who begins this Study, is acquainted with
 Architecture, Fortification, Joinery, Carpenter's Work,
 Chymistry, &c. and I believe all the Readers of this
 Book will be convinced that the Illustrations of the
 Parts of the Body taken from these Arts, are more ob-
 scure than they would have been by a simple Descrip-
 tion without Comparisons, or by making use of such
 Comparisons only as every one must be supposed to un-
 derstand.

IN the next place, the Author's way of applying Mathematical Terms, is not altogether warrantable: and as few apply themselves at this time, either to the Chirurgical or Physical Parts of Anatomy, without being previously acquainted with such Parts of Mathematics, and of the Application thereof to natural Philosophy, as are now universally acknowledged to be necessary for such Studies; I shall not be surpris'd to hear that Beginners are startled, when they read of an irregular Circle or Square, of a Fibre or Line transversely Oblique, of a Circular Oval, &c. I must therefore beg of them to be so indulgent as to believe that the Author who is a much better Anatomist than Mathematician, designed no more by such expressions, than that the Figures or Courses of the Parts which he describes, come nearer to the Figures and Directions to which he compares them, than to any other.

A third thing in which I think *M. Winslow* somewhat to blame, is in endeavouring to introduce a great number of new Terms of Art without any apparent necessity. The best excuse that can be pleaded for the numerous Terms of Art already used in Anatomy as well as in the other Sciences, is that by the help of these, Discourse is shortened by expressing in one word what must otherwise have been expressed by several; and for such things as must be mentioned very often, such a liberty is not only allowable but necessary. But then, without pretending to fix the exact bounds of this Licence, I believe I may venture to affirm, that there is at least a sufficient number of Terms of Art to be found in the Writers before *M. Winslow*, and that the introduction of
new

new Terms, amounts now to no more than to oblige Students to learn a Dictionary by heart; that is, to spend that time in the Study of a Language which might have been more usefully employed in acquiring the Knowledge of Things.

ANOTHER Liberty often taken by the Author, to substitute new Terms in the room of those hitherto universally used and understood among Anatomists, is, I think, still more unwarrantable than the former; and the pretence for it, that the common Terms either convey false Ideas of the thing signified by them, or do not sufficiently express the true Ideas, is intirely obviated by this consideration, that all Terms are, or ought to be defined, and that the signification of them in Anatomy ought to be extended no further than these Definitions allow of. The Muscles, for instance, hitherto commonly known by the names of Membranosus, Palmaris Longus, Plantaris, &c. though better described by *M. Winslow*, than they had ever been before, will not in any respect be better understood by means of his new names of *Musculus Fasciæ Latæ*, *Ulnaris Gracilis*, *Tibialis Gracilis*, &c. These Technical Innovations have been often complained of by the greatest Writers in other Branches of Physick: *Tournefort*'s strongest objection to the famous *Morison*, is that he changes the common names of Plants without necessity; and *Boerhaave* in his second Catalogue of Plants in the Garden of *Leyden*, deprecates the same fault committed by himself in the first. But it is still more to our present purpose to observe that even *M. Winslow*, who on all occasions shews a very great fondness for new Terms, owns nevertheless that he

he is sometimes obliged to retain the old ones, for the reasons already given. Thus, talking of the Muscles of the Fingers and Toes, he tells us, that though he gives up all names taken from the Functions commonly attributed to Muscles, yet the names taken from the uses of some Muscles may still be retained, *provided they be looked upon as proper names only*; which reason may be equally applied to all the old names changed by him, which, as Terms of Art, ought all to be looked upon as proper names.

WHAT I have hitherto said will be sufficient to point out to an attentive Reader, the principal Beauties and slight Blemishes in the Descriptive, that is, in the chief part of *M. Winslow's Anatomy*: The inferences or conclusions drawn from the Phænomena he describes, come next in order. He tells us himself, that he has not much insisted on the uses of the Parts, and that he mentions those only which appear to him to be well founded on the known Structure of the Body; frankly owning his ignorance, as to those about which he knows nothing certain, in order to excite others who may perhaps be more lucky in discovering them, than he has been. He likewise assures us in many places of this Work, that it was designed to be purely Anatomical, that is, to contain an accurate Description of the Structure of the Parts; and only to point out their uses in general; the farther prosecution of that curious Subject being reserved for another Performance. Notwithstanding these repeated declarations of his design, I am very sensible that his not having insisted more on the uses of the Parts, that is, his

not having applied his excellent Descriptions at greater length, to the Animal Oeconomy, is made a heavy charge against him by two sorts of Persons; by those of a Philosophical Genius, because they do not here meet with so much Philosophy as they expected from an Anatomist of so great Reputation; and by those who have been his Scholars at *Paris*, because they do not find all that they have heard him deliver on this Subject in his private Courses. In answer to both, we need only observe, that according to our Author, the solid Parts of the Body are the chief Subject of a System of Anatomy, the Fluids being there taken notice of only occasionally, or as far as is necessary to explain the former; and in the next place, that the Foundation of a compleat Physiology, is the Description of the Fluid as well as of the Solid Parts; that is, the Nature, Properties, Motions, &c. of the Chyle, Blood, and all the Liquors secreted from the Blood, are to be inquired into and illustrated by Hydrostatical, Chymical and Mechanical Experiments, before the Animal Oeconomy can be explained. Therefore, in a Work designed for the explication of the solid Parts only, the Doctrine of the Animal Oeconomy is no further to be expected, than as the uses of the solid Parts can be pointed out, without taking in the consideration of the Fluids. This our Author has done, and it is very unreasonable to quarrel with him for not having done more than his Subject led him to, or for not having enlarged his Subject; in chusing which, every Writer has always enjoyed, and ought always to enjoy a full and absolute Liberty. Had he described the Fluids particularly, and afterwards ap-

plied the Description of the Solids and Fluids to the whole Animal Oeconomy in a healthful state, it might with equal reason still have been objected to him, that he ought likewise to have given us the History of all the Alterations that happen to these Solids and Fluids from various Causes variously applied, that is, that instead of a Description of the solid Parts of the Body, he ought to have published an intire System of the Theory and Practice of Physick.

UPON the whole, notwithstanding a few small Mistakes which the Author might have avoided, and notwithstanding all the other Objections that have been or may be made to his Work, it will be found to contain the best System of the Anatomy of the Solid Parts of the Body that was ever published to the World. This was *M. Winslow's* sole design in composing it; and by the help thereof, an industrious Student may lay an admirable Foundation for understanding the Animal Oeconomy, and for the application of that necessary part of Physick, to the Knowledge and Cure of Diseases, which every Physician ought always to have principally in view in his Inquiries into the Structure and Uses of the Parts.

I am in the next place to give some account of the Translation I have made of this excellent Work. Tho' such a degree of Knowledge of the *French* as to be able to read the Books written in that Language, with ease and pleasure, has for many years past, been reckoned an essential part of a polite and liberal Education in *Great Britain*; yet there are a great many People, who

either from inclination or from the way of life which they have chosen, may be supposed to apply themselves more or less to Anatomical Studies, without being sufficiently skilled in this Fashionable Language. The number even of good *French* Books imported by our Booksellers, seldom over fond of foreign Commodities, is generally very small; and for these two reasons, a good Translation of a valuable Original ought to be looked upon not only as the most proper way to make the Original more generally known; but also as a new Edition of a Book with which we could not otherwise be easily supplied. The same Apology will serve for good Translations of good Books written in all the other living Languages.

It is laid down as a general Rule, that in all Translations, the Author ought to be made to express himself in the same manner as if he had written originally in the Language into which his Work is translated. With respect to the dead Languages, especially the *Greek* and *Latin*, I believe this Rule will hold; and I dare say every Reader would be very much pleased to find in an *English* Version of *Celsus* or *Aretæus*, the same Beauties which good Judges have discovered in the Originals; but with respect to the *French* Originals this Rule must admit of some limitations. Without entering into a particular detail of the different Genius of the *English* and *French* Languages, or of the Writers in each Language, it will be sufficient for my present purpose to make two Observations; first, that the generality of the *French* Writers think themselves obliged to express a great many things which the *English* leave to be supplied by their

3

Readers;

Readers; and secondly, that the *French* Words are in many cases, Signs of less complex Ideas than the *English*. From these varieties which might be very easily traced to their true sources, it follows that the *French* are the best Writers on the Elements of Sciences, and that the *English* Writings are a great deal more concise than the *French*. *M. Winslow's* Book confirms what I have said; for as no compleat Anatomical Treatise was ever so well calculated for Beginners, so had he lived as many years in *London* as he has lived in *Paris*, his Book would have appeared in a much smaller Volume than it does at present; and therefore when he tells us that he writes in a close, concise Stile, he must be supposed to have compared it only with that of the other *French* Writers in Anatomy; for when compared with that of the Writers in several other Languages, both dead and living, it is certainly very diffused. It would nevertheless have been an unpardonable Liberty in an *English* Translator to have reduced the Original into the small form in which it might have been written by the Author in that Language; for in that case I should have been thought to have given rather an Abridgment than a Translation of the Original. My chief business therefore as a Translator, was to express the Author's Thoughts in his own way, as far as was consistent with the propriety of the *English* Anatomical Stile.

I have given most of the Terms of Art in *Latin*, because they are most familiarly used by *English* Anatomists, in that Language; and for that reason I judge them to be as really *English* Words as if they had been originally

nally derived to us from the *Britons*, *Saxons*, *Danes* or *Normans*; for after all the Efforts made, whether by Grammatical or Logical Pedants, Use will and must remain the sole Standard both for Speaking and Writing; and Bishop *Wilkins's* Project for flying to the Moon was every whit as feasible as that for establishing a Philosophical Language.

THERE are some Words in the Original which cannot well be rendered either by *Latin* or *English* Terms without a Circumlocution, or without taking some other Liberties. *Le Trou Mentonier* in *French* signifies the External Orifice of that Canal in the Lower Jaw which transmits the inferior Maxillary Nerve, or the third Branch of the fifth Pair: but as there is no Adjective either in *Latin* or *English* which answers to the *French* one *Mentonier*, that expression cannot be translated without a Circumlocution. The Word *Attache* signifies what is commonly called in *English* both the Origin or Beginning, and Insertion or Ending of Muscles; but as I could not consistently with my Author's Meaning and Design, use these *English* Words, either indifferently or as they have been commonly used hitherto; and as there is no one Word in *English* that I know of, which expresses both Significations of the original Term, I have taken the Liberty to affix that meaning to the Word Insertion, by which I have constantly translated the *French Attache* when applied to Muscles.

ON a cursory View of the Original, when I first undertook the Translation, I judged that an Alphabetical
Index

Index would have made a very useful Supplement to this *English* Edition; and I designed that this Index should have contained short clear Definitions of the principal Anatomical Terms; and these together with the proper References to the particular Sections and Numbers, would have made up a pretty compleat Anatomical Dictionary in a small compass. But I soon found in the progress of the Translation, that such an Index would be unnecessary; for in the first place the Author has explained the principal Terms of Anatomy in the beginning of Section VII. and the various Tables which he has given us of the Muscles, Arteries, Veins and Nerves, together with the particular Enumerations of all the Parts of the Body, all which will be easily found by the Contents, render any other particular Tables or References, in my judgment, altogether superfluous. However, as I promised an Alphabetical Index in my Proposals, if those who have done me the honour to encourage this Undertaking, are not perfectly satisfied with my Reasons for omitting it; I assure them that each Subscriber shall have one delivered to him *Gratis*, done with all the exactness that I am capable of.

THE want of an Alphabetical Index is one reason why this Edition does not swell to the number of Sheets which I at first proposed; but this is chiefly owing to another Cause which it was not in my power to prevent, I mean the smallness of the Character; and this I was obliged to consent to that my Bookseller might not be a Sufferer, in case, the other *much* cheaper Translation
with

with which we were threatened, had been published before mine. Whether the Undertakers have desisted or not, I cannot tell; but that such an Undertaking was actually set on foot, I am fully assured upon better Grounds than from what was published in one of the *English Journals*.

I hope this Book is at least as correctly printed as *English Books* generally are. As the chief literal Mistakes are in the Terms of Art, they may be easily amended from other places where these Terms occur; and therefore I have added no List of Errata. Such Lists may serve to fill up a few Pages, but are very seldom regarded by the Readers.

AN

Anatomical Exposition

OF THE

STRUCTURE

OF THE

HUMAN BODY.

SECT. I.

A Description of the Skeleton or of the dry Bones.

1. **T**HE exact Knowledge of the Bones is the Foundation of all Anatomy; because without this, we can never have a just *Introduc-*
Idea of the situation, disposition, connection, and uses of the
other parts of the human Body, nor consequently understand
or cure the disorders to which they are subject.

2. THIS Science is termed Osteology, from a *Greek* word which signifies
a discourse or reasoning upon the Bones, and it is ordinarily acquired
from a Skeleton, that is, a Collection of Bones well clean'd and dried, united
together in such a manner as to represent as justly as is possible the natural
Fabrick of fresh Bones.

3. I say as justly as is possible, because in the fresh Bones we observe
not only the natural consistence and colour of their different Portions, but
likewise their Cartilages, Ligaments, Membranes, Vessels, &c. as will be
shown hereafter.

4. BUT still, tho' the Skeleton does not come perfectly up to the natural
structure of fresh Bones, it is both very necessary and very useful, because

THE ANATOMY OF

we may readily have recourse to it at all Times and in all Seasons, in order first to acquire a preliminary Idea of the Natural State of the Bony Edifice, and afterwards to refresh our Memory at our leisure, especially if we desire with ease and pleasure to reap the fruit of an Examination or Demonstration of the Bones in a fresh subject, *i.e.* of a particular Osteology, as it may be termed.

5. My Design is to treat of the Bones in both states, beginning by the History of the Bones of the Skeleton, or the common Osteology. I shall next describe the fresh Bones taken from dead bodies newly prepared, which according to *Riolan*, may be termed *Osteologia Nova*.

A R T. I.

General Doctrine of the Bones.

*Enumeration
of the Bones.*

6. ANATOMISTS commonly begin Osteology by the general Doctrine of the Bones, but as we cannot avoid mentioning several particular Portions thereof, as Examples of what we deliver in general, it will be more methodical to give first an Idea of the Skeleton by enumerating simply all the Pieces of which it is composed.

7. AFTER this Enumeration, I shall lay down what relates to the Bones in general, and then go on to the Description of each dry Bone in particular.

8. IN another place I shall give some Observations on the Proportions which Bones bear to one another, and on the differences thereof in the two Sexes: but here I shall speak only of the dry Bones of an adult body, that is which has reached the utmost pitch of growth.

9. THE Skeleton is a regular Arrangement or Disposition of all the Bones, that is, of all the most hard, most solid, and most firm parts of the Human Body, cleared from the Flesh, and dried and connected together either by Artificial or Natural Ligaments.

10. THE Natural Ligaments soon grow hard and inflexible; they hide the extremities of the Bones, and hinder us from examining each Bone in particular: Therefore the most Instructive Skeletons are those in which the pieces are join'd by Art.

11. THE word Skeleton, according to its Original, seems only to agree to a Collection of dry Bones: It is however apply'd likewise to those which have been but newly clean'd, and which are connected by the Natural Ligaments.

12. THE Ordinary and most proper Division of the Skeleton is into the Head, Trunk and Extremities.

13. THE Head is divided into two general parts. The first is a bony Cavity call'd the Skull; the other consists of several pieces, which form the greatest part of the face; and for this reason probably, they have been termed the Face, tho' some part of the Skull contributes likewise thereto.

14. THE Skull consists commonly of eight Bones; one Anterior, call'd *Os Frontis* or Bone of the Forehead; one Posterior, call'd *Os Occipitis* or the Occipital Bone; two Superior, called *Ossa Parietalia*, or Sincipital or Parietal Bones; two Lateral, call'd *Ossa Temporum* or Temporal Bones; one Inferior, call'd *Os Sphenoidale* or the Sphenoidal Bone; and one Interior call'd, *Os Ethmoides* or *Cribriform*, or the Ethmoidal Bone.

15. BESIDES these, we sometimes meet with supernumerary Bones, the size and number of which vary considerably.

16. ALL the Bones which compose the Face in the sense already explained, belong to the two Jaws, one upper, the other lower.

17. THE Upper Jaw comprehends not only the two large Bones named *Ossa Maxillaria*, from the word *Maxilla*, by which this Portion of the Face is express'd, but likewise the two *Ossa Malæ*, the two *Ossa Unguis* or *Lachrymalia*, the two *Ossa Nasi*, the two *Ossa Palati*, the two *Ossa Convoluta* or lower Shells of the Nose, and one single Bone term'd *Vomer*. All these amount to thirteen in number, without reckoning the Teeth which are commonly sixteen.

18. THE Lower Jaw is but one Bone, with as many Teeth as in the upper.

19. THE trunk is divided in three parts; one common, called the Spine; and two proper, namely the Thorax or Breast and the Pelvis.

20. THE Spine is composed first of twenty four Pieces called *Vertebræ*, seven of which belong to the Neck, twelve to the Back, and five to the Loins; and secondly, of the Bone call'd *Os Sacrum*, with its Appendix call'd *Os Coccygis* or *Coccyx*.

21. THE Thorax is made up chiefly of the Ribs and Sternum. There are twelve Ribs on each side fix'd by their posterior ends to the *Vertebræ* of the Back, the remaining parts of the Thorax. The seven uppermost are call'd true Ribs, and the five lowest false Ribs.

22. The Sternum consists of two or three pieces lying between the anterior ends of the true Ribs.

23. THE Pelvis is principally form'd by two great Bones call'd *Ossa Innominata* join'd anteriorly to each other, and behind to the *Os Sacrum*, which compleats the Pelvis.

24. THE Extremities of the Skeleton are four in number, two upper, one on each side the Thorax, and two lower join'd to the two sides of the Pelvis.

25. Each upper Extremity is divided into the Shoulder, Arm, Fore-Arm and Hand.

26. THE Shoulder is made up of two pieces, one Anterior call'd *Clavicula*, and one Posterior call'd *Scapula*. The Arm is only one Bone term'd *Os Humeri*. The Fore-Arm contains two, the *Ulna* and *Radius*. The Hand is divided in three parts; the *Carpus* or Wrist, consisting of eight Bones; the *Metacarpus*, which is made up of four; and the five Fingers, each of which contains three Bones call'd *Phalanges*.

THE ANATOMY OF

27. EACH lower Extremity is divided into the Thigh, the Leg and the Foot.
28. THE Thigh is but one Bone, term'd Femur or Os Femoris.
29. The Leg is made up of two large Bones, nam'd Tibia and Fibula, and of one small Bone call'd Patella.
30. THE Foot is divided in three parts; the Tarsus, which is made up of the seven following Bones, the Os Calcis, Astragalus, Os Naviculare, Os Cuboides or Quadratum, and three Offa Cuneiformia; the Metatarsus made up of five Bones, and the Toes which are five in number, the greatest consisting of two Bones, and the other four of three Bones each, call'd Phalanges, as those of the Fingers.
31. THERE are, besides these, some small Bones which are seldom met with in a Sceleton, viz. the Os Hyoides or Bone of the Tongue, the eight Officula Auditus or Bones of the Ear, four lying in each temporal Bone, the little Bones sometimes found at the extremities of the Apophyses Petrosæ towards the Sella Turcica, and the Sesamoidal Bones of the Fingers and Toes, of which two belonging to the great Toe are considerable enough to be commonly preserv'd in Sceletons.
32. I say nothing of a kind of Sesamoidal Bones found sometimes on the Condyles of the Femur, at the lower end of the Fibula, at the Os Calcis and at the Os Cuboides.
33. AFTER this Enumeration of the Bones of the Sceleton, it is an easy matter to determine their Number: To the Head belong fifty four, without reckoning the Os Hyoides, or Bones of the Ear; to the Trunk, fifty four, taking the Coccyx for one Bone, and the Sternum for two; and to the Extremities, an hundred twenty four, leaving out all the Sesamoidal Bones: so that the whole Number is two hundred thirty two; to which if we add the eight Bones of the Ear, and the five principal pieces of the Os Hyoides, we shall have in all two hundred forty five, the Sesamoidal Bones being still left out.
34. BEFORE I go on to the particular examination of each of these Bones, it will be proper to consider them in general, with respect, (1.) To their external conformation; (2.) Their inward structure; (3.) Their connexion; and (4.) Their uses.
35. By the external conformation of the Bones, I mean all that may be learnt about them while they remain intire; such as their size, figure, external parts and colour.
36. SOME Bones are large, as the Os Humeri, Bones of the Fore-Arm, Os Femoris, Bones of the Leg, Offa Innominata: some middle-sized, as many Bones of the Head, the Vertebrae, Ribs, and Bones of the Metacarpus and Metatarsus: others in fine are small, as those of the Carpus, of the Fingers and Toes, the Teeth, &c.
37. SOME Bones are long, as the Os Humeri, Bones of the Fore-Arm, the Ribs, &c. Some are broad, as the Parietal Bones, the Scapula and Offa Innominata; and there are others in which the three dimensions of length, breadth and thickness do not differ much from each other, as the Vertebrae, Bones of the Carpus, Patella, &c.

External
conforma-
tion.

Size of
Bones.

Figure of
Bones.

38. SOME Bones are Symmetrical, a certain reciprocal Regularity being observed between their different sides; as the Os Frontis, Os Occipitis, Os Sphenoidale, Os Cribrosum, Vomer, the lower Jaw, the Os Hyoides, Vertebrae, Sternum, Os Sacrum, and Coccyx. These Bones are single, being placed in that space which distinguishes the right side of the body from the left.

39. THE rest of the Bones are double or in pairs, whereof one is situated on each side of the body. These taken singly, have not that Symmetry already mention'd, but when join'd to the corresponding Bones on the other side, they form a regular figure, as we see in the Parietal Bones, Ossa Humeri, Ossa Femoris, &c. The other varieties remarkable in the figures of Bones will be explain'd hereafter.

40. THE external parts of a Bone may be divided into one principal, which is as it were the body of the Bone; and into four subordinate Classes term'd Regions, Eminences or Risings, Cavities and Inequalities. *External parts of a Bone.*

41. THE principal part of a Bone is commonly term'd its body, which has been defined to be the middle hardest portion, at which the Ossification of that Bone begins.

42. BUT this Definition will not hold universally; the Bodies of the Vertebrae, for instance, are neither the middle nor hardest parts of them, and the Ossification of the Ossa Innominata does not begin at that portion which is the principal part of them in an adult body.

43. BY the Eminences of a Bone I understand all sorts of risings, prolongations or productions observable on its Surface. *Eminences of a Bone.*

44. THESE are of two kinds; in the first, the risings are continuous with the rest of the Bone, and make one piece with it; in the other, they are as it were contiguous only, appearing to be parts added to or united with the body of the Bone.

45. THE risings of the first kind are term'd Apophyses, from a Greek word signifying an Excrescence, because they grow or shoot out immediately from the Bone it self; such are the sharp Eminences of the lower Jaw, &c.

46. THE others are nam'd Epiphyses or Appendices, because they appear to be parts added to the rest of the Bone, and still distinguish'd from it by the intervention of another softer substance call'd a Cartilage, the thickness of which diminishing with Age, it becomes at last almost insensible, and is oftentimes quite lost: so that what was an Epiphysis in a Child, has the true appearance of an Apophysis in a person full grown; as we see in the Extremities of the Os Humeri, Bones of the Leg, &c.

47. WE must here observe by the bye, that some Epiphyses have Apophyses belonging to them, as in the lower extremity of the Tibia; and on the contrary, there are Apophyses which have Epiphyses join'd to them, as in the great Trochanter, and the head of the Os Femoris is really an Epiphysis of that part of the Bone which is term'd its Neck.

48. DIFFERENT names have been assigned to these two kinds of Eminences, taken from their figure, situation and uses.

49. From their figure they are term'd Heads, when they are convex, roundish, and smooth in their surface; Necks, when they are smallest at the middle, and grow gradually bigger towards both ends; Condyles, when two opposite sides of them are flat; Tubercles or Tuberositys, when they are uneven, rough and irregular; Spines or Spinal Processes, when they are sharp or pointed.

50. THE name of Spine is sometimes given to small Tubercles, and also to long risings with sharp edges, which are likewise call'd Cristæ. There are still other names taken from the figure of these Eminences, which will be met with hereafter.

51. FROM their Situation they are call'd Transverse, Oblique, Upper, Lower, &c.

52. Some are denominated from their uses: thus two Tubercles in the Os Femoris are term'd Trochanters, because they serve to turn that Bone.

53. A more particular Account of the Eminences of both kinds will be found in the description of each Bone.

External
Cavities of a
Bone.

54. BY Cavities I mean all the depressions perceivable in the outsides of Bones. These are in great Numbers; very different from one another, and they are call'd by many different Names.

55. THEY may however be distinguish'd into two general kinds; those which receive soft parts, as the Cavities which contain the Brain, the Eyes, the Marrow, &c. and those which receive hard parts, that is, where the Cavity of one Bone contains the Eminence of another. These last are either deep or superficial.

56. OF the deep Cavities some are term'd Cotylæ or Cotyloide, from the resemblance they bear to a Vessel of that name with which the Ancients measur'd Liquors; such as the great Cavity in the Ossa Innominata, which receives the head of the Os Femoris. Others are named Alveoli or Sockets, as those in which the Teeth are lodged.

57. THE more shallow Cavities are term'd Glenæ or Glenoide, from an ancient Greek word; such is that of the Scapula, which receives the head of the Os Humeri, in the Sceleton. I say, in the Sceleton, because in fresh Subjects, this Cavity is deeper, as shall be said hereafter. These superficial Cavities have scarce any sensible depth, as those in most of the Vertebrae, in some Bones of the Carpus, Tarsus, &c. Some of them are double, as in the upper extremity of the Tibia.

58. THE Cavities which receive soft parts differ from one another in size, figure, &c. The Names given to them are these.

59. FOSSA, when the opening of the Cavity is large or evasated, as the Orbits in which the Eyes are lodged. When such Cavities are small, they are named Fossulæ.

60. SINUS, when the opening of the Cavity is the narrowest part of it, as in those at the lower part of the Os Frontis.

61. LABYRINTH, when a Cavity has several hidden turnings which communicate with one another.

62. HOLE, when a Cavity penetrates from one side of the Bone to the other.

63. CANAL or Duct, when a Cavity runs for some considerable space in form of a Tube. The Orifices of such Cavities are sometimes call'd Holes.

64. WHEN the Cavities are very small and almost imperceptible, both they and their Orifices are term'd Pores.

65. SLIT or Fissure, where the Cavity is long, deep and narrow.

66. NOTCH, a Cavity in the Edge of a Bone from which a piece appears to have been cut out: Groove, a kind of Half-Canal, open, and of a considerable length.

67. AND when these Half-Canals are shallow, narrow and many of them together, they are term'd Sulci or Furrows.

68. THE Cavities in which Tendons lie, such as that at the upper part of the Os Humeri, are commonly call'd Sinuosities; and those in which only Blood-Vessels and Nerves are lodged, as we see in the Ribs, are term'd Scissures.

69. THESE two terms are very improper, and the Cavities expressed by them would be much better named Notches or Grooves. Those through which the Tendons pass, and which are lined with a particular kind of Cartilage, might be called Channels.

70. IT is proper to remark here, that when a Cavity is call'd Fossa or Groove, we have no regard to the Situation, but only to the Figure of the things from which these terms are borrow'd.

71. BESIDES these Cavities which appear on the outward Surface of Bones, there are others internal, which cannot be discover'd till the Bones have been broken. These we must refer to the description of the Internal Structure.

72. AMONG the external parts of Bones (N^o 40.) I reckon'd the superficial Inequalities which are to be observ'd in them. Of these some serve for the insertion of Tendons, others for receiving and fixing Muscles: both kinds were formerly term'd Impressions, Seats, &c. I have likewise chosen to call them Marks, Sides, Traces, &c. adding the Epithets of Ligamentary, Tendinous, Muscular or Aponeurotick, to express their uses at the same time.

*Superficial
Inequalities
of Bones.*

73. THESE Inequalities augment the Surface of some Bones, and render it proportionable to the extent of a Membrane which covers them, call'd Periosteum, of which hereafter.

74. THO' these Inequalities are partly rais'd and partly depress'd, yet they are too superficial to be rank'd among those to which we have given the names of Eminences and Cavities.

75. By the word Region I understand certain Portions of the Surface of a Bone, determined in respect of extent, figure, situation or other circumstances.

*Regions of a
Bone.*

76. THUS with regard to extent and figure, the long Bones are divided into a middle Part and Extremities; the broad Bones, into Sides, Angles, Bases and Edges. These Edges are sometimes termed Costæ, sometimes Cristæ, and they are sometimes subdivided in two lateral parts call'd Labia.

77. WITH regard to Situation, Bones are divided into the upper, middle, lower, antierior, posterior and lateral parts, and these again into external and internal, as occasion requires.

78.

78. BUT in order to determine these several parts exactly, the natural Situation thereof ought to be well observed, in doing which I shall always consider the Subject in an erect posture. And indeed it would be proper that this rule should be extended to all the other parts of the body, that the Language of Anatomy might be perfectly uniform, and that one person, for instance, might no longer call that the Superiour Part, which another calls the Anteriour. Such confusion may be of very bad consequence in Reports deliver'd to Judges.

79. WE must likewise observe, that the words Internal and External, besides their ordinary and natural Signification, are taken in several other Senses by Anatomists.

80. IN such cases, I shall call that part Internal that lies nearest a Plane, which being supposed to pass from the Crown of the Head down between the two Heels, divides the Body into the right and left Sides; and the part that is furthest from such a Plane I shall name External. Thus the Edge of the Orbit, near the Nose, is Internal; that near the Temples, External.

81. I shall observe this rule likewise in the parts which compose the Extremities; thus I shall call that side of the Tibia External which is next the Fibula of the same Leg, and that Internal which is next the other Leg.

Colour of a Bone.

82. THE last thing to be taken notice of concerning the External conformation of Bones is their Colour, which is not only different in different Bones, but in the different parts of the same Bone; but this observation relates properly to fresh Bones, and not to the Sceleton.

Internal structure of Bones.

83. ALL that relates to the Internal Structure of Bones may be reduced to two heads, their Substance and inward Cavities.

Substance of Bones.

84. The substance of Bones is found on examination to be a texture of solid Fibres differently disposed, according to the particular conformation of each Bone. These bony Fibres are easily distinguish'd on the Surface of the Ribs, where they may be separated much after the same manner as we do those of Whalebone or Horn. We may likewise discover them by the Fissures in Bones which have been long exposed to the Sun or Air, or any otherways dried.

85. IN general these Fibres are so disposed, as to form in some Bones Laminæ of a considerable extent; in some, little plates or small portions of the foremention'd Laminæ; and in others, Filaments of different sizes.

86. THE general Structure of the substance of Bones consists in this disposition; and their substance is partly compact or solid, partly cellulous or spongy and partly reticular.

87. THE solid part lies chiefly towards the outside of Bones, the cellulous part, toward the inside. The first is most considerable in the large hollow Bones, the other in those which have no remarkable Cavities.

88. THE solid part is form'd by Laminæ disposed in different Strata. The spongy part consists chiefly of the plates and Filaments variously interwoven: the Filaments alone form the reticular texture principally observable in the long hollow Bones.

89. WE may be convinced, that the solid part of Bones is made up of different Strata of Laminæ, closely join'd together, by examining broken Bones, those that have been long expos'd to the Air, Rain, or Sun, those that have been calcined by Fire to a certain degree, or those that have been soften'd by long and violent boiling, as in *Papin's Digester*.

90. AND even without the help of such Preparations, the Laminæ in some Bones may be seen through a good Microscope; and still plainer in Exfoliations, the coming away of the Splinters of Bones after Wounds, &c. The number of these Laminæ answers to the thickness of the Bone.

91. *GAGLIARDI*, Professor of Anatomy at *Rome*, pretends to have observ'd that these Laminæ are connected by means of certain small long Bones, which running through them in different places, some directly, others obliquely, nail them together like so many Pins.

92. THESE little Bones, he says, seem to be transverse Epiphyses of the bony Fibres, of which the Laminæ are composed: and that they are of various kinds and figures, straight, crooked, branched, long, and short, and that some of them have small heads belonging to them.

93. THEY appear, according to him, to arise from within outward in each Lamina, except a few near the outer Surface of the Bones, the Points of which are turn'd inwards in a contrary direction to the rest; in such a manner as that the Nails or Pins arising from the internal Laminæ pierce several of those that lie upon them, and each of these again send out others which pierce those that surround them.

94. LASTLY, he says, that these little Bones are not only of different kinds and figures, but of different orders likewise, and that they are found in great numbers, even in the cellular Substance of Bones. I cannot here take upon me to form any Judgment of this Doctrine, having been hitherto unable to satisfy my self so much as about the Existence of these little Bones from all the Experiments I have made.

95. To return to the Laminæ, the external may be observ'd to lie in pretty regular Strata; but in the more internal, this disposition is gradually alter'd, these appearing in some measure to lie in Gathers or unequal Folds. The innermost of all are perforated by many Holes of different size and figure.

96. IN this manner do the Laminæ which compose the solid parts of Bones, change their regular Disposition, to form what I call the cellulous or spongy part, which makes up almost the whole interiour Texture of the Bones which have not large Cavities, and of all the Epiphyses without exception; but in the hollow Bones this part is found only near the Extremities.

97. THE Cells or void Spaces in this spongy part are more considerable in some Bones than in others; and the Plates which compose them differ in form as well as in extent; being more or less flat, crooked, twisted, angular, irregular, thick, thin, broad, narrow, &c.

98. IN many Bones these Plates appear to degenerate into small Filaments, so that the cellulous part of such Bones is, as it were, a mixture of

Plates and Filaments, representing a kind of fine Sponge. In some Bones, a certain regularity may be observed in the disposition of them.

99. BESIDES the small Filaments found in the cellulous part of Bones, there is a reticular Texture of them in the Cavities of several long Bones; the bony threads of which net-work, are long, fine, branched and pliable, and curiously interwoven at different distances.

100. THIS reticular Texture may be said to arise partly from the sides of the innermost Laminæ of these Bones, partly from their Extremities, and partly from the cellulous Portion. Several Ramifications are produced from it, which appear, as it were, suspended in the Air, through the whole length of the Cavity of the Bone, meeting and uniting together from all quarters, in many places, which, however, are always at a considerable distance from each other. This Texture is very often destroy'd in taking out the Marrow, when Bones are design'd for a Sceleton.

*Internal
Cavities of
Bones.*

101. BESIDES the Cavities which appear in examining the external Conformation of Bones, there are others observable in examining their internal Structure; which may all be reduced to three kinds, very different from one another.

102. THE first kind comprehends the large internal Cavities found chiefly in the middle of the long Bones, which are nearly of a Cylindrical Figure; such as the Os Humeri, Ulna, Radius, Os Femoris, Tibia, Fibula, the Bones of the Metacarpus, Metatarsus, Fingers and Toes. In these the Cavities are proportionable to the length and thickness of the Bones.

103. THE Surface of these Cavities is more smooth and even in the middle than near the Extremities, where they become more rough, unequal, and furrow'd, according as the disposition of the Laminæ happens to be changed; and bony Productions or cross Pieces may sometimes be observed in them, which are either single or combined together in different manners. The reticular Texture already described, is chiefly found in these large Cavities.

104. THE second kind of internal Cavities consists of the Cells and Intervals in the cellulous Portion of Bones.

105. OF these some are large, small, single, double, or more compounded, and of these last some contain several small ones within them. Others are round, flat, oblong, tubular, oval, angular, square, irregular, &c. And of these the oblong and tubular lie in directions nearly parallel to the length of the Bone. Almost all these Cells communicate with one another in different manners.

106. THE third sort of internal Cavities comprehends the Ducts and Pores found in the Substance of Bones.

107. OF these Ducts some are very small, and lose themselves in the inner Substance of the Bone; the rest are larger, which having penetrated the Substance of the Bone for some space in an oblique Direction, do afterwards pass quite through it. These latter are but in small number, and are more seldom met with in the middle of Bones than about their Extremities and Edges. The former are very numerous, and lie commonly in a Direction parallel to the length or breadth of the Bone.

108. THE internal Pores, tho' imperceptible to the Eye, are plainly discover'd by the yellowish Matter which transfuses through Bones long kept without being prepared. *Havers* pretends to have observed the particular Disposition of them, but I have never hitherto been so lucky.

109. ALL that has been said about the inward Structure of Bones, may be exemplify'd in the Os Femoris, by sawing it through the middle lengthwise.

110. FOR thus we discover the three different Substances very plainly; the middle part consisting of a Tube, with thick sides form'd by the compact or solid Substance alone; the Extremities made up chiefly of the cellulous Substance, and the reticular Substance observable in the Cavity of the middle Part.

111. THE Laminæ of the solid Part, are gradually separated from one another towards the Extremities, being connected by small lateral Plates differently disposed in form of Cells. From this disposition the Laminæ come to be of different lengths, those near the Surface of the Bone reaching to the very end thereof; the rest, which lie more inwardly, decreasing gradually in length: thus the innermost Lamina is the shortest; the outermost, the longest; and the intermediate ones of different lengths between these two extremes.

112. FOR this reason the solid Substance of the Os Femoris is very thick in the middle, but grows gradually thinner towards each end, appearing there only as a bony Crust laid over the cellulous Substance. It may likewise be observ'd, that the most interior Laminæ are less smooth and even than the other, lying, as has been said, in gathers or folds with some openings between them, and in a word every way irregular.

113. THE spongy Substance appears clearly enough to be made up of irregular Portions or Fragments of both the internal Laminæ, and of the Extremities of all that lie between these and the outermost.

114. THESE Portions of Laminæ, which I call Plates, appear in some places to have something of a regular Disposition: for from the middle of the Bone to its upper Extremity, the Fragments from the outer Laminæ follow nearly the same Direction with the Laminæ themselves; but in those that lie more inward, and are consequently shorter, these Plates gradually leave the Circumference of the Bone, and turn towards its Axis, or that Line which may be imagined to run in the middle of the Bone through its whole length. From this Disposition, they seem to form several Vaults or Hives placed one upon another, the small distances left between them being fill'd by another numerous Order of little Plates, situated some more some less transversely.

115. BELOW the middle of the Os Femoris, and towards the inferior Extremity, the Fragments are more disposed according to the length of the Bone, and the little Plates which fill up the Spaces between them, are more transverse. It may be remark'd likewise, that these Plates in many places, and principally towards the ends of the Bone, seem to degenerate into

small Filaments of different sizes, which together with the Plates from which they arise, represent a kind of Sponge.

116. IN the cellular Substance of both ends of the Bone, some Marks of the original Union of its Epiphyses are often to be seen. In Children each of these Marks has a thick Stratum of Cartilaginous Matter, which as they grow up becomes gradually thinner and harder, and at length ossifies. In many Subjects these Marks are totally effaced, the Epiphyses then becoming true Apophyses, or at least as difficultly separable from the body of the Bone as Apophyses are. In other Subjects this Ossification remains long without being compleated, and thus the Epiphyses may, either by Art or accidentally, be loosen'd and parted from the Bone.

117. THE Os Femoris furnishes us with an example, not only of the three different Substances in Bones, but also of the different kinds of internal Cavities. We see one large Cylindrical Cavity, through the whole length of its middle part; also numerous lesser Cells of various Figures and Dimensions form'd in the Interstices of the cellulous Substance in both Extremities; and lastly, little Eyes or Holes in the Interstices of the reticular Substance, and where the Filaments are mingled with the Plates in the spongy part. We may likewise discover the small Ducts, which are either distributed through the Substance of the Bone, or penetrate it all the way to the Marrow. The Existence of the invisible Pores is likewise demonstrated, through which the Marrow transudes, being first convey'd through the whole thickness of the Bone.

*Connexion of
Bones in ge-
neral.*

118. THE Connection of Bones is a Subject which in all Ages has occasion'd Disputes, and we find even the best Authors divided in their Sentiments about it. I shall not here give any History of these Controversies, but content my self with conveying a simple and exact Idea of the thing it self, by which the Reader may be in a condition to clear up and remove misunderstandings, doubts, and prejudices, and distinguish what is true and certain from what is false and doubtful.

119. IN order to this, we need only consider well the resemblance between the Structure of the Bones, and that of a Building; or to make the Comparison more adequate, that of a moving Fabrick, as a Ship, Coach, Clock, or any other such Machine.

120. EVERY one will agree, that two things are absolutely necessary to put together all the Pieces of which it consists; first, they must be set in their proper places; and secondly, they must be kept there. To set them in their proper places, they must be exactly proportion'd to each other, whether they be designed to remain immoveable as the Beams, Joysts, Pillars, &c. or be contriv'd for Motion, as the Doors, Windows, Wheels, &c. Both these kinds of Pieces are form'd into different Shapes, that they may agree with one another, and all of them together make a commodious Structure.

121. THE several Pieces being thus adjusted, are afterwards united together in different manners, by glewing, nailing, jointing, lying, hanging, chain-
ing,

ing, &c. so that the Methods, both of putting and keeping them together, must vary suitably to the form, situation, and use of each Piece.

122. IT is easy to apply what has been said to the Composition of the Sceleton, or rather to the natural Fabrick of the Human Bones, which cannot serve the purposes it is designed for, except the several Pieces of which it consists, be fitly adjusted, and then kept together by different ways. The most ancient Osteologists, (speaking only of the perfect Bones of an Adult) call'd the first of these Articulation, and the other Symphysis.

123. ARTICULATION thus understood is of two kinds, one moveable, by which the Bones are allow'd a certain degree of Motion; the other immoveable, by which they are fix'd together without Motion. The first is commonly call'd *Diarthrosis*, that is, (according to the expression of *Carolus Stephanus*, an ancient Physician of the Faculty of *Paris*) an Articulation separated; the other *Synarthrosis*, or an Articulation conjoined. *Articulation of Bones.*

124. IN the *Diarthrosis*, or moveable Articulation, the Pieces are really separate; and the parts in which they touch, are each of them cover'd by a smooth Cartilage, by means of which they easily slide upon one another. In the *Synarthrosis*, or immoveable Articulation, the Pieces are join'd together in such a manner, as that the Parts in which they touch have nothing particular in their Surface, and cannot slide upon each other.

125. There is still another Species of Articulation, which cannot well be reduced to either of the two former, because it partakes of both; and therefore I think it necessary to establish a third kind, by the name of *Amphiarthrosis*, which agrees better to this sort, than to the other Articulations, to which it has sometimes been apply'd.

126. DIARTHROSIS is either manifest with large Motion, or obscure with small Motion. Each of these again is of two kinds, one indeterminate, or with Motion many different ways, as that of the *Os Humeri* upon the *Scapula*, of the *Os Femoris* on the *Os Innominatum*; the other alternative, or with Motion confin'd to two opposite sides, as that of the *Ulna* on the *Os Humeri*, and of the two last *Phalanges* on the first and second. *Diarthrosis.*

127. A Bone is said to be moveable many different ways, when it can be turn'd upwards, and downwards, forwards and backwards, to the right and to the left, and quite round. The Motion quite round is made either on a Pivot, that is about an Axis, or in the manner of a Sling, where the Bone describes a sort of Cone or the Figure of a Funnel, one end of it moving in a very small Space, the other in a large Circle.

128. THE first of these round Motions is term'd Rotation by Anatomists; the other is only a Combination of several Motions upwards, downwards, &c. And it must be remark'd, that Rotation is not to be met with in all the Articulations for Motion many different ways, e.g. the Articulation of the first *Phalanges* with the *Metacarpal Bones*, &c. does not admit of it.

129. MOREOVER this indeterminate *Diarthrosis* is of two different kinds; one orbicular or globular, the other flat or planiform.

130. THE Orbicular Diarthrosis is when the round end of one Bone moves in the Cavity of another, more or less proportionable to it, as the Head of the Os Femoris in the Acetabulum of the Os Innominatum; or when the Cavity in one Bone moves upon an Eminence in another, as the Bases of the first Phalanges on the heads of the Metacarpal Bones.

131. THE planiform Diarthrosis is when the articulated Bones slip upon one another, much in the same manner, as when we rub the Palm of one Hand against the other: this Articulation is found in the Bones of the Carpus and Tarsus, and in the oblique Processes of the Vertebrae.

132. THE Ancients call'd the first of these two kinds of Articulation, Enarthrosis; the other, Arthrodia. Some modern *French* Writers seem to comprehend both, under the word *Genou*; a term borrow'd from Workmen, who, probably first ignorantly took it from the Human Body, to apply it to their Instruments. I own, that this term, as used and explained by them, agrees well enough to all the Degrees of the Orbicular Diarthrosis; but there are undoubtedly many Articulations of the other kind so very flat, that a skilful Workman would not allow them the name of *Genou*.

133. THE Alternative or reciprocal Diarthrosis bears some resemblance to a Hinge, and for that reason the Ancient *Greeks* term'd it Ginglymus, which signifies the same thing; and has accordingly been translated in some modern Languages.

134. IT has been divided into several Kinds; but properly speaking, I think there can be but two. The first is that which is confined to Flexion and Extension; and as in one of these Motions the two Bones always make an Angle, I term it an Angular Ginglymus. This is exactly the same with the Motion of a Hinge. The second Kind is adapted only to small turns toward each side, or to small lateral Rotations, in the Language of Anatomists: and therefore I term it a lateral Ginglymus. In each kind several differences are to be taken notice of.

135. IN the Angular Ginglymus, either each Bone partly receives, and partly is receiv'd by the other, there being reciprocal Eminences and Cavities in each, as in the Articulation of the Os Humeri with the Ulna; or there are only several Eminences in one Bone, receiv'd into the same number of Cavities in the other, as in the Articulation of the Os Femoris with the Tibia.

136. THE lateral Ginglymus is either single, as in the Articulation of the first Vertebra of the Neck, with the Apophysis Dentiformis of the second; or double, that is, in two different Parts of the Bone, as in the Articulation of the Ulna with the Radius.

137. IT must in general be observ'd, concerning these kinds of Articulations, that some of them are more perfect and close than others; and that they are not all confined to Flexion and Extension, or to the reciprocal turns already explain'd, as we shall afterwards see.

138. THE obscure Diarthrosis, or that which admits only of small Motions, is also of different kinds, as shall be shown in the particular Description of the Bones. Examples thereof are found in the Articulations of the

the Bones of the Carpus, and Metacarpus, and of the Fibula with the Tibia.

139. THIS Articulation was formerly call'd doubtful and neutral, and by some Amphiarthrosis, while others reduced it to Synarthrosis. The first of these Names might pass, the rest are improper.

140. SYNARTHROSIS, or the Articulation of Bones so join'd together, *Synarthrosis*. as to remain fix'd in their Situation, is of two kinds; one is made by Ingrailing, and the other in the same manner as a Nail or Pin is fix'd in Wood. The first may again be subdivided into a deep and more superficial kind.

141. THE deep kind is observable in the Articulations of the broad Bones. The Ancients term'd it Suture, because of some resemblance it bears to a coarse Seam, as is seen in the upper Bones of the Skull. It is made by Jags, Notches, and Holes in each of the articulated Bones, by which they are mutually indented, much after the same manner as what is call'd Dove-tailing by the Joiners. By the Ancients it was call'd Unguis, probably because the indented Pieces are rounded like Nails. Sutures have been divided into true and false; which shall be spoke to in describing the Skull.

142. THE other kind is that which is observ'd in Bones join'd together by more extended Surfaces, in which no Indentation appears outwardly. This the Ancients term'd Harmony, and the Articulation of some of the Bones of the upper Jaw were given as examples of it. But tho' they describe it as running in a single Line, they did not mean this in a strict Sense, but only that the Joint was like that of two rough Boards without Grooves. They have expressly told us, that some small Inequalities might be observ'd in these Joints; and some of them have used the Terms of Suture and Harmony indifferently.

143. SUTURE differs very much from Harmony. In the first, the Jaggings and Notches are very considerable, and the Indentation is made likewise by small lateral Eminences therein; so that the Bones thus join'd, cannot be separated without breaking a great many of these Jags and their little Eminences; whereas those that are join'd by Harmony, may easily be parted without breaking any thing, or at most but very little.

144. HARMONY differs from Suture, in that the Inequalities therein are very small, their Union is superficial, and there is no appearance of them on the Surface of the Bones; the Joint there representing only a kind of Line, more or less irregular.

145. THE other kind of Synarthrosis, an Example of which we have in the Articulation of the Teeth, is call'd Gomphosis, a *Greek* Term still retained. I shall describe it in the History of the Bones of the Head, to which both these kinds of Synarthrosis peculiarly belong.

146. THE third general kind of Articulation partakes of both the former two, the moveable and immoveable; and for that reason I have *Amphi-* term'd it Amphiarthrosis, or the mixt Articulation; as resembling Diarthrosis in being moveable, and Synarthrosis in its Connexion. *arthrosis.*

147. THE Pieces which compose it have not a particular Cartilage belonging to each of them, as in the Diarthrosis; but they are both united to a common Cartilage, which being more or less pliable, allows them certain degrees of Flexibility, tho' they cannot slide upon each other. Such is the Connexion of the first Rib with the Sternum, and of the Bodies of the Vertebrae with each other.

Symphysis.

148. HAVING examin'd the Articulation of Bones, we come now to consider their Union or Connexion, properly so call'd, which the Ancients named Symphysis; taking this Term in an improper or large Sense, when they apply'd it to the Connexion of Bones; but in its proper meaning they used it only to signify Ossification.

149. THE Authors, who say that the Ancients took Symphysis for a Species of Articulation, misunderstand them; neither are they more in the right, who advance, that the Ancients look'd upon Articulation and Symphysis as opposite to each other. If they speak of the most early Antiquity, both these Propositions are false.

150. IN the first place, the Ancients do not confound Articulation with Symphysis, but plainly distinguish them, taking Articulation for the simple setting of Bones together, independently of their being connected or kept together. In the second place, they do not look upon these two as opposites, that is, where they talk of Articulation, they do not exclude Symphysis; because their Writings clearly show, that in order to compose the Sceleton, they thought it necessary to bring them both in together.

151. THE Words of *Galen* alone, are sufficient to prove this. In general he tells us, "That the Sceleton is a regular Disposition of all the Bones connected together;" and afterwards, "That their Composition is by Articulation and Symphysis: that Articulation consists in the Bones being naturally rank'd, Symphysis in their being naturally connected." In fine, after having enumerated all the Differences of Articulation, he declares in plain Terms, that by Symphysis, or the Union of Bones, he understands not only that, by which two or more Pieces become one by Age, but also that, by which the Bones are naturally united and connected together in different Ways. Of these he reckons three (as his Predecessors had done) by Cartilage, Ligament, and Flesh. The first kind of Symphysis, they call'd Synchondrosis; the second, Synneurosis; and the third, Syssarcosis. He likewise takes notice, that his Predecessors did not take the word Synneurosis so far in a literal Sense, as if it signify'd the Union of Bones, by means of Nerves; but that they were accusom'd to call both Ligaments and Tendons by the name of Nerves, tho' they were very well apprised of the Distinction of these three things.

152. THE Distinction of Symphysis into that without a Medium, and that with a Medium, can have no place here; for the first, of which the Lower Jaw is cited as an Example, belongs not to the Connexion of Bones, but to their Formation while imperfect; and therefore may be call'd Symphysis of Ossification, and the other Symphysis of Articulation.

153. IN another sense, however, this Division may still be made use of in this manner. All the Pieces which compose the bony Fabrick are naturally connected and united together. This Union or Connexion which, with the Ancients, I term Symphysis, is either without or with a Medium.

154. SYMPHYSIS without a Medium, is where the articulated Bones support themselves in their Situation, without any other assistance than that of their Conformation only; thus the Parietal Bones are mutually fixed by their Indentations, and so give us at once an Example of Articulation and Symphysis. In the same manner the Bones in the Basis of the Skull are supported by those which make the convex part of it. In a natural State, however, none of these Pieces touch one another immediately, but are separated by Membranes which run in between them.

155. THE Connexion or Symphysis of Bones with a Medium, is of three kinds; Cartilaginous, Ligamentary, and Fleshy or Muscular: *i. e.* as the Ancients termed them, by Synchondrosis, Synneurosis, and Syssarcosis.

156. SYNCHONDROSIS, or the Cartilaginous Symphysis, is either moveable, as in that by which the Bodies of the Vertebrae are kept together, or which joins the first Rib to the Sternum; or immoveable, as that of the Offa Pubis, in an ordinary state. The Symphysis of Ossification is different from this, and the Union of Epiphyses belongs to that, rather than to the Symphysis of Articulation.

157. SYNNEUROSIS, or the Ligamentary Symphysis, is found in all the Joints designed for Motion, in the manner that shall be shown in treating of the Ligaments.

158. SYSSARCOSIS, or the Muscular Symphysis, is as real as the two former, and may be said to be much more general, because it accompanies and strengthens the others, and supplies what is wanting in them. The Connexion of the Os Humeri with the Scapula, is a sufficient proof of this: for the Strength and Security of that Joint is owing more to the Muscles, than to the Ligaments.

159. BEFORE we end this Article, it is proper to observe that the word Symphysis taken in the sense of the most ancient *Greek* Authors, is not more ridiculous or improper than the word Aponeurosis, which the Moderns continue to use without hesitation for any tendinous Expansion, tho' it signifies properly a Nervous Expansion. *Galen* has even made use of this term to express all sorts of Connexions; and when he speaks of that of the Diaphragm to the Ribs, he employs the Verb from whence it is derived; so that if we were at liberty to coin a new *English* word, we might in his manner say, that the Diaphragm symphysed to the Ribs.

160. THE Bones are in general in respect to the Body, what a wooden Frame is in respect to the whole Building. They give Strength and Posture to the Body, sustain all its Organes, and keep the Animal in all situations proper for its Functions, by means of their different Conformation, Structure, and Connexion. *Use of the Bones in general.*

161. THE Apophyses and Epiphyses dilate the ends of Bones, and thereby increase the extent of the articulated Parts. They make more room

for the Insertion of Muscles and Ligaments; they change the Direction, and lastly facilitate the Action of many Muscles.

162. THE External Cavities receive the Muscles, direct the Tendons, give passage to the Blood-Vessels, Nerves, and Ligaments, as we shall show particularly in describing each Bone.

163. THE Uses of the internal Structure equally deserve our Attention. The long hollow Bones are very compact in the middle, and thereby secured against bending or breaking in great Motions and the Strokes to which they are exposed. Their Hollowness join'd to the Solidity of their Substance, increases these Advantages; and without augmenting their Weight or Quantity of Matter, enables them to bear very great Loads.

164. THE Cellulous Substance in the Extremities of these Bones, and through the whole Extent of almost all the rest which are not liable to the same Dangers, gives them a large Size, with a small Portion of Substance; and thereby procures for them a sufficient Extent, without any superfluous Incumbrance of Weight.

165. THE Reticular Substance sustains the Body of Marrow with which the great Cavities are fill'd, and the Cells of the spongy Substance serve to contain the separate Portions of Medullary Juice, as shall be shown in the History of fresh Bones.

166. IT is sufficient to observe about the Articulations in general, that the moveable ones serve for all the Motions and Changes of Situation of the whole Body, or of its particular Parts. Those that are immoveable have the same uses which Carpenters or Joiners find in making their Works of many Pieces, when they are to be much exposed to external Accidents.

167. LASTLY, The Connexion or Symphysis of Bones supports them in their natural State, whether they be design'd for Motion or not. I shall speak to all these uses at more length in the History of each Bone, observing nearly the same order in which I have here mention'd them.

A R T. II.

The Bones of the Head.

§. I. *The Bones of the Head in general.*

168. THE Head is composed of several bony Pieces, one part of which by their Connexions form a kind of Oval Cavity properly call'd the Skull. The other represents a complicated Piece of Sculpture, which partly supports the antierior half of the Skull, and as it forms the greatest part of the Face, it is call'd by that name.

169. BEFORE we examine particularly each Bone of the Head, it is necessary, in order to prevent Repetitions and Obscurity, to consider the Head in general, that is, as consisting of all the Bones that belong to it. In this view, several Eminences, Cavities, &c. come to be taken notice of, the Formation of which is owing to more Bones than one; and consequently, in

examining each Bone by it self, we can see but an imperfect Portion of them.

170. IN the Language of Anatomists these parts may be call'd common, and those that belong to some one Bone only may be term'd proper. The common parts ought first to be distinctly known, before we go on to the proper ones; if we would shun an inconveniency otherwise inevitable, of explaining one unknown thing by another equally unknown.

171. THE Bony Head being considered as one Piece, the following particulars may be taken notice of in it: 1. Its Situation in general; 2. The Size; 3. The Figure; 4. The external Parts; 5. The internal Structure; 6. The Situation in particular; 7. The Connexion; 8. The Uses. I shall follow the same order nearly, through the whole of this Exposition.

172. THE Head is the highest or most superiour Part of the whole Skeleton. *Situation in general.*

173. THE whole Head of the Sceleton is Spheroidal, composed as it were, of two Ovals, a little depress'd on each side. One of them is superiour, the Extremities pointing forward and backward; the other is anteriopur, the Extremities being turn'd upward and downward in such a manner, as that one Extremity of each Oval meets and is lost in the other, at the place particularly known by the name of the Forehead. *Figure.*

174. THIS complex Figure being view'd sidewise, represents a Spheroidal Triangle; and we ought further to observe about it, that the Oval of the Skull is broader behind than before, and that of the Face broader above than below.

175. THE upper Region is term'd the Crown of the Head, the lower, the Basis; the lateral Regions, the Temples; the Anteriopur, the Forehead; the Posterioir, the Occiput; the lower part of which is call'd the Nape of the Neck. *Regions.*

176. SOME of the Eminences, Cavities, and Inequalities are External, being visible in an intire Head; others are Internal, and can only be discovered by opening the Skull. Both these kinds are either proper, belonging only to some one Piece; or common to more Pieces than one. *Eminences, Cavities, Inequalities.*

177. THE External Eminences are ten in number, two Mastoide, two Styloide, two Condyluide, two Pterygoide, and two Arches, call'd Zygomata. Of these five Pairs, the three first are simple or proper; the other two, viz. the Zygomata and Pterygoides are compound or common, being form'd by the Connexion of more Bones than one; the Zygomata by the Offa Temporum, and Offa Malarum; the Pterygoide Eminences by the Os Sphenoides and Offa Palati. To these may be added the Tubercle and external Spine of the Occiput, and the Condyluide and Coronuide Apophyses of the lower Jaw. *External Eminences.*

178. THE simple external Cavities are, the Parietal Holes; the Superciliary Holes, in place of which there are sometimes only Notches; the superiour orbital Slits; the Optick Holes; the external, or rather inferiour Orbital Holes; the Holes in the Offa Nasi; the Holes in the Offa Malarum; *Simple External Cavities.*

the Maxillary Fossæ; the Oval Holes in the Basis of the Skull; the Spinal Holes; the Orifices of the Passages of the internal Carotides; the Mastoide Grooves; the Stylomastoide Holes; the posterioir Mastoide Holes; the large Occipital Hole; the anterior and posterioir Condylode Holes; the Glenoide Cavity and Fissure for the Articulation of the lower Jaw: the external Auditory Hole; the small posterioir Maxillary Holes; the Sockets in both Jaws; the internal and external Orifices of the Canal of the lower Jaw, which last may likewise be named the Holes of the Chin.

*Compound
external
Cavities.*

179. THE compound external Cavities are the Orbits, the Edges of which are divided into two lateral parts, improperly call'd Angles, one internal toward the Nose, the other external toward the Temples; the Temporal Fossæ; the Zygomatic and Nasal Cavities, which last are also call'd Nostrils; which have anterior and posterioir Openings, and are parted by a middle Septum; the Vault of the Palate; the anterior Hole of the Palate, or of the Incisors; the posterioir Holes of the Palate; the Pterygoide Fossæ; the inferioir Orbitary, or Spheno-Maxillary Slits; the interior Orbitary Holes, one anterior, and one posterioir; the Nasal or Lachrymal Duct; the Duct of *Eustachius*, call'd the Aqueduct, the small Fossæ for the internal Jugular Veins; and the Foramina Spheno-Palatina and Lacera.

*Internal
Eminences.*

180. THE internal Eminences are the Frontal or Coronal Spine; Crista Galli; the Sella Turcica or Sphenoidalis; the Clinoide Apophyses, Apophyses Petrosæ; the internal Occipital Spine; the Crucial Tubercle, and two lateral Cristæ.

*Internal
Cavities.*

181. OF the internal Cavities, one is simple, the bottom of the Sella Sphenoidalis, call'd Fossâ Pituitaria. The rest are compound, *viz.* eight large Fossæ in the Basis of the Skull, two anterior, two middle; and on the backside, two upper, and two lower: The Grooves of the superior longitudinal and of the lateral Sinusses, and the Sulci of the Arteries of the Dura Mater.

*External
Inequalities.*

182. THE external Inequalities are two large semicircular Planes surrounding the Temples, one on each side; the Edge or Circumference of which, begins by a sort of Crista or Spine above the external Angle of the Orbit, and ends in two Arches; one on the foreside, the other on the backside of the Mastoide Process; two Occipital Arches, one superior, the other inferior, which are both divided into two Portions by the Occipital Crista or Spine; the external Vestiges of the Sutures, &c.

*Internal
Inequalities.
Substance.*

183. THE internal Inequalities are the undulated Impressions in the Basis of the Skull; the internal Vestiges of the Sutures, &c.

184. THE compact or solid Substance of the Bones of the Skull, is call'd Table, of which one is External, and another Internal, call'd also the Vitreous Table, as being more brittle than the former, because it is of a more close Texture.

185. The spongy or cellulous Substance between the two Tables, is named Diploë, the quantity of which is proportionable to the thickness of the Bones. In some places it is wanting, and there the Tables uniting, are something transparent, as in the temporal Bones, &c. In the internal Table

Table there are several considerable Depressions, some of them near a quarter of an Inch in depth, which run in through the Diploë, and even reach the outer Table. These Depressions deserve to be taken notice of in relation to the Operation of trepanning.

186. BY the Situation of the Head in particular, I understand the natural Posture of it, when a Man stands, or sits, without inclining his Head either backwards or forwards, to one side or the other, or drawing it down upon the Neck or Shoulders. Particular regard ought to be had to this Situation in examining the Head, either in general or in particular; and especially in considering the lower parts of the Basis of the Skull, and Arch of the Palate. *Situation in particular.*

187. THE common Method of showing these parts in a Skull turn'd upside down, has often occasion'd even expert Anatomists to mistake the upper Parts for the lower, and the lower for the upper. Therefore it is very necessary for beginners often to hold the Skeleton of a Head raised, in its true Posture, and to view it from below upwards, that they may frame to themselves a just Idea of it.

188. IN order to this, whether the Head be held in our hands, or set upon any thing else, the best way I have as yet hit upon, is to place the two Zygomatic Arches in a plane exactly parallel to the Horizon. An Head divided into two equal lateral Parts, is likewise of great use in determining the true situation of the Parts I have mention'd, and of those that lie near them.

189. THE Connexion of the Head with the Trunk is by Ginglymus; the Condylode Proccesses of the Os Occipitis, being received in the superiour Cavities of the first Vertebrae of the Neck. The Connexion of the particular Bones of the Head with each other is partly by Diarthrosis, as in the Articulation of the lower Jaw; partly by Synarthrosis, which obtains in the Articulation of all the other Bones, as shall be shown hereafter. *Connexion.*

190. THE principal Uses of the Bones of the Head are to contain the Brain, to be the Seat of the Organes of Sensation, and to serve for Mastication, Respiration, the Voice, &c. *Uses.*

§. 2. *The Bones of the Skull in particular, and first, the Os Frontis.*

191. THE eight principal Bones of the Skull are ordinarily divided into common and proper. By proper Bones, Anatomists mean those which are wholly imploy'd in forming the Globe of the Skull; and of these they reckon six, the Os Frontis, two Parietal Bones, the Occipital Bone, and two Ossa Temporum. The common Bones are those which contribute to form the Face as well as the Skull, viz. the Os Ethmoides, and Os Sphenoides.

192. THIS Division is not just, for the Os Frontis and Ossa Temporum deserve as much to be call'd common, as the two that are reckon'd such; and thus, instead of six, there would be only three proper Bones, the Ossa Parietalia, and Os Occipitis; and instead of two, there would be five common ones; the Os Frontis, two Ossa Temporum, the Os Ethmoides and Os Sphenoides.

- Situation of the Os Frontis in general.* 193. THE Os Frontis is situated in the antierour part of the Skull, and forms that part of the Face, which is call'd the Forehead, from whence it has its Name.
- Figure.* 194. ITS Figure is Symmetrical, resembling a large Shell almost round; so that two frontal Bones of the same size join'd together, represent one sort of Shell-Fish pretty exactly.
- Division.* 195. BEFORE we speak of the parts of this Bone, we must take notice, that tho' it is always look'd upon as one Bone, it is sometimes found to be divided into two equal Parts, by a continuation of the sagittal Suture, and this Division is common to both Sexes equally.
- Regions.* 196. WHEN we consider it as one Bone, it may be divided into an upper Part, which belongs to the Crown of the Head; a lower Part, which belongs to the Basis of the Skull; an antierour Part, which is the Forehead; and two lateral Parts, at which the Temples begin.
197. IT has two sides, one external, which forms the Forehead, the greatest Part of it being convex; and one Internal, which is concave in proportion. By external I here mean what appears when the Skull is intire; and by internal, what cannot be seen till the Skull is open'd.
- External Eminences.* 198. ON the outside we observe the following Eminences; two superciliary Arches, which form the upper Edge of each Orbit, or the Supercilia; three risings not always equally apparent, one between the two Arches, and the other two above the Arches, which may be call'd the Knobs of the Forehead: five Apophyses, one at the Extremities of each Arch; one between the Orbits which sustain the Offa Nasi, and which in some subjects makes a part of the bony Septum of the Nose. This last I call the Nasal Apophysis, and the other four, the Angular Apophyses.
- External Cavities.* 199. THE external Cavities are these: two Orbitary Arches or Vaults, forming the upper Portions of the Orbits: a remarkable Depression in each of these Vaults, above the external Angle, which contains the Lachrymal Gland: A small Depression above the internal Angle, to which is fix'd the Cartilaginous Pulley of the great Oblique Muscle of the Eye: two Portions of the temporal Fossæ: two little Cristæ, which form the antierour Extremity of the great semicircular Plane of the Temples on each side, at the Edge of the superciliary Arches, near the external Angle: two superciliary Foramina, which are sometimes double, and sometimes only Notches; and lastly, two Holes or Portions of Holes, call'd the internal Orbitary Holes.
- Internal Eminences and Cavities.* 200. ON the inside of this Bone we see a sharp perpendicular Eminence, call'd the Frontal or Coronal Spine, directly opposite to the middle rising on the outside already mentioned; Above this Spine, a portion of the Groove for the longitudinal Sinus, which, when the Spine is wanting, runs down lower; Below the Spine, a considerable Opening, call'd the Ethmoidal Opening, because it contains the Os Ethmoides, the sides thereof are always more or less Cellulous. Between this Opening and the Coronal Spine, a blind Hole which in some subjects is wholly in the Os Frontis, in others, common to that Bone, and to the Os Ethmoides, and which seems to open into the frontal

frontal Sinusses near the Nose: the antierour Fossæ of the Basis of the Skull, which receive the antierour Lobes of the Brain; and which, by jutting out forwards, form the risings on the outside already taken notice of; towards the lower Part, they are uneven, answering the Inequalities of the Lobes, and they are also a little rais'd to make room for the Orbits: Sulci or Furrows for the Arteries of the Dura Mater, and sometimes indeterminate Depressions mention'd, N^o. 181. in the general Account of the Head.

201. THIS Bone is compos'd, as has been already observ'd in general, of two Tables and a Diploë, except the orbitary Vaults, which are very thin and without any Diploë. About the middle of the lower part of the Bone, where the middle rising is commonly situated, the two Tables are parted, to form two Cavities, call'd the frontal or superciliary Sinusses; and the separated Portions are each of them in some measure composed of two Tables, or at least have two Surfaces, which makes in all four Surfaces or Tables. *Substance and Sinusses.*

202. THE frontal Sinusses are extended on the Edge of the Supercilia, on each side, more or less, all the way to the superciliary Perforations: below, they are open, and communicate with the Cells of the Os Cribrosum. They are commonly parted by a bony Septum, which is often more to one side than to the other, and more or less uneven. Sometimes it is perforated; and sometimes part of it and sometimes the whole is wanting.

203. In different Subjects, these Sinusses are observ'd to vary extremely, both in respect of their Extent, which in some is very small, and in respect of their Form, which is often very irregular and their Disposition, cellulous. Sometimes they are intirely wanting, and in such Subjects, the internal Cavity of the Nose is larger than ordinary. It has likewise been remark'd, that one of them does not open into the Nose, but only communicates with the other.

204. To have a just Idea of the true Situation of all the Parts of this Bone, we ought, in examining or demonstrating it, to hold it in the same Manner as it is situated in an intire Head, placed as has been already directed, N^o. 188. For thus, we shall see that the upper Part of it is a little inclined backward, and that its Circumference or Edges are in an inclined Plane. *Situation in particular.*

205. THE Os Frontis is articulated by Suture, with seven other Bones; the Offa Parietalia, Os Ethmoides, Os Sphenoides, Offa Lachrymalia, Offa Nasi, Offa Maxillaria and Offa Malarum. *Connexion.*

206. IT contains the antierour Lobes of the Brain, and a Portion of the longitudinal Sinus. It forms the Forehead, the upper Part of the Orbits, and a Portion of the Temples. *Uses.*

§. 3. Offa Parietalia.

207. THE parietal Bones are two in number, one on each side, situated on the superiour, lateral, and a little on the posteriour Parts of the Skull.

Size and Figure.

208. THEY are of a larger Extent than any other Bone of the Skull; their Figure is nearly that of an irregular convex Square.

Parts.

209. THEY have each, two Sides, one external and convex, the other internal and concave; four Edges, one superiour or Sagittal, one inferiour or Temporal, one anterior or Frontal, and one posterior or Occipital. The superiour Edge is the longest, the inferiour the shortest, in which there is a very large squamous Slope, which I name the temporal Slope. The upper and posterior Edges are indented through their whole length. The anterior Edge is likewise indented, except at the lower Part; all the lower Edge is squamous, except a small Portion next the Os Occipitis.

210. IT has four Angles, the anterior and upper, the anterior and lower; the posterior and upper, the posterior and lower. The anterior and lower Angle ends in a squamous Production, which, from its Situation, I call the temporal Angle or Apophysis.

211. ON the outside, above the temporal Slope, we see the most considerable Portion of the semicircular Plane of the temporal Muscle. Near the upper Edge, towards the posterior Angle, is a small Hole call'd the parietal Hole, which is sometimes found only in one of the Bones, sometimes in the sagittal Suture, and sometimes it is wanting. In some Bones, it goes only to the Diploë; in others, it perforates both Tables.

212. THE Inside is something uneven, and many Furrows are remarkable upon it, answering to the Ramifications of the Artery of the Dura Mater; the Trunk of which is lodged sometimes in a Groove, sometimes in a very short perfect Canal running through the Substance of the Bone near the anterior and lower Angle. Near that, another such Canal is sometimes, tho' rarely, met with, for another Artery of the Dura Mater.

213. ALONG the upper Edge of this Inside, we see one half of the sagittal Groove for the longitudinal Sinus; and at the posterior and lower Angle we meet generally with a small Portion of another Groove for the lateral Sinus. Lastly, the same sort of irregular indeterminate Depressions are sometimes observable in this Bone, which we took notice of in the Os Frontis.

Substance.

214. THESE Bones are the weakest of the eight that compose the Skull. The Diploë is found between the Tables, through the whole length of the sagittal and occipital Edges, and through the upper half of the coronal Edge.

Situation in particular.

215. To place or demonstrate this Bone in its true situation, we need only observe what has been said concerning its Edges and Angles, N^o 209, 210. remembering only that the posterior and lower Angle reaches further down than the anterior.

Connexion.

216. EACH parietal Bone is join'd to that on the other side, by the sagittal Suture; to the Os Frontis, by the Coronal Suture; to the Os Occipitis, by the Lambdoidal Suture; and to the Offa Temporum and Os Sphenoides, by the squamous Suture.

217. ITS Connexion with the Os Frontis, below the semicircular Plane, is by the squamous Suture, and the same is to be said of its Articulation with the

the Sphenoidal Bone, as well as with the *Ossa Temporum*. The squamous Portions of the *Os Frontis* are cover'd by those of the *Ossa Parietalia*; the squamous Slopes in these last, are cover'd by the *Ossa Temporum*; and the squamous Apophysis of the *Ossa Temporum* is cover'd by a Process of the *Os Sphenoides*.

218. THESE Bones contain a large Portion of the Brain, form part of *Ufes*. the Temples, serve for the Insertion of the temporal Muscles, &c.

§. 4. *Os Occipitis*.

219. THE occipital Bone is situated in the posterior and lower Part of the Cranium. *Situation in general.*

220. IT represents a kind of Losenge irregularly indented, and yet symmetrical, Convex on the outside and Concave on the other. It consists very rarely of two Pieces divided by the Continuation of the sagittal Suture. *Figure.*

221. IT consists of an external and internal Side; of the upper, lower, lateral, and middle Parts (the first four of which may be look'd upon as so many Angles) of four Edges, two Superiour which are indented, and two Inferiour, which are more or less unequal. *Division.*

222. THE outside is Convex, near the middle of which the occipital Protuberance or Rising is observable. Under this Protuberance are two superficial transverse Arches, more remarkable in some Subjects, than in others; one Superiour and largest, the other Inferiour and least, and both reaching to the Mastoide Process on each side. The inferiour Arch is cut at right Angles by a perpendicular Line, call'd the external Occipital Spine or Crista. Under the superiour Arch are two rough Planes, one on each side of the Spine; and between the Extremities of the two Arches, are two other such Planes, one on the right hand, the other on the left. We see likewise two Condyles or Condylode Apophyses crusted over with Cartilages, gently convex, of an oblong oval Figure, and situated obliquely, their posterior Extremities being at a greater distance from each other than the anterior: also a large Cuneiform Production, which, from the Condyles, is directed upwards, and in Adults is often join'd inseparably to the *Os Sphenoides*; it may be term'd Apophysis Basilaris, or the great Apophysis of the Occipital Bone: Lastly, some unequal Tubercles on the lower part of this Apophysis, and two little angular Productions in the Edge of the Bone over-against the Condyles.

223. WE are likewise to take notice of two large Notches under the lateral Angles, which receive the posterior Apophyses of the *Ossa Temporum*: two small Notches or Portions of the Jugular Fossæ, and of the Foramina Lacera; each of which is often divided by a small bony Production: The great Occipital Hole, on the anterior Edge of which there is an Impression for the Insertion of a Ligament: two anterior and two posterior Condylode Fossulæ: two anterior Condylode Holes for the ninth Pair of Nerves, which are sometimes double: two posterior Condylode Holes for small Veins, which are sometimes wanting.

224. THE inside of this Bone is concave, and there we are to take notice of a crucial Groove, the Edges of which are a little rais'd; the upper Branch contains part of the great longitudinal Sinus of the Dura Mater, the lateral Branches receive the lateral Sinusses, and the lower Branch is oftener a Spine or Crista, than a Groove; it is situated opposite to the external Spine, and may be call'd the internal Occipital Spine. It happens often that the Groove for the longitudinal Sinus is more to one side than to the other. We see also the Place where these Grooves cross each other: a considerable Tubercle opposite to the external Protuberance: four Fossæ separated by the four Branches of the crucial Groove, two of which contain the posterior Lobes of the Brain, and the other two, the Cerebellum: a very broad Groove in the Apophysis Cuneiformis, for the Medulla Oblongata, &c. two small Portions of Grooves lower down, which compleat the Grooves for the lateral Sinusses of the Dura Mater. Along the inner Edge of the large Occipital Hole, there is a kind of Groove more or less sensible.

Substance.

225. THE upper part of this Bone is very thick, as being much exposed to blows; the lower part of it is thin, but well guarded by Muscles. The thickest part of the whole Bone is at the Occipital Protuberance, between which and the Tubercle of the crucial Groove, there is a large Quantity of Diploë.

Situation in particular.

226. To set the occipital Bone in its true Situation, the great Foramen is to be turn'd downward, and placed horizontally; the Apophysis Cuneiformis, forward, and a little rais'd.

Connexion.

227. THIS Bone is join'd on the upper part, to the *Ossa Parietalia*, by the Lambdoidal Suture, on the lower and lateral Parts, to the *Ossa Temporum* by the Continuation of the Lambdoidal Suture; on the lower and anterior Part, to the *Os Sphenoides*, by the Apophysis Cuneiformis, both which in Adults make commonly but one Bone. It is likewise join'd by a kind of Suture to the supernumerary Bones, when there are any such.

Uses.

228. THE *Os Occipitis* forms the back part of the Head; serves for the Articulation of the Head with the Trunk; contains a part of the Brain, and almost all the Cerebellum; gives passage to the Medulla Oblongata, and to a great many Vessels and Nerves; gives insertion to a great many Muscles, &c.

§. 5. *Os Sphenoides.*

Situation in general.

229. THE Sphenoidal Bone is situated in the lower part of the Cranium, a little toward the fore-part, making the middle of the Basis of the Skull, from whence it got the Name of *Os Basilare*. It is call'd Sphenoides or Cuneiforme, because it is in a manner wedged in between the other Bones.

Figure.

230. It is of a very odd figure, and yet symmetrical. Its greatest Extent is transverse, and it may in some measure be said to represent a Bat, with its Wings spread.

Division.

231. It consists of a great number of Parts. The posterior and thickest part, by which it is join'd to the Apophysis of the *Os Occipitis*, may be call'd

call'd its Body. The rest is wholly made up of Eminences and Cavities; and in order to examine these methodically, the Bones must first be divided into two Sides, one external, the greatest part of which may be seen in an intire Skull; the other internal, which does not appear till the Skull is open'd.

232. THE Eminences on the outside are these: two temporal Apophyses, *Eminences on the outside.* which are the largest of all the Processes of this Bone, and at the greatest distance from each other; called by *Ingrassias* the great Wings of the Os Sphenoides, and they are sometimes, tho' very rarely, separated from the rest of the Bone by transverse Sutures: two orbitary Apophyses, which form a considerable Portion of the Orbit, next the Temples: a small sharp Process shaped like a Bird's Bill, in the middle space between the two orbitary Apophyses: two Pterygoide Apophyses, each of which is divided into two Alæ, one external, which is the largest, the other internal, the lower end of which is in the shape of a Hook. Each Ala is again divided into two Sides, one external, towards the Temples, and one internal, towards the Palate: Two spinal Apophyses: a little antierior Eminence above the sharp Process, for the Articulation of this Bone with the Os Ethmoides. In some Subjects, instead of this Eminence, there is a little Notch.

233. THE external Cavities are as follow: two Portions of the temporal Fossæ: two Portions of the orbitary Fossæ: two Pterygoide Fossæ, the lower ends of which are divided by an irregular Notch or Slit, which may be term'd Fissura Palatina: a little oblong Fossula at the root of the internal Ala: two superiour orbitary or sphenoidal Fissures: a little Notch at the end of each Fissure, for the passage of an Artery of the Dura Mater: two temporal Notches: two maxillary Notches, the Edges of which help to form the inferiour orbitary Fissures, which I call Fissuræ Spheno-Maxillares; these Edges are likewise sometimes considerably groov'd: two Holes for the superiour Maxillary Nerves: two other Holes on one side of the former, call'd Pterygoide, which in an intire Skull are hid by other Bones: two oval Holes for the inferiour Maxillary Nerves: two little round Holes, call'd spinal Holes, each of which transmits an Artery of the Dura Mater; sometimes they are only Notches: another little Hole between the two Maxillary Holes: a little Groove on one side of the spinal Apophysis, which forms part of the Eustachian Tube.

234. THE internal Eminences are two thin sharp transverse Apophyses, *Eminences on the inside.* which form the superiour orbitary Fissures; called by *Ingrassias* the little Wings of the sphenoidal Bone: a little Process in some Subjects, in the middle Space, between these thin Apophyses, for the Articulation with the Os Ethmoides, which in other Subjects, is a Notch: four clinoid Apophyses, two antierior, and two posterioir; which last are sometimes united in one, and sometimes they run forward all the way to the antierior Processes, forming a kind of Bridge, under which the internal carotide Artery passes at its last Curvature; this Passage has likewise been found divided in two by a middle bony Septum, besides many other Varieties: one or two small Productions, where the internal Carotide enters the Cranium: two little styloide Processes

or Hooks, which in some Subjects join the Extremity of the Os Occipitis, before the perfect Union of these two Bones.

*Cavities on
the inside.*

235. THE internal Cavities are: two Portions of the large middle Fossæ of the Basis Cranii: two superiour orbitary or sphenoidal Fissures: two optick Holes: a small superiour orbitary Hole, near the end of each sphenoidal Fissure, which is often no more than a Notch: a small Groove at the Extremities of the same Fissures: A Depression between the clynoide Apophyses, call'd Sella Sphenoidalis, Sella Turcica and Fossâ Pituitaria. We see likewise almost all the Holes taken notice of in the outside, and in particular, that the superiour Maxillary Hole ought more justly to be call'd a short Canal.

236. BESIDES the Cavities hitherto mention'd, there are two very considerable ones, call'd the sphenoidal Sinusses, situated in the thick Portion of this Bone, under the anterior part of the Sella Turcica and middle Space, between the two optick Holes, reaching as far as the sharp Process or Bill already described; they are commonly divided by a bony Septum, and they open before, on each side of the sharp Process, just behind the superiour Conchæ of the Nose or Ossa Convoluta superiora. Their Figure, Size, Openings, and Septum vary considerably; sometimes one of them is wanting, sometimes one opens only into the other; sometimes they are both wanting; sometimes there are several Cells without any Septum, and sometimes the Septum is placed more to one side than to the other.

Substance.

237. THE Substance of this Bone is compact for the greatest part, having very little Diploë, and what Diploë there is, lies in distinct parts of the Bone, viz. in the thick Portion behind the Sella Turcica towards the Symphysis with the Occipital Bone, and in the Orbitary Apophyses in a small quantity.

*Situation in
particular.*

238. To situate the Sphenoidal Bone aright, the Sella Turcica must be turn'd upward, the sharp Process forward, and the Pterygoide Apophyses downward.

Connexion.

239. IT is articulated with all the other Bones of the Cranium, with the Ossa Malarum, Ossa Maxillaria, Ossa Palati and Vomer.

Uses.

240. THE Uses have all been mentioned in the Course of the Description.

§. 6. *Os Ethmoides.*

*Situation in
general.*

241. THE Os Ethmoides is situated interiorly in the fore part of the Basis Cranii.

Figure.

242. THE Figure of the whole Bone taken together is very particular; it may be said, however, in some measure to be Cubical.

Division.

243. THE Divisions of this Bone are perfectly Arbitrary; that which I make choice of is into a middle and two lateral Portions; in the middle Portion I distinguish three parts, an upper, middle, and lower.

244. THE upper part of the middle Portion is an Eminence, call'd Crista Galli, which is often solid; sometimes, however, it has been found hollow in several degrees, and perforated by a small Opening, which communicates

with

with the frontal Sinusses: A Groove is sometimes met with in its antierior Edge, which leads to the Spinal or blind Hole in the Os Frontis.

245. THE middle part of this Portion is a small horizontal Plate perforated by several Holes, call'd Lamina Cribrosa, and in the back part it has a little Notch for its Articulation with the Sphenoidal Bone. This Lamina may be reckon'd the Body of the Bone, as being what principally supports all the other parts thereof.

246. THE lower part is a perpendicular Lamina which makes part of the Septum Narium. Its Edge is rough and uneven for its better Connexion with the Vomer.

247. The lateral Portions of the Ethmoidal Bone are by far the most considerable, if we regard the size only. I divide each of them in two, one superiour, which is the largest, and which I term the Labyrinth of the Nostrils, it being full of turnings and windings, and irregularly cellulous; and one inferiour in the shape of a Shell.

248. THE Labyrinth has four sides and two ends. The upper side is partly cover'd by the Cells of the frontal Sinus, and large Opening already described. The lower side is partly join'd to the Cells of the Os Maxillare, and partly left exposed and free; it sends backward several Productions more or less considerable, which in Sceletons are often broken. These Productions sometimes join the Root of the sharp Process in the Sphenoidal Bone, being there fix'd in lateral Grooves. The inside is something convex and rough; it is turn'd toward the Septum, and fix'd only to the Edge of the Lamina Cribrosa. The outside is flatten'd and very smooth, from whence it got the name of Os Planum; it makes part of the inside of the Orbit, and at its upper Edge there are often one or two small Notches, parts of the internal Orbitaly Holes already mention'd in the Description of the Os Frontis.

249. THE antierior Extremity of the Labyrinth is unequally cellulous; it is partly cover'd by the Cellulæ in the large Opening of the Os Frontis, and partly by the Os Unguis; and by a kind of Funnel it communicates with the frontal Sinus. The posterioir Extremity is cover'd partly by the Sphenoidal Bone, and partly by the Os Palati.

250. THE inferiour part of each lateral Portion resembles in some measure an oblong Shell, such as that of a Muscle. I give it the name of Concha Narium superior, or upper Shell of the Nostrils. It is very rough and porous, its convex side being towards the Septum, and the concave side towards the Os Maxillare. One end of it is turn'd backward, the other forward, and there the upper part of it joins the Labyrinth, by means of the Funnel already mention'd. This inferiour part is distinguish'd from the superiour or Labyrinth, by a remarkable lateral Groove.

251. WHAT has been said is sufficient to direct us in situating this Bone, *Situation in particular.* remembering only that the Head of the Crista Galli ought to be turn'd forward.

252. IT is of a very delicate and tender Structure, tho' compact and without any Diploë, being almost all composed of very thin bony Plates. *Substance.*

Connexion.

253. IT is join'd to the Os Frontis, Os Sphenoides, Offa Nasi, Offa Maxillaria, Offa Unguis, Offa Palati and Vomer.

Uses.

254. THE Uses of it are to be a principal part of the Organ of Smell, and to give a very great extent to the pituitary Membrane in a small compass, &c.

§. 7. *Offa Temporum.*

Number and Situation in general.

255. THE *Offa Temporum* are two in number, situated in the lower and lateral parts of the Skull.

Figure.

256. THE Figure of each is partly semicircular, resembling the Scale of a Fish, partly like a shapeless Rock ending in several Points.

Divison.

257. EACH of them is divided in two Portions, one superiour, term'd squammous from its Figure, the other inferiour, call'd Apophysis Petrofa or the Rock, not so much from its Figure as from its Hardness. This Portion is easily separable from the former in Children, and some marks of this Divison still remain in Adults, as *Riolan* has observ'd.

258. THEY are likewise divided into two Sides, one external and convex, the other internal and concave; and thus the Eminences and Cavities in them may likewise be divided into external and internal.

External Eminences.

259. THE external Eminences are the Mastoide Apophysis in the lower and posteriour part of the Bone: The Zygomatic Apophysis in the anterior Part: The Styloide Apophysis under the Bone, which seems originally to have been an Epiphysis. In one Subject I saw this Apophysis three Inches in length, and in another, a Styloide Appendix join'd to the ordinary Apophysis by a Ligament, and stretched along the Stylo-Pharingæus Muscle: The capsular Apophysis in which the bony Stilet seems as it were to be set: The articular Eminence of the Zygomatic Apophysis: The Lambdoidal Angle: the lower side of the Apophysis Petrofa.

External Cavities.

260. THE external Cavities are the articular Cavity immediately behind the Eminence so call'd, which both together serve for the Articulation of the lower Jaw: the Crack in the articular Cavities: the Mastoide Notch or Groove in which the Digastric Muscle is inserted: the Opening of the external Meatus Auditorius; the anterior indented Border of that Opening: the Stylo-Mastoide or anterior Mastoide Hole, which is the Orifice of the Passage of the Portio Dura of the auditory Nerve; *Falloppius* term'd this Passage the Aqueduct, not because of its use, but because of the resemblance it bears to a kind of Aqueduct in his Country: the Orifice or inferiour Hole of the carotide Canal in the Apophysis Petrofa, which alters its Direction upward and forward, and ends at the Point of the Rock near the Sella Sphenoidalis: a Portion of the jugular Fossa, and a Portion of the Foramen Lacerum.

261. AMONG the external Cavities, we are likewise to reckon a Portion of the Ductus Palatinus of the Ear, call'd commonly Tuba Eustachiana, and in *France*, the Aqueduct. This Duct, which must not be confounded with the Aqueduct of *Falloppius*, follows pretty much the Direction of the articular Crack: The Zygomatic Notch: The Parietal Notch, which receives the posteriour

posterior and lower Angle of the Os Parietale: the sphenoidal Notch, which receives the spinal Apophysis of the Os Sphenoides: one or more little Sulci for the Ramifications of the temporal Artery: the Groove in the Apophysis Petrosa, by which it is connected to the great Apophysis of the Os Occipitis. We may likewise add the posterior Mastoide Hole, through which a small Vein passes, that empties itself into the lateral Sinus: this Hole is sometimes formed between this Bone and the Os Occipitis, sometimes it is wanting in one of the Bones, and sometimes in both. There is likewise in some Subjects, a small superior Mastoide Hole, which loses itself in the Substance of the Bone.

262. IN examining the internal Eminences and Cavities we must distinguish the squamous Portion from the Apophysis Petrosa. In the former we see the radiated Indentations of the semicircular Edge, which, with the Parietal Bone, forms the squamous Suture: a Portion of the middle Fossa of the Basis Cranii on the same side, and several Inequalities in that Fossa. *Internal Eminences and Cavities.*

263. THE Apophysis Petrosa, or Rock, is a sort of pyramidal Body with three Sides, situated obliquely, so as that its Basis is turn'd backward and outward, and its Apex forward and inward, toward the Sella Turcica. Of the three Sides, one is superior and inclined a little forward; the second posterior, and the third inferior; this last belongs to the outside of the whole Bone, which has been already described.

264. THE upper Side assists in forming the middle Fossa of the Basis Cranii, being uneven in the same manner as the inside of the squamous Portion. We observe here a small irregular Hole appearing to be double, and partly covered by a small bony Plate. This Hole is a kind of Break or Interruption in the Duct, through which the Portio dura of the auditory Nerve passes.

265. IN the backside of the Rock we see the internal Auditory Hole, and a Portion of the Fossa for the Cerebellum. Sometimes small indeterminate Depressions are observable in it, pretty deep in Children, but gradually obliterated as they advance in Years. At the Basis of this Apophysis we see a Portion of the Groove for the lateral Sinus, form'd partly in this Basis, and partly in the lambdoidal Angle: also a Portion of the Foramen lacerum; and a small Point, which, as it were, divides this Hole in two, and distinguishes the passage of the jugular Vein, from that of the eighth Pair of Nerves.

266. As this Apophysis has three Sides, so we may observe in it three Angles; the first superior between the upper and back Sides, the second posterior, between the back and lower Sides, and the third anterior between the lower and fore Side. The superior Angle, which is the most apparent, has a Groove for a small Sinus of the Dura Mater; the posterior Angle is in a manner interrupted near the middle by the Foramen lacerum, and from it proceeds the little bony Point which divides this Hole. At the end of it is a Groove, by which it is connected with the great Apophysis of the Os Occipitis. Between the Apex of the Apophysis Petrosa and the

the superiour Opening of the Carotide Canal, we often meet with a small Bone of the sesamoidal kind, mention'd long ago by *Riolan*.

Situation in particular. 267. To set any one of the *Ossa Temporum* in its true situation, the Zygomatic Apophysis must be placed horizontally and turn'd forward, and the Mastoide Process directly downward.

Substance. 268. ALMOST the whole Substance of the *Ossa Temporum* is compact. The squamous Portion is thin and transparent. The Mastoide Apophysis is hollow'd by considerable Cells. The Substance of the Apophysis Petrosa is very hard and solid, with several internal Cavities for the Organ of Hearing contain'd in it.

Connexion. 269. EACH *Os Temporis* is join'd above, to the *Os Parietale* by a squamous Suture; behind and below, to the Occipital Bone, partly by a true Suture, and partly by Harmony; before, to the great Alæ of the *Os Sphenoides*, by a squamous Suture, and below to the spinal Apophyses of that Bone. It is likewise joined before, to the *Os Malæ* by the Zygomatic Suture.

Uses. 270. THE chief Uses of these Bones are to compleat the Globe of the Skull, to serve for the Articulation of the lower Jaw, and for the Insertion of many Muscles, and lastly to contain the Organ of Hearing.

N. B. The Description of the Bones of the Ear, and of the supernumerary Bones of the Skull, is placed immediately after that of all the other Bones of the Head.

§. 8. *The Bones of the Face; and first, the Ossa Maxillaria.*

271. I shall only add here, to what has been said about these Bones in general, in the Enumeration of the Parts of the Sceleton, that the *Ossa Palati*, *Vomer*, *Conchæ narium inferiores*, and *Ossa Unguis*, are very improperly said to belong to the Face, except we chuse to look upon them as concerned in the internal Structure of the Nose, which is undoubtedly a part of the Face.

Number and Situation of the Ossa Maxillaria. 272. The *Ossa Maxillaria*, or great Bones of the upper Jaw, are two in number, situated one on each side, in the antierour and middle part of the Face.

Figure. 273. THEIR Conformation is very irregular, and they are of a very considerable Extent.

Division. 274. EACH of them may be divided into two Sides, one external, the other internal. By the external Side, I mean all that appears in an intire Skull, without taking in the Arch of the Palate; and by the internal Side, that which makes part of the Arch of the Palate, and all that is turn'd to the Septum Narium.

External Eminences. 275. THE external Eminences are the nasal Apophysis, which makes the lateral Part of the Nose: the orbitary Apophysis, which makes the inferiour Portion of the Cavity of the Orbit, and by a sort of Crista forms the internal Portion of its Edge; this Process is likewise call'd Apophysis Malaris, because of its Connexion with the *Os Malæ*: the Apophysis Palatina, which, together with that on the other side, forms the Arch of the Palate: the Apo-

Apophysis Alveolaris, which is in the shape of an Arch, and contains the Teeth: the maxillary Tubercle, or the posteriour Extremity of the last named Arch: the Spine of the Nares, which is a small pointed Eminence above the anterior Extremity of the Apophysis Alveolaris.

276. THE external Cavities are these: A Portion of the orbitary Fossa, *External Cavities.* where there is a small Fossula, in which the inferiour oblique Muscle of the Eye is inserted, near the lachrymal Duct, and a Fissure or Crack, of which hereafter: a Portion of the Zygomatic Fossa: a Portion of the Fossa Palatina, or Arch of the Palate, in which many little Inequalities are observable, more or less pointed, and often little pointed Hooks.

277. ALSO the lachrymal Opening, which receives the Os Unguis: a small lachrymal Groove, which, together with the Os Unguis, forms the superiour Part of the lachrymal Duct: the Opening of the Nares: a Portion of the inferiour orbitary Fissure, or Fissura Spheno-Maxillaris: the Opening which receives the Os Palati: a very small Notch at the anterior Extremity of the Arch of the Palate, which forms the anterior Foramen Incisorium, so call'd from its Situation behind the Incisors: an oblique Groove in the posteriour Part of the maxillary Tubercle, which contributes to the Formation of the posteriour Foramen Maxillare.

278. ALSO the orbitary Canal, which runs from before, backward immediately under the inferiour Portion of the Orbit: an anterior orbitary Hole, or the anterior Orifice of the orbitary Canal: the posteriour orbitary Hole, or the posteriour Orifice of the orbitary Canal, by which that Canal ends at the Edge of the Spheno-Maxillary Fissure: the Crack or Fissure of the orbitary Canal, which appears more or less in the Orbit, and is often a little open backward: the small Holes of the maxillary Tubercle. The small Holes near the orbitary Canal and those of the Apophysis Nasalis, vary and are sometimes wanting. The Sockets shall be described hereafter.

279. THE internal Eminences and Cavities are as follow: the greatest Part of the Fossa Nasalis: the anterior Crista of the Nares, which is high and narrow: the posteriour Crista of the Nares, which is low and broad. These two Cristæ are a Continuation of the Spine of the Nares, No. 275. and are so dispos'd as to form a long Groove for the Reception of the Septum Narium, when the two maxillary Bones are join'd together: a perpendicular and pretty hollow Groove, wide towards the upper part, narrow towards the lower, which makes the inferiour Portion of the lachrymal Duct.

Internal Eminences and Cavities.

280. ALSO the anterior Ductus Palatinus on one side of the anterior Crista, and near the Spine of the Nares; this Duct, in its Course downwards, joins that of the other Jaw, and both together form the anterior Foramen Palatinum, or Incisorium, which is often very complex: a small anterior Eminence or transverse Line, between the nasal Opening, and the lower end of the lachrymal Duct, which sustains the fore Part of the Concha Narium inferior: a rough broad impression on the maxillary Tubercle, on both sides of the Passage of the Foramen Palatinum, by which this Bone is join'd with the Os Palati: a small posteriour Eminence or transverse Line, cover'd with a Lamina of the Os Palati, which sustains the Inequalities of the posteriour

End of the Concha Narium inferior, by the intervention of a Lamina of the Os Palati, as we shall see afterwards.

281. LASTLY, the maxillary Sinus, which is a large Cavity under the Orbit, in the orbitary Apophysis. It extends to the Suture of the Os Malæ, to the Spheno-Maxillary Fissure, to the inferior orbitary Hole and below, to the Sockets. Towards its upper Edge, there are sometimes Cells, which communicate with the Os Ethmoides. It opens between the two Conchæ Narium, behind the lachrymal Duct, by one or more Orifices, form'd partly by a Portion of the Os Palati, partly by a Portion of the Concha Narium inferior, and sometimes partly by a Portion of the Os Unguis. These Openings are all much higher than the bottom of the Sinus.

282. I say nothing here of the Separation of this Bone by a small transverse Suture, behind the Foramen Incisurum, because it is seldom found but in young Subjects before the Ossification is compleated.

Substance. 283. THE maxillary Bone is almost all compact, and without Diploë, except in the alveolar Arch, and at the Point of the orbitary Apophysis.

Situation in particular. 284. To put this Bone in its true Situation, the nasal Apophysis must be turn'd upwards, the alveolar Arch downward, and the Spine of the Nares forward.

Connexion. 285. THE maxillary Bones are connected with the Os Frontis, Os Ethmoides, Os Sphenoides, Offa Unguis, Offa Malarum, Offa Nasi, Offa Palati, Vomer, Conchæ Narium inferiores, and with each other.

Uses. 286. THEY assist in forming the Organ of Mastication, the Arch of the Palate, the Cheeks, the Orbits, the Nose, &c.

§. 9. *Offa Malarum.*

Number and Situation in general. 287. THE Offa Malarum, call'd also Offa Zygomatica, and Malaria, are two in number, situated in the lateral and middle Parts of the Face.

Figure. 288. THEY are in some measure triangular, or irregularly square.

Division. 289. THEY are divided into two sides, the external gently convex, the internal unequally concave.

Eminences. 290. THE Eminences in each Bone are the superiour or angular orbitary Apophysis, which joins by Suture with the external angular Apophysis of the Os Frontis, and assists in forming the external Angle of the Orbit: from this Apophysis another subaltern Process runs inward on the inside of the Bone, one side of which forms a Portion of the Orbit, the other, a Portion of the Zygomatic Fossa: the inferiour or maxillary orbitary Apophysis, which, with the angular Apophysis, forms the inferiour external Portion of the Orbit: the Apophysis Malaris, which is in some measure the Basis of the rest, and together with the Apophysis Maxillaris joins the orbitary Apophysis of the Os Maxillare: the Zygomatic Apophysis, which makes a part of the Zygoma, and also of the Zygomatic Fossa.

Cavities. 291. THE Cavities are the great orbitary Slope, which makes the inferiour external Portion of the Edge of the Orbit: the Zygomatic Notch above the Zygoma:

Zygoma: one or more little Holes on the outside and in the orbitary Apophyses.

292. EACH Bone is composed of two pretty compact Tables, with a small *Substance*. Quantity of Diploë between them, except in the anterior part of the Apophysis Malaris.

293. THE true Situation will be easily fixed, by considering what has been said about the Sides and Apophyses of this Bone. *Situation in particular.*

294. THE Os Malæ on each side is join'd to the Os Frontis by the angular Apophysis, to the Os Sphenoides by the subaltern Apophysis, to the Os Temporis by the Zygomatic Apophysis, and to the Os Maxillare by its Basis. *Connexion.*

295. THESE Bones make the prominent upper Part of the Cheeks, most remarkable in lean Persons. They form likewise a Portion of the Orbit, and compleat the Zygomatic Arches. *Uses.*

§. 10. *Offa Nasi.*

296. THE proper Bones of the Nose are two in Number, join'd together, and situated below the Forehead, between the two nasal Apophyses of the *Offa Maxillaria*. *Number and Situation.*

297. EACH of these Bones comes near the Figure of an oblong Square, the upper Extremity being narrow and thick, the lower oblique and thin; the middle Part bent inwards near the upper End in some Subjects, in others almost streight. The two Bones join'd represent a sort of Saddle. *Figure.*

298. EACH of them is divided into two Sides, one anterior or external, the other posterior or internal; two Extremities, one upper, the other lower; and two Edges, one external, the other internal. *Division.*

299. THE anterior Side is convex, tho' a little depress'd or hollow'd above the middle. The posterior side is gently concave. The upper Extremity is very thick, full of Points and Depressions. The lower Extremity is thin, unequally indented, and cut obliquely in such a manner, as that the two Bones, join'd together, form an acute slope. The inner Edge, contiguous to the same Edge of the other Bone, is even, except near the upper Part, where they are united by a kind of Suture. From this Edge a little Eminence runs inward or backward (which is sometimes wanting in one of the Bones;) and when they are join'd, these Eminences represent a sort of Crista or prominent Line, answering to the Septum Narium. About the middle of the outside, sometimes higher, sometimes lower, there is a Hole, which is sometimes wanting in one of the Bones, and sometimes there are several Holes in each.

300. THE Substance is compact, sometimes however we meet with a small Quantity of Diploë at the upper end. *Substance.*

301. THE particular Situation of these Bones is easily understood by the Description. *Situation in particular.*

302. THEY are join'd to each other, partly by Suture, and partly by Harmony. They are join'd above to the nasal Apophysis of the Os Frontis, laterally

laterally to the nasal Apophyses of the *Ossa Maxillaria*, and interiorly or posteriorly to the anterior Edge of the perpendicular Lamina of the *Os Ethmoides*, by means of the prominent Line already mention'd.

Uses. 303. THEY form the anterior and upper Portion of the Nose, and part of the *Septum Narium*.

§. II. *Ossa Unguis.*

Number, Situation and Size. 304. THE *Ossa Unguis* or *Lachrymalia* are two in number, each being situated in the Orbit, at the lower part of the internal Angle. They are the least Bones of the Face, very thin and transparent.

Figure. 305. THEY are longer than they are broad, resembling in some measure the Nail of a Finger, (from whence they have their name) especially when in Situ; for being taken out of the Skull, their Figure is more irregular.

Division. 306. EACH of them is divided into two Sides, one external, the greatest part of which appears in the Orbit, in an intire Skull, the other internal, which is hid; two Extremities, one upper, the other lower, and two Edges, one anterior, the other posterior.

307. THE outside is smooth, and a little concave. Towards the anterior Edge, is a Groove full of small Holes, like a Sieve, call'd the *lachrymal Groove*. It begins at the upper Extremity, and runs down lower than any other part of this side of the Bone, the lower Extremity of it being hid by the *Os Maxillare*. It is distinguish'd from the rest of the outside, by a very sharp prominent Edge.

308. THE inside is rough and unequally convex, with a perpendicular Depression, answering to the sharp Prominence on the outside. On the upper part of this inside, small Portions of cellulous *Laminæ* are sometimes observable, which communicate with the Entry of the *frontal Sinus*. There are likewise some about the middle, which compleat the anterior *Ethmoidal Cells*; and others towards the lower end, which communicate with the rugged Portions of the upper Border of the *Sinus Maxillaris*. These often vary, and are sometimes wanting.

Substance. 309. THESE Bones are altogether without *Diploë*.

Situation in particular. 310. WHAT has been said about the two Sides and *lachrymal Groove*, sufficiently determines the Situation.

Connexion. 311. THEY are connected with the *Os Frontis*, with the *Os Ethmoides*, covering a part of the Cells in that Bone, with the nasal Apophysis of the *Os Maxillare*, and with the Groove of that Bone, in such a manner, as that the two Grooves join'd together, form an intire Tube, call'd the *lachrymal Duct*. They also cover a little the Opening of the *Maxillary Sinusses*, and join the inferior *Conchæ* of the *Nares*, of which they appear to be only a Continuation, in an advanced Age.

Uses. 312. THE Uses of them are to compleat the internal Sides of the Orbit, to cover the forepart of the Labyrinth of the Nose, and to form the *lachrymal Duct*.

§. 12. *Offa Palati.*

313. THE Bones of the Palate are two, situated in the posteriour part of the Arch of the Palate, between the Pterygoide Apophyses, and the *Offa Maxillaria*, and running up on the Sides of the nasal Fossæ, all the way to the bottom of each Orbit. *Number and Situation in general.*

314. THE Figure of these Bones is not square, as is said by those who have only seen that Portion of them which belongs to the Palate, and from thence have named them *Offa Palati*. The intire Bone is crooked, hook'd, pointed, and uneven, tho' but of a small size. *Figure.*

315. EACH of them may be divided into four Portions, one superiour, one middle, and two lower; whereof, one is antierior, the other posterior. *Division.*

316. THE lower and antierior Portion, which I call *Portio Palatina*, is the Basis or Body of the Bone, and the only part of it which the ancient Anatomists have observed, *Vidus Vidius* excepted. It compleats the Arch of the Palate, and the Bottom of the nasal Fossa. The inner Edge of it is rais'd, and that join'd to the like Edge of the other Bone, forms a Groove, which receives part of the *Septum Narium*, in the same manner, as the other part of it is received in a like Groove of the *Offa Maxillaria*. The posteriour Edge is gently sloped, and ends inwardly in a Point which joins a like Point in the other Bone.

317. THE lower and posterior Portion, which I name *Pterygoide*, is pointed and hollowed on each side, to join the *Pterygoide Apophysis*, of which it compleats the Fossa, being fix'd like a Wedge in the irregular Notch of that Process. Exteriously it is uneven, the better to be connected with the *Os Maxillare*. This Portion is distinguished from the *Portio Palatina*, and also from the middle Portion, by an oblique Half-Canal which, with the Half-Canal in the maxillary Tubercle, forms an intire Canal, the lower end of which is the posterior Foramen Palatinum.

318. THE middle Portion to which I give the name of *Nasal*, is very thin, and is situated laterally. It has an internal and external Side. The internal Side is a little concave, being turned toward the Nares, and at the lower part of it there is a transverse Eminence or bony Line which distinguishes this Portion from the *Portio Palatina*. The outside is a little convex, and partly covers the Opening of the maxillary Sinus. At the lower part of it, is a transverse Groove, answering to the Eminence on the other side and moulded, as it were, by the posterior transverse Eminence of the *Os Maxillare*.

319. THE upper Portion, which I call *orbitaly*, is distinguished from the nasal Portion, by a Notch, which, together with the *Pterygoide Apophysis* of the Sphenoidal Bone, forms an Opening more or less considerable, which may be call'd *Foramen Spheno-Palatinum* or *Pterygo-Palatinum*. This Portion has five little Sides, three of which are rather Cavities; one superiour, which compleats the Extremity of the Bottom of the Orbit, and is more or less

less flat, very small, smooth and triangular; one antierour, which is a little hollow, covering the upper part of the maxillary Tubercle, and by a smooth rais'd Edge compleating the Fissura Spheno-Maxillaris; the third Side is likewise antierour, more hollow than the former, joining the back part of the Labyrinth of the Os Ethmoides: The fourth is posterour, more or less hollow, answering to the Sphenoidal Sinus: the fifth is lateral and external, covering the posterour and upper part of the Maxillary Sinus. It must be observed, that these Sides and Cavities vary, being sometimes single, sometimes complex.

Substance. 320. THERE is very little Diploë in these Bones, except in the Palatin and Pterygoide Portions.

Situation in particular. 321. BY considering the Division of these Bones already mention'd, it is easy to put them in their true Situation.

Connexion. 322. THEY are join'd to each other by the Portio Palatina, to the Vomer by the common Groove form'd by their rais'd Edges, to the Maxillary Bones before, and laterally, to the Sphenoidal Bone behind, to the inferiour Shells of the Nares, by their transverse Eminences; and lastly, by their Orbitary Portions to the Os Ethmoides, Offa Maxillaria, and Os Sphenoides.

Use. 323. THEY compleat the Arch of the Palate, the Pterygoide and Nasal Fossæ, and the Orbit; they assist in supporting the Vomer and Conchæ Narium inferiores.

§. 13. Vomer.

Situation in general. 324. THE Situation of the Vomer is perpendicular between the two Nasal Fossæ backward.

Figure. 325. THE Figure of it is nearly that of an oblique Square, having some resemblance to a Ploughshare, from which it has its Name.

Division. 326. IT is divided into two sides, one to the right, the other to the left, both of them unequally flat; and into four Edges, the superiour, inferiour, antierour, and posterour.

327. THE upper Edge is an horizontal Groove which receives the sharp Process or Rostrum of the Os Sphenoides. This Groove is broad and a little notched backward; the fore part of it is narrower, and ends in a strait Canal, which runs downward and forward in an oblique direction, dividing the Bone, as it were, into two Laminæ.

328. THE antierour Edge is oblique and very unequal. It may be divided into two parts, one antierour the other posterour. The posterour part is small and thin, and supports the perpendicular Lamina of the Os Ethmoides. The antierour part is larger, with a pretty deep Groove, continued from the Canal in the upper Edge, which sustains the Cartilaginous Septum of the Nares.

329. THE lower Edge is likewise unequal, and near its antierour Extremity, is an Angle which divides it into two parts; one antierour very short, which is set in the Crista Narium; the other posterour and much longer,

longer, set in the common Groove of the *Ossa Maxillaria* and *Palati*. The Angle by which this Edge is divided lies in the Notch form'd by the *Crista Narium* and the Groove of the *Maxillary Bones*.

330. THE posteriour Edge is oblique and sharp, becoming insensibly more obtuse as it approaches to the large Groove in the upper Edge.

331. THIS Bone has but very little *Diploë*.

332. To situate it right, we need only attend to the Description of its parts.

333. IT is connected with the *Os Sphenoides*, *Os Ethmoides*, *Ossa Maxillaria*, and *Ossa Palati* in the manner already said.

334. ITS Use is to form the posteriour part of the *Septum Narium*.

Substance.

Situation in particular.

Connexion.

Use.

§. 14. *Conchæ Narium Inferiores.*

335. THE inferiour Shells of the Nares are two in number, situated in the *Nasal Fossa*, under the Openings of the *Maxillary Sinus*, and immediately above the inferiour Orifices of the *Lachrymal Ducts*. They cover these Orifices much in the same manner as the superiour *Conchæ* of the *Ethmoidal Bone* cover the *Maxillary Openings*. They are likewise termed the inferiour spongy *Laminæ* of the Nose.

Number and

Situation in general.

336. THEIR Figure is very much like that of the superiour Shells.

Figure.

337. TWO Sides are distinguishable in each of them, one internal, and one external; as likewise two Extremities, the anterior and posterior; three Edges, two superiour, one small, the other great, and one inferiour; and lastly, two Apophyses, one small or superiour, the other large or lateral.

Division.

338. THE inside is gently convex, being turn'd towards the *Septum Narium*; the outside is proportionably concave, turn'd toward the *Maxillary Sinus*. Both Sides are rough and uneven.

339. THE Extremities are pointed, but the posterior more than the anterior.

340. THE inferiour Edge, the most considerable of the three, is rough, thick, a little rounded and turned outward, that is, toward the *Os Maxillare*. It is suspended like the *Ethmoidal Concha*, without resting on any thing.

341. THE small or anterior upper Edge is thin, uneven, and of the same length with the anterior transverse Eminence of the *Os Maxillare* to which it is join'd. The large or posterior upper Edge is longer than the other, and is join'd backward to the small transverse Eminence of the middle Portion of the *Os Palati*. These two superiour Edges are distinguished by an obtuse Angle form'd by them. The great Edge has a large thin Apophysis in shape of a Nail, which runs down on the inner or concave side of the Bone. This Apophysis, which is the greatest of the two already mention'd, is sometimes smooth, sometimes uneven, divided and notched. It partly covers the *Maxillary Sinus*, and helps to make the Opening thereof.

342. THE small or superiour Apophysis, is a thin Plate, which divides the two upper Edges. It is, as it were, a small Portion of a Groove which join'd to the lower end of that in the Os Unguis, compleats the Lachrymal Canal, and in Adults it has appear'd to be a true Continuation of the last named Bone, as if the inferiour Concha of the Nares and Os Unguis were both one piece.

Situation in particular.

343. The true situation of these Bones is sufficiently shown in what has been said about their Sides, Extremities and Edges.

Connexion.

344. THEY are connected with the Offa Maxillaria, Offa Palati, Offa Unguis, and sometimes with the Os Ethmoides, of which they appear'd in one subject to be a true continuation. In most Sceletons, these Connexions are but very slender, and therefore these Bones are easily lost, which is the reason why the Ancients have not observed them.

Uses.

345. THEY compleat the bony Structure of the Nose, augment its Surface, and render it proportionable to the extent of the Organ of Smell, and of the Pituitary Membrane.

§. 15. *Maxilla Inferior.*

Situation in general.

346. THE lower Jaw is but one Bone in Adults, and makes the lower part of the Face, being situated there.

Figure.

347. IT bears some resemblance to a Bow, with the ends bent upward.

Division.

348. IT may be divided into a Body and Branches. The Body is that Portion which represents a Bow; the Branches are the Extremities bent upward. In the Body, we distinguish an antieriour Portion, call'd the Chin, two lateral Portions; two Sides, one internal, and one external; and two Edges, one superiour, which is the alveolary Arch of this Jaw, and one inferiour, call'd the Basis, and divided into an external and internal Labium. This Basis ends posteriorly in a crooked Portion, termed the Angle of the lower Jaw.

349. IN the middle of the antieriour Side of the Chin is a perpendicular Eminence or Line which marks the place where this Bone is divided in Children and, for that reason, named the Symphysis of the lower Jaw. On each side of the Symphysis, are two muscular Impressions, one high, the other low, more or less excavated, and in some Subjects distinguish'd by a small transverse Eminence. The external Labium of the Basis of the Chin is a little prominent, and bordered on each side by Eminences more or less considerable, by which the Chin appears to be distinguish'd from the lateral parts of the Body of the Bone.

350. THE backside of the Chin is concave, and Inequalities are seen in it, through the whole length of the Symphysis. From the upper Edge, to the middle of the Symphysis, or thereabouts, runs a superficial Asperity, broader below than above, and more remarkable in the Symphysis, than on either side. Immediately below this Asperity, there are several Tuberosities more or less rais'd and rough, the lowest of which is on the internal Labium of the Basis. On each side of the uppermost Tuberosity, is a large shallow Impression.

At

At the very lowest Border of the internal Labium of the Basis, on each side of the Symphysis, there is a pretty large muscular Impression, with a transverse Asperity between them, which in a manner joins them to each other. We sometimes meet with small Holes in the upper part of the Symphysis, and near it.

351. THE outside of each lateral Portion of the Body of the Bone, is a little convex. On each side of the Chin, is a pretty large Hole which is the antierior Orifice of a Canal hereafter to be described. There is also a long Eminence or Elevation, which beginning at the Basis, near the forementioned Hole, runs obliquely upward and backward toward the Branch of the Jaw, growing more prominent as it ascends. The lower Edge of this Side sometimes juts out a little.

352. IN the inside of this lateral Portion, a little below the alveolar Edge, there is likewise a long Eminence, less oblique, but more prominent, which runs upward and backward, much in the same manner with that on the outside.

353. THE posterior Curve Portions are the flattest of all, and represent a sort of oblong Square, irregular, and a little oblique. In each of these Branches, two Sides are to be taken notice of, one internal and one external; also two Apophyses in the upper part of them, one antierior call'd the Coronoid Apophysis, and one posterior call'd the Condyloid Apophysis; a large Opening between the two Apophyses, and lastly, an Angle by which the posterior and lower part or Basis of the Branch is terminated.

354. THE antierior or Coronoid Apophysis is flat, sharp at the upper End, broad at the lower, something uneven on the outside, and a little prominent about the middle of the inside, by the Continuation of the internal oblong Eminence of the lateral Portion. The antierior Edge of this Apophysis is a Continuation of the oblique external Eminence of the same Portion.

355. THE posterior Apophysis is termed Condyloid, because it ends in a Head resembling a Condyle, set upon a kind of Neck. This Condyle is oblong, and situated almost transversely, the internal Extremity of it being only turn'd a little backward, and the external forward, which Direction answers to that of the articular Eminence and Cavity of the Os Temporis, with which this Condyle is articulated. It advances more toward the inside than toward the outside of the Bone, and the Neck is bent a little forward. This Neck is convex on the back part, and on the fore part there is a muscular Fossula immediately under the Condyle.

356. THE great Opening between the Apophyses, has a sharp Border, which is as it were, a Continuation of the posterior Edge of the Coronoid Apophysis. It is in the shape of a Crescent, and ends at the outer Extremity of the Condyle on the outside of the Fossula in its Neck.

357. THE outside of the Branch is very full of superficial Inequalities or muscular Impressions, especially near the Angle. This Angle is blunt, uneven, and turn'd more or less toward the outside.

358. THE inside has the same sort of Inequalities towards the Angle. About the middle of this side is a very irregular Hole, being the internal Orifice of a large Canal, which, after having run down a little way in the middle Substance of the Branch, changes its Direction, continuing its Course through the middle of the lateral Portion, all the way to the Hole near the Chin, which is its external Orifice, and then loses itself in the Substance of the Chin. The internal Orifice of this Canal is broad above, oblique, flat, more or less notched, and in some measure lacerated. A little below this Orifice, are sometimes found two little Holes, one above, and at some distance from the other; which are the Orifices of a very small Canal running immediately under the Surface of the Bone. This Canal is the Continuation of a small Groove, which begins at the Edge of the Orifice of the great Canal, and from thence runs a very little way down. In some Subjects, we find only this Groove without any Canal.

359. THE upper Edge of the Body of the lower Jaw is pierced by sixteen Holes and Fossulæ, call'd Sockets, which contain the like number of Bones, called Teeth, both which I shall describe together.

Substance.

360. THIS Bone appears to have a larger share of Diploë in proportion to its Size, than any other Bone of the Face, especially near the alveolar Arch. The Tables are very solid, and not equally thick in all Parts.

Situation in particular.

361. THERE is no difficulty in determining the Situation of the lower Jaw.

Connexion.

362. THE lower Jaw is connected with the Ossa Temporum, by a very singular kind of Articulation, partaking of the Nature both of a Ginglymus and Arthrodia, and therefore I term it Amphidiarthrosis. Its principal Motions are upward and downward, and in all the different Degrees thereof we can thrust it forward, pull it backward, and turn it to either side; and in the same manner, in any Degree of Motion forward, backward, or laterally we can raise or depress it. The Mechanism of this Articulation, and the Motions thereof depend also on a Cartilage, which not being found in the Sceleton, the Description of it must be referred to that of the fresh Bones.

§. 16. *Dentes.*

363. THE Teeth are the hardest, most solid, and whitest parts of the whole Sceleton.

Number, Situation in general and Figure.

364. IN an adult Person, they are generally thirty-two in Number, sixteen placed in the lower Edge of the upper Jaw, and sixteen in the upper Edge of the lower Jaw. They are all fix'd in their Sockets, like so many little Wedges or Stakes, the Heads and Points of which are different from each other.

Division and Situation in particular.

365. THE Teeth in each Jaw are divided into three Classes; the first including the four antierior Teeth, called Incisores; the second, including the two next, one on each side, named Canini; and the third including the other ten, five on each side, named Molares.

366. IN each Tooth, we distinguish two Portions, one without the Socket, call'd the Body of the Tooth, and in the Dentes Molares, the Crown; the other within the Socket, call'd the Root of the Tooth. These two Portions are divided by a kind of circular Line, which may be termed the Collar of the Tooth. When the Teeth are in Situ, the Roots of the superiour Row are turn'd upward, the Bodies downward; in the lower Row, the Roots are turn'd downward, and the Bodies upward.

367. THE Incisors are so call'd from a *Latin* Word, which signifies, to cut or divide. They were likewise called formerly Dentes Risorii, because they appear in laughing. The four upper Incisors are larger and broader than the four lower; and of the upper, the two in the middle are larger than the other two. *Dentes Incisores.*

368. THE Bodies of these Teeth resemble sharp cutting Wedges, and their Roots, pointed Wedges. The Bodies are so disposed, as that their sharp Edges lie all in a Line, making one uniform Edge. Each Body has four Sides, one antierour, a little Convex; one posterour, a little Concave; and two lateral, much narrower than the former, and almost flat. The antierour and posterour Sides decrease in breadth towards the Collar, the lateral Sides, towards the Edge; so that they represent in some measure four Triangles with their Apices and Bases reciprocally opposite.

369. THESE Teeth have long Roots; their lateral Sides are broad and flat, the antierour and posterour Sides, narrow, and they terminate by degrees in a Point, in which a small Hole is observable, pretty considerable in Children, but obliterated in old Age.

370. THE Dentes Canini are so term'd, because they are naturally a little pointed, and appear longer than the rest, almost in the same manner as in Dogs. They might likewise be call'd Angular, because they make a sort of Angle by which the Incisors are separated from the Grinders. The two superiour have also been named Eye-Teeth from their Situation. *Dentes Canini.*

371. THE Bodies of them are thicker and more prominent than the Incisors, convex and a little rounded on the outside, and ending in a short triangular Point, one of the sides of which is a continuation of the Convexity of the outside, the other two are flatter and turned inwards. These Points are often worn out by Mastication. Their Roots are commonly larger, thicker, longer, and more pointed, than those of the Incisors, and sometimes perforate the bottom of the Maxillary Sinus.

372. THE Dentes Molares are so called, because they serve as so many Mills to grind the Food. They are generally twenty in number, five placed on each side of both Jaws; immediately after the Canini. The two first in each row are small, the two next larger; as is also the last, which appears very late, and is often wanting; and from thence the Molares have been distinguished into small Grinders, large Grinders and Dentes Sapientiae, because they seldom appear till Men arrive at the years of Discretion. *Dentes Molares.*

373. THEIR Bodies, in general are short, very thick, irregularly Cylindrical, or rather, with four sides a little rounded, and terminated by a broad end more or less fill'd with obtuse Points cut, in some measure, like

so many Diamonds. The name of Crown is most frequently given to the Bodies of these Teeth, the resemblance being greater than in the others.

374. IN the two small Molares, the Crown is less than in the others, and often not so large as the Bodies of the Canini: they have commonly but two Points; tho' sometimes the second appears to have three. In the two large Molares, the Crown has a much greater extent, and the Points are three, four, or five in number. The fifth Grinder or Dens Sapiientiæ has a Crown much like the two former, but often more rounded and with fewer Points.

375. THE Roots of the Molares are long and more or less flat; single in some of them, in others, two, three, four, but rarely five in number. Sometimes all these Roots are distinct, sometimes wholly united, and sometimes united only in part. They are generally streight, and at a greater distance from each other at their Extremities, than at the Crown of the Tooth.

376. THE Roots of the small Grinders, appear often single without being so in reality; for in examining them narrowly, we find they have two Roots united, or as it were, solder'd together. Sometimes all the distinction that appears, is in two separate Points.

377. THE great Molares have commonly several Roots; the first three, and the second four; or the first four, and the second sometimes five; but these numbers are variable. These Roots are sometimes all perfectly distinct; sometimes they are partly distinct and partly united in the same Tooth, in different degrees. In some Subjects, one or more of their Points are bent outward, inward, or in other Directions; and we do not always meet with more Roots in the upper Teeth than in the lower.

378. THE fifth Grinder has often but one Root, sometimes very short, and sometimes very long. We meet with this Tooth even in grown Persons almost wholly hid in its Socket, which has then but a very small opening. Lastly, it ought to be remark'd concerning all the Molares, that near the Collar, their Roots unite in a sort of Trunk.

Substance.

379. IN an adult Person, the Teeth, in general, are very compact and solid. A very narrow Cavity goes from the Body to the point of the Root, where it ends in a small Hole, which at length becomes imperceptible, and even quite disappears. But to be more particular, the outer Substance of the Teeth is different from the inner; and that of the Body, from that of the Root.

380. THE Bodies of the Teeth are crufted over with a Substance much harder than the rest, naturally very white, polish'd, and shining, looking like the imperfect Vitrification of China-Ware or like Enameling; and nothing can destroy it but the File or Corrosive Liquors. It may be call'd the Enamel of the Teeth. The Roots have some small share of it, but not near so much as the Bodies.

381. WHEN view'd through a Microscope, this Substance appears to be made up of short Fibres, the radiated Extremities of which are turn'd both inwards and outwards. The inner Substance of the Teeth is the same with that

that of the other Bones, only harder than any of them except the Apophysis Petrosa of the Os Temporis.

382. THE Teeth are connected with the Sockets in both Jaws by an Articulation without Motion, call'd Gomphosis. They are fix'd in the Sockets like Pins or Nails, their Roots being exactly surrounded by the spongy Substance or Diploë; and appearing like Moulds for the Cavities of the Sockets, which are rather porous Vaginæ than spongy Fossulæ. The Trunk of the Root is surrounded by the common Orifice of the Socket at a small distance from the circular Line or Collar. The upper and lower Teeth meet in such a manner as that the first, and especially the Incisors, advance most forward and run over the latter, the Arch of the lower Teeth appearing to be smaller than that of the upper. *Connexion.*

383. IN general, the Teeth serve for Mastication or Chewing. In particular, the Incisores tear and cut the Food; the Canini break it to pieces, and the Molares bruise and grind it. The Teeth, especially the Incisors, contribute likewise to the Articulation of Sounds. *Uses.*

§. 17. Os Hyoides.

384. THE Os Hyoides or Bone of the Tongue is situated in the middle Space between the Angles of the lower Jaw. It is a little Bone, and resembles in some measure the Basis of the lower Jaw, or a small Bow. The ancient Greeks compared it to one of the Vowels in their Language, and from thence came the name of Os Hyoides, Yoides, or Ypsiloides. *Situation in general and Figure.*

385. IT is distinguish'd into the Basis which is the antierior part; two large Cornua which are the lateral parts, and two small Cornua or Appendices which are the superiour parts, to the upper end of which, other Appendices are frequently join'd. *Division.*

386. THE Basis is the broadest and thickest part. It is situated transversely, and two Sides may be distinguish'd in it, one antierior unequally convex, and one posterior unequally concave: it has likewise two Edges, one superiour, and one inferiour; and two Extremities, one to the right and one to the left. The Angles of it might likewise be distinguished.

387. IN the middle of the Fore-side, is a perpendicular Eminence, which divides it into right and left Portions, and which terminates above in a small pointed Tubercle, with a small hollow Impression on each side. At the lower end of this Eminence there are also two such Impressions, but much larger. Near each Extremity we find Inequalities which end in the Angles of the Basis. The backside as has been already said is hollow.

388. THE large Cornua are join'd to the Extremities of the Basis by Cartilaginous Symphyses; which in Adults become long. In each Cornu we distinguish the Root or antierior Extremity, the Point or posterior Extremity, and the middle Portion. The length of each Cornu is near double that of the Basis. The Roots are thick and broad, and by them the Cornua are join'd to the Basis. The lower part of the middle Portion is a little crooked and also broader than the rest. The Points end in a little Cartilaginous. *nous*

nous Head, and in the natural State, a short Ligament with a little round Bone or Cartilage, runs down from each of these Heads, as we shall see in examining the fresh Bones.

389. THE small Cornua are placed on the Symphyfes of the large ones, almost perpendicularly, being only inclined a little outward and backward. They are join'd by a Cartilaginous Symphysis peculiar to them; and are themselves Cartilages in young People, but they afterwards ossify, tho' not always at the same Age, and at last their Symphyfes are lost. The length of these Cornua varies pretty much; and at the upper Extremity of each of them, we sometimes meet with one or more additional Portions; in the shape of little oblong Pearls, or of little Pillars set upon one another and held together by a kind of Ligament more or less Cartilaginous, of which hereafter. The Substance of these Appendices is different in different Ages, in the same manner as that of the Cornua themselves.

Connexion.

390. THE Connexion of the Os Hyoides not being by Articulation, does not belong to the Description of the Sceleton, and therefore must be referr'd to the account of the fresh Bones, and of the Tongue. It will be sufficient to observe here that it is connected by a Ligamentary Symphysis with the Styloide Apophyses, the Cartilago Thyroides of the Trachea Arteria, and the Epiglottis: it is also connected by Muscles, with other parts, as we shall see hereafter.

Uses.

391. THE chief Use of this Bone is to be the Basis and Support of the Tongue. The pliability of the small Cornua are likewise believ'd to contribute to the perfection of Singing.

§. 18. *The Bony Parts of the Organ of Hearing.*

Situation in general.

392. ALL the Bony Parts of the Organ of Hearing, or Bones of the internal Ear, being contained in the inferiour Portions of the Offa Temporum; it will be very proper to recollect what has been already said about these N^o 255, &c. and especially to consider well the particular Situation of the Apophysis Petrosa, its Basis, Apex and Sides, and also of the Mastoide Apophysis, with the Eminences, Cavities, Holes, &c. which lie thereabouts.

393. ALL the Bony Organ of hearing may very naturally be divided into four general parts; 1. The external Meatus Auditorius; 2. The Tympanum or Barrel of the Ear; 3. The Labyrinth; 4. The internal Meatus Auditorius. It may likewise be divided into immoveable or containing parts, which take in all the four already mentioned; and moveable or contained parts, which are four little Bones lodged in the Tympanum, call'd Incus, Malleus, Stapes, and Os Orbiculare or Lenticulare.

External Meatus Auditorius.

394. THE external auditory Passage begins by the external auditory Hole, the Edge of which is rough and prominent; but backwards towards the Mastoide Apophysis it appears very much stop'd. The Passage it self is about half an Inch in length, running obliquely from behind forward, in a curve Direction, and sometimes winding a little in the middle, like a Screw.

Its

Its Cavity is almost Oval, wider at the entry than at the middle, after which it widens again by degrees.

395. It terminates inwardly by an even circular Edge lying in a Plane very much inclined, the upper part of it being turn'd outward, and the lower part, inward; so that the whole Canal is longer on the lower Side than on the upper. The concave Side of the circular Edge is grooved quite round.

396. IN Children this bony Canal is wanting, as well as the Mastoide Apophysis; and the inner circular Edge is a distinct Ring, which, in an advanced Age, unites intirely, and becomes one piece with the rest. It is termed the bony Circle in Infants, and indeed it is very easily separated from all the other parts.

397. It would seem therefore that the whole bony Canal in Adults, is only a prolongation of the bony Circle in Children; because even in a more advanced Age, the whole Canal may without much difficulty be taken out. The circular Groove lies between the Mastoide Apophysis and the articular Fissure or Crack.

398. THE Tympanum or Barrel of the Ear is a Cavity irregularly Semi-spherical, the bottom of it being turn'd inward, and the Mouth join'd to the circular Groove already mention'd. Both Eminences and Cavities are observable in it. *Figure and Situation of the Tympanum.*

399. THE remarkable Eminences are three in number; a large Tuberosity lying in the very bottom of the Barrel, a little toward the back part; and a small irregular Pyramid situated above the Tuberosity, and a little more backward; the Apex of it is perforated by a small Hole, and on one side of the Basis, two small bony Filaments are often found in a parallel Situation, and indeed, I believe they are seldom wanting, tho' their tender Structure exposes them to be often broken: In the third Eminence is a Cavity shaped like the Mouth of a Spoon, situated at the upper and a little towards the antierour part of the bottom of the Tympanum. This Cavity is part of a Half-Canal, of which hereafter; and at a very small distance from its Point, is a little bony Ridge which goes from one Edge of it to the other, but is sometimes not entire. *Eminences.*

400. THE principal Cavities in the Tympanum are, the Opening of the Mastoide Cells or Sinuosities; the Opening of the Eustachian Tube; the bony Half-Canal; the Fenestra Ovalis and Rotunda; and to these may be added the small Hole in the Pyramid. *Cavities.*

401. THE Opening of the Mastoide Cells is at the posterour and upper part of the Edge of the Barrel. The Cells themselves which end there are dug in the Substance of the Mastoide Process, being very irregular and full of windings and turnings.

402. THE opening of the Eustachian Tube is at the antierour and a little toward the upper part of the Edge of the Barrel. This Tube, in France generally term'd the Aqueduct, runs from the Tympanum, towards the posterour Openings of the Nasal Fossæ, and Arch of the Palate. The bony Portion thereof, of which alone I here speak, is dug in the Apophysis *Retrofa,*

Petrosa, along the Duct of the Carotide Apophysis, and when it leaves that, it is lengthen'd out by the spinal Apophysis of the Os Sphenoides. These two Cavities, the Mastoide Cells, and the Eustachian Tube, are, in some measure, Prolongations of the Tympanum, one antierour, the other posterour.

403. THE bony Half-Canal, of which the Cavity resembling the Mouth of a Spoon, is the Extremity, lies immediately above the Eustachian Tube, towards the upper side of the Apophysis Petrosa, or rather in the very Substance of that upper Side. In a natural State, a small Muscle is lodged in it.

404. THE Fenestra Ovalis is a Hole of communication between the Tympanum and Labyrinth. It lies immediately above the Tuberosity, the upper side of it being a little rounded, the lower a little flatted; and one Extremity being turn'd forward, the other backward. Towards the Labyrinth, this Opening has a little flat thin Border quite round it, which renders it narrower at that place than any where else.

405. THE Fenestra Rotunda is something less than the Ovalis, and situated in the lower and a little towards the posterour part of the large Tuberosity; the Opening of it, which is the Orifice of a particular Duct in the Labyrinth, lying obliquely backward and outward.

406. THE Hole in the Apex of the Pyramid is the Orifice of a Cavity, which may be named the Sinus of this Pyramid.

Officula Auditus.

407. The Tympanum contains several little Bones, call'd the Bones of the Ear. They are generally four in number, denominated from some thing to which they are thought to bear a resemblance, *viz.* Incus, Malleus, Stapes, and Os Orbitulare or Lenticulare.

Incus.

408. THE Incus or Anvil resembles in some measure, one of the antierour Grinders with its Roots at a great distance from each other; at least it comes nearer to this than to the shape of an Anvil. It may be divided into a Body and Branches. The Body is a large Substance, the Branches or Legs are two, one long and one short. The Body is turn'd forward, the short Leg backward, and the long Leg downward.

409. THE Body of the Incus is broader than it is thick. It has two Eminences, and two Cavities between them, much in the same manner as we see in the Crown of the first Grinders.

410. THE short Leg is thick at its Origin, and from thence decreasing gradually, it ends in a Point. It is situated Horizontally, its Point being turn'd backward, and join'd to the Edge of the Mastoide Opening of the Tympanum.

411. THE long Leg view'd through the external auditory Passage, appears to be situated Vertically; but if we look upon it either on the fore or backside, we see it is inclined, the Extremity of it being turn'd much more inward than the Root or Origin. The Point of the Extremity is a little flatted, and bent inward like a Hook, and sometimes a little hollow'd like a kind of Ear-picker. By this we may distinguish the Incus of one Ear from that of the other, when out of their places; for, turning the short Leg

Leg backward and the long Leg downward, if the Curvature of this long Leg be toward the left hand, the Bone belongs to the right Ear; if towards the right, it belongs to the left Ear.

412. THE Malleus or Hammer is a long Bone, with a large Head, a small Neck, an Handle, and two Apophyses, one in the Neck, the other in the Handle. *Malleus.*

413. THE Top of the Head is considerably rounded, and from thence it contracts all the way to the Neck. Both Head and Neck are in an inclined Situation, and the Eminences and Cavities in it answer to those in the Body of the Incus.

414. THE Handle is look'd upon by some, as one of the Apophyses of the Malleus; and in that Case, it is the greatest of the three. It forms an Angle with the Neck and Head, near which, it is something broad and flat, and decreases gradually toward its Extremity.

415. THE Apophysis of the Handle, term'd by others, the small or short Apophysis of the Malleus, terminates the Angle already mention'd, being extended towards the Neck, and lying in a streight Line with that side or border of the Handle which is next it.

416. THE Apophysis of the Neck, call'd also Apophysis Gracilis, is in a natural State very long, but so slender withall, that it is very easily broken, especially when dry; which is the reason why the true Length of it was for a long time unknown. It arises from the Neck, and sometimes appears much longer than it really is, by the addition of a small dry'd Tendon sticking to it.

417. WHEN the Malleus is in its true Situation, the Head and Neck are turn'd upwards and inwards, the Handle downwards, parallel to the long Leg of the Incus, but more forward; the Apophysis of the Handle upwards and outward, near the superiour Portion of the Edge of the Tympanum, near the Center of which is the Extremity of the Handle; and the Apophysis Gracilis forward, reaching all the way to the articular Fissure in the Os Temporis. It is easy, after what has been said, to distinguish the Malleus of the right Side, from that of the left.

418. THE Stapes is a small Bone, very well denominated from the resemblance it bears to a Stirrup. It is divided into the Head, Legs and Basis. *Stapes.*

419. THE Head is placed upon a short flatted Neck, the Top of it being sometimes flat, sometimes a little hollow.

420. THE two Legs taken together, form an Arch, like that of a Stirrup, in the concave Side of which is a Groove, which runs through their whole length. One Leg is longer, more bent, and a little broader than the other.

421. THE Basis resembles that of a Stirrup, both in its oval Shape, and Union with the Legs, except that it is not perforated as the Stirrups now are, but solid, like those of the Ancients. Round its Circumference, next the Legs, is a little Border which makes that side of the Basis appear a little hollow. The other side is pretty smooth, and one half of the Circumference is something more curve than the other.

422. THE Subject being in an erect Posture, the Stapes is to be considered as lying on its Side, with the Head turn'd outward, near the Extremity of the Leg of the Incus; the Basis, inward, being fix'd in the Fenestra Ovalis; the longest Leg, backward; the shortest forward, and both in the same Plane. By this Situation, it is easy to know the Stapes belonging to each Ear.

Os Orbiculare.

423. THE orbicular or lenticular Bone is the smallest Bone in the Body. It lies between the Head of the Stapes and Extremity of the long Leg of the Incus, being articulated with each of these. In dry Bones, it is found very closely connected, sometimes to the Stapes, sometimes to the Incus; and might in that State be easily mistaken for an Epiphysis of either of these Bones.

Labyrinth.

424. THE Labyrinth is divided into three Parts, the antieriour, middle, and posteriour. The middle Portion is term'd Vestibulum, the antieriour, Cochlea, and the posteriour, the Labyrinth in particular, which comprehends the three semicircular Canals.

425. IT is proper here to call to mind the true Situation and Direction of the Apophysis Petrosa. This being supposed, the Cochlea lies forward and inward, towards the Extremity of the Apophysis; the semicircular Canals, backward and outward, toward the Basis of the Apophysis, and the Vestibulum between the other two.

Vestibulum.

426. THE Vestibulum is an irregularly round Cavity, less than the Tympanum, and situated more inward and a little more forward. These two Cavities are, in a manner, set back to back, with a common Partition-Wall between them, perforated near the middle by the Fenestra Ovalis, by which the Cavities communicate with one another.

427. THE Cavity of the Vestibulum is likewise perforated by several other Holes; on the outside or towards the Tympanum, by the Fenestra Rotunda, but this is commonly seen in dry Bones only; on the backside, by the five Orifices of the semicircular Canals; on the lower part of the foreside, by two Holes which are the Entry of the Cochlea, but one of them is shut up in fresh Bones; and on the foreside, towards the internal Meatus Auditorius, opposite to the Fenestra Ovalis, by a great many very small Holes for the Passage of the Nerves. On the upper side there are only small Pores.

Semicircular Canals.

428. THE semicircular Canals are three in Number, one vertical and superiour, one vertical and posteriour, and one horizontal. The superiour vertical Canal is situated transversely with respect to the Apophysis Petrosa, the convex Side or Curvature of it being turn'd upward, and the Extremities downward, one inward, the other outward. The posteriour vertical Canal lies parallel to the length of the Apophysis, the Curvature being turn'd backward, and the Extremities forward, one upward, the other downward; and the superiour Extremity of this Canal meets and loses itself in the internal Extremity of the former. The Curvature and Extremities of the horizontal Canal are almost on a level; the Curvature lying obliquely backward, and the Extremities forward, ending under those of the superiour vertical Canal,

but

but a little nearer each other; and the inner being almost in the middle Space, between the Extremities of the posteriour vertical Canal.

429. THE horizontal Canal is generally the least of the three, the posteriour Vertical is often, and the superiour Vertical sometimes, the greatest; and sometimes these two are equal. All the three Canals are larger than a Semicircle, forming nearly three Quadrants; they are broader at the Orifices than in the middle. These Orifices open into the backside of the Vestibulum as has been said, being but five in Number, because two of them are lost in each other, N^o. 428. So that in the posteriour part of the Vestibulum, two appear towards the inside, and three towards the outside.

430. IN Children, the Substance of these Canals is compact, while that which surrounds them is spongy, so that they may be easily separated from the rest of the Apophysis Petrosa. In Adults, all the Parts of the Bone are so solid, that these Canals appear only like Passages dug in a piece of Ivory. From this Description it is easy to distinguish the right Labyrinth from the left.

431. THE Cochlea is a sort of spiral Shell, with two Ducts, form'd in the anterior part of the Apophysis Petrosa, in some measure resembling the Shell of a Snail. The parts to be distinguished in it, in its true Situation, are the Basis, the Apex, the spiral Lamina or Half-Septum by which its Cavity is divided into two Half-Canals; the Spindle round which the Cochlea turns, and lastly the Orifices and Union of the two Ducts. *Cochlea.*

432. THE Basis is turn'd directly inward, toward the internal Foramen Auditorium, the Apex outward, and the Axis of the Spindle is nearly horizontal; but in all of them allowance must be made for the Obliquity of the Os Petrosum in which they lie.

433. THE Basis of the Cochlea is gently hollow'd, and towards the middle, perforated by several small Holes. The Spindle is a kind of short Cone, with a very large Basis, which is the middle of the Basis of the Cochlea. Through its whole length runs a double spiral Groove, which, through a Microscope, shews a great number of Pores.

434. THE Cochlea makes about two turns and an half from the Basis to the Apex; and the two Ducts being strictly united together through their whole Course, form an intire common Septum, which must not be confounded with the Half-Septum or spiral Lamina, as is often done. The first might be term'd the common Septum, the other, the particular Septum or Half-Septum.

435. BOTH of them are closely join'd to the Spindle, being thicker there, than in any other Place. The common Septum is compleat, and separates the turns intirely from each other; whereas the Half-Septum in the Sceleton is only a spiral Lamina, the Breadth of which, is terminated all round by a very thin Border lying in the middle Cavity of the Cochlea. In the natural State, there is a membranous Half-Septum which compleats the partition between the two Ducts, as we shall see in describing the fresh Bones.

436. THE two Half-Canals turn jointly about the Spindle, one being situated towards the Basis of the Cochlea, the other towards the Apex; for

which reason I have always term'd one of them Internal, the other External; the Division of them into the upper and lower Flight, not being agreeable to the natural State, but liable to convey a very false Idea thereof.

437. THE Spiral or Volute of the Cochlea, begins at the lower part of the Vestibulum, runs from thence forward to the top, then backward down to the bottom, afterwards upwards and forward, and so on from the Basis which is turn'd inward, to the Apex which is turn'd outward.

438. FROM this Description it is easy to know to what Ear any Cochlea belongs when we see it prepared. It likewise teaches us that in the right Cochlea, the Direction of the Turnings is the same as in Garden Snails, and almost all the other common Shells; but in the left Cochlea, the Turnings are in a contrary Direction, as in one kind of Shell, which is rarely met with.

439. THE two Half-Canals communicate fully at the Apex of the Cochlea. Their separate Openings are towards the Basis, one of them being immediately into the lower part of the foreside of the Vestibulum, the other into the Fenestra Rotunda. These two Openings are separated by a particular Turning, which shall be explain'd in describing the Organ of Hearing.

Foramen
Auditorium
Internum.

440. THE internal auditory Hole is in the backside of the Apophysis Petrosa, in some measure behind the Vestibulum and Basis of the Cochlea. It is a kind of blind Hole, divided into two Fossulae, one large, the other small. The large one lies lowest, and serves for the Portio Mollis of the auditory Nerve or seventh Pair. The small one is uppermost, and is the Opening of a small Duct through which the Portio Dura of the same Nerve passes.

441. THE inferiour Fossula is full of little Holes which in the natural State, are fill'd with nervous Filaments of the Portio Mollis, which go to the Spindle, to the semicircular Canals, and to those of the Cochlea. It is this Fossula which forms the shallow Cavity at the Basis of the Spindle of the Cochlea.

442. THE Passage for the Portio Dura of the auditory Nerve runs behind the Tympanum, and its Orifice is the Stylo-Mastoide Hole. *Falloppius* gave to this Duct, the name of Aqueduct, from its resemblance to some Aqueducts in *Italy*. It begins by the small Fossula, and pierces from within, outwards, the upper part of the Apophysis Petrosa, making there an Angle or Curvature. From thence it is inclined backward, behind the small Pyramid of the Tympanum, and runs down to the Stylo-Mastoide Hole, through which it goes out and is distributed in the manner we shall see in the Description of the Nerves. It communicates likewise by a small Hole, with the Sinus of the Pyramid, and lower down by another Hole with the Barrel of the Ear.

443. IN some Skulls this Aqueduct of *Falloppius* is open on the upper part of the Apophysis Petrosa, a kind of Break appearing in it, form'd by a double Hole: It is at this place that it makes the Angle already mention'd. But commonly it is cover'd with a bony Lamina.

§. 19. *The supernumerary Bones of the Head.*

444. I call by the name of supernumerary Bones, several pieces found in some Skulls, chiefly between the Parietal and Occipital Bones. They form Breaks in the lambdoidal Suture, and are join'd by true Sutures, to the Bones already mention'd.

445. THEIR Figure, Number and Size vary very much. They are sometimes in some measure triangular, but oftener of no regular Figure. In some Subjects, they incroach on the Occipital Bone, in others, on the Parietal Bones, and sometimes they extend themselves every way. They are commonly indented, and broader on the outside of the Skull than on the inside, in which they are without any visible Indentations; and sometimes are scarcely to be seen, when they are small on the outside.

446. THEY have been term'd Keys, a name given by Joiners, to the Pieces which serve to strengthen the Joints of Boards; but which can agree to them only in respect to their Situation, and not in respect to their Uses in the Cranium or other Bones of the Head. They may serve to multiply the ordinary Sutures, &c.

447. SOME such Bones have likewise been found in the Joints between the Bones of the Head and Face; and between those of the Bones of the Face, with each other; and to these might be added the supernumerary Teeth placed out of the Rank of the rest.

A R T. III.

The Bones of the Trunk.

448. THE Trunk comprehends all the Bones, which in a natural State lie between the Head and the four great Extremities. These Bones are divided into three Parts, the Spine, Thorax, and Pelvis; the first of which, that is, the Spine, may be look'd upon as a common Part, the other two as proper.

§. 1. *The Spine and Vertebrae in general.*

449. By the Spine, is meant all that Order of Bones which follow one another without interruption, from the Os Occipitis, downward, along the posterious part of the Trunk.

*Extent and
Situation in
general.*

450. It represents a very compound folding Pillar, round on the foreside, and on the backside stuck full of Prickles or Points, representing so many particular Spines; having a Canal in the middle, through its whole length, into which a great number of Holes open on each side. When it is view'd directly on the fore or backside, it appears straight, and to be made up of different Portions of Pyramids in a contrary Situation to each other; but view'd sidewise, it presents several different Curvatures.

Figure.

Division.

451. THE Pieces which form the Spine, are of two kinds, one single, the other compound. The single Pieces are generally twenty-four in Number, call'd by the name of *Vertebræ*; the compound Pieces are two, the *Os Sacrum* and *Os Coccygis*; the single Pieces are likewise call'd true *Vertebræ*, to distinguish them from the Portions which compose the other two, which are call'd false *Vertebræ*.

452. THE true *Vertebræ* are divided into three Classes, *viz.* seven *Vertebræ* of the Neck; twelve of the Back, and five of the Loins, to which are likewise given the names of cervical, dorsal, and lumbar *Vertebræ*.

453. To have a clear Idea of the Structure and Disposition of each *Vertebra*, we must first examine what they have in common, and next what is peculiar to the *Vertebræ* of each Class, or to any particular *Vertebræ* therein. Afterwards, the Description of the Portions which compose the *Os Sacrum* and *Coccygis*, will compleat this first part of the Trunk.

454. WHAT is common to all the *Vertebræ*, may be reduced to their external Conformation, internal Structure, Connexion and Uses.

*External
Conforma-
tion and Di-
vision of each
Vertebra.
Body of the
Vertebræ.*

455. IN the *Vertebræ* in general we are to consider the Body, Apophyses and Cavities.

456. BY the Body of the *Vertebræ*, we mean that principal part or large Mass, situated anteriorly, and which supports all the other Parts. In most of the *Vertebræ*, the Body represents a Portion of a Cylinder cut transversely, the Circumference of which is more or less round on the forepart, and sloped on the back part. It has two Sides, the upper and lower, each of which is, as it were, border'd by a thin Lamina in form of an Epiphysis.

Apophyses.

457. THE Apophyses in most of the *Vertebræ*, are seven in number: one posterior, call'd the spinal Apophysis, which ends in a small Epiphysis, and has given the Name to the whole System of the *Vertebræ*: two lateral, call'd transverse Apophyses; and four, which are likewise lateral, two on each side, one above, and one below. They are call'd by the general name of oblique Apophyses, and distinguish'd into superiour or ascending, and inferiour or descending. These four are the least of all the Processes of the *Vertebræ*, and each of them has a cartilaginous Side. I should chuse to call them articular rather than oblique Apophyses, for a reason which shall be afterwards given, and I sometimes name them likewise the small Apophyses of the *Vertebræ*.

Cavities.

458. THE Cavities in the *Vertebræ* are these: a large middle Hole, between the Body and Apophyses; four Notches, two on each side, one superiour and small, and one inferiour, which is larger. The great Foramen is part of the vertebral or spinal Canal, and the Notches of one *Vertebra* meeting those in another, form the lateral Holes, which communicate with the Canal.

Situation in particular.

459. THO' the Situation of the *Vertebræ* has been already mention'd pretty exactly, it will be proper to repeat it again. The Body is the anterior part of each *Vertebra*; the spinal Process, the posterior Part; the transverse and oblique or articular Processes are the lateral Parts; and the great Foramen is in the middle of all these Parts.

460. THE inner Substance is spongy or like a Diploë, cover'd with an *Internal* outer compact Substance which in the Body of the Vertebrae is very thin, *Structure.* but thicker in the Processes.

461. THE Vertebrae are join'd together by their Bodies and by their *Connexion.* small Apophyses. The Bodies in a natural State are principally united by a Cartilaginous Symphysis, that is, by the intervention of a pliable and elastic Cartilage, as we shall see in describing the fresh Bones. This Cartilaginous Connexion makes the lateral Holes of the Spine larger in the Body than in the Sceleton, where these Cartilages are wanting.

462. THEIR Connexion by the small Apophyses, is by Arthrodia, and not by Ginglymus, as shall be afterwards shown. These two Articulations are secur'd by very strong Ligaments, of which in another place.

§. 2. *Vertebrae of the Neck.*

463. IN most of the Vertebrae of the Neck, the Body is a little flattened *The Body.* anteriorly, and is thinner or shorter than that of all the other Vertebrae of the Spine. The upper Side is a little concave, the lower proportionably convex. The breadth on the fore part increases gradually as they descend; so that taken all together they represent a sort of Pyramid. All that is here said is not to be extended to the two first Vertebrae nor to the seventh.

464. THE spinal Apophyses are more or less streighten'd, and fork'd *Spinal Pro-* at the Extremity, except in the first Vertebra which has no such Process. *cesses.*

465. THE transverse Apophyses are for the most part very short, perforated perpendicularly, concave or groov'd on the upper side, a little *Transverse* fork'd, and, as it were, double, except in the first and last Vertebrae, in *Apophyses.* which these Apophyses are longer, and more pointed.

466. THE articular Apophyses, except the first, are more oblique than *Oblique Apo-* in the other Vertebrae, and their Cartilaginous Sides are inclined in such a *physes.* manner as that in each Vertebra, the superiour Apophyses are turn'd backward and upward; the inferiour forward and downward. Some particularities in the two first Vertebrae are here likewise to be excepted.

467. THE first Vertebra is call'd Atlas, because it supports the Head, *First Verte-* as Atlas did the Globe of the Universe, according to the ancient Fable. *bra of the* It is neither Body nor spinal Apophysis. The Hole or Opening in it, is *Neck.* much larger than in the rest. It looks like an irregular bony Ring fill'd all round with Eminences and Cavities. It may be divided into two Arches; the anterior or largest, and posterior or smallest.

468. THE anterior Arch is form'd by two thick lateral Portions, and a small curve middle part, which with the other two makes a Notch in the anterior part of the great Cavity of the Vertebra. The lateral Portions may be look'd upon as a Body in two parts, without which the first Vertebra would have been too weak to sustain the Articulations.

469. IN the middle of the convex Side of the posterior Arch, is a Tubercle a little pointed, larger than the anterior Tubercle, and mark'd with

Muscu-

muscular Impressions on each side, and on the upper and lower Edge. This Tubercle seems to be in the place of a spinal Apophysis.

470. THE transverse Apophyses of the first Vertebra arise from the middle of the breadth of the lateral Portions, being perforated perpendicularly at their broad Origins. They are much longer than those of the five Vertebrae below them, and contracting gradually, they terminate in an obtuse Point, which is sometimes in a manner, double, and mark'd on the upper and lower side with Muscular Impressions.

471. THE superiour articular Apophyses are larger than any other Apophyses of the same kind in the whole Spine. They are oblong Cartilaginous Cavities fram'd in the upper side of the lateral Portions. Their Situation is almost Horizontal, and their anterior Extremities are turn'd more inward, that is, nearer one another than the posterior. They are, in a word, every way proportion'd to the Condyles of the Os Occipitis.

472. THE inferiour articular Apophyses are less hollow, shorter and broader. They are inclined laterally from within outwards, and from above downward. They are directly under the superiour Apophyses; and thus the articular and transverse Apophyses, the Holes and lateral Portions on each side are all in the same Line.

473. THERE is a long Notch or kind of Groove between each superiour articular Apophysis, and the posterior Arch of the bony Ring, reaching from the Hole in the transverse Apophysis backward: in which Notch, the vertebral Blood-Vessels in the natural State, make a turn, before they enter the great Occipital Foramen. Sometimes, tho' very rarely, there is a compleat Hole in the room of this Groove. There is another Notch, but more shallow, on each Side, between this Arch and the inferiour Apophyses.

474. IN the internal Circumference of the great Hole of this Vertebra, in the middle of the great Notch, is a Cartilaginous Impression for the Articulation of the Axis of the second Vertebra; and on each side of that Notch, between the superiour and inferiour Apophyses, there is another small Impression for the Insertion of a transverse Ligament, which secures the Axis in its place. All round this Circumference, both toward its upper and lower Edges, there are many other Inequalities or Impressions.

Second Vertebra.

475. THE second Vertebra of the Neck is very different from the first. Its Body is narrower and longer than that of the following Vertebrae; and its length is increas'd on the upper part by an Eminence like a Pivot or Axis, call'd by the *Greeks* Odontoides, by the *Latins* Dentiformis or simply Dens.

476. IN this Axis four Impressions or Marks are observable; one anterior which is Cartilaginous, for its Articulation by a like Impression, with the great Notch in the first Vertebra; one posterior, for the Insertion of the transverse Ligament already mention'd; two superiour, which unite at the Point of the Axis, and serve for the Insertion of the Ligaments by which the Axis is fasten'd to the anterior Edge of the Occipital Hole. The

The superiour Portion of the Axis, is a true Epiphyfis grafted upon a forked Apophyfis.

477. THE spinal Apophyfis is short, broad, and very much forked, being distinguish'd into two lateral Parts by a kind of angular Crista. The lower Side of it is hollow, and the Cavity is angular, and divided into two lateral Parts by a Bony Line.

478. THE transverse Apophyses are very short, a little inclined downward, and perforated obliquely; whereas in all the other Vertebrae, these Perforations are perpendicular. When the Apophyses are thin, this Obliquity does not appear so much; but when they are thick, the Hole is more like a true Canal, bent in such a manner as that one Orifice is downward, the other outward. The Apophyses themselves end in a Point turn'd downward.

479. THE superiour articular Apophyses do not answer exactly to the inferiour Apophyses of the first Vertebrae. Their Cartilaginous Sides are inclined obliquely outward and downward; and as they are narrower than the former, and have their Edges more raised toward the outside, a small empty Space is commonly left between the two, on the fore and back Parts, in the Sceleton: the Reason of which appearance shall be given in the History of the fresh Bones. The superiour Apophyses of this Vertebra, the transverse Processes of the first and their Holes are all in the same perpendicular Line.

480. THE inferiour Apophyses are less, and situated further back. Their Cartilaginous Sides are turn'd backward, and very obliquely inclined from below upward, and from before, backward; so that their Situation is more Vertical than Horizontal. They are likewise a little hollow.

481. THE superiour Notches are superficial, long, situated behind the superiour Apophyses, and insensibly disappear toward the spinal Apophyses. The inferiour Notches are situated more forward, directly under the transverse Apophyses, and their Holes. The Body of this Vertebra has a very small Tubercle on the fore Side.

482. THE Conformation of the third Vertebra of the Neck, is not very different from that of the Vertebrae of the Neck in general already described. *Third Vertebra.* The superiour Apophyses answer to the inferiour Apophyses of the second Vertebra, their Cartilaginous Sides being a little convex and turn'd backward. The inferiour Apophyses are a little hollow and turn'd forward.

483. THE transverse Apophyses are very short, and placed before the articular ones. They are something forked and depressed on the upper Side, between the lateral Hole and the Extremity. The Notches are turn'd a little forward, above and below the transverse Apophyses, and the lower are deeper than the upper.

484. THE fourth, fifth, and sixth Vertebrae are like the third, except that their Bodies are gradually more extended, but still hollow on the upper Side, and convex on the lower; and that the spinal Apophyfis of the sixth Vertebra is longer, thinner, and streighter than in the three above it. *Fourth, fifth and sixth Vertebrae.* The inferiour Apophyses of the fourth and fifth Vertebrae, and the superiour of the sixth are not so much inclined as those above them.

485. THE Body of the last Vertebra of the Neck is the largest of all, so that, as has been already said, all the seven represent a sort of Pyramid set on the Vertebral Pillar of the Back. The lower Side of the Body of this Vertebra is almost flat. The spinal Apophysis is long, almost streight and very prominent, for which Reason it has been term'd Prominens in *Latin*. It ends in a little flat Head, sometimes smooth, and sometimes a little depressed or forked.

486. THE transverse Apophyses of this Vertebra, are longer, placed further back, and less groov'd than the former. Their Holes are sometimes double, and in that case, less than when they are single: and sometimes there is a Break or Opening in them like a Notch, which variety is also observable in the sixth Vertebra.

487. THE superiour Apophyses are like those of the other Vertebrae, but in the inferiour, the Sides are more inclined and broader, answerably to the superiour Apophyses of the first Vertebra of the Back.

488. IN the six lower Vertebrae of the Neck, the middle Holes are much larger than in the Vertebrae of the Back. They are in some measure triangular, being broad on the Fore-side, and contracted on the back-side.

§. 3. *Vertebrae of the Back.*

489. THE Bodies of the Vertebrae of the Back are longer than those of the Neck, and in all of them, except the first, the upper Side of which is a little hollow, both upper and lower Sides are equally flat.

490. FROM the first Vertebra to the fourth or fifth, their Bodies are contracted between the upper and lower Sides, gradually more in the lower Vertebrae; and in the same manner, they grow broader between the fore and back Sides: so that when view'd on the fore-side, they represent an inverted Pyramid or Cone, but view'd laterally, they represent a Pyramid in its natural Situation.

491. FROM the fourth Vertebra to the last, the Size of the Bodies gradually increases, but more between the upper and lower, than between the fore and back Sides. Therefore when the whole Pillar of the Dorsal Vertebrae is view'd on the fore Side, a sensible Contraction is perceivable in the upper half of the Pillar, which does not appear in a lateral View.

492. THE spinal Apophyses are long, sharp on the upper Side, and a little hollow on the lower, in which there is often a small bony Line directly opposite to the sharp Edge. They end in a sort of little pointed Head. They are very much inclined downward, except the first three or four, which are streighter and shorter in proportion to their nearness to the Vertebrae of the Neck. The three last grow likewise streighter by Degrees as they descend, and are broader and shorter than those above them.

493. THE articular Apophyses are situated almost directly above and below the transverse, and their Sides are rather perpendicular than oblique. The Sides of the superiour Apophyses, are a little convex and turned backward; the inferiour, a little concave and turned forward.

494. THE transverse Apophyses are pretty long, but their length diminishes by degrees all the way to the twelfth Vertebra, in which they are both very short and very small. They end in a sort of Head set upon a narrow Neck. In the antierour Part of these Heads are Cartilaginous Cavities answering to the Tubercles in the Ribs. These Cavities diminish by degrees as they descend, and in the two last Vertebrae there are scarce any to be seen. In the upper Vertebrae they are situated more forward than in the following, in which they remove gradually outward.

495. THE lateral Notches, are between the articular Apophyses and Bodies of the Vertebrae, and the inferiour are the most hollow.

496. MOST of these Vertebrae have four small Cartilaginous Impressions two on each Side of their Bodies, one at the upper Edge, the other at the lower, near the articular Apophyses. These Impressions are obliquely hollow, and disposed in such a manner as that the inferiour in the Body of one Vertebra and the superiour in the next below, form a sort of Niche, in which the Heads or Ends of the Ribs are articulated. In the first Vertebra there is commonly an intire Niche for the first Rib, and half of another for the second. The two last Vertebrae have generally but one entire Niche on each side. These Marks are peculiar to the Vertebrae of the Back, and easily distinguish them from the rest.

497. IN the lower articular Apophyses of the last Vertebra, the Sides are turn'd laterally from within outward, and are likewise a little convex: for which reason this Vertebra is receiv'd both above and below; whereas the first Vertebra of the Neck receives both ways. Besides the seven ordinary Apophyses, this last Vertebra has often two small ones between the transverse, and superiour articular Apophyses.

498. THE large middle Holes in the Vertebrae of the Back, grow rounder and narrower as they descend, especially from the first to the tenth, where they begin again to be more flat and more extended nearly in the same manner as in the two first.

499. ALL these large Holes, each of which ought to be look'd upon as a Portion of a Canal, have a Notch in the back side above the spinal Processes, and between the articular Apophyses. In most of the Vertebrae of the Neck, we meet likewise with large Notches or Slopes, above the spinal Apophyses; but as they are very broad and shallow, they are but little regarded. In the last Vertebra of the Neck, this Notch is remarkable enough, and that in the last Vertebra of the Back, appears to be deeper than any of the rest.

§. 4. *Vertebrae of the Loins.*

500. THE Bodies of the Vertebrae of the Loins are the largest in the whole Spine, and as they descend they increase, tho' much more in breadth than in thickness; that is, more between the upper and lower Sides, than between the Back and fore Sides. Between the upper and lower Sides they are a little contracted in the middle, and their Edges are consequently prominent.

501. THE spinal Apophyses are short, streight and broad on each Side, but narrow on the upper and lower Parts. The upper Edge is sharp; the lower divided as it were into two Labia by a narrow Ridge more or less prominent. The Extremities swell a little, and the spinal Apophysis of the fifth Vertebra is shorter and narrower than the rest, and bent a little downward.

502. THE transverse Apophyses are longer and more slender than in the Vertebrae of the Back; they increase in length from the first to the third, and then diminish, to the fifth. They are flat on the back Part and more even on the fore Part.

503. THE superiour articular Apophyses of all these Vertebrae are hollow'd lengthwise; the inferiour are convex lengthwise, and placed nearer each other than the superiour. The Cavities are turn'd inward or toward each other, the Convexities outward and from each other; so that they are situated in two different Planes more or less parallel to the Planes of the spinal Apophyses.

504. THIS Direction changes by small Degrees as the Vertebrae descend; and thus in the fifth Vertebra, the Sides of the inferiour Apophyses are turn'd a little more forward.

505. BESIDES these seven Apophyses, each Vertebra has two additional ones near the superiour Apophyses. The lower side of the Body of the last Vertebra is obliquely inclined forward, so that it is much longer before than behind.

506. THE great Foramina in these Vertebrae are larger than in those of the Back. They are flatted on the fore Side, and almost angular behind; much in the same manner as in the Vertebrae of the Neck.

§. 5. *Os Sacrum.*

Situation in general.

507. THE Os Sacrum is situated in the posteriour and lower part of the Trunk, as the Basis by which the whole Spine is supported, and from hence it has by some been term'd Os Basilare.

Figure and Division.

508. ITS Figure comes near that of a long Triangle with the Basis upward and the Apex downward. It may be divided into the upper Part or Basis; the lower Part or Apex; two Sides, the anterior or concave, and the posteriour or convex; and two lateral Parts or Edges. We here consider it as one Bone only, as it is in an Adult Subject.

509. IN young Subjects it is made up of several distinct Pieces term'd false Vertebrae, united together by Cartilages which in time diminish, grow hard, and disappear, leaving no Marks behind them but little Ridges or Lines more or less prominent. These Pieces are five in number, and sometimes six, all of them resembling the Vertebrae in something. The first is much larger than any of the true Vertebrae; but their size diminishes by very great Degrees as they descend, so that the lowest which makes the Point of the Os Sacrum has scarcely the appearance of a Vertebra.

Anterior Side.

510. IN the anterior or concave Side, we see commonly four pair of large Holes, and sometimes more, (according to the number of false Vertebrae) disposed in two longitudinal Rows; and appearing to be form'd by the Notches in the original Pieces meeting each other. Between these two Rows

Rows of Holes, through the whole length of the middle of this Side, we observe the Bodies of five or six false Vertebrae cemented together, of which the uppermost or first comes nearer to the Structure of a true Vertebra than the rest. The last is very small, and below the Holes, it has a Notch on each side, and sometimes a Production in shape of a little Horn.

511. THE posteriour or convex Side is very uneven. The same number of Holes appear here, as in the fore Side, and disposed in the same Order, *Posteriour Side.* but they are not so large. Between the two Rows of Holes, is a sort of spinal Apophysis more or less imperfect, especially toward the upper Part. In these Apophyses we often find Openings, sometimes in the superiour, sometimes in the inferiour; and thus perpendicular Fissures are form'd of different breadths. Sometimes a transverse Opening is left between the several Spines; but in all that has been here said, great Varieties are observable. On the outside of each Row of Holes, are Tuberosities which appear like transverse and articular Apophyses confounded together.

512. AT the Basis or upper Part of the Os Sacrum, are two true articular Apophyses answering to the inferiour ones of the last Vertebra of the Loins. Below each of these Apophyses, laterally, is a large Notch; and between them, we see distinctly enough the upper Side of the Body of the first false Vertebra, which is like that of the Lumbar Vertebrae; being very much inclined backward; so that the Body of this false Vertebra, as well as of the last true one, is longer before than behind. From this Obliquity it happens, that the Os Sacrum and last Lumbar Vertebra form at their Connexion a very considerable Angle.

513. BEHIND the Body of this first Vertebra of the Os Sacrum, between the articular Apophyses, lies the Orifice of a large Canal, triangular and flat, which runs down in the middle Substance of the Bones between the two Sides, and between the four Rows of Holes, behind the Bodies of all the false Vertebrae. It contracts as it descends, and communicates with all the large Holes, being the Continuation of the great Canal of the Spine. It is often broke into by the Fissures already mention'd, on the back Side.

514. THE lateral Parts are broad toward the top, forming on each hand, a large uneven, irregular Cartilaginous Surface in the Figure of a great S, *Lateral Parts.* and sometimes of a Bird's Head. By these two Sides the Os Sacrum is connected with the Ossa Innominata by a Cartilaginous Symphysis. Between each of these lateral Sides and the nearest posteriour Holes, there is a large rough Depression, and under that, another not so large. These Depressions are often pierced by several Holes, which lose themselves in the inner Substance of the Bone.

§. 6. Os Coccygis.

515. THE Os Coccygis situated at the Extremity of the Os Sacrum, is in some measure an Appendix thereof. The Figure of it is something like that of an inverted Pyramid, a little bent forward toward the Pelvis or like a Cuckoo's Bill. The anterior Side is flat, the posteriour a little convex.

It is made up of four or five Pieces, like false Vertebrae, join'd together by Cartilages more or less pliable. Sometimes all the Pieces are intirely cemented together.

516. THE first Piece is the largest, and on each side of its Basis there are sometimes small Apophyses or Cornua, join'd closely to the Extremity of the Os Sacrum. It has also sometimes a kind of transverse Apophyses, with small Notches on their upper Part, which joining with those in the last Piece of the Os Sacrum, form a pair of Holes, situated in the same row with the other large ones. The other Pieces of the Os Coccygis are a kind of irregular Squares, diminishing in Size as they descend, so that the lowest is like a Sesamoide Bone.

§. 7. *Uses and Mechanism of the Spine.*

517. THE Spine taken together is the support of all the other Bones, and the universal Director of all the Attitudes necessary for their different Motions. To give a Machine both these Advantages, it must have two Properties, which at first sight appear incompatible, viz. Strength and Flexibility or Pliableness; and it will still be more perfect, if it be withall very light in proportion to its Bulk.

518. THE Author of Nature has framed the Spine, with all these Advantages, in a manner which is the more wonderful, because it is most simple. He has made the Spine flexible, by the number of Pieces of which it is composed: He has made it firm and strong, by disposing these Pieces, so as naturally to support and sustain each other, and by framing them in the most convenient manner for that infinite number of Cords by which they are bound together; and lastly, their internal Structure renders them very light.

519. THE Contrivance of this excellent Mechanism is not the same in all the three Classes of Vertebrae. Those of the Back and Loins sustain each other easily enough by the Extent and Direction of their Bodies; and in all of them, this Disposition is proportion'd to the Weight they have to bear, the inferiour Vertebrae being larger than those above them.

520. THE Contraction of this bony Pillar at the fourth or fifth Vertebra of the Back, does not in the least impair this Mechanism: for it being at that place in a particular manner strengthen'd by the Connexion of the true Ribs, large Vertebrae would there have been useless; whereas, by diminishing their Size, the Capacity of the Thorax is increas'd, for the more commodious Reception of the Viscera hereafter to be described.

521. IN the Vertebrae of the Neck the Case is different; their Bodies are but of a small extent, and the Sides of them narrow. The Situation of the whole Row of these Vertebrae is oblique and inclined forward, except the two first, which are placed perpendicularly; so that this Portion of the bony Pillar is concave, the upper half of it being bent forward.

522. To be able to judge how far this Obliquity extends in a living Body; we need only either stand or sit, holding our Head in a streight Posture, that

is, turn'd neither to one side nor the other, and then observe the Situation of the Mastoide Apophyses; because the Articulation of the first Vertebra of the Neck with the Condyles of the Os Occipitis is exactly between the anterior Edges of these Apophyses.

523. WHEN a Man stands or sits in an erect Posture, the oblique Disposition of these Vertebrae, puts the oblique Sides of their articular Apophyses almost in an horizontal Situation; so that they support each other, not only by their Bodies, as in the other Vertebrae, but also by their articular Apophyses, the Bodies being thus eas'd of part of their Burden.

524. THE Obliquity of these Apophyses appears particularly to facilitate the Rotation of the Neck, or that Motion by which it is turn'd round, as upon an Axis; for the natural oblique Situation of the Neck, would have made that Motion very difficult without the Obliquity of the Apophyses already mention'd. The Disposition of the second and third Vertebra, being more vertical than oblique, the lateral Inflexions of the Neck are thereby made more easy.

525. THE Holes in the transverse Apophyses of the Vertebrae of the Neck, form a sort of Canal for the Passage of the Blood-Vessels. The length of this Apophysis in the first Vertebra, enables it to turn more easily on the Axis of the Second; and the shortness of these Apophyses in the other Vertebrae, prevents them from injuring the neighbouring Parts in the lateral Inflexions of the Neck.

526. THE length of the spinal Apophysis of the second Vertebra, facilitates the Rotation of the first. The smallness of this Apophysis in the three following Vertebrae, prevents them from compressing the neighbouring Parts when the Neck is bent backwards; and they are broad and fork'd, to afford sufficient room for the Insertion of Muscles.

527. THE Vertebrae of the Back serve principally for the Formation of the Cavity of the Thorax, by sustaining the Arches of the Ribs; and this Cavity is augmented by this, that the whole Row of these Vertebrae, is concave on the fore-side.

528. THE length of their spinal Apophyses is proportion'd to the great number of Muscles inserted in them. The oblique Situation of these Apophyses and their lying for the most part close on one another, not only prevents the Inconveniencies of so great a length; but hinders the Vertebrae from being bent backward, and consequently enables them to support great Weights without sinking under them.

529. THE Curvature of the transverse Apophyses backward, enlarges the Capacity of the Thorax, and gives to the double Articulation of the Ribs a peculiar sort of Obliquity, without which it is impossible to conceive how by simply raising the Ribs, all the Dimensions of the Thorax should be increas'd, and diminish'd by lowering them.

530. THE articular Apophyses of the Back being almost vertical, and nearly in the same Plane, small degrees of Flexion and Extension are thereby made practicable, as also lateral Inflexions; but they cannot allow of any Rotation. As these Apophyses are placed between the transverse, and near the posterious.

posterior Extremities of the Ribs; they are very little expos'd to Strains or external Injuries, and thereby their small Size, when compar'd with the Bodies of the dorsal Vertebrae, becomes sufficient.

531. THE gentle Curvature of the Row of lumbar Vertebrae, counterballances the different Directions of the other Portions of the Spine. The shortness and straightness of their spinal Apophyses gives room to bend the whole Spine backward on the Loins; and their Largeness affords sufficient place for the Insertion of Muscles. The length of their transverse Apophyses, facilitates the Action of the Muscles; but the shortness of the upper and lower Apophyses prevents their striking against the Ribs, or *Ossa Innominata* in lateral Inflexions.

532. THE Size of the articular Apophyses is proportion'd to the great Efforts which they often suffer in their Motions. The particular Direction of these Apophyses, sets bounds to the Motions of Rotation, by their meeting and striking against each other; and it is principally on this Occasion, that their large Size becomes necessary, to enable them to sustain such Strokes without breaking.

533. THE Use of the *Os Sacrum* is to sustain the Spine, with all that belongs to it; but in order to this, it was necessary that it should be strongly connected with, and enclosed by the *Ossa Innominata*, with which it likewise serves to form the Pelvis; the posterior part thereof belonging to this Bone. Its lower Extremity is turn'd very far backward, and thereby the lower part of the Pelvis is enlarged. Its Appendix, the *Os Coccygis*, serves chiefly to support the *Intestinum Rectum* and *Anus*, as shall be said in another Place.

534. LASTLY, the whole Canal of the Spine, from the first Vertebra of the Neck, to the Extremity of the *Os Sacrum*; may be look'd upon as an articulated Elongation of the Cranium, serving to contain a Production of the Brain, call'd the spinal Marrow. This Canal is larger in the Neck and Loins than in the Back. The lateral Holes form'd by the Notches in each Vertebra, transmit the same number of Nerves.

§. 8. *The Bones of the Thorax; and first, the Ribs.*

535. THE Thorax, call'd commonly the Breast, is the first and superiour proper part of the Trunk. It may be compar'd to a sort of Cradle, being composed of several lateral Pieces, term'd Ribs, and of one anterior Piece, call'd *Sternum*, which, with the twelve Vertebrae of the Back, form the bony Cavity of the Breast.

536. THE Ribs are bony Arches of different Sizes, situated transversely and obliquely on each side of the Thorax, and so disposed, as that their Extremities are turn'd toward each other.

537. THEY are commonly twenty-four in number; twelve on each side. This number varies, sometimes on one side only, sometimes in both. They are distinguish'd into true and false.

Figure and
general Si-
tuation of
the Ribs.

Number and
Differences.

538. THE seven upper Ribs on each side, go to the Sternum, and thus form intire Arches; for which reason they are named true Ribs. The five inferiour Ribs do not reach the Sternum, and because they do not form intire Arches, they are term'd false Ribs.

539. IN each Rib we may consider in general, the middle Part or Body; *Division.* two Extremities, one antierour, the other posteriour; two Sides, one external and convex, the other internal and concave; two Edges, one superiour, the other inferiour; and two Labia in each Edge, one external, the other internal. The posteriour Extremity, which may be call'd the Head of the Rib, is articulated with the Vertebræ of the Back. At the antierour Extremity, fresh Ribs are lengthen'd out by Cartilaginous Epiphyses stuck into their bony ends. This Production is term'd the Cartilage or Cartilaginous Portion of the Rib.

540. EACH of the true Ribs at the posteriour Extremity, hath two small cartilaginous Impressions, distinguish'd by a kind of Angle, by which they are articulated with the lateral cartilaginous Impressions in the Bodies of two Vertebræ of the Back; but the first Rib has no more than one such Impression, being articulated with one Vertebra only.

541. AT a small distance from the Head of this Extremity, posteriourly, is another cartilaginous Impression on each side, a little convex and closely join'd to a small Tuberosity. By these, the Ribs are articulated with the cartilaginous Depressions in the transverse Apophyses of the dorsal Vertebræ; and the Tuberosities serve for the Insertion of Ligaments. The Portion which lies between the Head and these Impressions, is contracted, and represents a Neck.

542. WHEN the posteriour Extremity of a Rib is articulated with two Vertebræ, the second Articulation is always with the transverse Process of the lowest of the two.

543. BETWEEN the Tuberosity and middle part of the Ribs; there is on the outside of most of them, a kind of oblique rough Angle of different Breadths. In the first Rib, this Angle is not distinct from the Tuberosity. In the second, it reaches but to a small distance from it. In the third Rib, this distance is greater, and from thence continues to increase gradually all the way to the third false Rib; so that if we look directly at the Back of a Skeleton, these Angles seem to represent the two Legs of a Pair of Compasses open'd pretty wide.

544. ON the inside of the Ribs towards the lower Edge, we observe a Groove reaching from the Angle, all the way to the Extremity, and that chiefly in the five lower true Ribs, and the first three false ones. The upper Edge of the two first Ribs, is sharp; the lower, a little rounded. The upper Edge of the third is more obtuse, and the lower more flat. In the rest, the upper Edge is something rounded, and the lower more or less sharp.

545. THESE Ribs increase in length as they descend, and their antierour Extremities on each side are at a greater distance from one another; so that all the Extremities of one side, with the Extremities of the other, represent on the forepart of the Breast, an Angle almost like that which I already

took notice of on the back part. The Extremities of the first Ribs on each side do not lie in the same Line with the rest, but being much shorter, are situated further back. The same thing is sometimes, tho' very rarely, observable in the two second Ribs. There is this likewise, peculiar to the first Rib, that its Breadth increases from behind, forward.

546. IN all the Ribs the antierour Extremity is lower than the posterour. The first is but little inclined, the second, more, and the Inclination of all the rest, increases as they descend; their antierour Extremities being proportionably at a greater distance from each other than the posterour, the Spaces between which are every where nearly the same.

547. THE Ribs are much more crooked in the Back than in the forepart. The Curvature of the two first Ribs on each side lies almost in the same Plane with the two Extremities of each. This equality begins to be lost in the third Rib, which is something contorted from the Angle all the way to the antierour Extremity, the lower Edge being turn'd a little outward, and the Curvature being turned a little upward, about the middle of the Arch, and afterwards a little more downward, from thence to the antierour Extremity. This Contorsion increases in the following Ribs, all the way to the third false Rib; all which look like a contorted Italick *f*, and when laid on an even Table, one Extremity is always turned upward, the other downward.

548. THE Appendices, Epiphyses, or cartilaginous Portions of the true Ribs increase in length, as they descend, in the same manner as the Ribs themselves. Each of them, except the first, terminates by two little cartilaginous Sides join'd together by an Angle, by which they are articulated with the Sternum. The Extremity of the first Cartilage is very broad, and cemented to the Sternum by a Symphysis, like that by which the other end is connected with the bony Extremity of the Rib.

549. THE Cartilages of the first three or four Ribs lie nearly in the same Direction with the Ribs themselves. In the Ribs below, these the Cartilages make Angles, at which they turn upward toward the Sternum, and this Curvature increases in proportion as the Ribs descend. The lowest Cartilages in changing their Direction, upwards, lie very close to each other, and those of the last two true Ribs, have often at their inferiour Edge a sort of Apophysis or Production, by which they are connected with the Cartilages immediately below them.

550. THE last two true Ribs extend considerably in breadth towards their lower sharp Edges, from the Angle for a good distance antierourly. Afterwards they contract in breadth and increase in thickness, forming a sort of Neck a little longer than that at their posterour Extremity; then their breadth begins to increase again by degrees all the way to the antierour Extremity. In all the Ribs, this Extremity terminates in a Cavity in which the Cartilages are grafted.

551. THE three uppermost false Ribs increase in breadth from the Angle forward, in the same manner as already said. The Grooves are in them most considerable. They have Heads, Necks, Tuberosities and Angles, almost the

the same as in the last true Ribs. Their length diminishes by degrees, and their antierior Extremities separating from each other in the same manner with those of the true Ribs, lie in the same Line with them. The last two have only one Impression at their posterior Extremities, and are without any Tuberosity. They are both much shorter than the rest, especially the fifth.

552. ALL the false Ribs have cartilaginous Appendices. The first is longest and fix'd to the Cartilage of the last true Rib. The two following are united together at their Extremities. The last two are connected only to Muscles and Ligaments. They are both very short, especially the last, which is not above a quarter of an Inch in length. All these Cartilages of the false Ribs are pointed at their Extremities.

553. THE Ribs are articulated antieriorly with the Sternum, and behind *Connexion* with the Vertebræ of the Back. The first Rib is intirely united with the Sternum, by means of its Cartilage. In the six following, the Extremities of the Cartilages join that Bone.

554. THE three upper false Ribs are join'd to each other, by the Extremities of their Cartilages; and the first is likewise join'd to that of the last true Rib. The two last have no such Connexion, as has been already said.

555. THE Connexion of the Ribs with the Vertebræ of the Back is for the most part by a Ginglymus. The first Rib on each side is articulated by its Head, with the lateral Impression in the Body of the first Vertebra, and by its Tuberosity, with the small Cavity in the transverse Apophysis of the same Vertebra.

556. THE Head of the second Rib is articulated by its Head with the Impressions in the lower part of the Body of the first Vertebra, and in the upper part of the Body of the second; and by its Tuberosity, with the articular Cavity in the transverse Apophysis of the second Vertebra.

557. ALL the other Ribs, except the two last of the false Ribs, are articulated in the same manner; that is, by their Heads, with the Impressions on the Bodies of two Vertebræ next each other, and by their Tuberosities, with the transverse Apophysis of the lowest of each two Vertebræ. The eleventh and twelfth Ribs are commonly articulated by their Heads only, with the Impression in the Body of one Vertebra.

558. FROM what has been said, it is evident, that the ten upper Ribs are confined to two Motions, one upward, the other downward; whereas the two last are left more at liberty, and are therefore term'd floating Ribs.

559. THE Ribs join'd to the Vertebræ of the Back and Sternum form a *Ufes* Cavity, capable of Expansion and Contraction, in which are contain'd chiefly the Organs of Respiration and those of the Circulation of the Blood. The Mechanism of their Structure shall be spoken to hereafter.

§. 9. The Sternum.

560. THE Sternum is situated lengthwise in the antierior part of the *Situation in* Thorax. *general.*

Figure.

561. It is a long flat Bone not all of the same breadth, representing a sort of Dagger.

Division.

562. It is generally made up of three principal Pieces, the first broad and short; the second longer and narrower; the third a sort of small Appendix, call'd by the *Greeks* Xiphoides, from its resemblance to the Point of a broad Sword.

The first Piece.

563. THE first or uppermost Piece is broad and thick at the top, but thinner and narrower, below, being nearly of the figure of a Triangle with the three Angles cut off, or of an irregular Square. We distinguish in it two Sides, one external or anterior, the other internal or posterior; four Edges, one superiour, two lateral, and one inferiour; and four imperfect Angles, two superiour and two inferiour.

564. THE anterior or outside is unequally convex, the posterior or inner side, a little concave.

565. THE upper Edge is the thickest, with a large smooth Notch or Slope in the middle, call'd by the Ancients, the Furca. The two superiour Angles are two large thick articular Notches, situated obliquely on each side of the Furca. The lateral Edges are thin and oblique, and in each of them we see an oblong Cartilaginous Mark, which belongs to the Cartilage of the first true Rib. The two inferiour Angles are two articular Half-Notches, which receive the Cartilage of the second Rib. The lower Edge is smaller and thicker than the others, being join'd by Symphysis to the second Piece.

The second Piece.

566. THE second Piece of the Sternum is much longer than the first. It is flat on both sides, and broader towards the lower than towards the upper Part. We observe in it sometimes, especially on the fore side, several transverse Lines, which point out the places where the Pieces of which it is made up in Children, are united together. Both sides are flat, but depressed more or less, through the middle of their whole length. The upper Edge is small, being proportion'd to the lower Edge of the first Piece with which it is connected by a Cartilaginous Symphysis. The lower Edge is still smaller, appearing like a truncated Angle.

567. THE two lateral or greatest Edges have each a Cartilaginous Half-Notch, and five Cartilaginous intire Notches. The Half-Notches are at the upper Part of the lateral Edges, where they meet the Half-Notches in the first Piece. The five intire Notches come nearer to each other in proportion as they are lower, and part of the last belongs often to the third Piece.

The third Piece.

568. THE third Piece called commonly Cartilago Xiphoides or Ensiformis, and in *French*, by a word which signifies the Brisket, is intirely Cartilaginous in young Subjects; but in an advanced Age it generally ossifies either wholly or in part; in some Subjects later than in others: it would therefore be more properly named Appendix Xiphoides or Ensiformis.

569. THIS Piece is join'd to the lower Extremity of the second, between the Cartilages of the last true Ribs; and it is often more or less notched on each side, to form part of the last articular Notches of the Sternum.

Its

Its Figure is nearly that of the Point of a broad Sword, from whence it has its Name both in *Greek* and *Latin*; but neither its Figure nor Size are constant. In some Subjects it is forked, in some perforated. Sometimes it is very large, sometimes very small, hardly exceeding the third part of an Inch.

570. THE inner Substance of the Sternum is almost all cellulous and very slender, and cover'd on the outside with a thin compact Lamina. *Substance.*

571. THE Sternum compleats the fore part of the Cavity of the Thorax, and sustains the antierior Extremities of the Ribs, being sufficiently fix'd to resist Compressions, and other outward Accidents; and yet moveable enough by means of its articulation with the Cartilages of the Ribs, not to obstruct the Motions necessary for Respiration. It likewise serves for the insertion of several Muscles, and to support the Mediastinum, &c. *Uses.*

§. 10. *The Bones of the Pelvis; and first, the Ossa Ilium.*

572. THE Pelvis is the third and lowest part of the Trunk, consisting chiefly of two large Pieces, call'd Ossa Innominata, which being united anteriorly by a Cartilaginous Symphysis, and posteriorly to the two Sides of the Os Sacrum, represent a kind of Basen. When consider'd separately, they have no regular Figure, being of different breadths in different Parts, unequally convex on the outside, and unequally concave on the inside. *Situation of the Pelvis in general.*

573. EACH Bone is but one Piece in adult Subjects, but in Children it consists of three Pieces, join'd together by a Cartilage, which afterwards perfectly ossifies, leaving commonly no Vestige of the first Division. Anatomists, however, consider in it, even in Adults, three different Portions, and distinguish them by different Names, as if they were three distinct Bones. *General Division.*

574. OF these three Portions, the largest is superiour and posterior, call'd Os Ilium; the second, inferior, call'd Os Ischium; and the third and smallest, anterior, call'd Os Pubis.

575. BEFORE we treat of each of these Portions separately, it must be observ'd, that in the intire Bone, there are several common Parts, or which belong to more Portions than one, viz. a deep Cartilaginous Cotyloide Cavity, call'd in *Latin* Acetabulum; form'd by all the three Portions: a large Opening, call'd Foramen Ovale, form'd by the Os Ischium and Os Pubis: a large posterior Notch or Sinus, call'd the Ischiatic Notch, form'd by the Os Ilium and Os Ischium: an oblique Eminence or Protuberance above the Acetabulum towards the Foramen Ovale, made by the Os Ilium and Os Pubis. To these may be added a Ridge on the inside of the Pelvis, which divides the upper wide part from the bottom, to which alone the Ancients gave the Name of Pelvis.

576. THE Os Ilium was so named by the Ancients, because it supports the parts call'd by them Ilia.

577. THIS Bone is the largest of the three. It is flat, very broad, unequally convex and concave, partly round and partly of an irregular square Figure. *Size and Figure of the Os Ilium.*

Division.

578. IT is divided commodiously enough into the Crista, Basis, anterieur and posterieur Edge, and two Sides one external the other internal.

579. THE Crista is the upper part, being a pretty thick arched Border, the Circumference of which is a little more than a Quadrant of a Circle. The anterieur and middle part is convex outward, the posterieur part a little convex inward. We distinguish in it two Labia and a middle Space or Interstice between them. It is originally an Epiphysis, of which we sometimes see plain Marks in a very advanced Age.

580. THE posterieur Portion of the Crista, which is convex inward, is much thicker than the anterieur, and for that reason might be call'd the Tuberculum of the Crista. The whole Crista appears to be crufted over with a Cartilage, which in reality is no more than the dried tendinous Insertions of the Muscles.

581. THE anterieur Edge of the Os Ilium has two Eminences or Tubercles, call'd the anterieur Spines; one superieur, the other inferieur; and likewise two Notches, one between the Spines, the other below the inferieur Spine.

582. THE posterieur Edge is shorter and thicker than the anterieur. It terminates likewise in two Eminences or Spines, between which there is a considerable Notch.

583. THE Basis or inferieur part of this Bone is the thickest and narrowest of all. It forms anterieurly a Portion of the Acetabulum, and posterieurly, almost all the Ischiatic Sinus.

584. THE outside is convex on the fore part, and concave on the back part. We observe on it the remains of a long semicircular Line which reaches from the upper anterieur Spine, to the great Ischiatic Sinus, being a Muscular Mark. Above and behind this Semicircle, there are several other Impressions and Muscular Marks. A little above the Edge of the Acetabulum, we see likewise many Inequalities which surround part of that Edge in a semicircular Form, being a Collection of Muscular and Ligamentary Marks.

585. THE inside is unequally concave, and has several Inequalities toward the back part, the chief of which is, that large Cartilaginous Surface of the Figure of an S, or of a Bird's Head, which answers to the lateral Surface of the Os Sacrum, with which it is connected by a Cartilaginous Symphysis. The other Inequalities are much of the same kind with those in the lateral part of the Os Sacrum, with which they form several rough and irregular Cavities. From the upper part of the Cartilaginous Surface or Symphysis, all the way to the oblique Eminence, runs a prominent Line which bounds the Concavity of the inside of this Bone, and distinguishes the Margin of the Pelvis from the bottom.

§. 11. *Ossa Ischium.*

586. THE Os Ischium is the lowest Portion of the Os Innominatum, as well as of the whole Trunk. It is divided into the Body, Tuberosity, and Ramus or Branch. *Situation in general and Division.*

587. THE Body of the Os Ischium forms the lowest and greatest part of the Acetabulum, and sends out an Apophysis backward, call'd the Spine of the Ischium.

588. THE Tuberosity is very thick, unequal, and turn'd downward; and it is on this part that the whole Body rests, when we sit. It appears Cartilaginous, because of the dried and hardened Remains of the Tendons. The whole convex Portion of it is originally an Epiphysis, of which the Marks are obliterated sooner in some Subjects than in others. Three Muscular Impressions may be distinguish'd in it.

589. THE Branch of the Ischium is a kind of small, flat, thin Production or Apophysis, which ascends forward from the Curvature of the Tuberosity to the Os Pubis; and it is often cover'd in part by a continuation of the Epiphyses of the Tuberosity.

590. THESE three parts of the Ischium taken together form a large Opening which makes the greatest part of the Foramen Ovale. Three other Notches are remarkable upon this Bone; one posteriour between the Tuberosity and the Spine, for the passage of the internal Obturator Muscle, which is a little Cartilaginous, and divided into three or four small superficial Channels: one lateral between the Tuberosity and the Acetabulum, for the passage of the external Obturator Muscle: and one anterior at the Edge of the Acetabulum, for Ligaments, &c.

§. 12. *Ossa Pubis, and Acetabulum.*

591. THE Os Pubis is the least of the three Portions of the Os Innominatum. The two together form the fore part of the Pelvis; and in each we may distinguish the Body, Angle, and Branch. *Situation in general and Division.*

592. THE Body of the Os Pubis is its upper part, situated transversely before the inferiour part of the Os Ilium. Its posteriour Extremity is very thick, and by its union with the Os Ilium forms the oblique Eminence which distinguishes these two Portions of the Ossa Innominata. It likewise contributes to the formation of the Cotyloide Cavity. Its anterior Extremity ends in a small Eminence or Tuberosity, call'd the Spine of the Os Pubis, which is sometimes double.

593. THE upper Edge has on its inner part an oblique Ridge, which may be call'd the Crista of the Os Pubis, and is continuous with that Ridge which distinguishes the margin and bottom of the Pelvis. Before this Crista is a broad oblong oblique slope. The lower Edge is obliquely notched, and forms the upper part of the Foramen Ovale.

594. THE Angle of the Os Pubis is its antierior Portion, and makes part of that Connexion, call'd the Symphysis of the Offa Pubis. This Portion is flat, and not very thick; and in some Subjects, toward the upper part of the fore-side, near the angular Curvature, it has an Eminence which increases the size and extent of the Spine already mention'd. The two Offa Pubis connected together by this Portion, form on the fore-side an unequal Convexity, but on the back-side a pretty even Concavity.

595. THE Branch of the Os Pubis, is a flat thin Apophysis, which running downward, unites with the Branch of the Ischium by a Cartilaginous Symphysis, of which only some Marks remain in Adults. It compleats the Formation of the Foramen Ovale. The Branches of the two Offa Pubis form on the fore-side, a pointed Arch, which in the natural State is much more round.

Acetabulum. 596. BESIDES what has been said of the Acetabulum in general, there are other particulars observable about it, which could not well be mention'd till after the Description of the three Portions of which it is made up. These are the Edge call'd Supercilium, the Cartilaginous Cavity, the Impression at the bottom of the Cavity, and the Notch in the Edge.

597. THE Edge or Supercilium is very prominent on the upper part; on the sides this Prominence decreases as they descend, and between the antierior and inferiour part it is quite lost. In the natural state it is increased by an additional Elastic Circle, which shall be described in the Treatise of fresh Bones.

598. THE Cavity is proportionable to the Prominence of the Edge, and consequently deeper on the upper and back part than on the lower and fore part. It is cover'd with a very smooth Cartilage except from the middle to the Notch.

599. THIS Portion of the Cavity which is without Cartilage, is what I call'd the unequal Impression, which is broader toward the bottom of the Cavity than toward the Edge, and serves to contain a Ligament and a bundle of Glands.

600. THE Notch is precisely between the antierior and inferiour Portion of the Edge of the Cavity, near the Foramen Ovale, which it, in a manner, unites with the Cavity. The Situation of this Notch is oblique with respect to the direction of the whole Body in an erect Posture.

Substance of the Os Innominatum. 601. THE Substance of all the three Portions is mostly spungy, except in the middle of the Os Ilium, where the two Tables uniting, render the Bone transparent; and the same is to be said of the Acetabulum.

Connexion. 602. THE Offa Innominata are join'd to the Os Sacrum, and to each other by a Cartilaginous Symphysis. They are articulated with the Os Femoris by Enarthrosis, as we shall see in describing that Bone.

Uses. 603. THE Offa Innominata, together with the Os Sacrum, form the Pelvis which is part of the Cavity of the Abdomen, and supports several Viscera, especially those which are the Common-Sewers of the Urine and gross Excrements, and those by which the two Sexes are distinguish'd. The Pelvis is larger in Women than in Men; the Offa Ilium and Ischium are wider.

The

The Arch form'd by the Branches of the Offa Pubis, is likewise greatest in Females.

604. MOREOVER, these Bones together with the Os Sacrum support the whole Trunk and all the parts belonging to it, and also the lower Extremities. In a word, they are the Basis of the whole Body of Man, and the general Center of all its Motions, when standing, sitting, or lying.

A R T. IV.

The Bones of the upper Extremities.

605. **T**HE upper Extremities of the human Body, are two in number; fix'd to the upper and lateral parts of the Trunk, from whence they may be extended below the inferiour part thereof, that is, below the Pelvis. Each of them is divided into four Parts, the Shoulder, the Arm, the Fore-Arm, and the Hand.

§. 1. *The Bones of the Shoulder; and first, the Scapula.*

606. **T**HE Shoulder is made up of two Bones, one large and posteriour, call'd the Scapula, the other small and anterior named the Clavicle.

607. **T**HE Scapula is a large Bone, in some measure of a triangular figure, situated laterally at the upper and posteriour part of the Thorax, from about the first Rib down to the seventh.

*Situation in
general, and
Figure of
the Scapula.
Division.*

608. **I**T may be divided into two Sides, one external or posteriour and convex, the other internal or anterior and concave; three Edges, one named the Basis, and two named Costæ, one superiour, the other inferiour: three Angles, one anterior, call'd the Head or Neck, one superiour, and one inferiour. I shall begin with the Edges, and end with the Sides.

609. **T**he Basis is the longest Edge of the Scapula. It is commonly situated on one side of the Spine, a little obliquely, the upper Part of it being nearer the Vertebræ than the lower. It is, as it were, divided into two Parts by a very obtuse Angle, which distinguishes the superiour Quarter from the three other Quarters. It is considerably thick, and is accordingly divided into two Labia, one exterior the other interior. It continues to be an Epiphysis in many adult Subjects, towards both its Extremities, especially towards the lower.

610. **T**HE superiour Costa is the shortest and thinnest of the three Edges. It is situated almost transversely between the superiour Point of the Basis and Neck of the Scapula, being a little more raised toward the Basis than at the other end, where it often terminates by a small Notch. It is divided into an external and internal Labium.

611. **T**HE inferiour Costa is of a middle length between the other two Edges. Its Situation is very oblique between the inferiour Point of the Basis and Neck of the Scapula. It is thicker than the rest, and often appears to be double, having two very distinct Labia, the outermost of which is

thin, the other round. These two Labia are separated by a kind of Channel, or Groove; and upon the external Labium is a narrow Impression, which runs from the Neck through two thirds of the length of the Costa.

612. THE Neck of the Scapula is the biggest of the three Angles. It ought more justly to be call'd a Head with a very short Neck; and a superficial or glenoide Cavity in the top of it, which is lin'd with a Cartilage and of an Oval Figure, but pointed at the upper Part, and rounded at the lower; and deeper in the natural State than in the Sceleton, as will be seen in the History of fresh Bones. In the natural Situation of the Scapula this Cavity is turn'd obliquely forward, and not directly outward. Between the Edge of this Cavity and the contracted part which is the true Neck, some Inequalities are observable, which are the remains of the Symphysis of Ossification.

613. At the upper part of the Neck there is a Production or Epiphysis resembling a crooked Finger or Crow's Bill, call'd the Coracoide Apophysis or Epiphysis, which at its Origin has a Tuberosity, for the Insertion of the Ligaments of the Clavicle. It terminates by three Muscular Impressions, which all together form an obtuse Point.

614. THE Angles next the Basis have nothing very remarkable, only that the superiour is more acute than the inferiour in some Subjects.

615. THE Outside of this Bone is unequally convex, and a little below the superiour Costa, shows a long, high, thin Eminence, call'd the Spine of the Scapula, which rises gradually higher from the Curvature or obtuse Angle at the Basis all the way to the Neck, and afterwards turns upwards and forward over the Coracoide Apophysis, forming another broad Apophysis, call'd the Acromium. The name of Crista is given to the Edge of this Spine.

616. THIS Crista is extended in breadth in three particular places. The first is near the Basis of the Scapula, where there is a smooth triangular Surface. The second is a kind of oblong, flat and rough Tuberosity. The third is at the Acromium, of which already. On the anterior Edge of this Apophysis near its Point, is a small Cartilaginous Apophysis for the Articulation of the Scapula with the Clavicle.

617. The Body of the Spine divides the outside of the Scapula in two Portions, the uppermost and least of which is term'd Fossa Supra-spinalis, the lowest and largest, Fossa Sub-spinalis, in which we observe a long Depression, lying a little above the Costa Inferior, and running from the inferiour Angle, to the Neck. Near this inferiour Angle we see likewise a kind of small distinct Surface unequally triangular and oblong, which runs up upon the inferiour Costa towards the Channel or Groove in its external Labium.

618. THE inside of the Scapula is irregularly concave, chiefly toward the upper part, and, in a manner, divided into several superficial and longitudinal Fossulae, by little Ridges which run like Radii from the Neck toward

toward the Basis. The direction of these Lines is transverse with respect to that of the Ribs.

619. BESIDES these parts, we observe likewise three Notches; one very large, between the Neck and the Spine; one small, between the superior Costa and the Coracoide Apophysis; and one of a middle size, between that Apophysis and the Glenoide Cavity. There is sometimes a particular Hole which either perforates the Basis of the Spine at its middle, or is there lost in the Substance of the Bone.

620. WE must not forget here, two small rough Marks or Impressions immediately above and below the Glenoide Cavity; the lowest of which extends it self a little over the neighbouring Costa. They might be term'd Muscular Impressions of the Neck of the Scapula.

621. IN the Neck, Spine, Basis, inferior Costa, and Coracoide Process, *Substance* there is a Diploe; the rest of the Bone is transparent, thin, and almost without any middle cellulous Substance.

622. THE Scapula is articulated with the Clavicle, by the Acromium, *Connexion and Uses* and with the Os Humeri, by the Glenoide Cavity. It is likewise join'd to the Trunk by a fleshy Symphysis or Syssarcosis. It serves to facilitate the Motions of the Arm, to give Insertion to a great many Muscles, and as a Shield, to defend the back parts of the Thorax.

§. 2. *Clavicula.*

623. THE two Clavicles are situated transversely and a little obliquely, *Situation in general* opposite to each other, at the superior and anterior part of the Thorax, between the Scapula and the Sternum.

624. EACH Clavicle resembles in some measure an *Italic f*, being a *Figure* long Bone, irregularly Cylindrical, bent forwards near the Sternum, and backward near the Scapula, as if it were made up of two Arches join'd endwise in opposite Directions, that which lies on the fore part of the Breast being the largest. The Clavicles are streighter in Women than in Men.

625. THE Clavicle is divided into a Body or middle Part, and two *Division* Extremities, one anterior, inferior, and internal, which I term the Pectoral or Sternal Extremity; the other posterior, superior, and external, which I name the Humeral or Scapular Extremity.

626. THE Pectoral Extremity is the thickest, and of a triangular Figure, especially near the end, where it is a little enlarged, and shows a Cartilaginous Surface with three Angles, of which the lowest is the most prominent, and turn'd a little toward the Cavity of the Thorax. Near these Angles there are several Muscular and Ligamentary Impressions, one of which near the inferior Angle is sometimes rais'd like a Tubercle.

627. THE Humeral Extremity is flat and broad, and two Sides may be consider'd in it, one superior, the other inferior; likewise two Edges, one anterior, the other posterior; and a small articular Surface.

628. THE upper side has several Inequalities, and in the lower there is a kind of oblong rough oblique Tuberosity. The posterioir Edge is convex, thick, and uneven, being that of the small Arch of the Clavicle. The anterior Edge is concave, narrow, and smooth every where, except near the great Arch where it has a rough Impression. The articular Surface terminates this Extremity, being Cartilaginous, turn'd obliquely forward, and of an oval figure, like that of the Acromium, with which it is articulated.

629. THE Body or middle Portion, which, together with the pectoral Extremity, forms the great Curvature of the Clavicle, is not so thick as the Extremities. It is a little flatted, both on the upper and lower Sides, and therefore two Edges may likewise be distinguish'd in it. The upper Side is pretty even, the lower something rougher, and a little depress'd by a superficial Channel. The Edges are rounded, the anterior being Convex, the posterioir Concave.

Substance. 630. THE inner Substance of the Extremities, is cellulous. The rest is more solid, consisting of very thick Sides, with a narrow Cavity more or less fill'd with reticular bony Filaments.

Situation in particular. 631. THE particular Situation of this Bone is easily understood from what has been said. The most uneven side of the Body, and rough side of the humeral Extremity, are always to be turn'd downward.

Connexion. 632. THE Clavicle is articulated with the Acromium and Sternum by *Arthrodia*. The Articulation with the Scapula, by means of the Acromium, is as real and distinct as the Articulation with the Sternum; which last appears something extraordinary in the Sceleton, where the small Notch in the Sternum is no ways proportion'd to the broad Extremity of the Clavicle. In the Description of the fresh Bones, I shall show how this is to be accounted for; and likewise demonstrate the ligamentary Connexions.

Uses. 633. THE Clavicles serve for Butteresses to the Scapulæ, and bound their Motions forward, and upward; by their ligamentary Connexions they likewise hinder the Scapulæ from running too far back; which might happen in those who drag Burdens behind them, &c. They also give Insertion to many Muscles.

§. 3. *Os Humeri.*

Situation in general, Size and Figure. 634. THE *Os Humeri* or Bone of the Arm is both longer and thicker than any other Bone of the upper Extremity. It is situated under the Acromium, along the lateral part of the Thorax, from which however it may be removed to a considerable distance, in all Directions. Its Figure is irregularly Cylindrical, and it is thick at one end and broad at the other.

Divison. 635. It is divided into the Body, and two Extremities, or into an upper, middle and lower part.

636. THE upper part is generally call'd the Head of the *Os Humeri*, and the part immediately below that, is call'd the Neck.

637. IN the Head, we consider a Half-Globe obliquely inclined, crufted over with a smooth Cartilage: two Tuberosities, one large, terminating upward in a Point, over-againft the Half-Globe; the other small, placed laterally between the large one and the Half-Globe: a Channel or Groove between the two Tuberosities: four muscular Impreffions, three of which are on the large Tuberosity, one in the Apex, one on the fide oppofite to the Groove, and the third lower down on the fame fide over-againft the small Tuberosity upon which the fourth is found. Of thefe four Impreffions, that on the small Tuberosity, and the fecond of the other three, are the largeft. All thefe parts of the Head of the Os Humeri are one Epiphyfis in Children, of which very plain Marks remain fometimes in an advanced Age.

638. THE Channel or Groove between the two Tuberosities is continued downwards in an oblique Direction through one quarter of the length of the Bone, and there becoming rough, it forms a muscular Impreffion not always equally fenfible. The Edges of this Channel are two Ridges or prominent Lines continued down, as it were, from the two Tuberosities. That from the great Tuberosity is the moft confiderable, and is continued down to the middle of the Bone, where it is loft in a long, broad, rais'd muscular Impreffion more or lefs rough. The other which comes from the small Tuberosity is lefs prominent and fhorter. At the fide of this Ridge, toward the lower part are two other narrow longitudinal and fuperficial muscular Marks one above the other, the lower Extremity of the firft reaching down on the forefide of the upper Extremity of the fecond.

639. THE middle Part or Body of the Os Humeri comes nearer to a cylindrical Figure than the Extremities. It is a little rais'd at the rough Eminence or Impreffion already mention'd. On each fide of this Eminence is another muscular Impreffion, which uniting immediately below it, it appears to be inclofed between them as between the two Prongs of a Fork. On that fide which answers to the middle of the Half-Globe, we fee likewise a longitudinal muscular Mark, and about the middle of that fide which is even with the great Tuberosity, there is an oblique hollow turning, of a confiderable length and breadth, which running down by the fide of the fork'd Impreffion, makes this part of the Bone appear contorted.

640. THE lower Extremity of the Os Humeri, is triangular from its very beginning, and from thence grows very broad and flat, being bent a little near the End, towards that fide which answers to the small Tuberosity in the upper Extremity. It is divided into three Sides, two anteriopour, and one pofteriour, which is the broadeft; and into three Angles, one anteriopour, and two lateral.

641. AT the end of this broad Extremity, are two Tuberosities, one fhort and prominent answering directly to the middle of the Half-Globe, the other oblong, rough, and refembling a Crifta, which answers to the Apex of the great Tuberosity of the Head. The fhort Tuberosity is call'd the internal Condyle, the other the external Condyle.

642. BETWEEN thefe two Condyles, on the very loweft part of the concave fide of this Extremity, are two articular Eminences, one double, like a Pulley,

Pulley, next the short Condyle, the other rounded like a small Head, next the long Condyle. The Pulley has a great and small Edge with a Depression between them. The small Edge is lost in the round Eminence or Head, the great one is gradually widen'd, and ends in a sharp Circumference. This Pulley is situated obliquely, for on the concave side it approaches toward the short Condyle, and on the other, it is turn'd from it.

643. THREE Fossulae are likewise observable in this lower part of the Bone, two antierior, one immediately above the Pulley, the other above the small Head; and one posterioir, which is very large, and situated likewise immediately above the Pulley. In Children, the Pulley, the small Head, and the short Condyle are Epiphyses.

Substance.

644. THE outer Substance of this Bone is compact, especially in the middle Part, within which there is a large tubular Cavity, containing a reticular Texture of bony Filaments. The outsides of the Extremities are less solid, and their inner Substance is cellulous.

Situation in particular.

645. THE particular Situation of this Bone deserves well to be consider'd, because we are often misled in forming an Idea of it, by viewing the Bone itself separated from the Trunk of the Body, by the Figures which have been given of it, and by the undue Application of the Terms External, Internal, Antierior and Posterioir, to the different Parts thereof; which Mistakes may be of very bad Consequence in many chirurgical Cases.

646. WHEN we examine the Os Humeri, as lying along either side of the Trunk, in its natural Situation; the Head will be found so dispos'd as that the Half-Globe is turn'd inward and backward, answering to the Situation of the Glenoide Cavity of the Scapula; the great Tuberosity outward and forward; the Channel between the two Tuberosities, almost directly forward; the long Condyle, said commonly to be external, turn'd as much forward as outward; and the short Condyle call'd the Internal, turn'd as much backward as inward.

Connexion.

647. THIS Bone is articulated above with the Glenoide Cavity of the Scapula, by *Enarthrodia*, which is much plainer in the fresh Bones than in the Skeleton; and below, with the two Bones of the Fore-Arm, in the manner hereafter to be described.

Uses.

648. THE Uses of this Bone are generally well enough known. The Explication of all its different Motions presupposes the Knowledge of the fresh Bones, and of their Ligaments and Muscles; and therefore must be referred to another Place.

§. 4. *The Bones of the Fore-Arm; and first, the Ulna.*

649. THE Fore-Arm is made up of two long Bones, whereof one is named Cubitus or Ulna, the other Radius.

Figure and Division of the Ulna.

650. THE Ulna is irregularly triangular, diminishing in thickness from one end to the other. It may be divided into the Body or middle Part, and two Extremities, one great, the other small.

651. IN the great Extremity we observe two Eminences, one large, call'd Olecranon or Ancon, the other small, call'd Corone or the coronoide Apophysis; and two Semilunar or Sigmoide Cavities, one great, the other small.

652. THE Olecranon is a large Apophysis ending in a rough Tuberosity and an obtuse Point. The Tuberosity makes the Corner of the Elbow; the Point is lodged in the posteriour Cavity of the lower Extremity of the Os Humeri, when the Fore-Arm is extended. Next under the Tuberosity is a flattish oblong, triangular Surface, on the outside of which is another of the same kind, but longer and a little hollow, together with a muscular Fossula.

653. THE coronoide Apophysis is prominent and a little pointed, resembling a broad short Beak. It is received into the anterior Cavity above the Pulley, at the lower Extremity of the Os Humeri, when the Fore-Arm is bent.

654. THE great Sigmoide Cavity lies directly between these two Eminences, reaching from the Point of one to the Point of the other. It is articular, cover'd with a smooth Cartilage, and divided through its whole length by a middle angular Line; being thus suited exactly to the Pulley of the Os Humeri upon which it moves obliquely; these two together making a most perfect Ginglymus, as well in respect of their Structure as of their Use. The Half-Cavities on each side the angular Line are also divided transversely by another Line a little hollow, which terminates at the middle of each Edge of the Cavity, by a very small Notch.

655. THE small Sigmoide Cavity which may likewise be termed transverse or lateral, is a sort of transverse Notch in the inferiour Portion of one Edge of the great Sigmoide Cavity, at the side of the coronoide Point, directly opposite to the muscular Fossula already mention'd. It is cover'd with a Cartilage as well as the great one, of which it appears to be a true Continuation, and it belongs to the Articulation of the Radius. Near this Cavity, directly under the coronoide Apophysis, there is a very rough muscular Impression, sometimes rais'd like a Tuberosity.

656. THIS upper Extremity is oblique, and its Obliquity answers to that of the Pulley in the Os Humeri.

657. THE small Extremity is Cylindrical, of a less Diameter than any other part of the Bone. It may be reckon'd a kind of Neck ending in an inverted Head, flat at top, and of a Cylindrical Circumference, both which are cover'd with the same smooth Cartilage, and the Circumference is broader on the side of the coronoide Apophysis, and small sigmoide Cavity, than any where else. From the Head, runs down a short styloide Apophysis, on the side of the Tuberosity of the Olecranon, distinguished from the rest of the Circumference by a small Notch.

658. THE middle Portion or Body of the Ulna is divided into three Sides, and three Angles. One of the Sides is narrow and rounded, one broad and hollow, and the third flat, and mark'd with an oblique Line on its upper Part. The narrow Side answers to the Tuberosity of the Olecranon, and is cover'd only by the common Integuments. The other two Sides are distinguish'd from the former by two blunt Angles; and they unite at a sharp Angle

Angle which lies opposite to the rounded Side, and answers to the Point of the Coronoide Apophysis. The hollow Side, is even with the small sigmoide Cavity, and the flat Side opposite to it. These two Sides give Insertion to many Muscles, and the sharp Angle, to what is call'd the Interosseous Ligament. At the top of this Angle there is a narrow oblong Muscular Impression. The Angle common to the rounded and flat Sides, ends below in an oblong uneven Muscular Eminence.

Substance. 659. THE Substance of the Ulna is much the same with that of the Os Humeri, already described. The Tuberosity of the Olecranon, and the small inferiour Head, with its Styloide Apophysis, remain for a long time, Epiphyses in some Subjects.

Connexion. 660. IT is connected with the Pulley of the Os Humeri by an angular Ginglymus; with the two Extremities of the Radius, by a compound lateral Ginglymus, and with the Hand by Ligament, and not by Articulation.

Situation in particular. 661. THE Situation of this Bone may be consider'd two ways, either when the Fore-Arm is extended and lies along the side of the Trunk, or when it is bent, and lies on the lower part of the Breast. The first Situation appears to be most commodious for determining what parts of the Bone are to be call'd anterior, posterior, superior, inferior, external, and internal. But the second seems most natural, as being the most common in living Bodies, whether sitting or standing, and has accordingly been followed by some of the Ancients. I shall have occasion to say something more upon this Head, in describing the Radius and Bones of the Hand.

§. 5. *The Radius.*

Size, Figure, and Situation in general. 662. THE Radius is nearly of the same length with the Ulna, bigger at one end than at the other, irregularly triangular, a little bent, and situated along the side of the Ulna. Its name is taken from the resemblance it bears to the Spoke of a Wheel.

663. WE are to consider in this Bone, two Extremities, and a middle Portion. One Extremity is small, and like a kind of Head set upon a Neck, the other is large resembling a Pedestal or Basis; and therefore it might be divided into a Head, Body and Basis.

Division. 664. THE Head or small Extremity of the Radius is very short or low, the Top of it is concave, and the Circumference Cylindrical; and both the Glenoide Cavity and Circumference are cover'd with the same smooth shining Cartilaginous Crust; and about one quarter of the Circumference is broader than the rest. The Neck is small, and its Situation a little oblique. It ends by a lateral Tuberosity which lies directly under the broad part of the Head, being rough in the middle and on one side, and smooth and superficially Cartilaginous on the other.

665. THE Basis or great Extremity of the Radius is much broader than it is thick, and has two broad sides and one narrow. One of the broad sides is a little hollow and pretty even; the other is unequally convex, and

and divided by longitudinal Eminences, or bony Lines, into three or four longitudinal Channels, much more distinct in fresh Bones than in the Skeleton. The narrow Side is hollow'd lengthwise, and between it and the other two, two Angles are form'd, by which the three Sides are distinguish'd, and opposite to it, the other two meet in a third Angle. This narrow Side ends in a semilunar Cavity border'd with a smooth Cartilage, and lying almost in the same Direction with the Tuberosity. The broad Sides end at their common Angle, by an obtuse Point or Production, which has been call'd the Styloide Apophysis of the Radius, and is really a Continuation of one of the bony Lines already mention'd.

666. THE whole Basis ends in an Oblong, Triangular, Glenoide Cavity, the Cartilage of which is continued over the hollow Edge of the narrow Side. This is an articular Cavity resembling an Arch, and ending on one side at the Styloide Apophysis, and hollow'd on the other, by the Cavity of the narrow side. It appears divided into two Portions by a small transverse Line, and in the natural State the hollow'd Side is lengthen'd out by a Cartilaginous Production, the description of which belongs to the History of fresh Bones.

667. THE middle or body of the Radius is a little incurvated, the Concavity lying between the Tuberosity in the Head, and semilunar Cavity in the Basis. It has three Sides, one rounded, which is the convex Side of Curvature, and two concave: three Angles, two of which are obtuse, distinguishing the two concave Sides from the convex; and the third sharp, lying between the two concave Sides, opposite to the convex Side. In each of these Sides there are several Muscular Marks.

668. THE Substance of this Bone is like that of the Ulna. The Head and Basis are Epiphyses in Children, and in some Subjects remain such for a long time afterward. *Substance.*

669. THE Radius is connected with the Ulna, Os Humeri, and Carpus. It is articulated with the Ulna, at its two Extremities, by a double lateral Ginglymus; the Cartilaginous Circumference of the Head turning in the small Sigmoide Cavity, and the semilunar Cavity in the Basis turning upon the small Head at the lower Extremity of the other Bone; and thus the small Extremity of one Bone is join'd to the great Extremity of the other. *Connexion.*

670. IT is articulated with the Os Humeri, by the application of the Cavity in the top of its Head, to the small Head at the lower Extremity of the other Bone. By this Conformation it would be capable of moving in all Directions, but as it is ty'd to the Ulna at both Extremities, its Motions on the small Condylode Head at the lower Extremity of the Os Humeri, are confined to two kinds; that of Rotation when it turns on the sides of the Extremities of the Ulna, and that of Flexion and Extension, in common with the Ulna; and both these Motions may be perform'd at the same time.

671. THE Articulation of the Radius with the Bones of the Carpus, shall be explain'd in describing these Bones.

§. 6. *The Bones of the Hand; and first, the Bones of the Carpus.*

*Situation in
general, and
Division of
the Hand.*

672. THE Hand is the last part of the upper Extremity, and is divided into the Carpus, Metacarpus, and Fingers, as has been already said in the Enumeration of the Bones of the Skeleton. It may be further divided into the concave and convex Side. The concave Side is likewise call'd the inside, because it is commonly, and as it were, naturally turn'd toward the Body, and so hid. The convex Side is, for the same reason, named the outside, as being for the most part turn'd outward and exposed to view. The first is also named the Hollow or Palm of the Hand; the other, the back of the Hand.

*Situation in
general, and
Division of
the Carpus.*

673. THE Carpus or Wrist consists of eight small, unequal, and irregular Bones; and taken all together they represent a sort of Grotto of an irregular Quadrangular Figure, and connected principally with the Basis of the Radius. Considered in this manner, the whole Collection of them has two Sides, and four Edges. One of the Sides is convex and external, the other concave and internal. The Convexity of the outside is pretty uniform, but the inner or concave Side has four Eminences, one at each Corner. One of the four Edges touches the Fore-Arm; and is, as it were, the Head of the Carpus; another Edge may be term'd the Basis, and touches the Metacarpus; the third is toward the Point of the Radius; and the fourth, toward the Point of the Ulna. The first of these last, I shall call the small Edge, the other the great Edge.

674. THE Bones of the Carpus are divided into two Rows; the first of which lies next the Fore-Arm; the second, next the Metacarpus. Each Row consists of four Bones, but the fourth of the first Row, lies in a manner, out of its Rank. Each Bone has several Cartilaginous Surfaces, for their mutual Articulations; and in some of them, for their Articulations with the Radius, and Bones of the Metacarpus, and Thumb.

675. IT is to no purpose to distinguish the three ordinary Dimensions in any of these Bones, except one; but in most of them we may consider six Sides, one external turn'd toward the convex Surface of the Carpus, one internal, toward the concave Surface; one towards the Fore-Arm, which I call the brachial Side; one toward the Fingers, which I call the digital Side; one toward the Point of the Radius, or the radial Side; and one towards the Point of the Ulna, or the cubital Side.

676. OF these Sides some are Bony, others Cartilaginous or Articular. These last I shall call Sides, the others Surfaces, as being Portions of the common Surface of the Carpus in its natural Situation.

677. To distinguish these eight Bones from each other, they are call'd first, second, third, and fourth Bones of the first or second Row, beginning to count from the Radius or Thumb.

678. LYSERUS has been at pains to give a particular Name to each of them. He calls the first Bone of the first Row *Os Scaphoides* or *Naviculare*; the second, *Os Lunare*; the third, *Os Cuneiforme*; the fourth, *Os*

Os Pisiforme : the first Bone of the second Row, Os Trapezium ; the second, Os Trapezoides ; the third, Os Magnum ; and the fourth, Os Unciforme.

679. THE first Bone of the first Row is term'd Scaphoides in *Greek*, *Os Scaphoides*, and Naviculare in *Latin*, from its resemblance to a small Boat. Next the Radius it has a convex Side, by which it is articulated with the Basis of that Bone, and a Tubercle, which is one of the four Eminences on the concave Side of the Carpus. Toward the Thumb it has two Half-Sides, one large one, for the Os Trapezium, and a small one, for the Os Trapezoides. It has likewise a hollow Side for the Os Magnum, and a small semilunar Side, for the Os Lunare. The inner and outer Surfaces are rough.

680. THE second Bone of the first Row is call'd Lunare, because one *Os Lunare* of its Sides is in form of a Crescent. The articular Sides in this Bone are four in number ; one convex, for the Basis of the Radius ; one semilunar, for the Os Scaphoides ; one almost triangular, for the Os Cuneiforme ; and one hollow, which with the hollow Side of the Os Scaphoides, forms a Cotyloide Cavity for the head of the Os Magnum. The convex Side, together with that of the Os Scaphoides, forms an oblong Convexity answering to the oblong Concavity in the Basis of the Radius. The outer and inner Surfaces are small and rough. This Bone would be better nam'd Os Semilunare.

681. THE third Bone of the first Row call'd Cuneiforme from its Figure, *Os Cuneiforme*, appears rather like a Wedge sticking between the two Rows. It has a rough Surface with a small Tubercle upon it, which forms the greatest part of the Cubital Edge of the Carpus ; and four articular Sides, whereof one is convex, which compleats the articular Convexity of the Carpus ; one orbicular and internal, or on the concave Side of the Carpus, on which the Os Pisiforme is set ; and two which make an Angle between them, one for the Os Semilunare, and the other for the Os Unciforme.

682. THE fourth Bone of the first Row call'd Orbiculare, Pisiforme and *Os Orbiculare*, Lenticulare from its Figure and Size, is irregularly round. It has but one Cartilaginous Side irregularly orbicular, the Border or Circumference of which represents a sort of narrow Collar. The rest of the Bone is rough, convex, and irregularly round, making one of the four Eminences on the concave Side of the Carpus. This Bone and the Os Cuneiforme may be suppos'd to make a third Row distinct from the other two.

683. THE four Bones of the second Row lie all in a Line, the first being articulated with the Thumb, the rest with the Metacarpus.

684. THE first Bone of the second Row is named Trapezium as being *Os Trapezium*, suppos'd to be of an unequal square figure. Its outer Surface is rough, and makes a Portion of the convex Side of the Carpps. On its inner Surface, is an oblong Eminence, which makes one of the four Eminences on the concave Side of the Carpus ; and on the same side, it has a Groove or Channel. There is likewise a small Tubercle on the outer Surface.

685. IT has several articular Cartilaginous Sides, viz. one Brachial, one Digital, and two Cubital Sides.

686. THE Brachial Side which is hollow, is articulated with the Os Scaphoides ; the Digital, with the first Phalanx of the Thumb ; one of

the Cubital Sides, with the *Os Trapezoides*, and the other with the first Bone of the Metacarpus.

687. THE Side which is articulated with the first Phalanx of the Thumb, appears to be made up of two superficial Sigmoide or Semilunar Half-Sides, distinguish'd by an Eminence of the same figure, being each more hollow toward the sides than at the middle, which makes a Portion of a sort of superficial Pulley with the Edges much worn.

688. ONE of the Cubital Sides which is articulated with the *Os Trapezoides*, is large; the other which joins the first Metacarpal Bone, is small.

*Os Trape-
zoides.*

689. THE second Bone of the second Row deserves the Name of Pyramidale, rather than Trapezoides, being a kind of Pyramid with the Point broke off. Its Basis makes a Portion of the outer or convex Side of the Carpus, and its Point, a part of the concave Side.

690. IT has several articular Sides, viz. one Brachial, which is the least of all, and articulated with the *Os Scaphoides*; one Digital, of a considerable length, notched on each side and divided into two Halves, by a sort of middle Line or Angle, which gives it the appearance of a Pulley, articulated with the Basis of the first Metacarpal Bone; one Radial, irregularly triangular and articulated with the *Os Trapezium*, and one Cubital, a little hollow and articulated with the *Os Magnum*.

Os Magnum.

691. THE third Bone of the second Row, call'd *Os Magnum*, is the largest of all the Bones of the Carpus. It is of a considerable length, and has a kind of articular round Head, which is received into the Cotyloide Cavity form'd by the two first Bones of the first Row; and this Articulation is capable of a small degree of Flexion and Extension.

692. THE Digital Side is a Cartilaginous Basis, unequally and obliquely Triangular, the Apex being turn'd inward. It is articulated with the second Metacarpal Bone, and is also a little notched on the Radial Edge for its Articulation with the small Edge of the first Metacarpal Bone.

693. THE Radial Side is very small and near the Basis, being articulated with the *Os Pyramidale*; the rest of this Surface is without Cartilage. The Cubital Side is double, answering to a like Side in the *Os Unciforme* with which it is articulated.

694. THE outer Surface which forms a Portion of the convex Side of the Carpus, is broad, rough, and uneven, for the insertion of Ligaments. The inner Surface is likewise rough, but narrower, and round both Surfaces are several Depressions which in the natural State are fill'd with small Glands, Ligaments, &c.

*Os Unci-
forme.*

695. IN the fourth Bone of the second Row, we are to consider the Body and hook'd or Unciform Apophysis, from whence it has the name of Unciforme. This Apophysis, one of the four Eminences on the concave Side of the Carpus, is flat, and the hollow Side of its Curvature, turn'd toward the *Os Magnum*.

696. THE outer Surface of its Body, is rough, and in some measure, Triangular. It compleats the convex Side of the Carpus, and toward the Ulna,

Ulna, terminates in a small Tuberosity which is all the Cubital Side of this Bone.

697. IT has three articular or Cartilaginous Sides, one Radial, one Brachial, and one Digital.

698. THE Radial Side is double, answering to the Cubital Side of the Os Magnum. The Brachial Side is very oblique, some part of it being gently concave, the rest gently convex, answering to the Digital Side of the Os Cuneiforme. The Digital Side is double, or distinguish'd into two Halves, by a Sigmoid Angular Line; for its Articulation with the two last Bones of the Metacarpus.

699. THE Bones of the Carpus are articulated with each other by Arthrodia; but the first Row forms a sort of Ginglymus with the second, because the Head of the Os Magnum may turn in the Cotyloide Cavity of the first Row, while the two first Bones of the second Row, slide upon the Digital Side of the Os Scaphoides, and the Os Unciforme in the same manner, on the Os Cuneiforme. *Connexion and Substance.*

700. WHEN all these Bones are in their natural Situation, a transverse Depression is form'd on the convex Side of the Carpus, by which the two Rows are distinguish'd. This depression appears most between the Os Scaphoides and the three last Bones of the second Row, and looks like a kind of fold by which the second Row is thrown back upon the first. The four Eminences on the concave side of the Carpus, are for the Insertion of a strong transverse Ligament. The inner Substance of all these Bones is spongy, and their Surfaces are not very compact.

§. 7. *The Bones of the Metacarpus.*

701. THE Metacarpus is the second part of the Hand, situated between the Carpus and Fingers. The Ancients who call'd the Carpus, Brachiale, from whence the word Bracelet seems to be derived, term'd the Metacarpus, Post-brachiale. *Situation.*

702. THE Metacarpus consists of four Bones, one side of which forms a broad Cavity, call'd the Palm of the Hand; the other, a gentle Convexity, call'd the Back of the Hand. The ancient Anatomists reckon'd five Bones in the Metacarpus, including that Bone which is now look'd upon as the first Phalanx of the Thumb. *General Division.*

703. THE Bones of the Metacarpus are long, thicker at the Extremities than at the middle, and of unequal length and bigness. The first is the largest, the rest are lessened by degrees in all their Dimensions. The two first are sometimes, tho' very rarely, equal. *Figure and Size.*

704. EACH Bone is divided into the Extremities and middle Part; or into a Basis, Body and Head. The Bases are angular and turn'd toward the Carpus; the Heads rounded like Condyles and turn'd toward the Fingers. Both are cover'd with Cartilages, and the Heads remain for a long time, very distinct Epiphyses. *Particular Division.*

705. THE Bases are narrow and almost angular toward the Palm of the Hand; toward the Back of the Hand, their Breadth is considerable, but on the other two Sides they are very broad; and there they have small articular Sides, which I call lateral Sides. The Heads are flatted on the two Sides, which answer to the lateral Sides of the Basis, and their greatest Convexity is turn'd toward the Palm of the Hand, terminating in two obtuse Points. Several Notches and Fossulæ break in upon the lateral Sides, and the flat Sides of the Heads are a little depress'd, a small Tubercle arising in the middle of each Depression.

706. THE Body of each Bone is contracted, of a triangular Figure, and distinguish'd into three Sides, whereof one is external and a little convex, contributing to make the Back of the Hand; the other two internal and a little concave, one being turn'd obliquely toward the Radius, the other toward the Ulna. These three Sides are separated by the same number of Angles, and that Angle which parts the two internal Sides, is sharp. It is by these two Sides and the Angle between them, that the Hollow of the Palm of the Hand is form'd.

First Bone.

707. THE first Bone of the Metacarpus is longer, thicker and bigger than any of the rest, and supports the Fore-Finger. Its Basis is a little hollow, answering to the digital Side of the Os Pyramidale of the Carpus. On the outer Edge there is a small angular Notch, and on the cubital Edge of the Basis, a small lateral Side which is articulated with the Basis of the second Bone. The inner Edge is terminated laterally by an oblique Angle, which is articulated with the neighbouring Angle in the Basis of the Os Magnum. Round the Basis are Inequalities and Depressions for the Ligaments and articular Glands. The outside of the Body of the Bone is broader toward the Head than toward the Basis.

Second Bone.

708. THE second Bone of the Metacarpus supports the Middle-Finger, and has this peculiar to it, that its Basis is very oblique, terminating at the outer Edge, by an angular Point turn'd toward the first Bone. By the triangular side of its Basis, it is articulated with the Basis of the Os Magnum, and by its lateral Sides, with those of the first and third Bones of the Metacarpus.

Third Bone.

709. THE third Bone of the Metacarpus supports the Ring-Finger, being less than the first and second. Its Basis is irregularly triangular, and proportionably less than the two former; and by the principal Side thereof, it is articulated with the first half of the Side of the Os Unciforme. The small lateral Sides of the Basis join those of the second and fourth Bone of the Metacarpus.

Fourth Bone.

710. THE fourth Bone of the Metacarpus supports the Little-Finger. The principal Side of its Basis, instead of being triangular, as in the other Bones, is all of an equal Breadth, a little oblique, and some part of it gently convex, the rest gently concave, and articulated with the second half of the Side of the Os Unciforme. By its lateral Side it joins the corresponding Side of the Basis of the third Bone, but in a much looser manner

than

than in the other Articulations of the like kind. In the opposite Side, there is a small Tuberosity.

§. 8. *The Bones of the Fingers.*

711. The Fingers make the third part of the Hand, and terminate the whole upper Extremitie. They are five in number in each Hand, call'd the Thumb, the Fore-Finger, the Middle-Finger, the Ring-Finger and the Little-Finger. *Situation, Number, Figure and Size.*

712. THEY may be said in general to represent the same number of compound, long, small bony Pyramids, convex on one side, gently concave on the other, and join'd by their Bases to the Carpus and Metacarpus, from whence they diminish gradually, and end in a sort of small Heads.

713. THE Thumb is the biggest of all the Fingers; next to that is the third, call'd the long Finger. The second and fourth are shorter than the third; the fourth being a very little longer than the second. The fifth is the smallest of all.

714. EACH Finger consists of three Pieces, call'd Phalanges; the first of which is longer and thicker than the second, and the second, than the third. Each Phalanx is divided in the same manner as an intire Finger, into a Basis, middle Portion, and Head; into two Sides, one convex, the other concave; and into two Edges. The Basis of the Phalanges remain Epiphyses for a long time, as well as the Heads of the metacarpal Bones. *Division.*

715. THE first Phalanx of the Thumb is not like those of the other Fingers. Ancient Authors reckon'd it among the Bones of the Metacarpus, which it resembles very much, and then they counted five metacarpal Bones, allowing only two Phalanges to the Thumb. The convex Side of this Phalanx is very much flatten'd, and broader toward the Head than toward the Basis. On the concave Side is a kind of angular Line, which in some measure distinguishes it into two Parts. Its Head is like those of the metacarpal Bones, only flatten'd at top. *First Phalanx of the Thumb.*

716. THE articular Side of its Basis is proportion'd to the digital Side of the Os Trapezium of the Carpus; and fram'd in such a manner as that the sigmoide Cavities and Eminences in both Bones cross each other. This Articulation has something very particular in it. It is a kind of double Ginglymus which readily allows of Flexion and Extension, Adduction and Abduction, but with difficulty permits the oblique Motions, because then the two Sides run counter to each other.

717. THE Head and Basis carry for a long time the Marks of Epiphyses; and for all these Reasons, this Bone may be reckon'd a metacarpal Bone degenerated.

718. THE second Phalanx of the Thumb is shorter than the first; its Body convex or semicylindrical on one side, flat on the other, and contracted between the Edges. The articular Side of the Basis is gently concave, and surrounded near the Edges by small Tuberosities, as also near the Angle of the Phalanx. The Head is a regular Portion of a Pulley, which pro-

projects more on the concave than on the convex side; and on each side of it there is a small Fossula, and some Inequalities in form of Tubercles. On the flat or concave side of the Phalanx, are two rough Lines, one near each Edge, which are often destroy'd in cleaning the Bones. They are the Impressions or Marks of the articular Vaginæ, which shall be explain'd in describing the fresh Bones.

719. THE Connexion of this Phalanx with the first, is by a kind of Arthrodia, or by a flat Enarthrosis, which permits a Motion in several Directions, tho' more limited than in other Articulations of the same kind. It is articulated with the third by a very perfect Ginglymus.

Third Phalanx.

720. THE third Phalanx of the Thumb represents the half of a sort of Cone, cut lengthwise, and by joining it to the same Bone of the other Thumb, an intire Cone is form'd. The convex Side is more even than the flat Side, and on each Edge, there is a Tuberosity near the Basis. The Basis has two hollow Sides, which form a Ginglymus, with the Head of the second Phalanx. The Head is small and flat, ending in a rough semicircular Border, which on the flat side of the Bone, represents a Horse-shoe.

The other four Fingers.

721. THE other four Fingers in general, and their Phalanges in particular, are all nearly of the same Structure, differing chiefly in Size. The Fore and Ring-Fingers are almost equal, only the Fore-Finger is generally a little bigger, and sometimes a little shorter than the other. The Middle-Finger is the longest, and the Little-Finger the least. Almost the same proportions are to be observ'd in the Phalanges.

First Phalanges.

722. THE first Phalanges of these four Fingers are made nearly in the same manner with the second of the Thumb; only they are longer in proportion, flatter on the concave Sides, and more rounded on the convex Sides. The Edges of the flat Sides have the same rough Line as the second Phalanx of the Thumb. Their Bases are more hollow, for their Articulation with the Heads of the metacarpal Bones, and their Heads are like Pulleys, as in the second Bone of the Thumb.

Second Phalanges.

723. THE second Phalanges are shorter, narrower and thinner than the first. Both Phalanges are gently incurvated, and resemble each other in Structure, except that the second contract by degrees from their Bases to the Heads, which are very small, and that their Bases have a double Cavity for their Articulation by a Ginglymus, with the Heads of the first Phalanges. Their flat Sides have the same rough Lines already mention'd.

Third Phalanges.

724. THE third Phalanges are in every thing like that of the Thumb, except that they are smaller, each of them being proportion'd to the Fingers they belong to.

725. IT is to be observ'd concerning all the Phalanges, that their Bases have small Tuberosities, and their Heads, except those of the last Phalanges, have on each side a roundish sort of Fossula, border'd with small Eminences.

§. 9. *The particular Situation and Uses of the Bones of the upper Extremity.*

726. The Hand is generally represented in Sceletons and Figures, as lying in the same Plane, and in the same longitudinal Direction with the Bones of the Fore-Arm. This gives a very false Idea of its true Situation, which, with respect to the Fore-Arm is oblique in two Respects. The Back of the Hand is inclined upon the convex Side of the Carpus, and makes an Angle with the Fore-Arm, and besides, the fourth Bone of the Metacarpus is inclined towards the Ulna in particular. In a word, the Breadth of the Hand makes an Angle with the Breadth of the Fore-Arm, and the Thickness of the Hand at the same time, with the Thickness of the Fore-Arm. I mean here that part of the Fore-Arm which is next the Hand.

727. THIS is owing to the Structure and Situation of the Bones of the Carpus, and to their Connexion with those of the Fore-Arm. First, the two Rows of these Bones make a sort of transverse Fold on the convex Side of the Carpus; and the articular Brachial Sides of the two first Bones of the first Row are turn'd a little toward the same convex Side of the Carpus; which obliges the whole Hand to be a little bent back in its natural Situation. Secondly, the Edge of these Bones next the Ulna is much shorter than that next the Radius, which makes the cubital Edge of the whole Hand incline to that side.

728. By not considering this, a large void Space is commonly left in Sceletons, between the Extremity of the Ulna and the Os Cuneiforme of the Carpus. It ought likewise to be observed that the Edge of the Metacarpus next the Ulna is shorter than the other, so that in the Metacarpus a small and great Edge may as justly be distinguish'd, as in the Carpus.

729. IN this oblique and natural Situation of the Hand, the Fingers being extended and a little separated, the Extremity of the Fore-Finger will be found to answer to the Interstice between the Bones of the Fore-Arm; and if in this Situation we make alternately the Motions of Pronation and Supination, the Extremity of the Fore-Finger will be found to be in some measure the common Center of these Motions.

730. THIS Disposition of all the Bones of the Hand is moreover very well contrived, to give it several kinds of Attitudes; for by means thereof, it may be lengthen'd, flatt'd, shorten'd and contracted. The Hand is lengthen'd or widen'd, and flatt'd, by extending all the Fingers and turning back the Thumb, which is what is call'd Extending or Opening the Hand. It is shorten'd by bending all the Fingers, whether in what is call'd closing the Fist, or in grasping any thing; and to this the Situation of the Thumb, and the oblique Disposition of the Bones of the Metacarpus and Fingers contribute in a particular manner. And as in this Case, the Thumb counter-ballances all the other Fingers, the Articulation of the first Phalanx thereof with the Os Trapezium, appears to be render'd more firm and stedd'y, by partaking a little of the Nature of a Ginglymus, without hindering its other Motions. Lastly, the Hand is contracted, and made into a sort of Gutter or Furrow, by the Adduction of the Thumb, and the easy Motion

of the fourth metacarpal Bone already mention'd. And if at the same time we bend the Fingers and press them close together, we both shorten and contract the Hand; and thereby form a Hollow, which is call'd *Diogenes's Cup*.

731. IN the Fingers, we ought likewise to remark, that tho' the Articulation of the second Phalanx of the Thumb, and first Phalanges of the other Fingers be moveable in many Directions, and framed nearly in the same manner as that of the Os Humeri with the Scapula, yet these Phalanges cannot be mov'd round their Axes. This is not owing to their Conformation, but to the want of proper Muscles, as we shall see afterwards. The same thing cannot be said of the first Phalanx of the Thumb, because, tho' it had proper Muscles, yet the kind of half Ginglymus, by which it is articulated, would not allow of such a Motion.

732. THE Thumb is situated differently from the other Fingers. The Fingers, both with respect to their Sides and Edges, have in their natural Situation, nearly the same Direction with the Plane of the Metacarpus. The Thumb being in its natural Situation, and free from the Action of all its Muscles, its convex Side answers to the convex Side of the Radius, and its flat Side is turn'd toward the Little-Finger; and the first Phalanx makes an hollow Angle with the Radius, and a prominent Angle with the second Phalanx; but both this and the third Phalanx lie in a streight Direction, like that of the Fore-Arm.

733. THE Carpus is the Basis and Center of all the Motions of the Hand, except that of Rotation. By means thereof, we can bend the Hand in all Directions, but with more ease toward the Sides and Edges, than any other way. The four Bones of the second Row may have a small degree of Motion on the first, such as a Ginglymus can allow of.

734. THE Radius is in a manner the Handle of the Hand, and it is chiefly by means thereof, that we can move the Hand reciprocally as on an Axis, turning either Edge of it toward the Body. When the Radial or great Edge is turn'd to the Body, this Motion or Attitude is term'd Pronation, and when the Cubital or small Edge is toward the Body, it is term'd Supination. In the natural and most ordinary Situation of the Hand, the Palm is turn'd toward the Body, and not the Edges.

735. THIS Disposition of the Hand determines the true Situation of the Radius, which is not on one side of the Ulna in a parallel Direction, as the Figures and Sceletons commonly represent it; but the Radius crosses the Ulna obliquely in such a manner, as that the styloide Apophyses in both Bones are directly over-against each other. This is its true natural Situation. The Radius being bent, may be still further cross'd over the Ulna, than in its natural Situation, and this happens in Pronation; but in Supination it is parallel to the other Bone.

736. THE Ulna supports the Handle of the Hand, without being itself articulated with the Hand. Two lateral Ginglymi and very strong Ligaments connect the Radius closely with it, so that in the most violent Motions, these two Bones cannot be separated. When we push or press any thing with the Hand, the whole force is sustain'd by the Radius, the Basis of which

which supports the Wrist, and its concave Head is strongly press'd against the small inferiour Head of the Os Humeri. The oblique Direction of the Pulley of the Ulna, is the reason that in bending the Fore-Arm upward, the Extremity of that Bone is naturally turn'd toward the Thorax, and not without difficulty toward the Articulation of the Scapula.

ART. V.

The Bones of the lower Extremities.

737. **T**HE inferiour Extremities are two in number, situated laterally below the Trunk, which both supports and is supported by them according to the different Situations of the Body. Each Extremity is divided into the Thigh, Leg and Foot. In describing the Situation of all these Bones, I suppose the Subject to be standing.

§. I. *The Os Femoris.*

738. **T**HE Thigh-Bone is the biggest and longest Bone of the Sceleton. Its *Size and Figure.* comes near that of a Cylinder, and it is a little bent at the middle.

739. **I**T lies in the same Direction with the Trunk; only a little obliquely, *Situation in general.* in such a manner, as that the upper parts of the two Bones are a greater distance from each other than the lower.

740. **I**T is divided into the upper, middle and lower Parts, or into the *Division.* Body and two Extremities.

741. **I**N the upper Extremity we are to consider the Head, Neck, and *Upper Ex-* two Tuberosities, one named the Great Trochanter, the other, the Little *tremity.* Trochanter.

742. **T**HE Head is rounded like a Portion of a Globe or Ball, and cover'd with a very smooth Cartilage. Its Situation is obliquely outward, and a little forward, so as that the greatest Portion of its Convexity lies in the upper Part, and the smallest in the lower Part; and the Cartilage extends further on the Fore and Backsides, than on the other Sides.

743. **A** little below the middle of its Convexity, there is a Fossula, nearly of a femilunar Figure, in which a Ligament is inserted in the natural State. This Head is an Epiphysis in Children, and in some Subjects remains such for a long time, and is therefore liable to be separated from the Neck by any violent Force.

744. **T**HE Neck is an Apophysis, situated interiorly at the upper part of the Bone, being inclined upward, and a little forward, and making an Angle with the Body more or less oblique, but in some Subjects it lies almost transversely. Towards the lower part, it expands into a kind of Basis; and at its middle narrow Part, we observe a rough superficial Impression, which surrounds it like a Collar.

745. **T**HE great Trochanter is a large Tuberosity lying on the exterior, and a little toward the posteriour part of the Basis of the Neck. It is very high, and turn'd a little backward, terminating in an obtuse Point in which

there is a Cavity or Fossula. Its Convexity is unequal, and distinguish'd into several Surfaces, which are muscular Impressions; and the like Impressions are found on its Edge and concave Side.

746. THE little Trochanter lies on the posteriour and inferiour part of the Basis of the Neck, being turn'd inward.

747. BETWEEN the two Trochanters posteriorly, there is an oblong, oblique Eminence, which is a sort of Communication between them, and lengthens out the Cavity behind the great Trochanter. Anteriorly there is likewise a broad oblique Line, sometimes considerably rais'd, which runs between the two Apophyses, and terminates the Basis of the Neck on the fore part.

*Lower Ex-
tremity.*

748. THE lower Extremity of the Os Femoris is broad and thick, being, as it were, the Basis of the whole Bone. We observe in it two large articular Eminences situated laterally with respect to each other, which are separated, and very prominent on the backside, but united like a Pulley on the fore-side. They are call'd Condyles, and with respect to the length of the Body of the Bone, the internal Condyle is longer, and reaches lower than the other; but regard being had to the Obliquity of the Bone, there is very little difference between them, both lying nearly in the same horizontal Plane.

749. THE external Condyle is broader, and advances more forward than the other. They are cover'd with a smooth Cartilage, and tho' they both make but one Body, they are in some measure distinguish'd on the fore and lower Sides by a superficial Depression, after the manner of a Pulley, and behind they are parted by a deep round Fossa.

750. IN this large Fossa or Notch, there are several small Holes; and likewise two superficial and pretty broad femilunar Impressions, one at the lower Edge of each Condyle; that on the internal Condyle being situated a little forward, and the other a little backward.

751. ON the side of each Condyle there is a Tuberosity, and behind that a muscular Impression, together with a small cartilaginous Surface, on which lies a kind of sesamoide Bone, as we shall see in describing the Muscles.

Body.

752. THE Body or middle Portion of this Bone represents a Pillar or Cylinder bent forward. We may however distinguish three Sides in it, one anterior, which is more rounded in the middle than in the upper and lower Parts; and two posterior, more flat than the former, and separated by a long angular Ridge, call'd Linea Aspera, which is rough, unequal, and very prominent, and seems to arise from both Trochanters. On the outside of this Ridge, toward its upper part, there is a rough longitudinal Mark, a little depress'd toward its lower Extremity. Below, the Linea Aspera is divided into two, each running in the Direction of the Condyles; but being soon lost after the Division, a flat triangular Surface, very broad near the Condyles, comes in its place. The external Line is more prominent than the internal, till they both vanish.

753. THERE is likewise another oblique unequal Line, before and under the little Trochanter, which, as it descends, unites with the Linea Aspera. All these Lines, Ridges and Depressions are for the Insertion of Muscles. About the middle of the Bone on the back part we see sometimes one Hole, sometimes more, for the Passage of Blood-Vessels and Nerves.

754. THE natural Direction of the Os Femoris is not perpendicular, but oblique, the superiour Extremity being inclined outward, the inferiour Extremity inward; so that the two Bones, as has been already said, are at a greater distance above than below; and from hence we see the reason why the internal Condyle appears to reach lower down than the external, when we view a single Bone. *Situation in particular.*

755. THIS Bone is spongy at the Extremities, and hollow in the middle; the Cavity being filled with reticular Substance and Portions of Laminæ detached from each Side. *Substance.*

756. IT is articulated above, by Enarthrosis with the Os Innominatum, its Head being received into the Acetabulum; below, it is connected with the Tibia by a particular kind of Ginglymus, of which hereafter. *Connexion.*

§. 2. *The Bones of the Leg; and first, the Tibia.*

757. THE Leg is the second part of the lower Extremity, situated perpendicularly between the Thigh and the Foot, and consisting of two large Bones call'd Tibia and Fibula, and a small one call'd Patella.

758. THE Tibia is a long Bone irregularly triangular, and much larger at top than below. Its name is taken from the resemblance it bears to a kind of Pipe or Flute used by the Ancients. It is divided into two Extremities and a middle Part, or into the Head, Body, and Basis. *Figure and Division of the Tibia.*

759. THE upper Extremity or Head of the Tibia, consists of two Condyles, the upper Side of which is flat and divided into two Cartilaginous Surfaces, almost Horizontal and a little hollow, one internal, the other external. Between these lies a Cartilaginous Tuberosity, which appears to be double, and has Inequalities both on the fore and back Part, for the Insertion of Ligaments. The two Surfaces answer to the two Condyles of the Os Femoris. The internal is something oblong from before backward, and a little more depressed than the other. The external is rounder and descends a little backward. The whole Head taken transversely is Oval, except toward the back part, where there is a superficial Notch; and the Circumference is very rough. *Upper Extremity.*

760. THE external Condyle is more prominent than the internal, and on its lower part, a little backward, there is a small Cartilaginous Surface for the Articulation of the Fibula. On the fore part of the Head there is an unequal Tuberosity, call'd the Spine of the Tibia, for the Insertion of the Tendinous Ligament of the Patella.

761. ALL that part of the Head which lies above the level of the Spine, is Epiphysis in Children; and the Spine is originally an Epiphysis distinct from the other; but it afterwards becomes an Apophysis of the Head of the Tibia.

762. THE lower Extremity is neither so thick nor so broad as the upper. It may be look'd upon as the Basis of the Bone, and on its outside there is a longitudinal Depression broader at the lower, than at the upper part, which receives the end of the Fibula. On the inside of the Basis, there is an *Lower Extremity.*

an Apophysis call'd the inner Ankle; which runs down lower than any other part, and has towards its posteriour Side, a Groove or Channel, for the Passage of a particular Tendon.

763. THE Basis of the Tibia terminates in a transverse oblong Cartilaginous articular Cavity, the capacity of which is increased on the inside by the inner Ankle, the Cartilage being likewise continued over that Side of it, which is turn'd toward the Cavity. Through the middle of this Cavity a superficial Eminence runs, by which it is divided into a right and a left Portion.

764. ALL the inferiour Portion of the Basis of the Tibia together with the Ankle, is Epiphysis in Children, and the Marks thereof remain for a long time after the Ossification is perfected.

765. THE greatest breadth or longest Diameter of the Basis of the Tibia does not lie in the same Plane with that of the Head, the Ankle lying a little more inward than the internal Condyle. This Observation is of great consequence in Fractures and Luxations.

Body.

766. THE Body of the Tibia is in a manner triangular, being distinguish'd into three Sides, one internal, one external, and one posteriour; and into three Angles, one anteriour, call'd the Crista of the Tibia, and two posteriour.

767. THE inner Side is the broadest of the three, very equal, gently convex, and turn'd a little forward. The outer side is unequally flat and narrower than the former. The back side is unequally rounded, and the narrowest of all. At its upper part, however, it is of a considerable breadth, and there we observe a long oblique Muscular Impression, beginning under the Notch in the posteriour part of the Head, and from thence running downward toward the inner Side. Immediately below the Extremity of this Impression there is another less oblique.

768. THE anteriour Angle call'd Crista, is sharp, prominent about the middle, and almost round at the lower part. It might be reckon'd a Continuation of the Tuberosity or Spine. The internal posteriour Angle is something rounded; the external is more acute, except toward the upper part where it is more or less flattened.

*Substance
and Con-
nexion.*

769. THE Substance of the Tibia is the same with that of the other long Bones. It is connected above, with the Condyles of the Os Femoris, by an Articulation which is partly a Ginglymus, for the Extension and Flexion of the Leg, and partly an Arthrodia for the Rotation of the Leg when bent. This is owing to two intermediate Cartilages which shall be examin'd in the Description of the fresh Bones.

§. 3. *The Patella.*

*Situation in
general, Fi-
gure, and
Size.*

770. THE Patella is a small Bone, situated above the Spine of the Tibia, resembling a large Chesnut. It is about half as thick as long, and its length and breadth are nearly equal.

771. It is divided into a Basis, Apex, and two Sides, one convex, the other concave. The Basis is the superiour, and thickest part of the Bone, and is mark'd with a very considerable Muscular Impression, which runs down for a little way on the convex Side. The Apex is obtuse, and serves for the Insertion of a strong Ligament, which ties the Patella to the Spine of the Tibia. *Division.*

772. THE anterior Side is convex, with some small Inequalities and Furrows upon it. The posterior Side is concave, cover'd with a Cartilage reaching near the Apex, and terminating at an unequal Cavity or Fossula, which is an Impression for the Ligament already mention'd. This Cartilaginous Side is parted in two by a Ridge which goes between the Basis and Apex; and the two parts are exactly suited to the Pulley of the Os Femoris, the external part being broader than the internal, which is likewise observable in the Pulley.

773. THE Patella remains long, Cartilaginous, and in ossifying, it becomes intirely cellulous, except the Surfaces of its two Sides and the Impressions. *Substance.*

774. It is connected with the Tuberosity of the Tibia by a thick strong Ligament, and indeed I look upon it as belonging in a particular manner to the Tibia, or as a moveable Olecranon, which again may be look'd upon as a fix'd Patella. The reason of this difference in the two Extremities shall be given in the History of the fresh Bones and Muscles. *Connexion.*

§. 4. The Fibula.

775. THE Fibula is a small long Bone, irregularly triangular, lying on the outside of the Tibia almost opposite to the external posterior Angle, but a little more backward. It is divided into the upper Extremity or Head, middle Portion or Body, and lower Extremity or Basis. *Size, Situation and Division.*

776. The upper Extremity is a kind of Tuberosity or Head obliquely flattened by a small Cartilaginous Plane, by which it is articulated with the Cartilaginous Surface at the lower part of the external Condyle of the Tibia. It terminates backward by a kind of short blunt Point directed upward.

777. THE lower Extremity is broader, flatter, and more oblong than the upper. It is partly a continuation of the Body of the Bone, and partly an Epiphysis in Children, the Marks of which are quite lost in an advanced Age. It has, in a manner, three Sides, one rounded like a Tuberosity, one flat, and the third narrow. When it is placed in the lateral Cavity of the Basis of the Tibia it makes the outer Ankle, opposite to the inner Ankle. In its natural Situation it reaches much lower down than the Basis of the Tibia, and ends in a Point turn'd a little backward.

778. THE flat Side is Cartilaginous, and turn'd toward the Cartilaginous Side of the inner Ankle, with which, and with the inferiour Side of the Basis of the Tibia, it compleatly forms the Cavity by which the Leg is articulated with the Foot. The narrow Side is turn'd backward, and near its

its lower part, is a small oblong, unequal Fossula, formerly believ'd to be for the Passage of a Tendon, in which a small Mucilaginous Gland is lodged. The Point by which the Basis of the Fibula ends, has a small smooth Surface immediately below the narrow Side, for the Insertion of an annular Ligament.

779. THE Body of this Bone is long and small, more or less contorted and irregularly triangular. Near the two Extremities it contracts into a kind of Neck, and a little below the middle it is often bent inwards, but this Curvature seems chiefly owing to the method of dressing Children, for we sometimes meet with this Bone very streight. It is distinguish'd in an irregular manner, into three Sides, and three Angles, principally towards its lower part.

780. THE outside is the most considerable. The upper half of it is more or less hollow; afterward it grows round, and altering its Direction, becomes almost posterious in the lower Half. The posterious Side is more or less convex toward the upper part; then it grows flat, and turning in the same manner as the former, becomes nearly internal toward the lower part. The inner Side has likewise a turn below its middle, and becomes anterior from thence downward; and this turn is mark'd by an oblique Line which runs down on this Side from behind forward, and divides it into two. These Sides serve partly for Muscles to lie upon, and partly for their Insertions.

781. THE internal Angle of the Fibula answers to the external posterious Angle of the Tibia, and both serve for the Insertion of the Interosseous Ligament of the Leg. The other two Angles are more or less sharp, especially the anterior, which is sometimes like a kind of Crista, and terminates below, in a small triangular Surface.

Substance
and Con-
nexion.

782. THE internal Structure of the Fibula, tho' a very small Bone, is like that of the other long Bones. It is articulated by its upper Extremity with the inferior Surface of the external Condyle of the Tibia. This Articulation is an Arthrodia with a very small degree of Motion. The inferior Extremity is articulated by its Cartilaginous Side, partly with the lateral Depression in the Basis of the Tibia, in the manner that shall be explain'd in the History of the fresh Bones, and partly with the first Bone of the Foot, completing the Ginglymus between the Leg and that Bone.

§. 5. *The Bones of the Foot; and first, the Bones of the Tarsus.*

783. THE Foot is the third Portion of the lower Extremity, and is divided into three Parts, the Tarsus, Metatarsus, and Toes. The Vulgar mention several other parts of the Foot, such as the Heel, the Point, the upper Part, the Sole, the Sides or Edges, one internal, the other external, &c.

784. THE Tarsus consists of seven Bones, much larger than those of the Carpus; the names for which, in the order in which they are commonly described, are the Astragalus, Os Calcis, Os Scaphoides, Os Cuboides, and three Ossa Cuneiformia. According to their Size they may be divided into three Classes of large, middle-siz'd, and small Bones. The Astragalus and

Os Calcis belong to the first Class ; the Os Scaphoides and Os Cuboides to the second ; and the three Offa Cuneiformia to the third.

785. THE particular Divisions of each of these Bones, and indeed of all the Bones of the Foot, are much more easy than in the Bones of the Hand, because the Foot remains always in the same attitude ; and therefore the antérieur, postérieur, supérieur, inférieur, latéral, and other Parts may be certainly fix'd, without any danger of mistaking.

786. ACCORDING to the natural Situation of the Foot, and its Connexion with the Leg, the Astragalus is the supérieur and first Bone of it. This Bone may be divided into two Portions, one large and postérieur, which is, as it were, the Body of the Bone ; and one small and antérieur, which is an Apophysis or the antérieur Portion. *Astragalus.*

787. THE Body or postérieur Portion has four Sides, one supérieur, two latéral, and one inférieur. The upper Side is the largest, cover'd all over with a Cartilage, Cylindrically convex from before backward, with a Depression running through the middle of its breadth, which represents half a Pulley, and continuous with the two latéral Cartilaginous Sides, of which the external is broader than the other. This upper Side is articulated with the lower Side of the Basis of the Tibia, the internal latéral Side, with the inner Ankle, and the external latéral Side with the outer Ankle. Below the internal latéral Side there is a great Depression without Cartilage, and several other Inequalities.

788. THE lower Side is likewise Cartilaginous and obliquely concave for its Articulation with the Os Calcis. At the very lowest and postérieur part of the Body of the Astragalus, on the Edge of the lower Side, is a small, oblique, smooth Notch or Channel for the Passage of Tendons.

789. THE Apophysis or antérieur Part of the Astragalus, is distinguish'd from the Body by a small Depression on the upper Part, and on the lower, by a long, oblique, unequal Notch, very broad toward the outside. The antérieur Side of this Apophysis is all Cartilaginous and obliquely convex, for its Articulation with the Os Scaphoides. The lower Side likewise Cartilaginous is parted in two, and articulated with the Os Calcis, being distinguish'd from the lower Side of the Body of the Bone by the long oblique Notch already mention'd. Besides these two Cartilaginous Sides there is a third below the antérieur, towards the inner Part, which in the Sceleton touches nothing.

790. THE Os Calcis is the largest Bone of the Foot, of which it makes the postérieur Part, and, in some measure, the Basis. It is oblong and very irregular, and may be divided into a Body and two Apophyses, one great and antérieur, the other small, latéral and internal. *Os Calcis.*

791. THE Body of the Os Calcis has six Sides, one postérieur, one antérieur, one supérieur, one inférieur, and two latéral.

792. THE postérieur Side is broad, unequally convex, and as it were divided into two Portions, one supérieur, small, and polish'd ; the other inférieur, much larger, unequal and rough, which in Children is an Epiphysis ; and may be nam'd the Tuberosity of the Os Calcis. The lower Part of it is bent

downward, and terminates in two Tubercles or obtuse Points, which belong rather to the inferiour than to the posteriour Side of the Bone.

793. THE upper Side may be divided into two Parts, one posteriour and unequal, having a small Depression; the other anterior, convex and cartilaginous, proportioned to the great inferiour Cavity of the Astragalus. This Side is turn'd obliquely forward, and by this Obliquity becomes part of the fore side, the remaining part of which is lost in the anterior Apophysis.

794. THE lower side is narrow, and behind it, lie the two Tubercles already mention'd, of which the internal is the biggest. They both serve for the Insertion of the Aponeurosis in the Sole of the Foot, but chiefly the biggest.

795. THE two lateral Sides are continued over the anterior Apophysis. The external is gently convex and unequal, cover'd only by the common Integuments and Ligaments. The internal is hollow'd and depress'd.

796. THE great or anterior Apophysis lies in the same Direction with the Body, being a continuation thereof. It has five Sides or remarkable Parts, and were it not for the Body, it would have a sixth.

797. THE upper Side has an irregular and unequal Depression, which together with that in the Apophysis of the Astragalus forms a considerable Fossula. At its anterior Extremity there is a small Cartilaginous Surface answering to one of those in the Apophysis of the Astragalus.

798. THE anterior Side of the Apophysis is broad, oblique, Cartilaginous, partly convex and partly concave, and articulated with a like Surface of the Os Cuboides. This is the fore Side of the whole Os Calcis when consider'd without any Division.

799. THE outside of the Apophysis is very rough, being a Continuation of the outer Side of the Body, with a Tubercle or Eminence at the place where these two Sides meet, which, however, is not found in all Subjects. On the lower part of this Tubercle, is a Cartilaginous Surface for the Passage of the Tendon of the Peronæus Longus. Sometimes we see only some small Vestiges of this Eminence, and often none at all. We sometimes meet with another small Cartilaginous Surface lower down and more forward, near the anterior Extremity of the Apophysis, for the Passage of the same Tendon.

800. THE lower Side is a Tuberosity continued from the Side of the Body, and design'd for the Insertion of Muscles.

801. THE lateral Apophysis is almost common to the Body, and to the great anterior Apophysis, and increases the Cavity on the inside of the Os Calcis. On its upper Part, it has a very smooth Cartilaginous Surface articulated with one of the inferiour Surfaces of the Astragalus. This Apophysis is very low down, and its inferiour Part is smooth for the Passage of Tendons.

802. THE Os Scaphoides, call'd also Os Naviculare from its resemblance to a little flat Boat, lies before the Astragalus. It has two Cartilaginous Sides, an Oval Circumference and a Tuberosity. Its thickness is inconsiderable.

Os Scaphoides.

siderable when compared with its other Dimensions, and it lies, as it were on its Side, before the Astragalus.

803. THE concave Side is posteriour, articulated with the anteriour convex Side of the Astragalus. The anteriour convex Side is divided by two small Lines into three Planes for the Articulation of the three *Ossa Cuneiformia*.

804. THE Circumference forms an Oval, which contracts by small degrees and terminates in an obtuse Point. One Side of this Circumference is more convex and rough than the other, and the Inequalities in it serve for the Insertion of Ligaments. The Point of the Oval ends in a Tuberosity mark'd with a Muscular Impression. In the natural Situation of this Bone, the most convex Side is uppermost, the other, lowest, and the Tuberosity turn'd inward and downward.

805. BY this Situation, and the difference of the Sides, it is easy to distinguish the *Os Naviculare* of the right Foot from that of the left. The small or inferiour Convexity of the Circumference, has near the Tuberosity, a superficial Notch, and on the opposite Side, a small Cartilaginous Surface and a small Tubercle for its Articulation with the *Os Cuboides* and the Insertion of Ligaments.

806. THE *Os Cuboides* is situated before the *Os Calcis*, on one side of *Os Cuboides*. the *Os Scaphoides*. It is a Mass with six Sides all very unequal and very irregular; and from these it has its Name.

807. THE upper Side is flat and rough, for the Insertion of the Ligaments which connect it with the neighbouring Bones.

808. THE lower Side has an oblique Eminence, and immediately below that, a Canal or Groove which is likewise oblique. The Eminence divides this Side into two, and is a little Cartilaginous on that Edge which touches the Groove. The Groove appears to be Cartilaginous from a Ligament which lines it, and both that and the Edge of the Eminence serve for the Insertion of an annular Ligament and for the Passage of the Tendon of the *Peronæus Longus*.

809. THE posteriour Side is cartilaginous, broad, oblique, partly convex and partly concave, answering to the anteriour Side of the *Os Calcis*.

810. THE anteriour Side is pretty broad, and divided into two Portions by a narrow prominent Line, by which Portions this Bone is articulated with the third and fourth Bones of the Metatarsus.

811. THE inner Side is the longest of all. It has a small Cartilaginous Surface, by which it is articulated with one of the *Ossa Cuneiformia*. The rest is rough, with several Depressions, in which Vessels and Glands are lodged. Behind the Cartilaginous Portion, there is in some Subjects another narrow Surface, which is articulated with the neighbouring Portion of the Circumference of the *Os Scaphoides*; this Articulation when wanting, is supply'd by Ligaments.

812. THE outside is the least of all, irregular, short, and narrow, and it has a Notch which communicates with the Groove on the lower Side.

Ossa Cuneiformia.

813. THE *Ossa Cuneiformia* are three in number, situated before the *Os Scaphoides*, and they have their name from the resemblance they bear to Wedges. The first is the largest, the third, the least; and the second of a middle size between the other two. With the *Os Cuboides* they form a sort of Arch which on the side next the other Foot is high, and low on the opposite side.

814. IN each Bone we may distinguish the Basis, Apex, and four Sides, one posteriour, one anterior, and two lateral, whereof one is internal, the other external.

815. THE first Bone is like a Wedge contorted and bent. Its Basis is low down, unequally rounded, like an oblong Tuberosity, serving for the Insertion of a Tendon.

816. THE internal lateral Side, or that which is turn'd toward the other Foot, is unequally convex and rough for the Insertion of Ligaments.

817. THE external lateral Side, or that next the second Bone, is unequally concave, and Cartilaginous toward the superiour and posteriour Edges. The largest Portion of this Side, is articulated with the second Bone; the rest toward the anterior Edge, is join'd laterally to the second Bone of the Metatarsus.

818. THE back side is the least, Cartilaginous, and almost Triangular, suited to the first of the three triangular Surfaces of the *Os Scaphoides*.

819. THE anterior Side is Cartilaginous, large, and semilunar, the convex Edge being turn'd to the other Foot, and by this, the first *Os Cuneiforme* is articulated with the first Bone of the Metatarsus.

820. THE Angle is turn'd upward, and the Obliquity thereof occasions the anterior Side to be the highest, and the posteriour, the lowest.

821. THE second *Os Cuneiforme*, the least of the three, has the Basis upward, and the Angle downward, and resembles a Wedge more than the first. Its Basis is short and rough for the Insertion of Ligaments. The back side is Cartilaginous, and perfectly Triangular, suited to its Articulation with the middle Surface of the convex Side of the *Os Scaphoides*. The anterior Side is also Cartilaginous, a little more oblong, and articulated with the Basis of the second Metatarsal Bone.

822. THE two lateral Sides have toward their superiour and posteriour Edges, oblong Cartilaginous Surfaces, by which they are articulated with the first and third *Ossa Cuneiformia*. The rest of these two Sides is a little depressed, and thereby small Interstices or void Spaces are left between the Bones. This is every way the shortest Bone of the three. Its Angle is hid between the other two Bones of the same name, and does not reach so low as theirs, which makes this part of the Foot a little hollow.

823. THE third *Os Cuneiforme*, of a middle size between the other two, has likewise its Basis upward and its Angle downward. The Basis is longer than that of the second, almost flat or very little convex, and rough for the Insertion of Ligaments. The Angle runs down lower than that of the second Bone.

824. THE back side is Cartilaginous and Triangular, that is, of the same figure with the third Surface of the convex Side of the Os Scaphoides. The anterior Side is likewise Cartilaginous and Triangular, but a little oblong, being articulated with the Basis of the third Bone of the Metatarsus.

825. THE internal lateral Side is broad, with two Cartilaginous Surfaces, one toward the posteriour Edge, the other toward the anterior. The first is for its lateral Articulation with the second Os Cuneiforme, the second for its lateral Articulation with the Basis of the second Metatarsal Bone.

826. THE external lateral Side is likewise broad, and toward its posteriour Edge, has a large Cartilaginous Surface for its Articulation with the Os Cuboides. Toward its anterior Edge, there is a sort of void Space for the Passage of Vessels, and sometimes a little Cartilaginous Corner for its lateral Articulation with the fourth Bone of the Metatarsus.

§. 6. *The Bones of the Metatarsus.*

827. THE Metatarsus is the second part of the Foot; and in some things it agrees with the Metacarpus, and differs from it in others. It consists of five Bones, whereas the Metacarpus is reckon'd to consist only of four, and it forms a sort of Grate, inclin'd in the same manner with the Arch of the Os Cuboides and Ossa Cuneiformia. These Bones are distinguish'd only by the names of first, second, &c. and to them we may add two Sesamoide Bones commonly preserv'd in the Sceleton, which belong to the great Toe.

828. THE Bones of the Metatarsus, like those of the Metacarpus, may be divided into two Extremities, and a middle Part; or into the Head, Basis, and Body. The Heads are situated forward, the Bases backward, and both are Cartilaginous as in the Hand. The Bodies are Triangular, but disposed in such a manner, as that the Parts call'd external and internal in the Hand, are here the superiour and inferiour.

829. THE first of the five Metatarsal Bones is the biggest and shortest of all. The four following are proportionably longer than in the Hand, and their Bases larger than the Heads; so that in their natural Situation, the Bases take up a greater Space than the Heads. The Heads terminate, towards the Sole of the Foot, by two small Productions as in the Hand. In these four Bones the inferiour Angles of their Bodies, are turn'd obliquely outward, and their Heads do not lie altogether in the same Direction with their Bodies. The Basis of the first Bone, and the Heads of the other four, remain for a long time Epiphyses; of which there are likewise some Marks in the Head of the first.

830. THE Basis of the first Bone of the Metatarsus, has a semilunar *First Bone.* Circumference, the flat Side being turn'd outward or toward the second Bone of the same Foot, and the convex Side inward, or toward the other Foot. One point of the Crescent is turn'd upward, the other downward; and the whole

whole Basis is gently hollow, but broader toward the upper than toward the lower Part. At the external Edge or flat Side of the Basis, there is often a Cartilaginous Surface for its lateral Articulation with the Basis of the second Bone; and at the lower part of the same Side, precisely at the inferiour Point of the Crescent, there is a very remarkable and very constant Muscular Impression for the Insertion of the Tendon of the Peronæus Longus. The Circumference of the Basis is a little raised, like a flat Roll.

831. THE Head of this Bone is thick, Cartilaginous, and convex on the fore and lower Part, but with this difference, that the Convexity on the fore part is simple and even, but on the lower, resembles a double Pulley, having two Cavities and three Eminences, viz. two Edges, a Channel near each Edge, and an Eminence between the two Channels. The Convexity in general is for the Articulation of this Bone, with the first Phalanx of the great Toe, and the double Pulley for that of the two Sefamoide Bones already mention'd, and which shall be described after the Toes.

832. THE Body of the Bone is triangular, and very big, having three Sides, two superiour and one inferiour. One of the superiour Sides is internal and rounded, the other external and gently concave, and the inferiour Side is flat. It has likewise three Angles, one superiour, and two inferiour, one internal, the other external; on the lower part of which we see a sort of Continuation of the tendinous Impression of the Peronæus Longus.

Second Bone.

833. THE second Bone of the Metatarsus is the biggest of all. Its Basis is large, triangular, and a little oblique, and the principal Cartilaginous or articular Side thereof is obliquely triangular, answering to the anterior Side of the second Os Cuneiforme. On each side, near the Basis, there is a Cartilaginous Surface for its Articulations with the first and third Offa Cuneiformia, between which this Bone appears to be fixed.

834. BESIDES these lateral Surfaces, there are others on the anterior and upper part of the Basis for its lateral Articulations with the Basis of the first and third Bones of the Metatarsus; so that this second Bone is articulated with five others, viz. backward with the second Os Cuneiforme, on one side, with the first Os Cuneiforme and first Bone of the Metatarsus, and on the other side with the third Os Cuneiforme, and third Bone of the Metatarsus.

835. ITS Head is rounded, and resembles pretty much that of the first Bone of the Metacarpus, having Tubercles, Points, &c. in the same manner.

836. THE Body is long and obliquely triangular, the Angle that makes the hollow of the Foot, being turn'd obliquely outward. The rest is proportionably as in the Metacarpus.

Third and fourth Bones.

837. THE third Bone of the Metatarsus is smaller than the second, and the Basis of this and of the fourth Bone very narrow; and indeed these two Bones are very much alike. The third is considerably less than the second, but the fourth is very little less than the third.

838. THE Basis of the third is deepest, conformably to its Articulation with the antierour Side of the third Os Cuneiforme. Besides this posterour Side, it has lateral Surfaces for its Articulation with the third and fifth Bones of the Metatarsus.

839. THE Basis of the fourth Bone is broader and shorter than that of the third, and articulated with one Portion of the antierour Side of the Os Cuboides. In every thing else it resembles the rest.

840. THE fifth Bone of the Metatarsus has something peculiar. Its Basis *Fifth Bone.* is transversely broader than it is thick or high, being very oblique, and terminating by a Tuberosity and Point which lie a great way out of the Plane of the Basis. The Tuberosity is turn'd outward, and the Point quite backward. The principal Side is oblique, answerably to that of the second Portion of the antierour Side of the Os Cuboides.

841. THERE is likewise an internal lateral Surface, articulated with the Basis of the fourth Bone. The Tuberosity and Point serve for the Insertion of the Peronæus Medius. The posterour part of the Bone is expanded proportionably to the Basis, so that this Bone is obliquely Pyramidal; and the Tuberosity reaches to the Ground, in the natural Situation of a Foot which has not been spoil'd by high-heel'd Shoes.

§. 7. *The Bones of the Toes.*

842. THE Toes make the third part of the Foot, and terminate the whole inferiour Extremity, and with that, the whole Body. They are five in number in each Foot, call'd the Great Toe, the second, third, fourth, and the Little Toe. The Figure of them is something like that of the Fingers.

843. EACH of the Toes, except the Great one, consists of three Phalanges; the Great-Toe has but two, whereas the Thumb has three; but then there are five metatarsal Bones in the Foot, and but four metacarpal Bones in the Hand. The Bases of the Phalanges remain for as long a time, Epiphyyses as those of the Hand.

844. THE Great Toe is very thick and big, whereas the other Toes are *The Great Toe.* very small in proportion to the Fingers.

845. THE first Phalanx of the Great Toe is pretty like the second of the Thumb, but its Basis is more hollow, answerable to the Convexity of the first Bone of the Metatarsus, by which it is supported. Its Head is in form of a Pulley, as in the Thumb, but much broader.

846. THE second or last Phalanx of the Great Toe is like the third of the Thumb, but bigger and broader, especially at the Basis. The Tuberosity in the shape of a Horse-shoe, which terminates this Bone, is more unequal and more flat, than in the Thumb.

847. THE other four Toes are very small when compared with the Great *The other four Toes.* one. The first Phalanges are the longest, but they are shorter and more convex than those of the Fingers. Their Bodies are very narrow, and contracted.

tracted in the middle. The Bases are generally excavated, and the Heads made after the same manner as in the Fingers.

848. THE second Phalanges are very short, and almost without Shape. Both their Bases and Heads are form'd for Articulations by Ginglymi, but they are very imperfect. The Bodies are of some length in the second and third Toes, but they are very short in the other two, especially in the Little Toe, the Body of which is broader than it is long.

849. THE third Phalanges are nearly of the same figure with those of the Fingers, but much shorter and thicker in proportion. In the two last Toes they are often united with the second Phalanges, which is owing perhaps to the continual Inaction and Compression occasion'd by the Shoes.

*Sesamoide
Bones.*

850. THE sesamoide Bones in general are very small, being denominated from a Seed to which they are supposed to bear a resemblance. Several such Bones are found in the Joints both of the Toes and Fingers; but as they are for the most part very small, and fix'd chiefly to Ligaments, it will be more proper to speak of them, in the Description of the fresh Bones.

851. Two of them, however, are big enough to be preserv'd in Sceletons. They resemble a large flat oval Pearl, hollow'd on one side.

852. THEY are about the third part of an Inch in length, and half as broad as long; and they are connected very near each other, by a small short Ligament, to the Basis of the first Phalanx of the Great Toe, so as to slide on each side of the middle Eminence of the double Pulley in the first metatarsal Bone, like two small Patellæ.

853. THO' they are generally fasten'd in Sceletons, to the first Bone of the Metatarsus, they nevertheless belong only to the first Phalanx of the Great Toe, as the Patella belongs not to the Os Femoris, but to the Tibia. I shall have occasion to say something more about them, in the History of the fresh Bones.

§. 8. *Mechanism and Use of all the Bones of the lower Extremity.*

854. THE Articulation of the Os Femoris with the Os Innominatum, being by Enarthrosis; that is, the spherical Head of the Thigh Bone, being lodged in the Acetabulum, the Thigh is disposed to be moved in all Directions. We can carry it forward and backward, nearer the other Thigh or to a greater distance from it, and these four Motions may be render'd more or less oblique, and thus the number of them may be multiply'd according to the different degrees of Obliquity.

855. ALL these Motions may likewise be combined in such a manner, as that the lower Extremity of the Bone shall describe a sort of Circumference, while the Head moves only round a Center.

856. THE Os Femoris may also have another kind of Motion, call'd by Anatomists, Rotation, tho' very improperly. By this Motion they understand two reciprocal Half-turns, that is, in opposite Directions to each other, which the Thigh is capable of making round an Axis, which they take for the Axis of the Bone; but it is very evident, if we consider the Obliquity

of the Neck, that this Motion is not round the Axis of the Bone, but round a Line drawn from the Head, to the middle of the Pulley at the lower Extremity, when the Subject is supposed to be standing.

857. WE are likewise to observe that by this Rotation of the Os Femoris, the Neck and great Trochanter are mov'd simply backward and forward; whereas when the Bone is moved directly forward or backward, the Neck moves more or less round its Axis, especially if at the same time the Bone be held at some distance from the other.

858. ALL these Motions of the Os Femoris are differently limited by the Structure of its Articulation, and especially by that of the Acetabulum; and likewise pretty much by the Situation of the Head on the superiour Extremity of the Bone. In a word, the Depth and Obliquity of this Articulation render the Mechanism thereof very particular, and it is of the greatest Consequence to be well acquainted with it in cases of Luxations and Fractures. The following Observations will be sufficient to give a true Idea of it.

859. THE Thigh ought to support firmly the Weight of the whole Body when we stand or kneel; and that in all the different Attitudes or Changes of Situation, that is, whether the Trunk be streight, inclined or turn'd, and even with the addition of a considerable Load.

860. THE Thigh is moveable in all Directions, but the Motion of Flexion is the greatest of all, whether we stand or sit; that of Adduction is likewise considerable, especially when the Thigh is bent. These two Motions are more frequent, as well as of a greater extent than the rest; for it is chiefly by them that the Body is carry'd from one place to another; and also put in several ordinary and necessary Situations, whether in standing, sitting or lying.

861. THESE two general Dispositions are founded on the Depth and Obliquity of the Articulation. By the first, the Thigh becomes able to support the Body in all the Attitudes already mention'd, and by the second, the principal Motions are made easy.

862. THE Acetabulum or Cotyloide Cavity is deeper on the upper and back part, than on the lower and fore part; and it is at these two Places or in the middle Space between them that the Body is sustain'd, according as it is in an erect or inclined Posture. The Structure of the Head of the Os Femoris is exactly suited to these supporting Points in the Acetabulum, its cartilaginous Convexity being larger on the upper part than any where else.

863. THE Acetabulum is shallow on the fore and lower Parts, not only because these Parts are less necessary for supporting the Body, but also because a Provision is thus made for the Obliquity of the Articulation, without which the Thigh could not without great difficulty have been bent, or carry'd inwards or over the other Thigh. The Obliquity of the Cotyloide Cavity facilitates the Motion of Adduction, and the Obliquity of the Head of the Os Femoris facilitates and enlarges the Motion of Flexion.

864. IN the Motion of Abduction, part of the Head of the Bone, goes out of the Cavity, and that in two different ways. When we stand or lie

at full Length, and in these Postures separate the Thighs from each other, the Head goes out at the lower part of the Cavity; but when we sit or lie on our Backs with the Thighs rais'd, and separate the Thighs, it goes out on the fore part.

865. THE Motion, call'd Rotation, varies according as the Thigh is extended or bent. The Rotation of the Thigh when extended, brings the Head of the Os Femoris either forward or backward. When the Head is carry'd backward, the Neck strikes against the posteriour Edge of the Acetabulum, and a large Portion of the Head goes out at the anteriour part of the Cavity; but when the Head is carry'd forward, a very small Portion of it goes out of the Cavity, because of the Depth of the Edge at the back Part, and the Neck does not strike against the anteriour Edge which is very low. In the Rotation of the Thigh when bent, the Head is brought upwards and downward, and goes less out of the Cavity above than below.

866. THE Articulation of the Tibia with the Os Femoris, is of a very singular Nature. In the Flexion and Extension of the Tibia, it is a Ginglymus, but there is something more in it still, by which the Leg becomes capable of having a Rotation independent of that of the Thigh. This double Mechanism depends on the semilunar Cartilages, and therefore must be referr'd to the Description of the fresh Bones. It will be sufficient in this Place to make that Motion be conceiv'd, which I term the Rotation of the Leg when bent; because in that case only, it is possible; and we see it evidently when sitting and pressing the Heel against the Ground, we turn the Toes alternately outward and inward.

867. WE then observe that the whole Leg makes reciprocal Half-turns independently of the Thigh; and if at the same time we put our Hand upon the Knee, and then grasp the Joint with our Fingers, we feel the Head of the Tibia to move in the same manner, while the Extremity of the Os Femoris remains at rest.

868. AND if we examine attentively, we shall find that the Center of this Motion is rather in the inner Cavity of the Head of the Tibia, than in the middle Space between the two Cavities; for we feel distinctly that the external part of the Head of the Tibia moves backward and forward, while the internal turns almost wholly round its Axis.

869. WE may therefore distinguish three sorts of Motion in this Joint, that of Flexion and Extension, the Rotation of the internal part of the Head of the Tibia upon an Axis, and a kind of arthrodial Motion of the external part of the same Head.

870. I look upon the Patella as a Piece belonging as really and peculiarly to the Tibia, as the Olecranon does to the Ulna; because it is of the same Uses with respect to that Bone, as the Olecranon is of to the other. They both serve to facilitate the Action of the Extensor Muscles, by placing their Direction at a greater distance from the Center of Motion of the Joint.

871. THEY both serve to defend the Tendons of these Muscles from the Compressions, Contusions and Ruptures which they would otherwise be subject

subject to in great Efforts, did they pass over the sharp Edges of the Bones; and lastly, they secure these Tendons from the like Accidents when the Joints strike against or press upon any hard Body, as when we lean on the Elbow or kneel; or when the Elbow or Knee receive any external Injury from Strokes, &c.

872. THE difference between the Patella and Olecranon lies in this, that one is immoveable, making but one Piece with the Ulna, the other is moveable, being a Piece distinct from the Tibia. The Immobility of the Olecranon strengthens and secures the Articulation of the Ulna with the Os Humeri, which is design'd only for Flexion and Extension.

873. FOR the same reason the Patella would have been immoveable, had the Articulation of the Tibia with the Os Femoris been contrived for these two Motions alone; and especially because the Extensor Muscles of the Tibia are very often expos'd to greater Efforts in supporting the Weight of almost the whole Body, sometimes increas'd by that of a considerable Burden.

874. THE Rotation of the Leg when bent is the sole Cause of this Difference, because, had the Patella been immoveably join'd to the Tibia, the Leg could never have made these Half-turns, without either a Luxation, or Fracture of the Patella. The Olecranon may therefore be look'd upon as an immoveable Patella, and the Patella as a moveable Olecranon.

875. THE Fibula is articulated by its upper Extremity, with the lower Surface of the external Condyle of the Head of the Tibia. This is an obscure Arthrodia, and suffers the Head of the Fibula only to slide a little forward and backward; the only Design of which small degree of Motion seems to be, that the Fibula in which many Muscles of the Foot are inserted, may have liberty to yield a little in the violent Efforts of these Muscles, as in running much, jumping, or walking under a heavy Burden, as we shall see in the Exposition of the Muscles.

876. THIS Bone is likewise join'd to the Tibia by its lower Extremity, and makes the outer Ankle; but this Connexion is chiefly Ligamentary, as shall be shown in the Description of the fresh Bones. The upper Edge of the cartilaginous Surface of this Extremity is articulated at the lower part of the lateral Depression of the Tibia, with a narrow cartilaginous Border, which is nothing but the thick Edge of the Cartilage at the Basis of that Bone.

877. THE Extremities of these two Bones touch each other likewise a little by their bony Portions, near the Cartilages. The Articulation resulting from these two sorts of Connexion, has but a very small Extent, and seems to be partly a Synarthrosis, partly a Diarthrosis; that is, a sort of Amphiarthrosis or doubtful Articulation, almost without any Motion, except what is necessary to make it the Center of Motion of the upper Extremity of the Fibula.

878. THE cartilaginous Side of the external Ankle or lower Extremity of the Fibula compleats the Cavity, by which the Leg is join'd to the Foot, and contributes more to that than the internal Ankle.

879. THE Crookedness frequently observ'd in the Fibula, below the middle or at about two thirds of its Length, does not seem to be natural, (because we sometimes meet with this Bone perfectly streight) but to be rather owing to the manner of dressing Children, this being the Place at which they are swaddled very tight.

880. THE Fibula is not situated directly on the outside of the Tibia, but a little more backward; so that having placed the two Legs of a Scele-ton in their natural erect Posture, a pretty thick Rod might be pass'd between the two Tibiæ and Fibulæ without changing the Situation of the Legs.

881. THE Foot is articulated with the Leg, by the Astragalus alone. This Articulation is a true angular Ginglymus, and confined intirely to the Motions of Flexion and Extension.

882. IT is commonly thought that two other Motions are likewise perform'd by means of this Articulation, *viz.* that of turning the Toes inward or outward, and that of the lateral Flexion of the Foot, or the turning the Sole of the Foot toward either Ankle. But neither of these Motions depend on the Articulation of the Foot with the Leg, as the Structure of the Parts, and just Observations evidently show.

883. THE Articulation of the Astragalus with the several Surfaces of the Os Calcis, is a kind of obscure Arthrodia, as well as those of the other Bones of the Tarsus with each other. By these Articulations, the Foot not being supported, makes the small lateral Motions already mention'd; but when the Toes are turn'd outward or inward independently of the Tibia, the Os Calcis makes small Half-Rotations under the Astragalus, and obliges the Os Scaphoides to slide in the same Direction with it on the antierour Side of the Astragalus; and this Motion of these two Bones is communicated to all the rest.

884. IT is by the Articulation of the Os Scaphoides with the Astragalus, that the small lateral Flexions of the Foot are perform'd, *viz.* when the Sole of one Foot is turn'd toward the other Foot, or the contrary way. In this case the Os Scaphoides makes small Rotations on the antierour Side of the Astragalus, while the Os Cuboides slides up and down on the foreside of the great Apophysis of the Os Calcis. The Obliquity of the articular Surfaces of these two Bones is perfectly suitable to such a Motion. In these Motions the Os Calcis and Astragalus are in a manner immoveable; but the other Bones are carry'd along with the Os Scaphoides.

885. THE Articulation of the Os Scaphoides and Cuboides with the three Offa Cuneiformia; that of the four last mention'd Bones, with those of the Metatarsus; and that of the metatarsal Bones with each other, allow of an obscure Motion, by which we can bend or contract the Foot according to its length, and a little according to its breadth likewise.

886. ALL these Motions of the Bones of the Tarsus and Metatarsus are pretty sensible in Children; and the loss of them is often owing to the manner of wearing Shoes, which loss is most frequent in the small Bones of the Tarsus and those of the Metatarsus. Womens high-heel'd Shoes change intirely

tirely the natural State of these Bones, causing in them the same sort of Disorder that we observe in the Vertebrae of crooked Persons. Those who do not wear strait Shoes may preserve these Motions to a very advanced Age.

887. THE Articulation of the first Phalanges of the Toes, with those of the Metatarsus, is Spheroidal or Orbicular, and allows Motion in different Directions. The Articulation of the Phalanges with each other is by Ginglymus. In the natural State these Motions are very free and easy, and they are impair'd chiefly by the bad manner of wearing Shoes, and it is for the same Reason that the Phalanges of the Little Toe often grow together.

888. THE Articulation of the sesamoide Bones is a kind of Ginglymus, but the Explication thereof belongs to the History of the Muscles.



SECT.

S E C T. II.

A Description of the Fresh Bones.

Introduction.

1. **I**T is not enough to have an exact Knowledge of the Sceleton, or of the common Osteology; we ought likewise to be acquainted with the natural State of the Bones when fresh.

2. **T**HE famous *Riolan* used to demonstrate these two kinds of Osteology separately, beginning his Courses of Anatomy by the Sceleton, and concluding them by the natural bony Fabrick of the Body. This last he term'd Osteologia Nova, and he has given us an Idea of it in a particular Treatise placed at the end of his *Encheiridion Anatomicum*. His words are these. "There are, he says, two kinds of Osteology, one of which is to be learned from Bones dried and prepared by boiling, &c. the other from the Bones of a dead Subject, as they are naturally connected with each other. Both these Methods are very necessary for the practice of Physick, and for the exact Knowledge of the Human Body.

3. "FOR by examining dry Bones, we can only learn their exteriour Form, their Situation, and the Connexion which they may have with one another. But when we consider them as join'd together in a dead Body, we are in a condition to observe many other things about them, useful in Physick, because their Connexions with one another by Cartilages and Ligaments, and by the diversity of Articulations, are sometimes very different in dry Bones from what we find them, when the Bones are moist and fresh. There are, for instance, in dry Bones, certain Cavities which appear to be Cotyloide, because they are divested of their Cartilages; but in fresh Bones they are found to be Glenoide, their Cavities being fill'd by Cartilages. On the other hand, some Cavities appear to be Glenoide in the Sceleton, which are Cotyloide in the Body, their Cavities being augmented by Cartilaginous Supercilia.

4. "THE exteriour Form and Qualities of Bones are much better demonstrated from fresh Subjects than from prepared Bones, because they lose a great many things in boiling, such as the Cartilaginous Borders, the Periosteum, the Mucilaginous Substance found between them, and the Marrow contain'd in their Cavities; all which may be shown in a fresh Body, but cannot be shown in a Sceleton.

5. "It is therefore necessary, for the practice of Physick, and especially for the Cure of fractured or luxated Bones, to examine attentively how they are framed, and join'd together in the Body. I would not, however, be thought to disprove the custom of preserving dry Bones, and of teaching the common Osteology. We ought always to begin by this, and afterwards show the natural Disposition of the Bones, in the Body; in the manner

“ manner that I have done in my Courses.” These are the express Words of the illustrious *Riolan*, which I could not help transcribing.

6. THIS Method of making a particular, regular, and compleat Demonstration of all the Bones, newly clean'd from the Muscles and other Parts that surround them, seems to have been wholly neglected ever since *Riolan*'s time, till I publicly restor'd it; but instead of ending my Courses by the fresh Bones, I always demonstrate them immediately after the Skeleton, because I look upon this as one of the principal Foundations of Anatomy; and that it ought naturally to follow the common Osteology, as being a necessary Introduction to the Knowledge of the Muscles.

7. IN this Osteology I shall observe nearly the same order as in the former, beginning by what relates to the fresh Bones in general, and from thence going on to the particular History of each Bone.

8. THE general Doctrine of fresh Bones takes in their external Conformation, internal Structure, Connexion and Uses.

9. IN the particular Description I shall follow the common Division of the Skeleton; but I choose for reasons which shall be given hereafter, to begin by the Extremities, and from thence to proceed to the Trunk and the Head.

10. I shall repeat as little as is possible, of what I have said in the Description of the Skeleton; but confine my self to these things only in which the Differences between dry and fresh Bones, precisely consist.

A R T. I.

The external Conformation of fresh Bones.

11. BY the external Conformation of fresh Bones, I understand, as in the common Osteology, all that is visible without breaking them, such as their Size, Figure, outward Parts, and Colour.

12. THE difference between fresh and dry Bones is chiefly owing to the parts that are peculiar to them, and to their natural Colour. I say, chiefly, because meerly by drying, both their Size and Figure may be alter'd; but these Alterations are more remarkable in the Cartilages than in the Bones.

13. OF the external Parts of fresh Bones, some are common to them with dry Bones, such as the Regions, Eminences, Cavities, and Inequalities; others are peculiar to them, as being either for the most part wanting in dry Bones; or, if they remain, their natural State being changed.

14. THE external Parts peculiar to fresh Bones are principally the Cartilages, Ligaments, Membranes, and Mucilaginous Glands. On account of all these Parts, as well as of the Colour, the external Conformation of the Bones of a fresh Subject differ from that of a Skeleton, even in the other Parts which are common to both.

15. I shall here give a general Idea of each of these parts, referring what relates to the Colour to the Description of the internal Structure.

§. 1. *Cartilages of fresh Bones.*

16. A Cartilage is a whitish or pearl-coloured Substance, which covers the Extremities of Bones join'd together by moveable Articulations, increases the Volume of some of them after the manner of Epiphyses, unites others very closely together, and has no immediate Adhesion or Connexion with others.

17. THE Substance of Cartilages is more tender and less brittle than that of Bones; but with Age they sometimes grow so hard as to become perfectly Bony. They are pliable and elastic, and so capable of restoring themselves after having been compress'd or bent to a certain degree; but when bent beyond that degree, they break.

18. ALL that I have here said about Cartilages is comprehended in the short Definition which *Carolus Stephanus* has given of them in his Anatomy. "A Cartilage, he says, is a part of the Body, which truly deserves the name of simple or similar. It is harder than all the other parts, but softer than the Bones, white, smooth, polish'd, and pliable or flexible. The Cohesion of its parts is different in different Cartilages; and no sensible Cavity, Cell or Pore, appears in any part of its Substance, except very small Passages for the Blood-Vessels, &c.

19. I here speak only of Cartilages that belong to the Bones. Those which have no relation to them, are described in other parts of this Anatomical Exposition. The Cartilages which belong to our present Subject, differ from each other, in Size, Figure, Situation and Use; and may all be rank'd under two general Heads; those which are closely united to Bones, and those which are not immediately connected with them.

20. THE Cartilages united to Bones are of four kinds, already hinted.

21. SOME cover both sides of the moveable Articulations, and are very smooth and slippery.

22. SOME unite the Bones to each other, either so firmly as to allow no sensible Motion, as in the Symphysis of the *Ossa Pubis*, and still more in that by which the Epiphyses are join'd to the Bones; or in such a manner as to allow of different Motions, as in those by which the Bodies of the *Vertebræ* are connected. The first grow easily hard, the others appear in some measure viscid, and retain their flexibility.

23. SOME increase the size, and extent of Bones. Of these again, some are articulated with other Bones, as the Cartilaginous Portions of almost all the true Ribs, or with other Cartilages, as the *Septum Narium*; others serve only for Borders, as those of the Basis of the *Scapula*, and of the *Crista* of the *Os Ilium*, the *Supercilia* of Cavities, and those of the spinal and transverse Processes of the *Vertebræ*.

24. SOME, in fine, have a singular form, as those of the Ears, and most of those of the Nose; in which last, their Elasticity appears most sensibly.

25. THE Cartilages belonging to the second general Class, or those not immediately join'd to Bones, are, for the most part, placed in the moveable Joints; and may likewise be subdivided into several kinds.

26. SOME lie altogether loose, being join'd neither to the articulated Bones nor to the Cartilages which cover them, but slide freely between them in different Directions; as those which are placed in the Articulation of the Tibia with the Os Femoris, in that of the lower Jaw with the Offa Temporum; and in that of the Clavicle with the Sternum. Those between the Clavicle and Acromium, and between the first and second Vertebrae of the Neck are of the same kind.

27. SOME are partly join'd to other Cartilages, and partly slide between the Cartilaginous Extremities of the articulated Bones, as the Cartilage at the lower Extremity of the Radius.

28. WE might likewise reckon among the Cartilages, tho' more improperly, several of the small sesamoide Bones which remain long Cartilaginous, and also the Cartilaginous Portions of Tendons, which do the same Office with sesamoide Bones.

§. 2. *The Ligaments of fresh Bones.*

29. A Ligament is a white fibrous, close, compact Substance more flexible than a Cartilage, not easily ruptured or torn, and which does not yield, or at least but very little, when pull'd.

30. IT is made up of very small and very strong Fibres, which by their different Texture and Disposition, form narrow Cords, broad Bands, or thin Webs; and these serve to bind, contain, limit, and defend the other parts both hard and soft.

31. I am not here to speak of the Ligaments peculiar to the soft parts, nor of those which are common to the soft and hard parts; but confine myself wholly to those which belong to Bones or Cartilages alone. Of these we may establish two general Classes; the first, containing those Ligaments which are of use only to the Bones in which they are inserted; the other, containing those which serve for other parts besides the Bones in which they are fix'd, and principally for the Muscles. If we have regard to the Bones only, these last are improperly term'd Ligaments, as not doing the Office of such, and consequently resembling the true Ligaments only in Texture.

32. OF those Ligaments which are fix'd in Bones or Cartilages alone, and are not employ'd about the other parts; some belong wholly to the Articulations or moveable Bones; and others have nothing to do with the Articulations.

33. THE Ligaments which belong particularly to the moveable Articulations, and may therefore be called articular Ligaments, are of several kinds.

34. SOME are designed only to fix and strengthen the Joints and to secure the Bones in their different Motions, from parting from each other, as it happens in Luxations. These Ligaments are like Ropes more or less flat,

or like Bands, sometimes narrow, and sometimes of a considerable breadth; and tho' some of them are thin, they are all very strong and yield but little. The Ligaments of the Articulations by *Ginglymus*, and those that tie the Bodies of the *Vertebræ* together, are of this kind.

35. SOME contain a very fluid Mucilaginous Liquor commonly call'd *Synovia*, which continually moistens the Articulations. These are not so properly Ligaments as Ligamentary Webs, bound immediately round the Articulations, and fix'd to the Extremities of the articulated Bones, and thus forming *Capsulæ* or Bags to contain that Liquor, and hinder it from running out.

36. THESE may very well be named *Capsular Ligaments*. They lie within the former sort, being closely united to their internal Surface, and are to be met with in all the moveable Joints, as in that of the *Ulna* with the *Os Humeri*, those of the Bones of the *Carpus* with each other, &c. But they are more like Membranes than Ligaments properly so called.

37. SOME perform both the former Offices, that of a Band to keep the Bones together, and of a *Capsula* to hold the Mucilage. These surround the Orbicular Articulations, as that of the *Os Humeri* with the *Scapula*, of the *Os Femoris* with the *Os Innominatum*, &c.

38. ALL the parts of these Ligaments are not of equal thickness, so that they appear to be made up of two kinds of Ligaments inseparably united or glew'd together; one *Capsular* which surrounds the whole Articulation; and several true Ligaments extended at different distances over the other, and closely united to it. The name of Orbicular Ligaments is not general enough, because it does not agree to those of the Bones of the *Tarsus*, *Carpus*, &c.

39. I do not think it proper to rank among these, the Membranous *Vagina* belonging to the Channel or Groove in the upper part of the *Os Humeri*, which shall be afterwards described.

40. SOME are hid by the Joints themselves and by the *Capsular Ligaments*, as that belonging to the head of the *Os Femoris*, call'd improperly *Ligamentum Teres*, and the *Crucial Ligaments* of the *Tibia*.

41. THE Ligaments which serve to connect *Cartilages* with Bones, might be reckon'd another Species of articular Ligaments; and of these some are proper, as those belonging to the semilunar *Cartilages* of the *Knee*, to the *Cartilaginous Trochlea* of the *Orbit*, &c. Others are common, as all those to which the inter-articular *Cartilages* are fasten'd by their *Circumferences*.

42. THE other Ligaments of the first Class, or those fix'd to Bones without any relation to the Articulations, are of two kinds.

43. SOME of them are loose, and serve only to set bounds to the *Motions* of Bones; such as those that tie the *Clavicles* to the *Coracoide Apophyses*; those that go from one *Clavicle* to the other, and those between the *Spinal Apophyses* of the *Vertebræ*.

44. SOME of them are tight, and stretched either between the parts of the same Bone, as the Ligaments between the *Acromium* and *Coracoide Apophysis*,

Apophysis, or between several Bones united together without Motion, as those that are fix'd by one Extremity to the Os Sacrum, and by the other to the Os Ischium.

45. THE Ligaments of the second general Class, or those which being fix'd to Bones or Cartilages are likewise of use to other parts, are of two kinds. Some of them are fix'd to Bones or Cartilages only, and some are likewise fix'd to other parts, or other parts are fix'd to them.

46. THOSE of the first kind serve chiefly to inclose, check, limit, and strengthen the Muscles and Tendons, and sometimes to change their directions.

47. THE annular Ligaments are of this kind, and they anciently had their Name not so much from their Figure, as from their Use, which is much the same with that of the Rings through which the Reins of Horses pass; for it is after the same manner that these Ligaments bridle the Tendons of many Muscles, and thus hinder them from starting from their places in violent Motions; and in some Circumstances, change their Directions.

48. THE annular Ligaments are either particular, and simple, or common, and made up of several single ones, as we shall see in those of the Carpus, Thumb, &c. Some of them are like Vaginæ or Sheaths, as those on the internal or flat side of the first and second Phalanges of the Fingers.

49. SOME of them are only semi-annular, as that of the superciliary Notch of the Orbit, when there is a Ligament there, and that of the Notch in the superiour Costa of the Scapula.

50. TO these might be referr'd the Ligaments between the Acromium and Coracoide Apophysis of the Scapula, and between the Os Sacrum and Os Ischium, which have been already mention'd in the first Class.

51. THOSE of the other kind which come under this second Class, comprehend the Ligaments fix'd to other parts as well as to Bones, and these again are of two sorts.

52. SOME of them are fix'd to one or more Bones with different degrees of Tension; and serve on each side for the insertion of Muscles, supplying in that respect, the place of Bones.

53. OF this kind are the interosseous Ligaments of the Fore-Arm and Leg, the Obturator Ligament; the Ligament extended on each side of the Os Humeri, from the Neck to the Condyles, the posteriour and lateral Ligaments of the Neck, and the Ligamentary Membranes of the posteriour Foramina of the Os Sacrum.

54. TO these may be added the Ligaments commonly term'd Aponeuroses; such as those of the Temples, Scapula, Os Humeri, Ulna, Palm of the Hand, Thigh, Leg, Sole of the Foot, &c. All these shall be described hereafter, and they may in general be term'd Aponeurotic Ligaments, Ligamentary Aponeuroses, Ligamentary Septa, Ligamentary Vaginæ, &c. But they ought to be carefully distinguish'd from the Aponeuroses of the Muscles and Tendons, which shall be mention'd in their proper places.

places. The Ligamentum Suspensorium of the Musculus Styloglossus belongs to this place.

55. OTHER differences of Ligaments may be deduced from their consistence, solidity, thickness, situation, and figure, as we shall see hereafter.

56. SOME Ligaments are almost Cartilaginous, as those which surround the Head of the Radius, and the small Head of the Ulna, a Portion of the Orbicular Ligament of the Head of the Os Femoris, and the annular Vaginæ of the Fingers.

57. SOME of them have a particular Elasticity; by which they are capable of being drawn out by a sufficient Force, and of contracting again when left to themselves. This Elasticity differs from that of Cartilages, which last is hardly perceivable, but by compressing or bending them to a certain degree. It differs likewise from that of the other Ligaments, in that it is not only very considerable in living Bodies, but remains such after death.

58. OF this kind are the Supercilium of the Cotyloide Cavity, the Ligaments which tie the Os Hyoides to the Styloide Apophyses, the posterior Cervical Ligament; the Ligaments which connect the sharp Edges of the spinal Processes of the Vertebrae to one another, and those seated at the Bases of these Apophyses next the great Canal of the Vertebrae, especially in those of the Loins.

§. 3. *The External Membranes of fresh Bones.*

59. THE fresh Bones of the Human Body in their natural State, are for the most part cover'd exteriorly by a Membrane, call'd by the general name of Periosteum, which is extended over the Cartilages and Ligaments, as well as over the Bones; but where it covers the Cartilages, it is term'd Perichondrium, and where it covers the Ligaments, Peridesmium. These terms are borrow'd from the *Greek*, but I shall not spend time in clearing up their original Significations.

60. THE Periosteum in general is a fine, strong Membrane or Membranous Expansion, not equally thick in all its parts, more or less transparent, of a very close Texture, not easily yielding, extremely sensible, and composed of several particular Planes of Fibres, differently dispos'd and mix'd with a great number of small Vessels and Nervous Filaments.

61. THIS Membrane does not immediately surround those Portions of Bones which are cover'd by Cartilages, nor those in which Ligaments and Tendons are inserted. Neither does it cover those Portions of Cartilages which are expos'd to friction, as in the moveable Articulations, Channels, &c. Lastly, it does not cover those Portions of the Teeth which lie out of the Sockets and Gums.

62. THE innermost Plane of the fibrous Texture of the Periosteum, or that which immediately adheres to the Surface of the Bones, is fix'd thereto by an infinite number of small fibrous Extremities brought from all the Planes, and which enter the Pores of the Bones. These Extremities are accom-

accompany'd by capillary Vessels and nervous Filaments, which having run for some space between the different Planes of the Periosteum, perforate the innermost, at the Orifices of the Pores of the Bones.

63. THE Periosteum is of different thickneses; but this difference does not appear near so much on the outer Surface, as on the inner, which is mark'd in many places with Impressions owing to the Sulci, Depressions, Lines and Inequalities on the Surface of the Bones.

64. SOME Anatomists have been of Opinion that this Membrane was not only united but closely braced round the Bones, and that therefore it might set bounds to their Growth. It is probable they had only examined a few Bones in this view; for had they consider'd those which have concave Surfaces, Depressions and Inequalities, they would have found only a simple Adhesion of the Periosteum without any Tension. In Places where it is only fixed to the Bones by the Filaments of its innermost Plane, the Periosteum is easily pulled from the Bones, but this Separation is more difficult where the Fibres of the other Planes likewise penetrate the Bone, especially when these Planes are numerous; and likewise where the Insertions of Tendons or Ligaments mingle with these Fibres.

65. THE Periosteum in general serves to support that admirable Texture of an Infinity of capillary Vessels, by which the Bones and all the Parts belonging to them are nourished. It likewise supports a great number of nervous Filaments by which Sensation is communicated not only to this and to the internal Membrane of the Bones, but even in some degree to some Portions of the Bones themselves. Other Uses of the Periosteum shall be explain'd hereafter.

§. 4. *The mucilaginous Glands of fresh Bones.*

66. IN all the moveable Articulations, especially of those Persons who end their Lives by sudden or violent Deaths, we find a viscid Liquor, in some measure resembling a liquid Mucilage or the White of an Egg well beat, which is commonly call'd Synovia, a Name given at first to a Disease.

67. THIS Liquor is contain'd, together with the Articulations, in the Ligamentary Capsulæ which hinder it from running out. It is furnish'd chiefly by small Bundles of Glands more or less flat, contain'd in the same Capsulæ, and known by the name of mucilaginous Glands; these being the Organs through which this Mucilage is convey'd from the Blood. It may likewise partly transude through the Pores of the internal Surface of the capsular Ligaments; and partly be made up of an unctuous Matter squeez'd from the fatty Substances lying near the Glands, by the Motion and Friction of the articulated Bones.

68. THESE Glands are more or less of a red Colour, and of a very singular Structure, resembling small floating Fringes, of different thickneses, made up of folliculous or vesicular Grains, and furnish'd with a great number of Vessels running in very different Directions. In some places they appear like

like distinct Grains immoveably fix'd. They are proportion'd to the Bones and Joints, and lodged so as to be secured from violent Frictions, chiefly near the Edges of the Capsulæ, or in particular Cavities contriv'd on purpose to receive them.

69. THE Liquor continually furnish'd by these Glands, mix'd with that which sweats through the Pores of the Capsulæ, and perhaps with that which comes from the fatty Moleculæ, is diffus'd between the articulated Bones, and its Use is to facilitate their Motions, to prevent them from bruising each other, and to keep their Cartilages from drying or wearing out.

70. IN the particular Description, we shall explain the differences of mucilaginous Glands, with respect to their Conformation, Size, Number and Situation.

ART. II.

The internal Structure of fresh Bones.

71. **I**N order to become acquainted with the internal Structure of fresh Bones, their Substance, internal Cavities, Marrow, Membrana Medullaris, and Vessels must be examin'd. The three last belong to this Treatise, the two first have been already described in the Treatise of dry Bones, which it would be very proper for beginners to revise, that they may comprehend as they ought what is here to be said.

§. 1. *The Marrow or Medullary Membrane of fresh Bones.*

72. THE greatest part of the Bones contain in their large Cavities or Cells an unctuous fat Substance of a solid Consistence in some, and soft in others. It is call'd by the general Name of Marrow, especially that which lies in the large Cavities of the long Bones. That which is dispers'd in the small cellulous Cavities is likewise call'd the medullary Juice.

73. THE Marrow of the great hollow Bones is a Mass, composed of an Infinity of fine Vesicles or membranous Cells, join'd together, and communicating with each other, furnish'd with Blood-Vessels and Nerves, and fill'd with a fine sweet oily Matter.

74. ALL these Cells or membranous Vesicles are surrounded by a very fine Membrane, which, like an internal Periosteum, sticks close to the inner Surface of the Bone, by means of an infinite number of capillary Vessels, and of several other kinds of very small Filaments. The reticular Substance of the Bones runs through this medullary Mass, and as it were interlards it, and by this means sustains it in the middle of the great Cavities.

75. THE Marrow of the cellulous or cavernous Substance of Bones, is divided by small bony Septa or Plates, and by the Filaments of the reticular Substance of Bones, into a vast number of Vesicles or membranous Cells which line the bony Cells, and communicate with each other. This cellular

Marrow

Marrow in the cavernous Texture of Bones differs from that in the great Cavities, both in Colour and Consistence. It is liquid, and almost quite of a red Colour, whereas the other is much more solid, and is often of a red Colour only on its Surface.

76. THIS difference is owing to the Blood-Vessels which run through each membranous Cell, whereas the Marrow in the great Cavities seems to be furnished with them in the common Membrane only. Many of these medullary Cells are likewise divided by the bony Filaments of the cavernous Substance, and these small Filaments, as well as those of the reticular Texture, are cover'd by Portions of the medullary Membrane, as by a Periosteum.

77. THE medullary Membranes may be separated from the Liquor which they contain, by steeping the whole Mass in very hot Water, and afterwards compressing it by gentle degrees. But it is to both these Substances taken together that Anatomists give the name of Marrow, not to either of them taken singly. The medullary Membrane is very sensible, but not the Juice, which is necessary to be observed to understand what is meant by the Sensibility of the Marrow. It is true, however, that in the Materia Medica, this Name is given to the oily Substance alone.

78. THE Marrow by its liquid and unctuous Part renders the Bones in some measure pliable, and less brittle, by continually running through the Substance of them in small degrees. This continues to old Age, and then the Bones being deprived of the Marrow, become very brittle.

§. 2. *The Vessels of fresh Bones.*

79. ALL the parts of fresh Bones have Blood-Vessels, which may be reduced to three Classes. Some go to the external parts of Bones, to the Ligaments, Cartilages, mucilaginous Glands and Periosteum. Others penetrate the Substance of the Bone, and the third kind goes all the way to the internal Cavities, and is distributed to the Marrow.

80. THE Vessels of the first Class, that is, those spread on the external parts of Bones, are Ramifications of those which go to the neighbouring Muscles, and other parts which lie near the Bones. The greatest number of them go to the Periosteum, and run in between its different Planes, being divided into an infinite number of capillary Ramifications, disposed in a reticular manner by their frequent Communications. I shall not here take upon me to determine whether this Membrane has any particular elastic Force by which it can increase that of the Blood-Vessels.

81. THE Vessels of the second Class, or those of the Substance of Bones, are Productions or Continuations of those of the Periosteum, which enter the Pores of the Bones like very fine Filaments, and run longitudinally between the bony Fibres. The Existence of these small Vessels becomes very certain from Fractures, especially in young People.

82. THE Arteries and Veins do not seem here to accompany each other as in the other parts of the Body, but to run in opposite Directions till they meet. This Conjecture is founded on the different Obliquity of certain Holes.

Holes. It must not however be imagined that all the Arteries enter at one end of the long Bones, and that the Veins go out at the other; the reunion of fractured Bones is sufficient to destroy this Opinion.

83. THE Vessels go to the inner Substance of the Bones, not only through the external Pores, but also through those of all the inner Cavities, both great and small, being detached from the medullary Membrane in the same manner, as from the Periosteum.

84. THE Vessels of the third Class come likewise from the Periosteum. They appear to be destined chiefly for the Marrow and medullary Juice, and are spread in great numbers over the Membranes of each. They enter the Cavities of the hollow Bones through the oblique Ducts in their solid Substance, and into the Cells by other small Openings. They spread themselves in all Directions, not only on the Membranes of the Marrow and medullary Juice, but likewise through the Substance of the Bones in their Passage to the inner Cavities.

85. THE Arteries and Veins of this Class often accompany each other as they pass through the Bones, and sometimes each passes through a separate Duct.

86. THE Vessels of the first Class serve chiefly to nourish the external parts of the Bones, and to furnish the mucilaginous Glands with the Liquor secreted by them. Those of the second Class furnish the nutritious Juice of the inner Substance of the Bones. The Uses of those of the third Class have been already mention'd.

§. 3. *The Colour of fresh Bones.*

87. THE natural Colour of the fresh Bones of an adult human Body is whitish, with a small Mixture of a pale Red. This red Colour is more considerable in Children, but decreases by degrees as they grow up, and is quite lost in old Age. It is most remarkable in the Surface of spongy Bones, and more toward the Extremities of the hollow Bones, than in the middle; and lastly, it is more or less perceivable in proportion to the different thickness of the bony Laminæ which cover the cellular Substance.

88. THIS red Colour is owing to the Blood-Vessels of the Bones, which being in Infancy, larger and less surrounded by the bony Juices, than in an advanced Age, make the Colour of the Blood to appear in some degrees through the Substance of the Bones; whereas in old Age these Vessels being compressed by the increased and condensed bony Juices, contain but very little Blood, and are not at all transparent. The particular differences of the red Colour, not only in the Bones of the same Subject, but also in the different parts of the same Bone, depends on the medullary Juice which is much redder than the Marrow in the great Cavities, and likewise partly on the thickness of the bony Substance by which that Juice is cover'd.

ART.

ART. III.

The Fresh Bones in particular.

89. **W**HAT has been already said about the mucilaginous Glands and Blood-Vessels of fresh Bones in general, may be easily apply'd to the greatest part of them in particular. But the Cartilages and Ligaments are different in each Bone, and therefore require to be particularly described. And as these Parts are more diversified, largest and more distinct in the Extremities of the Body than in the Trunk; I think it proper to begin by these, that they may afterwards serve for Examples of what is to be said about the rest.

90. **M**OREOVER, as it is only in this Osteology that a true Idea can be given of the Articulations in their natural State, I shall be obliged to begin by the *Ossa Innominata*, because of the *Acetabulum* with which the *Os Femoris* is connected, and because of several other particulars necessary to be known in order to comprehend the Mechanism of that Articulation.

91. **T**HØ' the *Ossa Innominata* belong to the Trunk in the ordinary Division of the Skeleton, they may however be considered with respect to the lower Extremities, much in the same manner as the *Scapula*, with respect to the upper Extremities. For this Reason likewise I must say something of the *Os Sacrum* to which these Bones are join'd, and likewise of the last Vertebra of the Loins.

92. **T**HIS particular Osteology is attended with one Difficulty which does not fall in our way in the Description of the Skeleton. We make a compleat Description of each dry Bone, which we cannot do of each fresh Bone, because of the Connexion it has with the neighbouring Bones, some parts of which must consequently be mention'd, especially those in which Ligaments are inserted.

93. **T**O remove this Difficulty, without breaking in upon that Order by observing which, these Descriptions will be easy and intelligible, I shall examine particularly the Ligaments of each Bone in the following manner: I shall first give the compleat History of the Ligaments by which each Bone is connected to those immediately above it, and then barely mention those that tie it to those below.

94. I shall not explain in what Manner or for what Purposes the Bone which I have described, is join'd to that which I am to describe next in order, till the Description of this last is likewise finished. Thus, for instance, I shall not give the History of the Connexion of the *Os Innominatum* with the *Os Femoris*, till I have explained all the parts of the Thigh-Bone concern'd in that Articulation; nor the History of the Connexion of the *Os Femoris* with the *Tibia*, till the latter has been described; and so of the rest.

95. **T**HIS Osteology presupposes the exact Knowledge of the foregoing, that is, of all the particulars relating to the Skeleton, of which I shall here

mention only as much as is necessary to enable us to apply to the Skeleton what has been already said in general about fresh Bones.

§. 1. *The fresh Bones of the lower Extremities.*

*Cartilages of
the Offa Innominata.*

96. THE Cartilages of the Offa Innominata are not so numerous, as one might imagine on examining the Skeleton only. We are apt to think we see the dried remains of Cartilages on the Crista of the Os Ilium, on the Tuberosity of the Os Ischium, and on the Grooves and Notches which give passage to the Tendons of Muscles. But none of these Incrustations are true Cartilages, being for the most part, Tendinous, Aponeurotic or Ligamentary, which being dried, look more like Cartilages than the true Cartilages themselves.

97. THE Crust which covers the Crista of the Os Ilium is chiefly Tendinous, and a small part of it Aponeurotic in adult Bodies, but in Children and very aged Persons it appears Cartilaginous. In Children, the parts which are not compleatly ossify'd, are easily taken for true Cartilages; and in old Age the Tendons are often harden'd to so great a degree, as to have the very same Appearance. The Substance which covers the Tuberosity of the Ischium is almost intirely Tendinous, and that which lines the Grooves and Notches of the Tendons is chiefly Ligamentary.

98. THE true Cartilages of the Offa Innominata in adult Subjects, are five in number, three common, and two proper.

99. THE first and principal common Cartilage is that which makes the Symphysis of the Offa Pubis. It reaches from the interval between the Spines of these two Bones, all the way to the Angle form'd by the two Rami, where they begin to separate. It is something thicker or broader at its upper part, than for a considerable Space lower down, but the inferiour Part is by much the broadest. It fills the Angle already mention'd, and forms a kind of Arch, which is more considerable in Women than in Men.

100. THE two other common Cartilages join the Offa Ilium to the Os Sacrum, but are thinner than that of the Offa Pubis.

101. THE proper Cartilages are those that line the cotyloide Cavities. Concerning these, we have already observ'd in the Description of the Skeleton, that in the Edge of each, there is a Notch or Opening between the antieriour and inferiour Parts; and that in the Cavity itself, there is a broad unequal shallow Depression, reaching from the Notch, beyond the middle of the Cavity. All the rest of the Surface of the Acetabulum is cover'd with a very white, shining, smooth Cartilage which terminates precisely at the Edge of the Cavity.

102. THE Circumference of the Acetabulum has besides, a Border of a particular kind, the Substance of which is neither wholly Cartilaginous nor wholly Ligamentary; but I choose to place it among the Ligaments.

*Ligaments of
the Offa Innominata.*

103. THE Ligaments of the Offa Innominata are of two kinds, common and proper. The common Ligaments are those which go between these and the neighbouring Bones, of which there is a considerable number, viz.

104. ONE superiour Ligament inserted by one end in the internal Labium of the posteriour part of the Crista of the Os Ilium, about an Inch above the Angle of that Crista. It is about an Inch in breadth, and is fasten'd by its other Extremity in the whole inferiour Edge of the transverse Apophysis of the last Vertebra of the Loins.

105. ONE inferiour and anteriour, fix'd by one end in the inner Side of the Angle of the Crista of the Os Ilium, and by the other in the superiour and anteriour Part of the first false transverse Apophysis of the Os Sacrum. In this Ligament there are transverse Openings which make it appear more or less complex.

106. SEVERAL inferiour and posteriour, fix'd by one end along the internal Labium of the Tuberosity of the Crista of the Os Ilium, and by the other in the first three false transverse Apophyses, and from thence extending laterally over the Marks of the false oblique Apophyses of the Os Sacrum.

107. To these must be added the Ligaments by which the Os Femoris is join'd to the Os Innominatum, which shall be described among the other Ligaments of the Thigh.

108. THE principal proper Ligaments are four in Number, two call'd Sacro-Sciatic, one broad and external, the other small and internal, one obturator and one inguinal.

109. THE broad Sacro-Sciatic or internal Sciatic Ligament is slightly fasten'd to the inside of the Tuberosity of the Crista of the Os Ilium, covers exteriorly the two posteriour Spines of that Bone, and continues to be inserted along the anteriour and exterior Edges of the false transverse Apophyses of the Os Sacrum.

110. FROM thence this Ligament diminishing in breadth, descends obliquely towards the Tuberosity of the Ischium, and is inserted immediately below the Sinus which lies between that Tuberosity and the Sciatic Spine. This Insertion is afterwards continued over the whole internal Labium of the inferiour Portion of the Os Ischium, and of the Ramus of that Bone, and the inferiour Portion of the Ramus of the neighbouring Os Pubis.

111. THROUGH all this latter Course of its insertion, that is, after its arrival at the Tuberosity of the Ischium, it produces a kind of ligamentary Falx, one Edge of which is fix'd to the Bones, the other lies loose; and by this Situation of the Falx, it forms, together with the Bones, a kind of deep Channel or Groove.

112. THE small Sacro-Sciatic or internal Sciatic Ligament adheres closely to the inside of the posteriour Portion of the former. It is fix'd interiorly to the Edge of the inferiour part of the fourth false transverse Apophysis of the Os Sacrum, and from thence, all the way to the upper part of the Os Coccygis.

113. FROM this insertion, it runs up a little obliquely to the Spine of the Ischium, in the sharp Point and upper part of which it is fix'd. During this Course, it crosses the broad Ligament, being closely united to the inside thereof, and loses but very little of its Breadth.

114. BY these two Ligaments two distinct Openings are form'd, a large one, with the superiour Sciatic Sinus, and small one, with the inferiour Sciatic Notch.

115. THE obturator Ligament fills up all the great Foramen Ovale, except the oblique Notch at its upper part. It is fasten'd precisely to the Edge of the Circumference of that Hole, from the antierour part of the oblique Notch, all the way to the Symphysis between the Os Pubis and Os Ischium.

116. FROM thence to the posterour part of the inferiour Notch, it is fix'd to the internal Labium of the Edge of the Circumference, forming a kind of small Channel with the external Labium; and afterwards it is fix'd to the common Edge of the Foramen Ovale and cotyloide Notch or Opening.

117. BY this Disposition, an Opening is left between this Ligament and the superiour oblique Notch; and immediately below this common Opening, there are two small Perforations in the Ligament alone.

118. ON the inside of the upper and antierour part of the Os Pubis, there is a transverse Ligament, resembling the shape of a Pent-house; fix'd by its upper part to the Os Pubis, from the oblique Notch of the Foramen Ovale, all the way to the lower part of the Symphysis, at a small distance from the Circumference of the last mention'd Hole.

119. THIS transverse Ligament is about half an Inch in breadth in an adult Body; and posterourly below the superiour oblique Notch of the Foramen Ovale, it joins the obturator Ligament, by means of a particular Fold; and by parting from it afterwards, a kind of deep narrow Groove is form'd between them, the transverse Ligament being at this place supported by ligamentary Fræna of different Sizes.

120. THE inguinal Ligament, call'd from the Discoverer, *Ligamentum Fallopii*, is an Aponeurotic or Ligamentary Band, fasten'd by one end to the antierour and superiour Spine of the Os Ilium, and by the other, to the Spine of the Os Pubis. The middle Portion of it is very narrow, but it expands considerably toward both Extremities. It is closely join'd to the Muscles of the Abdomen and to the Aponeurotic Fascia of the Thigh. It seems to be often wanting, as shall be observ'd in the Description of these Muscles.

121. BESIDES these Ligaments peculiar to each Os Innominatum, there is another small flat and very strong Ligament, which runs transversely between the two Angles of the cotyloide Notch, and may be term'd the proper or transverse Ligament thereof.

122. THE elastick Border of the cotyloide Cavity may likewise be reckon'd among the Ligaments. It is a sort of additional Piece strongly united to the Edge of that Cavity, but easily yields both ways to any Pressure. It may be stretched out by pulling, and recovers and contracts again when that Force is removed. It is of a very singular Texture, being composed of elastick Fibres, interwoven together through its whole Circumference, and which, in several places, are by degrees inclined toward the bony Edge of the Cavity. It makes an intire Circle, and where it passes over the Notch, the

the transverse Ligament before mention'd serves to support it, as the bony Edge of the Cavity does through all the rest of its Circumference.

123. THO' I have referr'd the Description of the two Ligaments by which the Os Femoris is connected to the Os Innominatum to another place, their Insertions in the last named Bone must nevertheless be mention'd here. One of these Ligaments surrounds the whole Articulation, the other is contained therein. The first is call'd the orbicular Ligament, the other very improperly, the round Ligament.

124. THE orbicular Ligament is very strong, and unequally thick. It surrounds the whole convex Circumference of the Supercilium of the cotyloide Cavity, to which it is strongly fix'd for the Breadth of near a quarter of an Inch, from the sharp Edge outward, and from thence seems to send off a ligamentary Aponeurosis, which shall be explain'd in the History of the Muscles.

125. ITS Insertion at the sharp Edge of the cotyloide Cavity, joins that of the elastic Border; the rest of the Ligament is distinct from the Border, and only touches it quite round; and where it passes over the Notch, it is fix'd in the transverse Ligament.

126. THE Ligament which lies in the Joint is not round, as its common Name would make us believe. It is a flat Cord, broad at one end, and narrow at the other, and therefore in some measure of a triangular shape. By its narrow End, it is inserted at the two Angles of the Notch of the cotyloide Cavity; and by the other, in the Os Femoris, in the manner hereafter to be described. This broad End may be reckon'd the Basis of the Ligament; and from thence arise some distinct ligamentary Filaments, which are inserted at different Distances, in the Circumference of the rough Impression of the cotyloide Cavity.

127. THERE is nothing in the Periosteum of this Bone different from what has been said above, except what relates to the Insertion of several Muscles; but that cannot be explained till these Muscles are described.

128. THE rough unequal Depression at the bottom of the cotyloide Cavity, is fill'd by a broad flat mucilaginous Gland, border'd with a fatty Substance, and cover'd by a fine Membrane, through which a mucilaginous Liquor passes, to moisten the Joint and facilitate its Motions. This Membrane rises above the Gland, and gives a sort of Covering or Coat to the Ligament contain'd in the Joint. The Blood-Vessels of this Gland pass between the bottom of the cotyloide Notch, and the transverse Ligament thereof.

129. As these Bones have no internal Cavity, and their Substance being cellulous or cavernous, they contain no medullary Mass. The small Cells of their cavernous Substance contain a medullary Juice, which distils incessantly through the Membrane with which they all are lined.

130. THE Blood-Vessels pass chiefly through the small Holes in both convex and concave Surfaces of these Bones, and ramifying upon the bony Cells, they end in a great number of small capillary Tubes, which make the medullary Juice appear red.

*Membranes,
mucilaginous
Glands and
Marrow of
the Os Inno-
minatum.*

*Cartilages of
the Os Fe-
moris.*

131. No part of the Os Femoris is cover'd with Cartilage, except the uniform Convexity of its Head, and the articular Portion of the lower Extremity. The Trochanters have no true Cartilage, what looks like it, being only the remains of tendinous Insertions, as has been already observed of the Crista of the Os Ilium. The Cartilaginous Substance which, to a certain Age, unites the Epiphyses to the body of the Bone, does not belong to this place, because it is only found in the time of youth, and in Adults is converted into Bone.

132. THE Cartilaginous Matter by which the Head of the Os Femoris is cemented, deserves, however, to be observed, because that Epiphysis has been separated by violent Falls.

133. THE Convexity of the Head of the Os Femoris all the way to its Symphysis with the Neck, is cover'd by a very smooth shining Cartilage. We have already remark'd in describing the dry Bones, that a little below the middle of this Convexity, and something toward the back part, there is a Depression in the shape of a Crescent, the Cartilage being here interrupted by the Insertion of the internal articular Ligament of the Head of the Os Femoris.

134. THE Cartilage which covers the lower Extremity of this Bone, is exactly fitted to the semi-oval Convexity of the inferiour Surface of each Condyle, and to the Pulley formed by their Union.

135. IN the posteriour part of the lateral Tuberosity of each Condyle, there is another kind of Cartilaginous Surface, which was spoken to in the History of the Tibia.

*Ligaments
of the Os
Femoris.*

136. THE Os Femoris is connected by its upper Extremity to the Os Innominatum, and by the lower, to the Bones of the Leg, by means of several Ligaments. The Ligaments of the upper Extremity are two in number, one which surrounds the whole Articulation thereof with the Cotyloide Cavity, and one contain'd in the Articulation. The first is term'd the orbicular Ligament of the Head of the Os Femoris; the other, the internal Ligament. To these we may, tho' very improperly, add a third, which is of the nature of a Capsular Ligament, as we shall see hereafter.

137. THE orbicular Ligament is the most considerable, largest, and strongest of all the articular Ligaments of the Human Body. It is fix'd quite round the border of the Cotyloide Cavity in the manner already said; and from thence largely surrounds the whole Head and superiour Portion of the Neck of the Os Femoris, and is closely inserted in the lower Portion of the Neck, that is, between its Basis and middle narrow part.

138. THIS Ligament is made up of several sorts of Fibres, the chief of which are longitudinal and oblique, and it is much thicker and stronger in some parts than in others. It is very thick between the anterior inferior Spine of the Os Ilium all the way to the small anterior Tuberosity, which unites, as it were, the Basis of the great Trochanter with the Basis of the Neck.

139. IT is likewise very thick between the same Spine, and the middle part of the oblique rough Line observable between the Tuberosity and the

little

little Trochanter; and here likewise it is strengthen'd by a bundle of Fibres connected to the Passage of the Tendon of the Iliack Muscle, and to the inferiour Portion of the oblique rough Line. The Disposition of the ligamentary Fibres of which these two thick Portions are composed, form a sort of Triangle with the oblique rough Line which terminates the Basis of the Neck.

140. AT the posteriour and upper part of this Ligament, there is another thick Portion formed by oblique Fibres, one end of which is fix'd between the inferiour Edge of the Cotyloide Cavity, and the Passage of the Tendon of the external obturator Muscle; the other, to the upper part of the small Tuberosity of the great Trochanter, already mention'd.

141. THE posteriour and lower part of it is thinner and shorter than the rest; but even this is strengthen'd by a band of pretty strong Fibres which from the whole Crista of the Os Pubis, runs down obliquely near the fore side of the Cotyloide Notch, and is fix'd in the upper part of the Basis of the Neck of the Os Femoris, immediately above the small anterior Tuberosity of the great Trochanter.

142. THE other Ligament of the Head of the Os Femoris which I call internal, resembles a flat Cord, being composed of a bundle of Fibres closely interwoven. One end of it is in a manner divided into two flat Bands, inserted one at each Corner of the Cotyloide Notch in the manner already explain'd. It might likewise be call'd the inter-articular Ligament of the Head of the Os Femoris.

143. FROM this Insertion, it runs obliquely backward and a little upward between the Cotyloide Gland, and the Cartilaginous Convexity of the Head of the Os Femoris, and ends in the upper part of the small semilunar Fossula, which may be reckon'd the Pole of that Convexity. This Insertion is oblique, a little rounded on the upper part, and flat on the lower, and in some Subjects there is a sort of Depression in the Head of the Bone for the Passage of the Ligament.

144. THE Ligaments of the lower Extremity of the Os Femoris, by which this Bone is connected with those of the Leg, are six in number, one posteriour, two lateral, two middle or Crucial, and one Capsular.

145. THE Crucial Ligaments lie within the Joint, and are fix'd by one end to the back part of the Notch or Opening which parts the two Condyles. They are surrounded by the Capsular Ligament, but all the rest lie on the outside thereof, being closely join'd to it.

146. OF the two lateral Ligaments, one is internal and broad, being fixed to the Tuberosity of the internal Condyle; the other is external and narrow, fixed to the Tuberosity of the external Condyle.

147. THE posteriour Ligament is broad and thin, being fixed a little above the convexity of the external Condyle, from whence it descends obliquely, behind the great Notch and internal Condyle.

148. THE Capsular Ligament glew'd, as it were, to the three former, as has been said, is fixed quite round the inferiour Extremity of the Os Femoris, at a small distance above the anterior, lateral, and posteriour parts

parts of the Cartilage, and above the posteriour part of the great Notch; and from the Cartilage and Notch, through the small Space upward already mention'd, it covers the Bone; and afterwards is inverted downward to form the Capsula for the Mucilaginous Liquor of the Joint. The rest of the Description of all these Ligaments must be referr'd to that of the Bones of the Leg.

*Marrow of
the Os Fe-
moris.*

149. THE Marrow of the Os Femoris lies in a large Mass in the middle Cavity of the Bone, and in small distinct Clusters in the Cells of each Extremity. The first is penetrated at different distances by the bony Filaments or Ramifications of the Reticular Texture, and thereby sustain'd in violent Motions and Shocks, as in leaping, running, &c.

*Cartilages of
the Bones of
the Leg.*

150. THE Tibia has four or five proper Cartilages, and two additional ones.

151. THE two proper Cartilages which cover the two superiour Surfaces of the Head of the Tibia, are the thickest. They are both gently hollow, but the internal, or that next the other Tibia, is more depressed in the middle than the other. The back part of the external, is insensibly depressed, and thereby a sort of Convexity is formed. Anteriorly they join each other, posteriorly they are parted by a shallow Notch; in the middle, they are separated by the articular Tuberosity of the Head of the Tibia, which is likewise partly cover'd by them on each side.

152. THE third proper Cartilage covers the small Surface which lies on the lower part of the external Condyle.

153. THE fourth covers the lower Surface of the Basis of the Tibia, being continued over the outside of the inner Ankle. There are likewise superficial Cartilaginous Incrustations on the back part of this Basis behind the inner Ankle, and likewise on the back side of the outer Ankle, all for the Passage of Tendons.

154. THE additional Cartilages of the Tibia are two in number, call'd femilunar from their Figure, and intermediate or inter-articular from their Situation.

155. EACH of these Cartilages is in the shape of a Crescent, or Roman C. Their Convexity or greatest Curvature is very thick, their Concavity or smallest Curvature very thin, something like the Edge of a Sickle. They lie on the two upper Surfaces of the Head of the Tibia; their thickest part or Convexity answering to the Edges of the Head, and their thin sharp Edges, to the middle of each Surface, their Extremities or Cornua being turn'd toward each other.

156. EACH Cartilage is broad enough to cover about two thirds of the Surface of the Tibia, on which it lies, leaving one third bare in the middle. Their under sides are flat; the upper sides hollow, and together with the middle Portions of the Surfaces of the Head of the Tibia, form Cavities proportionable to the Convexity of the Condyles of the Os Femoris.

157. THE Fibula has two Cartilages, one lying on the upper Extremity of that Bone, for its Articulation with the small Cartilaginous Surface in the head

Head of the Tibia. The other Cartilage covers the inside of the inferior Extremity, or of the outer Ankle, near the Point of which posteriorly, there is a superficial Cartilaginous Incrustation for the Passage of the Tendons of the Musculi Peronæi. The Cartilage at the upper Extremity of the Fibula seems to be thicker than that at the lower Extremity.

158. THE Patella which belongs properly to the Tibia and not to the Os Femoris, has a pretty thick Cartilage on its posterior or articular Side, divided by a superficial longitudinal Rising into two parts proportion'd to the two Portions of the Pulley of the Os Femoris, as has been observed in the Description of the dry Bones.

159. I have already observed, that the Tibia is connected with the Os Femoris by several Ligaments, two lateral, one posterior, two middle, and one Capsular, and I have shown in what manner they are fixed in the lower Extremity of the Os Femoris. Their Insertions in the Bones of the Leg are as follow.

*Ligaments of
the Bones of
the Leg.*

160. THE innermost and broadest of the two lateral Ligaments, is fix'd pretty low down, on the inner side of the superiour part of the Tibia between the beginning of the Crista or anterior Angle of that Bone, and the internal Angle which is turn'd toward the other Tibia. It is likewise join'd to the Edge of the internal semilunar or inter-articular Cartilage.

161. THE external lateral Ligament, which is narrower and thicker than the former, is fix'd partly in the Tibia immediately above the Fibula, and partly in the upper Extremity of the Fibula; and is joined likewise to the Edge of the external semilunar Cartilage. Both these Ligaments lie a little behind the middle of the Articulation.

162. THE posterior Ligament is fixed by several Expansions, in the posterior part of the Head of the Tibia.

163. ONE of the crucial Ligaments is fix'd by one end to the internal superficial Impression in the Notch of the Os Femoris, and by the other, to the Notch in the Head of the Tibia, behind the Cartilaginous Tubercle which lies between the two superiour Surfaces. The other Crucial Ligament is fix'd by one end to the external Impression in the Notch of the Os Femoris, and by the other, between the anterior Portions of the Surfaces just mention'd, before the Cartilaginous Tubercle.

164. THESE two Ligaments are composed of several Series of Fibres. The first, which is internal in respect of the Os Femoris, and posterior in respect of the Tibia, is broader and stronger than the other, which is external in respect of the Os Femoris, and anterior in respect of the Tibia.

165. THE semilunar Cartilages have likewise particular Ligaments, besides their Connexions with the lateral Ligaments of the Tibia. Their Cornua do in some measure degenerate into short strong Ligaments, by which they are fasten'd to the Cartilaginous Tubercle between the two superiour Surfaces of the Tibia, and likewise communicate by some Portions, with the Crucial Ligaments.

166. THEY have likewise a common Ligament, which like an Arch, runs transversely between the antierour Convexity of the one, to that of the other.

167. THESE Cartilages therefore have three sorts of Connexions. They are fasten'd to the Tibia by the Ligaments of the Cornua, to each other, by the transverse Ligament; and to the Os Femoris, by their Communications with the crucial Ligaments, and by their Adhesions to the lateral and capsular Ligaments.

168. THE Patella is fasten'd to the Tuberosity or Spine of the Tibia by a broad and very strong Ligament which runs down directly from the Apex of the Patella, and is oftentimes further strengthen'd by some Fibres of a considerable Tendon inserted in the upper part of that Bone.

169. IT has likewise small lateral Ligaments, fixed in the lower part of its Edge on each side, which parting gradually from the great Ligament as they run down, are inserted antierourly and a little laterally in the Edge of the Head of the Tibia.

170. THE capsular Ligament of this Joint of which I described one part in speaking of the lower Extremity of the Os Femoris, is fix'd round the Edge of the Head of the Tibia, and in the Edge of the Patella, so that the Patella it self forms a Portion of the mucilaginous Capsula of the Joint of the Knee.

171. THE crucial Ligaments, and those of the semilunar Cartilages are included within this Capsula; but the lateral and posterour Ligaments and those of the Patella lie without it, being closely join'd to its outer Surface.

172. THIS Capsula is likewise joined to a considerable Portion of the Circumference of the semilunar Cartilages, and it is also strengthened at different distances, by several distinct Series of ligamentary Fibres, more or less thick. The inside of it is smooth and shining, and it is very thin where it is not cover'd by Tendons, as shall be observed hereafter. It not only contains and surrounds the Ligaments already named, but likewise furnishes them with a very fine Vagina.

173. THERE is likewise a very thin Ligament fix'd by one end to the lower part of the Cartilaginous Side of the Patella, and by the other, to the antierour part of the great Notch between the Condyles of the Os Femoris, the use of which seems to be to hinder the articular Fat from being compressed in the Motions of the Knee.

174. THE Fibula is join'd to the Tibia by nine Ligaments, four at each end, and one in the middle call'd the interosseous Ligament.

175. THE Ligaments at the upper Extremity of the Fibula, are short, very strong, more or less oblique and compound. Two of them are antierour, two posterour, and they lie on each other; the superiour Ligaments surrounding the Articulation more closely than the inferiour, which leave a small void Space, and are weaker than the former. They are all glew'd to the capsular Ligament which runs in between them and the Articulation, and they are inserted round the Edges of the cartilaginous Surfaces in each Bone.

176. THE Ligaments of the lower Extremity of the Fibula, which runs below the Tibia, and forms the outer Ankle, are much stronger, thicker, more complex, broader, longer, and more oblique than those of the superiour Extremity; and are disposed much after the same manner, that is, two before, and two behind.

177. THEY are fixed to the anterior and posterior Edge of the lateral Depression at the inferior Extremity of the Tibia, and from thence they run down on the lower end of the Fibula. The two inferior Ligaments are longest, and they are fixed anteriorly and posteriorly at the lower end of the outer Ankle. The two superior are fixed more closely and nearer each other, but still there is a small Space between them filled with Fat.

178. As the two Bones touch each other only by the upper part of the Cartilaginous Surface of the outer Ankle, and the small Cartilaginous Border in the lower Edge of the Depression of the Tibia; the middle Space between them is filled by a sort of capsular Ligament, which lines each side of the Bones, and is continued down to the true Articulation of the external Ankle, with the inferior Edge of the Basis of the Tibia.

179. THE middle or interosseous Ligament of the two Bones of the Leg, so call'd because it fills up all the Space left between them, being stretched from one to the other, is fixed along the posterior external Angle of the Tibia and the neighbouring Angle of the Fibula.

180. IT is made up chiefly of two Planes of very oblique ligamentary Fibres, which cross each other, and at different Intervals, seem to be multiply'd. It is perforated both above and below, and sometimes in several places besides, for the Passage of the Blood-Vessels and Nerves.

181. IT is not a Ligament designed to tie these Bones together, but rather a ligamentary Septum for the Insertion of Muscles, in which respect it supplies the place of Bones; and seems partly to be a continuation of the Periosteum of the Tibia and Fibula.

182. AT the lower part of each Ankle, there are commonly three strong Ligaments for the Connexion of the Bones of the Tarsus with those of the Leg; one that runs forward, one that runs backward, and one that runs more or less directly downward; all of them being fix'd in the places hereafter to be mention'd.

183. THERE are some other ligamentary Expansions belonging to the Bones of the Leg, but as they do not serve so much for the Connexion of the Bones, as to support the Muscles, the Description of them as well as of the annular Ligaments, will more naturally come in, in the Treatise of the Muscles.

184. THE Marrow of these Bones lies in large Masses in the great Cavities, and in distinct Moleculæ in the spongy parts, as has been already observed in general.

185. THE mucilaginous Glands lie in the small Spaces, Depressions, and superficial Notches near the Edges of the Cartilages of each Joint. They

*Marrow and
Mucilaginous
Glands of
the Bones of
the Leg.*

are cover'd by the capsular Ligaments, and more or less mixed with a fatty Substance.

186. THE Glands of the Knee which lie near the Edges of the Patella, are the most considerable, being disposed in form of Fringes, and supported by a great quantity of fatty Matter, which makes in some measure, one Mass with them.

187. THIS common Mass is contain'd within the capsular Ligament, and on the side of the Joint, is cover'd by a very fine Membrane which likewise lines the inner Surface of the Ligament. The glandulous Substance is easily distinguished from the Fat, by the reddish colour of the capillary Vessels which surround the Glands.

188. THE superiour Portion of this Mass is as it were suspended by the small Ligament, fix'd in the anterior part of the great common Notch of the Condyles of the Os Femoris, and which from thence runs to the upper part of the Patella, as has been already observed in the Description of the Ligaments.

189. THERE are other mucilaginous Glands both above and below the Edges of the semilunar Cartilages.

190. AND likewise in the Ham, some whereof serve for the Joint, the rest, for the crucial Ligaments. These last lie in folds form'd by the internal Membrane of the capsular Ligament, which give particular coverings to the crucial Ligaments, and to the other bundles of ligamentary Fibres near them.

*Cartilages of
the Bones of
the Foot.*

191. THE Astragalus is cover'd by three Cartilages. The first covers the three Surfaces, which make the convex part and sides of the Pulley; the second, the concave Surface of its inferior part; and the third, the convex Surface of its anterior part, being continued over the inferior part, so far as to form three other small Surfaces, one of which is not articular in a strict Sense.

192. THE first of these Cartilages is for the Articulation of this Bone with the Tibia and Fibula; the second, for the Os Calcis; and the third, for the Os Scaphoides. Two of the inferior Surfaces form'd by the continuation of the third Cartilage, are for the Articulation of this Bone with the Os Calcis; the third contributes to the Formation of a Channel for the Passage of a Tendon.

193. THE Os Calcis has four Cartilages, of which three are superior, one large and two small for its triple Articulation with the Astragalus; the fourth is anterior, for the Os Cuboides. To these must be added a small thin Cartilage, of a kind of ligamentary Substance under the Tubercle on the outside of this Bone.

194. THE Os Scaphoides has two Cartilages, one posterior for its Articulation with the Astragalus; and one anterior divided into three parts for the three Offa Cuneiformia.

195. THE Os Cuboides has two remarkable Cartilages, one posterior for its Articulation with the Os Calcis, and one anterior lying in two Planes for its Articulation with the two last Metatarsal Bones. It has likewise

a Cartilage on the inside for the Os Cuneiforme which is next to it, and one on the lower side, covering a part of the oblique Eminence situated there.

196. THE three Offa Cuneiformia have each of them a posteriour Cartilage for their Articulation with the Os Scaphoides; and one anteriour, for the three first Metatarsal Bones; they have likewise small cartilaginous Surfaces on their lateral Sides, for their Articulations with each other; and besides, the first and third Bones are joined thereby, to the lateral parts of the Basis of the second Metatarsal Bone, and the third, to the Os Cuboides.

197. THE Bases and Heads of the Metatarsal Bones are covered with Cartilages.

198. THE Phalanges have Cartilages in the same manner at their Bases and Heads, except at the Heads or Extremities of the last.

199. THE sesamoide Bones are cover'd with Cartilages on that side by which they slide on other Bones.

200. WE ought to beware of confounding the Remains of Tendons, Ligaments, and Aponeuroses with the true Cartilages, as for instance, at the posteriour part of the Os Calcis. I gave the same caution when I spoke of the Cartilages in general.

201. THE Foot being made up of many Bones, must besides those Ligaments by which it is tied to the Bones of the Leg, have several others to connect not only the three parts of which it is composed, but also the particular Bones belonging to each part.

*Ligaments of
the Bones of
the Foot.*

202. I have already mention'd the Insertions of three Ligaments in each Ankle, one anteriour, one middle, and one posteriour, for the Articulation of the Ankles with the Foot.

203. THE Ligaments of the inner Ankle are all fixed in the inside of the Astragalus. The most anteriour is pretty broad, and sometimes seems to be join'd in one with the middle Ligament. It often consists of several distinct parts like so many Bands interlarded with Fat.

204. THE anteriour and middle Ligaments of the outer Ankle, being more or less broad, are fixed in the outside of the Astragalus; the posteriour, which is narrowest and pretty thick, is chiefly fixed in the outside of the great Portion of the Os Calcis.

205. ALL these Ligaments lie on the outside of the Capsula, which furrounds the Articulation of the Astragalus with the Bones of the Leg.

206. THE Ligaments by which the Bones of the Tarsus are connected with each other, are short, flat, of different breadths, and run from one Bone to another in various Directions. They are all superficial, except one, by which the Astragalus is tied to the Os Calcis, and for the most part are either superiour or inferiour, the lateral Ligaments being but very few in number.

207. SOME of them are partly common to several Bones, and partly belong only to two; that is, the superficial Strata of their Fibres, run over one Bone into the following, and sometimes further; but the Strata next the Articulation are generally confined to two Bones only.

208. THE Astragalus is tied to the other Bones of the Tarsus, by several true Ligaments, *viz.*

209. To the inside of the Os Calcis by a Ligament which comes from the posterious internal Tuberosity of the Body of the Astragalus, and is fixed in an inequality behind the lateral Apophysis of the Os Calcis.

210. To the inside of the same Bone by a Ligament which comes from the lateral Apophysis of the Os Calcis, and is fixed in a sort of Cartilaginous Production on the inside of the Neck of the Astragalus.

211. To the outside of the same Bone by two Ligaments which come from the Edge of the oblique inferior Depression of the Astragalus, and afterwards separating a little, are fixed in the outside of the great Apophysis of the Os Calcis, one forward which seems to send off a small Portion to the Os Cuboides, the other backward of different breadths.

212. To the Os Scaphoides superiorly by a Ligament which goes from the Neck of the Astragalus to the upper part of the Os Scaphoides, and from thence is extended to the middle Os Cuneiforme.

213. To the same Bone interiorly by two Ligaments, one of which is a Continuation of that which goes from the lateral Apophysis of the Os Calcis to the Cartilaginous Production of the Astragalus; the other is near the same Production, being partly covered by the former, and fixed in the Tuberosity of the Os Scaphoides.

214. To the Os Calcis, by a Ligament which comes from the oblique inferior Depression of the Astragalus, and is fixed in the oblique superior Depression of the Os Calcis.

215. If to these principal Ligaments of the Astragalus, we add several others less remarkable, and also those by which it is tied to the Ankles, their number will be very considerable.

216. THE capsular Ligaments go very little further than the Edges of the Articulations of this Bone with the rest. They adhere very closely to the true Ligaments, and are covered and hid by them.

217. THE Os Calcis is joined to the outer Ankle and Astragalus by the Ligaments already described. It is likewise connected to the Os Scaphoides and Os Cuboides by several Ligamentary Planes.

218. IT is connected to the Os Scaphoides; (1.) By a Continuation of the Ligament that goes from its lateral or internal Apophysis to the Cartilaginous Production of the Astragalus. (2.) By a Ligamentary Plane which goes from the inferior Tuberosity of its great Apophysis, and is fixed in the inferior part of the Circumference of the Os Scaphoides. (3.) By a narrower Ligament which goes from the superior and internal part of the same Apophysis, and ends in the nearest part of the Circumference of the Os Scaphoides.

219. IT is connected to the Os Cuboides. (1.) By a Ligament, or rather by several ligamentary Fasciculi which go from the Extremity of its oblique superior Depression to the contiguous Angle of the Os Cuboides. (2.) By one lying between the first, and the small external lateral Tuberosity of the Os Calcis, and inserted in the Os Cuboides near the first.

(3.) By

(3.) By one which is fix'd to the exterior and inferior part of the great Apophysis of the Os Calcis, and to the contiguous part of the Os Cuboides.

(4.) By a pretty broad Plane which covers the inferior part of the Os Calcis, and which from the anterior Tuberosity of this part, spreads over the contiguous inferior part of the Os Cuboides, and ends in the oblique Eminence of that Bone. (5.) By a broader Plane, which having filled the lower part of the lateral Concavity of the Os Calcis, is chiefly inserted in the contiguous Angle of the Os Cuboides.

220. THE capsular Ligaments agree with those of the Astragalus.

221. THE Os Scaphoides is tyed to the Astragalus and Os Calcis in the manner already said.

222. IT is likewise joined to the Os Cuboides and the Offa Cuneiformia by several Ligaments. On the outside, or that next the Os Cuboides there is one which connects it to the contiguous Angle of that Bone. On its upper part, two go from its Circumference, one to the second; the other to the third Os Cuneiforme. On its interior Side, it is joined to the convex side of the great Os Cuneiforme by two Ligaments. On its lower Side it has four, whereof the first appears as if it were double, going from the Tuberosity of this Bone to the Basis of the first Os Cuneiforme; the second and third go obliquely to the other two Offa Cuneiformia; the fourth is a little transverse, being fixed in the inferior internal Angle of the Os Cuboides.

223. THE Os Cuboides, besides the Ligaments which tie it to the Astragalus, Os Calcis, and Os Scaphoides already mentioned, has others which connect it above, below, and on the outside with the third Os Cuneiforme and two last Bones of the Metatarsus. The superior Ligaments are almost equally flat, the inferior unequally thick and stronger than the superior. The exterior goes from the Os Cuboides to the Tuberosity in the Basis of the last Bone of the Metatarsus, and seems likewise to communicate with the third Bone by some ligamentary Fibres.

224. THE three Offa Cuneiformia are fix'd to the Os Scaphoides and Os Cuboides, by the Ligaments abovemention'd. They are connected together on the upper Part by particular ligamentary Planes which go more or less transversely from one Bone to another, being all join'd to one common ligamentary Plane which covers these three Bones, and also the Os Cuboides. On the lower part they are join'd by stronger and thicker Ligaments. They are likewise connected by Ligaments to the three first Bones of the Metatarsus.

225. THE great Os Cuneiforme is joined on its upper, lower, and interior or convex Side, to the Basis of the first metatarsal Bone, by ligamentary Fibres, which form almost a continued Plane, the inferior part of which is strong and thick, and appears to be double. It is likewise tyed to the inside of the Basis of the second metatarsal Bone, by a particular Ligament.

226. IT has likewise on the outside of its inferior part, three considerable Ligaments more or less oblique; the first and shortest of which goes to the Basis of the second metatarsal Bone, the second to that of the third, and the third, which is the longest, to that of the fourth.

227. THE Bones of the Metatarsus are connected together by their Bases and Heads. The Ligaments that go between the Bases are superiour and inferiour. The superiour are flat and small: the inferiour strong and thick, and as it were multiplied by entering the Interstices between the Bases.

228. THE Ligaments which go between the Heads have nearly the same general Disposition. The inferiour have this peculiar to them, that by filling the Spaces between the Heads, they keep them at some distance from each other. The inferiour Portions of these Ligaments are fix'd in the Angles, at the lower part of each Head. They are moreover strengthen'd by their Union and Intertexture with the Aponeurosis Plantaris, as shall be said hereafter.

229. THE first Phalanges of the Toes are tied to the Heads of the metatarsal Bones, by a sort of orbicular Ligament, set round the Edges of the cartilaginous Portions of the Head, and those of the Bases of the Phalanges.

230. IN the four Toes, next the great Toe, the inferiour part of these Ligaments is very thick, and crufted over as it were with a cartilaginous Substance fix'd to the Basis of the Phalanges, and from thence continued over the Head of the metatarsal Bone next it. This Substance grows hard with Age, like a sesamoide Bone.

231. OF these sesamoide Bones, the Great Toe has two belonging to the first Phalanx, which are the largest, the soonest formed, and most considerable of all that go by that Name. They are shaped like an Olive, being about one third part of an Inch in length, and about half as broad as long. They are join'd by their anterior Extremities, to the Basis of this Phalanx, close by each other, and lie in the two Depressions, on the lower side of the Head of the first metatarsal Bone.

232. THE second and third Phalanges of all the Toes being articulated by Ginglymi, have lateral Ligaments, which go between the Sides of the Bases, to the Sides of the Heads. At the inferiour Edges of all these Bases, there is a cartilaginous Matter, join'd to the Ligaments, which hardens with Age, in the same manner as those of the first Phalanges.

233. THE capsular Ligaments of all these Articulations, are disposed in the same manner as in the first Bones of the Tarsus already described.

234. THE annular Ligaments and ligamentary Vaginæ, found on the Surface of many of these Bones, contribute nothing to their Connexion, and therefore shall be explained in another place.

*Periosteum,
Marrow,
and mucila-
ginous Glands
of the Bones
of the Foot.*

235. THE Periosteum which covers all these Bones, is of the same kind with that of the Bones of the Leg.

236. THE Marrow is suitable to their internal Structure, that is, in Moleculæ in the cavernous Portions, and in Masses in those which have large Cavities. Thus the Marrow of all the tarsal Bones is dispersed in Moleculæ, because their internal Structure is spongy. In the metatarsal Bones and first Phalanges of the Toes, it is disposed in the same manner as in the Tibia and Fibula, that is, it lies in Moleculæ in the Extremities, the Structure of which is Cavernous; but in the middle Portions of them, it lies in Masses greater or less

less, according to the Size of the Cavities. In the other Phalanges, which are intirely spungy, it is accordingly disposed in *Moleculæ*.

237. THE mucilaginous Glands answer in number and figure to the Depressions between the cartilaginous Edges and Ligaments.

§. 2. *The fresh Bones of the upper Extremity.*

238. THE Scapula in many Subjects has a small cartilaginous Border along its whole Basis, which in Children is remarkable enough, but in full grown Persons it disappears. *Cartilages of the Bones of the Shoulder.*

239. THE Glenoide Cavity of this Bone is cover'd with a Cartilage, which is thicker toward the Circumference than in the middle, and a little rais'd above the Edge of the Bone. This Thickness of the cartilaginous Circumference makes the Cavity greater than it appears in the Sceleton; and sometimes in place thereof there is an additional Border, which is thick at the Circumference of the Cavity, thin towards the bottom, and very narrow. It is of a pliable slippery Substance, yet something different from that of a Cartilage, resembling in some measure the Border of the cotyloide Cavity of the *Os Innominatum*.

240. THE small cartilaginous Surface of the Acromion, mention'd in the Treatise of dry Bones, is thicker in the natural State, and very little convex.

241. THE small triangular Surface, at the Extremity of the Spine of the Scapula, near the Basis, is covered with a very thin smooth cartilaginous *Lamina*; but being transparent, it does not appear very white.

242. THERE are no other Cartilages commonly found in the Scapula, tho' we sometimes observe in dry Bones several places which seem to have been Cartilaginous, but this is owing to the dried remains of Ligaments and Tendons.

243. THE sternal Extremity of the Clavicle is crufted over with a Cartilage, which is a little convex, and covers its whole triangular Surface; besides which, it has another moveable common Cartilage, which shall be explained together with those of the Sternum.

244. THE small cartilaginous Surface of the humeral Extremity of the Clavicle, answering to that of the Acromium, is much thicker in fresh than in dry Bones, and appears like that of the Acromium, to be a little convex.

245. BETWEEN these two Cartilages of the Clavicle and Acromium, there is in some Subjects a thin inter-articular Cartilage, very smooth on both sides.

246. THE Articulation of the Acromium, with the Extremity of the Clavicle, is strengthen'd quite round by several small strong Ligaments, which go from one Bone to the other. These Ligaments lie very near each other, and are withall so tightly braced over the Joint, as to hide it altogether, and they appear more like a cartilaginous Covering, than a ligamentary Texture. The internal Surface of these Ligaments is lined with the Capsula of the Joint. *Ligaments of the Bones of the Shoulder.*

247. WHEN the small inter-articular Cartilage is found, its whole Circumference is connected to these Ligaments.

248. THE Articulation of the Clavicle with the Sternum, is sustained by several Ligaments fix'd by one end, round the pectoral Extremity of the Clavicle, near the Edge of the triangular Surface, and from thence passing over the inter-articular Cartilage, are inserted by the other end in the Sternum, in the manner hereafter to be related.

249. THERE is a long, narrow, strong Ligament, which goes from one Clavicle to the other, behind the Furca of the Sternum, being fixed to the internal Angle of the contiguous Extremities of the Bones. It may be call'd the inter-clavicular Ligament.

250. THE Neck of the Scapula, at a small distance from the Edge of the glenoide Cavity, gives insertion to the capsular Ligament or mucilaginous Bag, and to the articular Ligaments of the Joint of the Scapula and Os Humeri.

251. BESIDES these articular Ligaments of the Scapula, there are three ligamentary Cords fixed to the Tuberosity of the Coracoide Apophysis, two of which, by their other Extremities, are inserted in the oblique Eminence on the lower Side of the humeral Extremity of the Clavicle; the third, under the Acromium. There is likewise a thin flat broad Ligament, reaching between the Crista of the Spine of the Scapula, and the Edge of the inferiour Costa.

*Cartilages of
the Os Hu-
meri.*

252. THE Cartilage by which the Hemisphere of the Head of the Os Humeri is covered, is gradually thicker toward the middle than toward the Edges.

253. THE four Surfaces of the Tuberosities which appear Cartilaginous in dry Bones, serve only for the Insertion of the Tendons of four Muscles which move the Os Humeri on the Scapula.

254. THE Channel or Sinus, between the two Tuberosities, is partly cover'd by a thin Crust, which appears rather Ligamentary than Cartilaginous, and partly by a tendinous Stratum, of which hereafter.

255. THE Trochlea and small Head of the lower Extremity of the Os Humeri are cover'd by a common Cartilage in which the same proportion of Thickness is observable, as in that of the upper Extremities. This holds pretty generally of all the convex articular Cartilages.

256. THE Fossulæ near the Pulley and small Head are covered with a kind of thin cartilaginous or ligamentary Varnish.

*Ligaments of
the Os Hu-
meri.*

257. THE capsular or mucilaginous Ligament loosely surrounds the whole Articulation of the Scapula with the Head of the Os Humeri. From its Insertion round the Edge of the glenoide Cavity already mention'd, it is continued over the Hemisphere of the Head of the Os Humeri, and fixed near its Edges, towards the muscular Surfaces of the great and small Tuberosities.

258. AFTERWARDS parting from them on both sides, in the large Space left between the two Tuberosities, that is, between the small Tuberosity and the lowest Surface of the great Tuberosity, it runs down gradually

on the Neck of the Bone below the lowest part of the cartilaginous Hemisphere.

259. IN all this course, the Capsula is closely fix'd in the Bone, except in the small Space left between the two Tuberosities, that is, at the Channel or Sinus already mention'd; where it forms a Production like the Tube of a Funnel, proportion'd to the Capacity of the Channel, and strongly fixed in the upper Portion thereof. This membranous Tube is the Vagina of the inter-articular Tendon of the Biceps, which shall be described in the Treatise of the Muscles.

260. THE true Ligament of this Joint is in some measure of that kind mention'd N^o. 37. 38. that is, which seem to be made up of two sorts of Ligaments closely united together, viz. of a capsular Ligament which surrounds the whole Articulation, and of several true Ligaments which run over, and closely adhere to the former at different distances.

261. THUS the Capsula or mucilaginous Bag of this Articulation is in part strongly united to four flat Tendons inserted in the two Tuberosities; and in part covered by true ligamentary Bands which between the four Tendons and on both sides of the first and last, form a considerable thickness. The rest of the Space between the first or superiour Plane of the great Tuberosity, and the small Tuberosity, is so little provided with ligamentary Fibres, that it has been believed to be altogether without them; and Anatomists have satisfied themselves with telling us, that in these places the orbicular Ligament is very rough on the outside, but shining and smooth on the inside.

262. THE inter-articular Tendon of the Biceps which has been already mention'd in speaking of the Production of the capsular Ligament of the Head of the Os Humeri, and which is contained in the Articulation much after the same manner as the inter-articular Ligament of the Head of the Os Femoris, call'd improperly Ligamentum Teres, might be properly enough described in this place, but I choose to refer it to the Muscles.

263. ON the Body of the Os Humeri, there are two particular Ligaments which I term intermuscular or lateral, of the same kind with those mention'd, N^o. 52. They are long, flat, thin, strong, and narrow, fixed by one Edge along the two lower thirds of the Bone and reaching to both Condyles. They are braced pretty tight, and are very narrow at the upper part, but broader toward the Condyles.

264. THE lower Extremity of the Os Humeri is joined to the Bones of the Fore-Arm by two Fasciculi of ligamentary Fibres, one fixed to the internal Condyle, the other to the external. Each Fasciculus is composed of Fibres closely joined together at the Condyle, and afterwards parting in distinct Bands like a Goose's Foot.

265. THE capsular Ligament is fix'd to the Condyles, and there covers them; and afterwards it is fixed round both sides of this lower Extremity above the Fossulae. Its Insertion in these sides is Arch-wise, so that it is there at a much greater distance from the Articulation than at the Condyles. The Fossulae are slightly varnish'd over with a cartilaginous Substance.

266. **THIS** Capsula appears to be strengthen'd by a ligamentary Web, the Fibres whereof cross each other in different Directions; but we must not take for ligamentary Filaments, some tendinous Fibres of Muscles to which the Capsula adheres very closely. It appears larger and looser when the Muscles are separated from it, than in its natural State when closely united to the Muscles.

*Cartilages of
the Bones of
the Fore-
Arm.*

267. **THE** two sigmoide Cavities in the upper Extremity of the Ulna, are covered by a Cartilage common to both, which is a little interrupted about the middle of the Edges of the Cavities by the transverse Notches mentioned in the Treatise of dry Bones. This cartilaginous Crust seems to be thicker at the Edges than in the middle.

268. **THE** inferiour Extremity or small Head of the Ulna, is crufted over by a Cartilage, round its cylindrical Border, in the Notch near the styloide Apophysis, and for some space on the Apophysis it self.

269. **THE** Cartilage which covers the Head of the Radius, is likewise stretched over the cylindrical Border thereof; and a lateral Portion of the muscular Tuberosity immediately below the Neck, is also cover'd with a thin shining Cartilage.

270. **ALL** the concave side of the Basis of the Radius is Cartilaginous, and often divided by a small cartilaginous prominent Line. The lateral Notch of the Basis is likewise covered by a continuation of the same Cartilage.

271. **THE** lateral Half-Grooves or Channels of the Basis of this Bone, appear likewise to be crufted over with a cartilaginous Matter; but this I rather take to be Portions of the annular Ligaments, which shall be hereafter described.

272. **AT** the Basis of the Radius there is likewise a particular additional Cartilage, or triangular Production longer than it is broad, very thin, and rather flat than concave on both its smooth Sides. It is fixed by its Basis, or shortest Side, to the lateral sigmoide Notch of the Basis of the Radius, in such a manner as that one Side of it is on a level with the large cartilaginous Surface of the Basis of the Bone, and its Apex directly opposite to the styloide Apophysis. The other side touches the flat Extremity of the small Head of the Ulna, but is not fixed to it.

273. **THIS** Cartilage is one of those mention'd, N^o. 26. 27. and may be term'd the inter-articular Cartilage of the Joint of the Wrist. It is tyed to the Radius by very short Ligaments, and sliding on the small Head of the Ulna, it follows all the Motions of the Radius. It is therefore a sort of articular Production of the lower side of the Basis of the Radius, and fills in the natural State, the void Space which in the Sceleton appears between the end of the Ulna and the neighbouring Bone of the Carpus.

*Ligaments
of the Bones
of the Fore-
Arm.*

274. **SOME** of the Ligaments of the Bones of the Fore-Arm are common to them with the Os Humeri, some common to them with the Bones of the Hand; and some are proper. These last are two in number, one call'd the interosseous Ligament of the Fore-Arm, and one which may be termed the coronary Ligament of the Radius. To these may be added the annular

annular Ligaments, which only serve for the Passage of Tendons; and other ligamentary Expansions, which may be called muscular Ligaments.

275. The interosseous Ligament of the Fore-Arm is very like that of the Leg. It is fixed by one Edge, along the sharp Angle of the Ulna, and by the other along that of the Radius. It is principally made up of two very strong Planes of Fibres, which cross each other at oblique Angles, and leave Holes at different Distances for the Passage of the Blood-Vessels.

276. THIS Ligament ties the two Bones closely together, and the two Planes serve for the Insertion of several Muscles. In the Supination of the Hand it is very tightly braced, but in Pronation it is folded a little length-wise.

277. THE coronary Ligament of the Radius, is a sort of ligamentary Hoop surrounding the circular Circumference of the Head of that Bone, reaching from one side of the small lateral sigmoide or transverse Cavity of the Ulna, to the other, in an Arch, which is about three quarters of a Circle. It is very strong, and comes near the Solidity of a Cartilage. The side next the Radius is very smooth, and tho' it connects that Bone very closely to the Ulna, yet it leaves it room enough to turn in the Motions of Pronation and Supination.

278. THE capsular Ligament of the Joint of the Elbow, runs down from its Insertion in the Os Humeri already described, and is fix'd in the Olecranon round the Edge of the great sigmoide Cavity, including both the Apex of the Olecranon and of the coronoide Apophysis. It likewise runs over the Head of the Radius, and is fixed to the coronary Ligament, quite round. Thus it compleatly surrounds the Articulation of these three Bones, and serves to contain the mucilaginous Liquor furnished by the Glands and fatty Substance, both which are found in the greatest Quantities near the Extremity of the Ulna.

279. THE true common Ligaments by which the Os Humeri is connected to the Bones of the Fore-Arm, call'd lateral Ligaments, are the two Fasciculi which after being inserted in the Condyles of the Os Humeri are expanded like a Goose's Foot. That which is fixed in the inner Condyle, may be call'd Brachio-Cubitale, and the other Brachio-Radiale.

280. THE Brachio-Cubital Ligament running down over the Capsula to which it closely adheres, below the great Edge of the Trochlea of the Os Humeri, is inserted like Radii (of which its other Extremity fixed in the Condyle is the Center) on the side of the great sigmoide Cavity of the Ulna. It is covered on the outside by several Tendons which adhere closely to it, and seem to strengthen it.

281. THE Brachio-Radial Ligament is disposed much after the same manner, but is of a greater Extent. It is expanded from the external Condyle of the Os Humeri, as from a Center, and is inserted round the coronary Ligament, and from thence all the way down to the Neck of the Radius, and also in the neighbouring parts of the Ulna. Through all this Passage,

Passage, it covers the capsular Ligament, and is covered by several Tendons, adhering closely to both.

282. OF the Ligaments by which these Bones are connected to those of the Hand, one is, like a roundish Cord, fixed in the styloide Apophysis of the Ulna, and from thence passes directly over the Os Cuneiforme of the Carpus, in which and in other Bones it is inserted in the manner that we shall afterwards explain: another pretty broad Ligament is fixed in the Point of the Radius, and by its other Extremity in the Bones of the Carpus.

283. FROM this styloide Ligament of the Radius, along each Edge of the Basis of that Bone, are ranks of ligamentary Fibres lying much in the same Direction with the Ligament it self, and continued all the way to the styloide Ligament of the Ulna; those nearest the Ulna inclose the inter-articular Cartilage of the Basis of the Radius, and near the styloide Ligament of the Ulna, there is a particular Fasciculus inserted in the Point of that Cartilage.

284. ALL these Ligaments surround and cover the capsular Ligament so closely, that they can hardly be distinguished from it. The Capsula is likewise in part cover'd by a Portion of a great oblique Ligament, which being by a very broad Insertion fixed in the large Extremity of the Radius, about two fingers breadth above the styloide Apex, afterwards crosses obliquely, partly over the convex side of the Basis Radii, and partly over that of the Carpus, and then turning toward the Os Orbiculare, is inserted therein. It is call'd the external transverse Ligament of the Carpus; and may likewise be named the great oblique Ligament of the Wrist.

285. THERE are several small annular Ligaments placed at different distances on the convex side of the Basis Radii, from its styloide Apex to its Articulation with the Extremity of the Ulna. They are at least six in number, some of them being often double or triple.

286. THE first is fixed in the styloide Apex; the second in the Groove near that Apex; the third in the small narrow or middle Groove; the fourth in the Groove next the former; the fifth in the corner of the semilunar Notch of the Basis, at its Articulation with the Ulna; and the sixth in the Extremity of the Ulna near the styloide Apophysis.

287. THESE particular Ligaments are almost wholly covered by the great oblique Ligament already mention'd, and are fixed as strongly in it by one side, as they are in the Bones, by the other. They are all very strong, and their concave sides serving for Fræna to the Tendons of several Muscles that pass over them, are very smooth, and accompanied with thin mucilaginous Vaginæ, which shall be described in the Treatise of the Muscles.

288. To these we might add the ligamentary Expansions, with which several Muscles are covered, and separated from each other, as by so many distinct Septa, which are all very thick and strong, where they are inserted in the Bones. One kind of them may be term'd ligamentary Bands or muscular Vaginæ, the other ligamentary Septa, inter-muscular Ligaments, &c. but the Description of them must be referr'd to that of the Muscles.

289. ALL the Bones of the Carpus, Metacarpus, and Fingers are cruſted over with Cartilages at theſe places, which I termed cartilaginous Surfaces in the Treatiſe of dry Bones; but in freſh Bones they are thicker, ſofter, and whiter than in the Sceleton. In adult Subjects, their figure remains the ſame in both, but it changes in the dry Bones of younger Subjects, and in thoſe of Children it is quite different. The Impreſſions and Notches in which the mucilaginous Glands are lodged, are moſt ſenſible in the Cartilages of freſh Bones, becauſe of their thickneſs.

*Cartilages of
the Bones of
the Hand.*

290. THE Ligaments of the Carpus are very numerous. Some of them tie each Bone to one or two neighbouring Bones in the ſame Rank; and theſe are compoſed of a great number of Filaments, but ſo very ſhort as to allow theſe Bones only a ſmall degree of Motion. Some of them tie the Bones of one Row to thoſe of the other; which are likewiſe made up of many Filaments, but not ſo ſhort as the former, and therefore allow theſe Bones a more manifeſt Motion, as we ſee in bending the Wriſt. Laſtly, there are other Ligaments of the Carpus, by which the three firſt Bones of the firſt Row are connected to the Bones of the Fore-Arm; and to theſe may be added the Ligaments by which the Bones of the ſecond Row are joined to thoſe of the Metacarpus and firſt Phalanx of the Thumb.

*Ligaments of
the Bones of
the Hand.*

291. WE have already deſcribed all the Ligaments belonging to the Articulation of the Carpus with the Bones of the Fore-Arm, except their Inſertions in the Carpus. The ſtyloide Ligament of the Radius is fixed round the neighbouring Tuberoſity of the Os Scaphoides. The ſtyloide Ligament of the Ulna is fixed firſt in the Os Cuneiforme, and then in the Os Unciforme, from whence it is a little ſtretched over the fourth Bone of the Metacarpus.

292. THE Ligaments which lie between the two former, round the Baſis of the Radius, and a ſmall Portion of the Head of the Ulna, are fixed round the common Convexity of the three firſt carpal Bones, as is alſo the mucilaginous Capſula by which theſe Ligaments are lined.

293. BESIDES all theſe ſmall ſhort Ligaments belonging to each Bone in both Rows, the rough Surfaces of all the Bones, eſpecially thoſe which form the Convexity of the Carpus, give Inſertion to a great many ligamentary Faſciculi, ſtretched over and cloſely united to the former ſmall Ligaments, and ſerving probably to ſtrengthen them. Some Faſciculi of the ſame kind are found on the concave ſide of the Carpus, but they are fewer in number, and not ſo ſtrong.

294. THERE is likewiſe a conſiderable Ligament, call'd the inner tranſverſe Ligament of the Carpus. It was formerly call'd an annular Ligament, and may ſtill very juſtly retain that name, in the ſenſe already explained when I ſpoke of Ligaments in general.

295. THE Bones of the Metacarpus, beſides the ſhort Ligaments by which they are tyed to the ſecond Row of the Bones of the Carpus, have ſeveral others, by which both their Baſes and Heads are connected together. The Baſes of the third and fourth Bones are not ſo cloſely tyed as the reſt, and

and therefore they have a very sensible Motion, which, however, is greater in the fourth than in the third.

296. THE Heads of these Bones are firmly tyed to each other by a strong transverse Ligament situated in the Palm of the Hand, and fixed by distinct Productions in the neighbouring part of the Heads, in such a manner as to form in the Spaces between the Heads, a kind of perforated Fræna through which the Tendons of the Flexor Muscles of the Fingers have a free passage; and these Fræna are also supported by aponeurotic Expansions, which shall be described in the Treatise of the Muscles.

297. THE first Phalanx of the Thumb is fixed to the Os Trapezium, by short Ligaments which pass obliquely over the Articulation. The first Phalanges of the other four Fingers, are joined to the Heads of the metacarpal Bones almost in the same manner, and by Ligaments like the former, which are strengthened by adhering to the transverse Ligament already mentioned. The second Phalanx of the Thumb is joined to the first by Ligaments of the same kind.

298. THE third Phalanx of the Thumb is joined to the second; the second Phalanges of the other Fingers to the first, and the third to the second, by lateral Ligaments almost in the same manner as the Bones of the Fore-Arm to the Os Humeri; that is, these Ligaments spread from a Point fixed in the lateral Tubercles of the Heads of the Phalanges, and are inserted by their other Extremity like Radii in the Bases of the neighbouring Phalanges.

299. THE two first Phalanges of each Finger have a very strong ligamentary Vagina inserted in the rough Lines or Ridges on their flat Sides. These Vaginæ are lined with a mucilaginous Membrane, which runs like a Tube from one Phalanx to the other, over the Articulation. They serve for Fræna to the Flexor Muscles of the Fingers, the Tendons of which pass through them.

§. 3. *The Fresh Bones of the Trunk.*

*Cartilages of
the Spine.*

300. THE Cartilages of all the Vertebrae in general are of two kinds, one proper to each Vertebra, the other common to the two Vertebrae that lie next each other. The first I term Cartilages of Articulation, the others, Cartilages of Symphysis.

301. THE proper articular Cartilages of each Vertebra of the whole Spine are those four which cover the Surfaces of the four small articular Apophyses. In the natural State they are very white and smooth, and much thicker than in dry Bones. Their Circumference is the same with that of the articulated Sides of the Apophyses, except in those places where there are small superficial Notches. In the first Vertebra of the Neck and Vertebrae of the Loins, these Cartilages are thicker than in the rest.

302. THE two inferiour articular Cartilages of the first Vertebra, and the two superiour Cartilages of the second, seem to be disproportionate,

tho' not so much as in dry Bones; and in some Subjects we find moveable or inter-articular Cartilages between the Apophyses of these two Vertebrae.

303. THE first Vertebra of the Neck has a small cartilaginous Incrustation in the middle of the concave Side of its antierior Arch, answering to another on the fore-side of the odontoid Apophysis of the second Vertebra; so that these two Vertebrae have five articular Cartilages each, besides the inter-articular ones already mentioned.

304. THE Vertebrae of the Back, besides the four Cartilages of their small Apophyses, have others which do not belong to their Articulations with one another, viz. those that cover the lateral Fossulae in the Bodies of these Vertebrae and the Fossulae of their transverse Apophyses, by both which they are articulated with the Ribs.

305. THE Cartilages of Symphysis lie between the Bodies of the Vertebrae, one of them being contained between, and closely join'd to the lower Surface of the Body of one Vertebra, and to the upper Surface of that next under the former; the Breadth and Circumference of them answering exactly to that of the Surfaces to which they are connected; but their height or thickness is different in each Class of the Vertebrae. In the Vertebrae of the Loins they are a quarter or third part of an Inch in thickness, according to the Stature of the Subject. In those of the Neck, they are not so thick, and the thinnest of all are those of the Vertebrae of the Back.

306. THESE Cartilages are not of an equal thickness in all their parts. Those of the Neck and Loins appear to be thickest on the fore-side, and those of the Back, rather thickest on the back-side; but these differences are most remarkable in the Vertebrae that lie near the middle of each Class.

307. THE internal Structure of these Cartilages is different from that of all the other Cartilages of the Body, and indeed they resemble the rest in nothing but in whiteness and elasticity. When we view their Circumferences only, they seem to be one uniform Mass as the others generally are, but when they are divided by an incision parallel to the Surface of the Vertebrae to which they are join'd, we see that they are made up of a great number of cartilaginous concentric Rings contained within each other, a small distance being left between them. They are closest and thinnest near the Center, and about the middle seem to degenerate into another softer kind of Substance.

308. THESE Rings do not form an intire Circumference, being turned inward on the back-side, answerably to the posterior slope in the Body of each Vertebra. They lie Horizontally, one Edge being fixed to the lower side of one Vertebra, and the other to the upper side of the Vertebra next below the former. The Interstices between the Rings are filled with a mucilaginous Substance, less fluid than that of the Joints; and their

breadth or height is proportionable to the distance of the Vertebrae between which they lie.

309. EACH cartilaginous Lamina taken separately, is very pliable according to its length, but taken all together, they are not so easily bent, partly because of their circular figure, and partly because of their Proximity and Multiplicity. They yield, however, in the Inflexions of the Spine; and their external Surface, which in the ordinary Situation of the Spine, is even with the Surface of the Vertebrae, becomes prominent, or jets out on that side toward which the Inflexion is made, the Cartilages being then compressed by the Vertebrae.

310. THEY likewise yield on all sides without any Inflexion of the Spine, to the weight of the Head and upper Extremities; but this is done by very small and imperceptible degrees, and most of all, when the upper parts of the Body are loaded with any exterior weight.

311. THEY restore themselves afterwards meerly by being freed from Compression; so that a Man is really taller after lying some time, than after he has walked or carried a Burden for a great while: the most natural and simple Reason that can be given for the different heights of the same Person at different times, first observed in *England*, and afterwards confirmed by *M. Morand*, a Member of the Royal Academy of Sciences; being the different State of the inter-vertebral Cartilages.

312. THE inter-vertebral Cartilages of the Neck, lying for the most part between the convex side of one Vertebra, and the concave side of another, are of a greater extent in proportion to the size of these Vertebrae, than those of the Back and Loins. Without this convexity and hollowness in these Vertebrae, which are the least of all, the Cartilages could not have been made large enough to be able to resist Strains and great Motions.

313. THE Os Sacrum has no Cartilage except that between the upper side of the first false Vertebra, and the last Vertebra of the Loins, and those by which it is connected with the *Ossa Innominata*, already described.

314. THE inter-vertebral Cartilages of this Bone in an adult Subject, are too much obliterated to need a Description.

315. THE Cartilages which join the different Portions of the Os Coccygis are preserved in some Subjects, to a very great Age; in others they soon become intirely bony.

*Ligaments of
the Spine.*

316. THE Vertebrae are strongly connected to each other by three kinds of Ligaments. Each Vertebra is connected to that above and below it, by a great number of very short and strong Ligaments which cross each other obliquely, and are fixed round the Edges of the Body of each Vertebra.

317. THESE crucial Ligaments cover the Circumference of the inter-vertebral Cartilages, and adhere closely to them. They seem to be looser in the cervical and lumbar Vertebrae than in those of the Back, and by that

that means yield to the Cartilages in the different Inflexions of the Spine already mention'd.

318. THE Bodies of all the Vertebrae from the second of the Neck to the Os Sacrum, are covered by ligamentary Half-Vaginæ on the convex side, in which these Vaginæ are fixed, surrounding all the crucial Ligaments, and made up of ligamentary Fasciculi and Filaments, partly oblique, but mostly longitudinal.

319. ALL the Vertebrae are likewise strongly connected by a ligamentary Tube, which lines the inner Surface of the medullary Canal from the occipital Hole, to the Os Sacrum, representing a kind of long flexible Funnel, its Cavity at the upper part being equal to that of the occipital Foramen; and ending in a small Point at the Os Sacrum.

320. THIS Ligament is made up of several Strata of longitudinal and oblique Fibres interwoven together, adhering closely to the inside of the great Foramen in each Vertebra, by a great number of Filaments detached from it to the porous Substance of the Vertebrae.

321. THE first Vertebra is not only fixed to the Os Occipitis by a Portion of this ligamentary Funnel, but also by a distinct and very strong ligamentary Covering, which surrounds and adheres very closely to that Portion of the Funnel. This Covering is fixed above, round the great occipital Foramen, where it begins to adhere to the Funnel, and below, quite round the Circumference of the first Vertebra.

322. THE second Vertebra has two Ligaments peculiar to it, one which connects the Apophysis Dentiformis to the Os Occipitis; and another transverse, which confines this Apophysis within the anterior Portion of the Cavity of the first Vertebra. The first may be termed the Occipital, and the second the transverse Ligament of the odontoide Apophysis.

323. THE occipital Ligament is very strong and thick, and adheres in a very singular manner to the three Planes of the Apex of the Apophysis, and is afterwards divided into two or three Portions which are fixed in the like manner, in the anterior Edge of the great occipital Foramen, and in the Inequalities of the Apophysis Basilaris near that Hole.

324. THE transverse Ligament may be said more justly to belong to the first Vertebra, both ends of it being inserted in the lateral Impressions of the inner Surface of that Vertebra mentioned in the Description of the Skeleton. But it is ranked among the Ligaments of the second Vertebra, because of its use, and because of the Insertion of its middle Portion.

325. THIS thick Ligament is stretched from one side of the inner Surface of the first Vertebra, to the second. About the middle of the fore-side, its texture is very close, and it is fixed by this Portion in the back part of the Apophysis Dentiformis; and sometimes it seems to have additional Fasciculi which adhere by one end to both Extremities, and by the other, to each side of the Apophysis.

326. **ALONG** the whole bony Canal of the Spine, between the Bases of each spinal Apophysis, lies a flat and very elastic Ligament of a yellowish colour, which fills up the posterious great Notches of the Vertebrae, adhering to their Edges; and likewise to the neighbouring Portions of the Funnel or great ligamentary Tube.

327. **BETWEEN** the Extremities or Apices of the spinal Apophyses, we find small ligamentary Ropes which go from one Spine to that next it; and which are really double, tho' they seem to be single in the Vertebrae of the Back and Loins. In the Vertebrae of the Neck, they are fixed separately to the forked Extremities of the Spines.

328. **BETWEEN** all the spinal Apophyses, from their Apices to the middle of the Bases, lies a ligamentary Membrane going between each two Apophyses, and thereby distinguishing the right Side of the Vertebrae from the left. There is a Ligament of the same kind between the transverse Apophyses.

329. **THESE** are inter-muscular Ligaments or ligamentary Septa, which divide the Muscles of one side from those of the other, as was already observed in speaking of the Ligaments in general, and will appear more particularly in the Description of the Muscles. The first kind may be termed Inter-Spinales, the other Inter-Transversales.

330. **THE** articular Ligaments of the Spina Dorsi, are those which tie the glenoid Cavities of the first Vertebra to the Condyles of the Os Occipitis; those that join the cartilaginous Surface of the Apophysis Dentiformis, to the anterior Cavity of the first Vertebra; and those by which all the oblique or articular Apophyses are connected together.

331. **THESE** are all small, short, strong ligamentary Fasciculi, fix'd by both Extremities, round the cartilaginous Surfaces of the Apophyses, surrounding very closely all the capsular Ligaments of these Articulations.

332. **THE** vertebral Ligaments of the Ribs, or those which connect the Ribs to the Bodies and transverse Apophyses of the Vertebrae of the Back, are of the same kind, being inserted round the cartilaginous Fossulae, in the Body and Apophyses of each Vertebra.

333. **BESIDES** all these Ligaments of the Spina Dorsi, there is one which goes in form of a Membrane, from the Os Occipitis, all the way to the last two Vertebrae of the Neck. It is broad at the upper part, and from thence diminishes gradually. By its upper broad Extremity, it is fixed along the occipital Spine, and by one Edge, in the posterious Tubercle of the first Vertebra, between the two spinal Furcae of the following Vertebrae, and in the Apices of the spinal Apophyses of the lowest Vertebrae; but the other Edge is loose. This is a true inter-muscular Ligament, and I give it the name of Ligamentum Cervicale Posterius.

334. **THERE** are two lateral Ligaments of the same kind fixed, to the transverse Apophyses of the Vertebrae of the Neck, which shall be described together with the Muscles.

335. THE Ligaments belonging to the Os Sacrum were described near the beginning of this Account of the fresh Bones.

336. THE Sternum of an adult Subject has commonly sixteen Cartilages, *Cartilages of* fourteen of which are Articular, the other two Symphyfes. Of the articular *the Sternum* Cartilages, two belong to the Articulations of the Clavicula, and twelve to *and Ribs.* those of the true Ribs, from the second to the seventh inclusively. The two Symphyfes are those between the Sternum and the first Rib on each side.

337. THERE is likewise another Symphysis by which the upper Portion of the Sternum is connected to the lower, the Cartilage of which is often obliterated in an advanced Age.

338. THE Apophysis Eniformis is often bony toward the Sternum, and more or less Cartilaginous at the other End. In very aged Persons it has been found intirely ossified; and sometimes wholly Cartilaginous, even in Adults.

339. ALL the Ribs have cartilaginous Portions, which differ from each other in length, breadth, incurvation, adhesions, and in their extremities, all which were explained in the Description of the Sceleton. We have only to observe here, that these Cartilages are whiter, more polished, broader and thicker in the natural State than when they are dried.

340. THE Cartilages of the false Ribs are naturally more slender and pliable than those of the true Ribs, the middle or inner substance of which acquires the consistence of Bones in old Age, and their Extremities sometimes ossify, and are immoveably fixed to the Sternum.

341. THE Sternum has several Ligaments by which it is connected with *Ligaments of* the Clavicles and Ribs. It is joined to the Clavicles by strong short Liga- *the Sternum* ments, fixed by one Extremity round the Edges of its two superior Notches, *and Ribs.* by the other, in the Extremity of each Clavicle, and by the middle, to the inter-articular Cartilages already explained, surrounding the particular Ligaments which go between the Edges of these Cartilages and the Sternum; and the capsular Ligaments between them and the Clavicles.

342. ALL the Ribs are connected to the Bodies of the Vertebræ, by strong short ligamentary Fasciculi, fixed by one end round the Fossulæ in the Vertebræ, and by the other, round the Head of each Rib. The Ribs are likewise tied to each other, by thin Ligaments which go obliquely from the Cartilage of each Rib to that of the next.

343. THE ten uppermost Ribs on each side are connected to the transverse Apophyses of the Vertebræ of the Back, by strong short articular Ligaments fixed to the Tuberosities of the Ribs, and round the Fossulæ of the Apophyses, much in the same manner with those which go between the Heads of the Ribs and Bodies of the Vertebræ. Both these Articulations are provided with capsular Ligaments.

344. The eleventh Rib on each side, having no Articulation with the transverse Apophyses, is connected to them by auxiliary strong short Ligaments fixed in its Neck.

345. The last Rib is only joined by its Head to the Body of the twelfth Vertebrae of the Back; but it is connected in a particular manner to the transverse Apophysis of the first Vertebra of the Loins, by a broad Ligament fixed in the whole upper Edge of the Apophyses, and in the lower Edge of the Rib through about two thirds of its length.

346. THE first true Rib has no ligamentary Connexion with the Sternum, the cartilaginous Symphysis being sufficient. The rest are closely joined to that Bone by small ligamentary Portions fixed by one end round the Extremity of the Cartilage, and by the other, round the Notches in the Sternum. On the upper and lower Sides of each Articulation, these Ligaments are very short, but on the fore-side they are expanded over the Sternum in a radiated manner.

347. THE Cartilage of the first false Rib is joined to that of the last true Rib, by several short Filaments, which go from the lower Edge of the one, to the upper Edge of the other, near its small Extremity. The other false Ribs are connected together much in the same manner, with this difference only, that the Filaments by which the fourth Rib is connected to the third, are longer than those above them; and those between the fifth Rib and the fourth, much longer than any of the rest: and for this reason these two Ribs are less steady than the others.

The Periosteum, Marrow and mucilaginous Glands of the Vertebrae, Sternum and Ribs.

348. THE ligamentary Expansions of the Vertebrae are in place of a Periosteum, both outwardly and inwardly. The Sternum and bony Portions of the Ribs have a Periosteum like the other Bones. The cartilaginous Portions of the Ribs are covered by a Membrane of the same kind, termed Perichondrium. As the internal Structure of these Bones is cellulous or spongy, they contain only small separate Portions of Marrow, or a red medullary Juice, like that in the Vertebrae.

349. THE mucilaginous Glands of all these Articulations are very small, but are accompanied by many fatty Moleculæ lying round each Joint. The inner Surface of the ligamentary Tube which lines the bony Canal of the Spine, is lubricated by an oily or adipose Substance, which shall be spoken to in the Description of the Brain.

§. 4. *The fresh Bones of the Head.*

Cartilages.

350. THE condyloide Apophyses of the Os Occipitis, the glenoide Cavities or articular Fossulae of the Ossa Temporum, the Eminences next these Cavities, and the condyloide Apophyses of the lower Jaw, are all crufted over with very white and smooth Cartilages; and there is likewise an inter-articular or moveable Cartilage in each Articulation of the lower Jaw, with the temporal Bones.

351. THIS Cartilage is thick near the Circumference, very thin and transparent, and sometimes perforated in the middle. The lower Side is uniformly concave, answering to the oblong Convexity of the maxillary Condyle;

Condyle; but the upper Side is partly concave and partly convex, suited to the Fossula and Eminence in the temporal Bone. The Mechanism of this Cartilage shall be explained in the Description of the Muscles.

352. THE remaining Cartilages of the Bones of the Head, viz. the cartilaginous Septum and other Cartilages of the Nose; the small cartilaginous Ring in each Orbit; the Cartilages of the outward Ear; and those which are joined to the Os Hyoides, must be referred to the Description of the Viscera.

353. THE Ligaments of the Bones of the Head are these. (1.) Those between the occipital Condyles and the superiour Apophyses of the first Vertebra of the Neck. (2.) Those between the Os Occipitis and Apophysis Dentiformis of the second Vertebra. (3.) Those of the Articulation of the lower Jaw with the temporal Bones. (4.) Those by which the Os Hyoides is connected to the styloide Apophyses. I here pass over the Ligaments which connect the Cartilages of the Ear, those of the Nose, the small cartilaginous Pulleys of the Orbits, and the ciliary Cartilages. *Ligaments.*

254. THE Ligaments of the occipital Condyles resemble the articular Ligaments of the Vertebrae, consisting of a strong Texture of ligamentary Filaments placed close by each other round the whole Articulation, and fixed by one end in the occipital Bone, by the other in the Edges of the superiour Apophyses of the first Vertebrae; and surrounding the capsular Ligaments.

355. THE Ligaments which go from the Os Occipitis to the Apophysis Dentiformis, are very thick, and disposed in separate Fasciculi which afterwards unite. The Fasciculi are fixed immediately before the great occipital Foramen in the lower side of the Apophysis Basilaris, and the united Ligament is inserted in the odontoide Apophysis in the manner already said.

356. THE Ligaments of the Articulation of the lower Jaw are very strong, and are disposed and inserted much in the same manner with those by which the Clavicle is connected to the Sternum. They are fixed by one Extremity round the glenoide Cavity or articular Fossula and Eminence of each temporal Bone, by their Middle, round the inter-articular Cartilage, and by the other Extremity, round each Condyle of the lower Jaw. The Disposition of the capsular Ligament with respect to the inter-articular Cartilage is the same as in the Articulation of the Clavicle with the Sternum.

357. THE Bones of the Head, as well as all the other Bones of the Human Body, are covered by a particular Membrane, of which that part which belongs to the Scull, is termed Pericranium, and that which covers the Bones of the Face, or of the two Jaws, is call'd simply Periosteum. This Membrane shall be more particularly described among the other soft parts of the Head. *Periosteum, Marrow and mucilaginous Glands.*

358. THE internal Structure of the Bones of the Head being for the most part cellulous, they contain also distinct Portions of Marrow included in membranous Cells lying in the Diploë.

359. THE Sinus Frontales, Maxillares, and Sphenoidales, are lined with a glandulous Membrane which secretes a Mucilage very different from that of the Joints, as we shall see in another place.

360. THE true mucilaginous Glands of the occipital and maxillary Articulations, have nothing peculiar to them. They are proportioned to the Joints to which they belong, and lie between the capsular Ligaments and Circumference of the Cartilages.



SECT.

S E C T III.

A Description of the Muscles.

A R T. I.

The general Doctrine of the Muscles.

1. **A**LL the Motions of the human Body, whether general or particular, whether natural or preternatural, are immediately performed by Organs which Anatomists name Muscles; and these are found in all the moveable parts of the Body. I do not here speak of motions caused merely by the elasticity of certain parts, by external impulses, or by the force of Gravity. *Situation in general.*

2. THE Muscles in general are bundles of Fibres of different figures and sizes, and for the most part consisting of two different portions; one whereof is thick, soft, more or less red, and sometimes pale, forming what is called the body, fleshy substance or belly of the Muscle. The other is thin and small, of a close contexture and very white, forming the Extremities and other parts termed by Anatomists Tendons or Aponeuroses. The fleshy Portion is the principal and essential part of the Muscle, being never wanting; but the Tendinous or Aponeurotic Portion is in some Muscles so very small as to be invisible. Both Portions are covered by a particular Membrane. *External Conformation.*

3. THE Ancients who compared a Muscle to a Rat or other Animal head, divided it into the Head, Belly and Tail; but the Moderns finding this comparison very lame and faulty, have left off the use of all the terms arising therefrom except that of Belly; and instead of the other two, they use those of Beginning or Origin, and Insertion. Some of the latest Authors think it most proper to call one end of the Muscle, the fixed Point or Fulcrum, the other the moveable Point. *Division.*

4. ALL these terms, whether old or new, tend to mislead us, and that of Fulcrum is without foundation. The best and most simple division of a Muscle is into the Body or fleshy Portion, which in some Muscles may be termed the Belly, and the Extremities, whether Tendinous, Aponeurotic, or fleshy.

5. THE Fibres, of which a Muscle is made up, go by the general name of Moving Fibres, and each of them, as well as the whole Muscle, is partly Tendinous and partly fleshy. They are for the most part ranked in fasciculi, in a lateral situation with respect to each other, and distinguished *Internal Structure.*

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by Membranous, Cellular or Adipose Septa, as by so many particular Vaginæ.

6. THESE Fibres are connected to each other, and to the intermediate Septa by a great number of very small fine Filaments, the Capillary Extremities of Arteries, Veins and Nerves running over them, and they are inclosed in a thin, membranous, cellular covering, called the proper Membrane of the Muscle, being a continuation of the Septa or Vaginæ already mentioned.

7. ALL these Septa or Vaginæ communicate with each other, by a mutual and reciprocal continuation of their cellulous Texture, and they are bound down transversely by filamentous or fibrous Pellicles, which cross them at small distances from one another, and lie nearly in the same direction through the whole body of the Muscle. The same sort of Fræna are observable between the moving Fibres, which connect them together, and appear to be in some measure nervous.

8. THE particular Structure of each moving Fibre is not as yet sufficiently known. They may all be divided into several smaller Fibrillæ; and the substance of their fleshy Portion is believed by some to be cellulous, by some to be vesicular, and by others to be spongy or medullary. Some of the Ancients imagined this Portion to be hollow, and that it contained a sort of Pulp called by them *Tomentum*, more or less saturated with Blood.

9. WHEN we examine a Moving Fibre through the best Microscopes, both the fleshy and Tendinous parts of it appear contorted, but the latter not so much as the former. Having injected any coloured penetrating liquor, we may by the help of an ordinary Microscope discover a very fine and close Vascular Net-work which insinuates itself between all the Fibres, covering or being twisted round them, and likewise spread on the Septa.

10. The fleshy Portion may be contracted or shortened, and relaxed or elongated. The Tendinous Portion yields but very little, resisting any force tending to prolong it, except it be so violent as to disorder its texture.

11. The disposition of the Moving Fibres is different in different Muscles, and their Tendinous and fleshy Portions do not always lie in the same straight Line, but make opposite Angles with each other. In some Muscles the fleshy Portion is not all of the same length, in others it is nearly equal, but the Fibres unequally and gradually disposed at the sides of each other, forming all together an oblique Plane.

12. SOME are disposed like Radii, others form Planes more or less incurvated; and some form compleat Circumferences, the two Extremities meeting and uniting together.

13. The tendinous Portions being only the supplement of the whole length of the Muscle, may be of equal or unequal lengths, according to the disposition of their insertions. They may be very short at one end of the Muscle and very long at the other. When the fleshy Plane is partly oblique, they vary gradually in length, and when that obliquity is reciprocal

procal at both ends, in form of a Losenge, the Tendinous Portions are alternately long and short.

14. IN some Muscles each moving Fibre is nearly of the same length with the body or belly of the Muscle; in others the fleshy Fibres are very short, though the body of the Muscle formed by them be very long. In the first kind, the Fibres run more or less streight from one end to the other, and are never very numerous. In the second they are situated obliquely, and are consequently in great numbers; so that the length of each Fibre is not always to be measured by that of the body of the Muscle to which it belongs.

15. THESE different Portions of Fibres are not equally to be met with in all Muscles. Some have two or more Tendons, some only one, but of different lengths; others have none at all, or at least none that can be perceived, as has been already said.

16. BUT there is no Muscle without a fleshy Portion which alone being capable of contraction, is absolutely necessary; whereas the Tendons in many places are only productions, by which the Muscles are fixed to parts at a distance from them.

17. MANY Muscles are observed to be covered by an Aponeurotic Expansion of different degrees of strength and size which seems to arise from one or more of the neighbouring Tendons. In proportion as it is extended it grows thinner, and then loses itself in the Cellular Membrane, called formerly the common Membrane of the Muscles.

18. THERE are likewise strong ligamentary Membranes of another kind, by which many Muscles are covered as by a Girth, and which may be termed broad or ligamentary Bands or Coverings. They are made up of several Planes of strong white shining Fibres, crossing each other, and they are strongly fixed along one or more Bones, almost in the same manner as the interosseous Ligaments of the Fore-Arm and Leg. They furnish Septa or common Vaginæ to the Muscles which they cover, and likewise particular Vaginæ to the Tendons, thinner than those of the fleshy Portions.

19. THESE common Bands and Vaginæ serve to gird and confine the Muscles, and to keep them in their places in great efforts. They likewise in some measure supply the place of Tendons, and multiply the Insertions. The loose portions of these Membranes are lined on the inside with other very fine Membranes, which are continually moistened by a mucilaginous liquor to preserve the Muscles and Tendons contiguous to them, from friction.

20. BESIDES these Bands and Septa there are other ligamentary Fræna peculiar to the long Tendons, called by the name of Annular Ligaments, the general history of which is to be found in the description of the fresh Bones.

21. THE difference of Muscles is very considerable, and depends on many *Difference* circumstances, the chief of which are the Size, Figure, Direction, Situation, *and Names.* Structure, Connexion and Use; and it is from these differences that the names

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of the greatest part of the Muscles are taken. From their Size they are termed Great, Middle, Small, Long, Broad, Thin: From their Figure, Triangular, Scalenous, Square, Rhomboidal, Indented, Orbicular, Deltoide: From their Direction, Streight, Oblique, Transverse: From their Situation, Superior, Inferior, External, Internal, Anterior, Posterior, Right and Left: These four differences and the names derived from them are easily comprehended; but what relates to the other three, acquires a little farther explication.

22. WITH respect to their Structure, Muscles are either simple or compound. Simple Muscles are those whose fleshy Fibres, or rather the fleshy Portions of their moving Fibres are all uniformly disposed, and terminate in Tendons lying either in a streight or oblique Line in the manner already explained.

23. COMPOUND Muscles are those whose fleshy Fibres are disposed obliquely in several particular ranks, representing the same number of simple Muscles with their Fibres lying in opposite directions. In proportion to the number of these ranks or series, the Muscle is said to be more or less compounded.

24. WHEN the compound Muscle is made up of two simple Muscles only, these are so disposed as to represent a Feather, and the compound Muscle is from thence termed Penniform. In some of these Muscles, one of the Tendons appears to be slit or divided, in order to contain the fleshy Portion between its two parts, while the other runs through the body of the Muscle diminishing gradually in size as it advances in the same manner as we see in a Feather. In others there is only one middle Tendon between the series of fleshy Fibres, which are by their other Extremity fixed to other parts. In more compound Muscles, the Tendons at one Extremity may all unite together, while those at the other remain divided.

25. BUT there are still other kinds of compound Muscles. Some are made up of two placed endwise and joined together by a common Tendon, so that this Tendon, the two Muscles and the two Tendons at their Extremities, lie all in a Line, and form the whole length or extent of the compound Muscle, which is termed Digastricus, or Biventris; and if three Muscles be thus joined, the compound is called Trigastricus.

26. SOME are made up of two Muscles more or less in a lateral situation with respect to each other, and united at one Extremity; others are made up of three or four Muscles situated in the same manner; and if they are united at that Extremity, which the Ancients called the Head of the Muscle, they are called Bicipites, Tricipites, &c. according to the number of these Heads; but if they are joined at the other Extremity, they are termed Bicornes, Tricornes, &c.

Connexion.

27. THE Muscles are fixed by their Extremities to different parts, and in different places of the human Body. The greatest part of them are inserted in Bones alone. Some are fixed partly to Bones and partly to Cartilages, as those of the Ear and Nose; some partly to Bones and partly to the Integuments, as several Muscles of the Face, which may therefore be termed Semicutaneous, in imitation of those in Brutes, which being inserted

in the Integuments alone, are from thence termed Cutaneous. In some the Fibres make an entire circle, without terminating any where by their Extremities; of this kind are several of those called Sphincters, to which may be added the Heart, Stomach and Intestines. All the Muscles have likewise a sort of connexion with the neighbouring parts, but this is only lateral by means of Membranes.

28. THE Names taken from the Connexions and Insertions of Muscles. *Names.* are generally of two kinds; one common and referred to some considerable part of the Body, as when we say the Muscles of the Head, of the Thorax, Abdomen, Arm, Leg, Eye, Lips, &c. the other proper, specifying more particularly the Insertions of each Muscle, as the Mastoideus, Sterno-Mastoideus, Coraco-Brachialis, Anconeus, Peroneus, &c. Some Names have no relation to the Insertions, as those of Ulnaris and Radialis, which are given to Muscles which lie upon the Ulna and Radius, without being inserted in either Bone.

29. THE Names of the first kind relate more to the uses of Muscles than to their Insertions, and are for the most part ill founded and apt to mislead us; as will appear when we come to the uses of the Muscles. The Names of the second kind are instructive, and those of the third are tolerable.

30. THE general Use of the Muscles is to move all the parts of the Body, whether hard, soft or fluid. Most of the hard and soft parts are moved by these Powers being fixed to them, and they move the rest without any such Insertion. *Uses.*

31. THE Muscles fixed by both Extremities to hard parts reciprocally moveable, may accordingly move either part. Thus the Muscles inserted by one Extremity to the Os Humeri, and by the other to the Ulna, may move the Ulna upon the Os Humeri, and the Os Humeri upon the Ulna.

32. MUSCLES fixed by one Extremity to hard parts, and by the other to soft parts, cannot perform these reciprocal motions, because in this case the hard parts must remain immoveable, the soft parts only being moved, as in the Muscles of the Ball of the Eye, those of the Lips, &c.

33. THE Fluids, of whatever nature or consistence they be, are moved in some cases by being immediately pushed or projected by the Muscles, as we see in the Heart, in others by their Canals being pressed upon, as in the oblique and transverse Muscles of the Abdomen; and there are other Muscles which stop or retard the motion of the Fluids at one time, and facilitate or accelerate it at another, as all the Sphincters.

34. THE Use of each Muscle in particular is confined to the motion of one or more moveable parts; some parts require a certain number of Muscles to move them, whereof some act one way and some another. Several Muscles, for instance, move the Os Humeri upon the Scapula, and of these some raise, others depress it; some turn it forward, some backward, and others round upon its axis, &c. In like manner the Fore-Arm is moved upon.

upon the Os Humeri by certain Muscles, whereof some extend and others bend it.

*Enumeration
and Distri-
bution.*

35. THE general Enumeration of the Muscles of the human Body which is commonly made, is founded on their supposed particular uses. We meet with lists of the Muscles of the Head, of the Thorax, Abdomen, Extremities, Eye, Nose, Lips, &c. and to the different Muscles said to belong to each part, names are given, specifying some determinate use; such as Raisers, Depressors, Adductors, Abductors, Flexors, Extensors, &c.

36. THIS method of distributing and naming Muscles is very well suited to the memory, and may be retained for those that are not entirely, or are not at all fixed to Bones; but with respect to those Muscles which are inserted in Bones alone, this way of talking is very capable of misleading Beginners, of begetting false Ideas, of obstructing the progress of Knowledge, and even of making able Philosophers, Physicians and Surgeons fall into considerable mistakes.

37. IT leads us naturally into several Errors, as for instance; that the parts to which a certain number of Muscles is attributed, cannot be moved by other Muscles; that the Muscles said to belong to one part can move no other part; that the Muscles whose uses are limited and determined by certain names, can have no other uses; and that the Muscles so named may have the uses assigned to them in all the different situations of the parts to which they are fixed. It is however absolutely necessary for the sake of memory, to divide the Muscles into Classes, and afterwards to subdivide each of these Classes.

38. TO shun the inconveniencies already mentioned in the Muscles fixed only to Bones, I discard the names taken from the parts to which these Muscles are commonly attributed, and from the uses assigned to them: I retain as much as is possible the usual names which express only the Insertions or other circumstances, that I may avoid all affectation of novelty; and when I find my self obliged to change a name, I set down the common name, after that which has appeared to me to be more natural and agreeable.

39. THUS, for instance, instead of this title: The Muscles of the Arm, I put the following: The Muscles that move the Os Humeri upon the Scapula, and the Scapula upon the Os Humeri; and having described those which are commonly mentioned, I add the rest which may likewise move the part; and point out the uses which the Muscles described may have, in moving other parts.

40. ON this plan it will be necessary to describe separately all the Muscles which are wholly inserted in Bones, and not to explain their uses till they have all been described, they being so nearly related to one another, that it is very difficult to speak of the uses of any one, without mentioning several others.

41. WHEN several concur nearly in the same motions, they are termed Congeneres; those which act in opposite directions, are relatively and alternately

ternately called Antagonists. Thus all the Muscles which extend or bend the Fore-Arm are Congeneres; and those which extend it are Antagonists to the Flexors; and these again reciprocally Antagonists to the Extensors.

42. THERE must at least be two Muscles to intitle them to the name of Congeneres, but that of Antagonist may be given to one Muscle as well as to several. Many Muscles contribute to the same motion without being Congeneres, viz. where by acting in an oblique direction, they produce a third motion which is direct and determinate. This is termed a combined Motion, and may be successively continued in different directions, as that of the Arm in turning a sling or the handle of any heavy Machine. Lastly, When all the Antagonists on every side, or all the Muscles that move a part, act equally and keep the part fixed in a middle direction between all the motions of which it is capable, they are said to be in a Tonic Motion.

43. To move any part, or to keep it in a determinate situation, all the Muscles belonging to it must co-operate, some of them drawing the part directly to the situation or attitude designed, some moderating this first motion by acting in a contrary direction, and others directing it laterally. The first kind of these Muscles I call principal Movers, the second Moderators, and the third Directors.

44. ALL these kinds are to be found in the Articulations by Enarthrosis, and in many of those by Arthrodia. The Director Muscles are wanting in those by Gynglymus, being there unnecessary. The Moderators in general are the same with those termed Antagonists, and the want of their action is in many cases supplied by the weight of the part to which they are fixed, or by the additional weight or resistance of some other Body.

45. THE Action of the Muscles in general, or, to speak more properly, the Mechanism of this Action consists chiefly in the contraction or shortening of their fleshy Portion; by which the Extremities of the Muscle are brought nearer to each other, and consequently the parts are moved to which these Extremities are fixed. It is, I say, the fleshy Portion alone which is shortened; the Tendons retain always the same length, and only follow the motions of the other part, much in the same manner as in drawing a great weight by ropes fixed to it, where the Arm alone is shortened, while the ropes only follow that motion.

46. THE principal Phænomena of Muscular Action are these: The fleshy Portion appears harder and more swelled in the time of action than of inaction, as may be readily perceived by touching it in both states: The hardness of this swelling increases in proportion as the motion is continued, as is likewise evident by the touch; and it likewise increases by meerly adding to the weight or resistance of the part moved, though its situation does not continue to be changed.

47. IN many Muscles, this action may be determined to any degree of velocity and space; that is, may be proportioned to the velocity and space of the motion; may be increased and diminished, accelerated, retarded

arded or stop'd; and may be made to cease in an instant, and be produced again in another instant.

48. DURING the contraction of a Muscle, its Fibres are bent through their whole length, or formed into very small fine folds in alternately opposite directions, as may be plainly seen in Animals fresh killed, when the Butchers cut their flesh while it remains warm, though the blood has been let out, and the entrails removed. By opening living Animals, and also in great wounds, the fleshy Fibres have been discovered to grow pale during their action, and to turn red again when at rest.

49. To these Phænomena we must likewise add, that where several Muscles are fixed to any moveable part, they are all in a state of contraction, in every motion of that part; but they are not all in the same degree of action, because the principal Movers act more than the Moderators and Directors, or collateral Muscles, if any belong to the part. This co-operation of Muscles is easily perceived by touching them when the part they belong to is moved with a considerable force. It must however be remembered, that I except the Moderators or Antagonists when any weight or assistance supplies their action.

50. LASTLY, there are some motions to which the Muscles, commonly believed to produce them, contribute nothing at all, but which depend solely on the relaxation of the Antagonists to these Muscles, or those that lie on the opposite side. This is seen evidently in supporting the Body by one Hand resting on a low Table, the Joint of the Elbow being in that state suffered to yield to the weight of the Body, or to bend sometimes slowly and sometimes fast; for if at the same time we feel with the other Hand the Flexor and Extensor Muscles of the Fore-Arm, the first will be found perfectly relaxed, the latter very much contracted. Thus it is evident that some Muscles may be relaxed to determinate degrees of velocity and space, with the same certainty as they can be contracted.

51. THIS last Phænomenon gave me room to conclude, that the action of the Muscles in general consists as really in the relaxation of the moving Fibres when contracted, as in the contraction of them when relaxed, whether this action be performed successively or instantaneously; and it was for this reason that when I began to speak of the action of the Muscles, I did not say absolutely that it consisted in the contraction of the fleshy Portion, but only that it was principally owing thereto. I do not here speak of those motions that are out of our power, and which we can determine only in part as those of Respiration, or not at all, as that of the Heart.

52. THE particular Mechanism or immediate Cause of muscular action has very much tortured the Brains of many Philosophers. The extreme delicacy of the Texture of a moving Fibre, and a great number of Phænomena, some of them very obvious, which have not been attended to, have hitherto prevented the discovery of this Mystery. Several Hypotheses have been formed concerning the Structure of this Fibre, which, as already said, has been supposed spongy, vascular, vesicular, contorted, elastick, &c. and

and concerning the concurrence of different Fluids with the supposed Structure of the Fibre; and Systems have even been founded wholly on the Spring or Elasticity of the solid Parts of which a Muscle is composed.

53. BUT by considering attentively the Phænomena already mentioned, especially the first three concerning the velocity, space and duration of Muscular action, all these Systems may be destroyed. For hitherto no instance can be found either in natural effects or in those of art, of any Explosion, Fermentation, Ebullition, Injection, Inflation, Imbibition, Vibration, Elasticity, &c. by which we can regulate and determine to a given degree, the Space, Velocity and Duration of any artificial Motion, or by which we can begin and put an end to such Motions in an instant of time at our pleasure. It is therefore altogether to no purpose to amuse ourselves with what has been said on this subject: Another method must be followed, which consists in collecting and examining all the Phænomena that can fall under our observation.

54. TILL some such lucky discovery is made, what can hitherto with the greatest certainty be gathered from the Structure, Conformation and Action of the Muscles is that their strength depends on the number of their fleshy Fibres, and the extent of their Action on the length of these Fibres.

55. FOR wherever strength is more necessary than large degrees of motion, there we find the Fibres of Muscles proportionably increased in number, and that their situation in a narrow compass is artfully provided for by the oblique disposition of them already mentioned. In like manner, wherever there is more occasion for a large degree of Motion than for strength, the fleshy Fibres are of a proportionable length. In a word, the strength of a Muscle is as the number of its fleshy Fibres, and the extent of its motion as the length of these Fibres.

56. To understand the uses and contrivance of each Muscle in particular, we must consider attentively its place or situation in general, its external Conformation, Insertions, particular Situation, Direction, Lateral Connexion, Relation and Composition of its parts. We ought likewise to examine how the neighbouring Muscles are disposed for producing simple Motions, and how those that are at a greater distance can produce combined or compound Motions.

57. IT ought moreover to be observed that in some subjects the Muscles vary, some being wanting, and others added in different manners, so that we ought to regulate our selves by what happens most frequently and universally, that we may not render the common cases obscure for the sake of a few that are extraordinary, and which ought to be considered in the same light as we do the instances of six Fingers, eleven Ribs, and other varieties of the like kind.

58. MUSCLES fixed only to Bones, act as so many Powers applied to Levers. By a Lever we understand a long inflexible Body, like a Rod or Bar, by the help of which we raise Weights and overcome resistances,

which it would be more difficult or impossible to do with the Hands alone.

59. A Lever, in order to act, is applied to three different things at three different places of its length, viz. at one place to the Weight or resisting Body, at a second to the Power by which it acts, and at a third to a Fulcrum, which with respect to the other two, ought to be immovable; so that the whole length of the Lever is as it were divided by three Points, which may be termed the Fixed Point, Point of Resistance and Point of Power.

60. THESE three Points may be disposed in three different manners.

1. The fixed Point may lie between the Power and the Weight; as when the Stone-cutters and Pavers raise or move stones with iron Croes.
2. The Weight may lie between the Power and the Fulcrum, as when Masons move large stones by applying Croes to them somewhere near their middle.
3. The Power may lie between the Weight and Fulcrum, as when Braziers scrape Copper in order to tin it, by laying one end of the Scraper on their Shoulder, the other on the Metal, and holding the middle in their Hands.

61. FROM these three Dispositions three different kinds of Levers have been established. In the first the Fulcrum or fixed Point is in the middle; in the second the Weight, and in the third the Power.

62. IN the action of Levers the following Maxims are to be observed as so many general Rules.

63. THE greater the distance of the line of Direction of the Power from the Fulcrum, less force is necessary to overcome the Resistance.

64. THE nearer that this line of Direction is to the Fulcrum, more force is necessary to overcome the Resistance or to raise the Weight.

65. WHEN the line of Direction of the Power passes through the fixed Point, and consequently falls in with the Direction of the Lever, the Power can produce no effect.

A R T. II.

The Muscles of the Abdomen.

Number and Situation in general. 66. **B**Y the Muscles of the Abdomen or Lower Belly we mean those which form principally the Sides or Circumference of that Cavity. They are commonly ten in number, five on each side; eight whereof are very large, the other two very small.

Division, Figure. 67. OF these Muscles two are long, called Musculi Recti, two small, called Pyramidales; six broad, two of which are named Obliqui Externi, two Obliqui Interni, and two Transversales. The Pyramidales are wanting in some subjects, sometimes there is but one, and sometimes three.

The

The name of these two Muscles has been taken from their Figure, those of the other eight, from the principal direction of their Fibres.

68. THESE ten Muscles lie in pairs; and those of each side appear to be separated by a kind of Tendinous Line or Band running along the Anterior part of the Abdomen, from the Cartilago Ensiiformis to the Symphysis of the Ossa Pubis, and including the Umbilicus; above which it is pretty broad, but narrower below, especially near the Ossa Pubis.

69. THIS Tendinous Band is named Linea Alba, and, as we shall see afterwards, is wholly formed by the intertexture of the Tendons of the six broad Muscles. *Linea Alba.*

70. I shall here describe only the five Muscles of one side, the other five being exactly like these; and the same method will be observed through the whole of this Treatise.

§ 1. *Obliquus Externus.*

71. THE Obliquus Externus is a broad thin Muscle, fleshy on its upper and back part, and Tendinous on the Anterior and greatest Portion of the lower part. It reaches from half the Lateral and Inferior part of the Thorax, to almost half the Lateral and Superior part of the Pelvis; and from the back part of the Regio Lumbaris to the Linea Alba. *Figure and Situation in general.*

72. IT is fixed by its upper part, to the Ribs, by the lower, to the Os Ilium, Ligamentum Falloppii, and Os Pubis, and by the fore part to the Linea Alba. The Posterior Portion next the Vertebrae of the Loins has commonly no true muscular Insertions. *Insertions.*

73. IN the first place it is fixed to eight Ribs (seldom to nine) that is, from the fifth true Rib to the last of the false, by the same number of Angles of its fleshy Portion in the following manner. It adheres to the external Labia of the lower Edges of the two or three last true Ribs, and of the four following false Ribs, at their bony Extremities; to the Extremity of the Cartilage of the last false Rib; to the external Labium of the lower Edge of that Rib, and a little to the broad Ligament which connects it to the Transverse Apophyses of the first Vertebrae of the Loins.

74. THE Insertions in the bony Extremities of the Ribs are at different distances from the Cartilages in this order: In the seventh true Rib the Insertion is very near the Cartilage, in the sixth at a little more distance; in the fifth the distance is about an inch; in the first false Rib, two inches; in the second, and third, three inches; in the fourth about two inches, and sometimes less; in the fifth, the Insertion reaches, and in a manner surrounds the Cartilage.

75. THE name of Digitations or Indentations has been given to these Angular Insertions, because they join a like number of the same kind belonging to other Muscles, as the Fingers of the two Hands are locked between each other. Three or four of these Digitations belong to the Serratus Major; and the same number to the Latissimus Dorsi. The three

or four lowest Digitations join likewise those of the Serratus Postericus Inferior, which are covered by the Extremities of the Latissimus Dorsi.

76. **THOUGH** these Digitations appear to be wholly fleshy, they are almost all a little Tendinous towards the back part. They seem to increase in breadth as they descend, and often unite more or less with the Intercoastal Muscles in their passage over them. Sometimes they communicate likewise with the Pectoral Muscle, the Serratus Major and Latissimus Dorsi, by distinct Fasciculi of fleshy Fibres, which are true reciprocal continuations of these Muscles.

77. **THERE** are likewise other internal Insertions covered and hid by those which appear outwardly, and which belong to the Ribs lying immediately below those to which the outward Digitations are fixed. Thus the Digitation fixed in the last true Rib, sends off a Fasciculus to the first false Rib, as it runs up on the fore-side thereof.

78. **THE** first Digitation, or that belonging to the fifth true Rib, appears longer than the rest, and is about the breadth of two Fingers, having communicating Fibres with the Pectoralis Major. The second, or that of the sixth true Rib is about an inch in breadth, and unites a little with one Digitation of the Serratus Major. The third, or that of the seventh true Rib is about three Fingers in breadth, and runs for a small space toward the Cartilage on the outside of the Rib. The fourth, or that of the first false Rib mixes by some of its anterior Fibres with those of the Serratus Major. The fifth, or that of the second false Rib mixes both with the foregoing and with the first Digitation of the Latissimus Dorsi, and runs for some space on the surface of the Rib. The sixth, or that of the third false Rib is about two Fingers in breadth, and sends off a Fasciculus of Fibres to the Serratus Major. The seventh, is of the same breadth with the former, and some of its Fibres are continued to the Serratus Postericus Inferior. The eighth, or that belonging to the lowest false Rib has been already described.

79. **FROM** these Insertions in the Ribs, the Fibres of this Muscle run down obliquely from behind forward. Those which come from the three lowest Ribs are less oblique than the rest, appearing to form a distinct Portion which continues fleshy all the way to the external Labium of the Crista Ossis Ilium, in which it is inserted from the posterior part of the Tuberosity of that Crista, to the anterior and superior Spine. This Insertion is by very short tendinous Fibres through one half the Crista; through the other half they are longer, and some of them communicate with the Fascia Lata of the Thigh. The posterior part of this Portion seems to me to consist of a double Plane.

80. **THE** other Portion of this Muscle, though not altogether separated from the former, runs more obliquely; and after some space, its fleshy Fibres degenerate into a strong broad Aponeurosis or thin Tendon; the Extremities of the fleshy Fibres from the fifth true Rib to the anterior Spine of the Os Ilium, forming a line, which till it reaches as low as the Umbilicus, is streight, and from thence downward, is incurvated backward.

ward. One Portion of the Tendinous Plane runs down to the Anterior and Superior Spine of the Os Ilium, where it unites a little with the Superior Tendon of the Musculus Sartorius, and afterwards is continued to the Spine of the Os Pubis, being by its lower Edge firmly united to the Ligamentum Falloppii, and adhering closely to the Fascia Lata.

81. THIS Aponeurosis grows firmer and thicker in its progress toward the Os Pubis, and in old Age becomes hard and dry; for which reason Hernia's are most troublesome in old People. A little before it reaches the Os Pubis it is divided into two Portions, one Superior or Anterior, the other Inferior or Posterior, between which a Fissure or opening is left of a particular kind.

82. THE Superior or Anterior Portion runs obliquely downward toward the Spine of the Os Pubis, crosses over the foreside of the Symphysis, and is inserted in the lower broad part of the Os Pubis on the other side. As it passes the Symphysis, it crosses the like Portion of the other External Oblique, and their Fibres decussate each other.

83. THE Inferior or Posterior Portion running more downward, ends in the middle part of the Symphysis, some small part of it being continued to the Os Pubis on the other side.

84. NEAR their Extremities these two Portions approach, so that the opening formed by them is in some measure oval, but narrower below than above. Through this opening the Spermatick Vessels pass in Men and the Round Ligaments in Women, but in them the Opening is much lower than in Males. It is about two Fingers breadth in length, and about half a Finger in breadth at its upper part, and there it is strengthened by several Tendinous Fibres detached obliquely from each side, which form a sort of roundish Border, from whence these Openings got the name of Rings. These Collateral Fibres hardly appear in Children.

85. The Inferior or Posterior Portion sends off a particular Expansion to the Fascia Lata, which having formed a covering for the Inguinal Glands, is afterwards lost in the Fat.

86. THE remaining part of the Tendon of the External Oblique is fixed by oblique Fibres in the Linea Alba through its whole length, mixing with those that come from the same Muscle on the other side. These Tendinous Fibres are likewise continued a great way beyond the Linea Alba through the Tendon of the other Muscle, and this Intertexture is reciprocal. Those who look upon the fleshy part of this Muscle as its beginning, call it Obliquus Descendens, and it has likewise been named Obliquus Superior and Obliquus Major.

§ 2. *Obliquus Internus.*

87. THE Internal Oblique is a broad thin Muscle like the former, having nearly the same extent and insertions, that is, in the lower Ribs above; in the Crista of the Os Ilium, and Ligamentum Falloppii, below; and in the

Figure and Situation in general.

the Linea Alba, before; but it differs from it in this, that its lower part is more fleshy than the upper.

Insertions.

88. ONE Portion of its lower Extremity, which is entirely fleshy, is fixed by very short Tendinous Fibres in the middle space between the two Labia of the Crista Ossis Ilium, from the back part of Tuberosity of that Crista near the Symphysis of the Os Sacrum, almost all the way to the Superior and Anterior Spine of the Os Ilium; so that its Insertion reaches further back than that of the External Oblique.

89. THE fleshy Fibres thus fixed, run up first a little obliquely from behind forward, and then this obliquity increases proportionably as the Fibres lie more anteriorly, and they cross those of the fleshy Portion of the External Obliquely, being afterwards inserted exteriorly in the lower Edges of the Cartilages of all the false Ribs, and those of the two lowest true Ribs, reaching to the Extremity of the Cartilago Ensisformis.

90. THESE Insertions form fleshy Digitations at the Extremity of the lowest false Rib, at the bony Extremity of the fourth, and through all its Cartilage, and at the middle Portion of the Cartilage of the third. Here the Insertions become Tendinous, and an Aponeurosis is formed, which from the second false Rib anteriorly, is divided into two Laminæ by which the Musculus Rectus is inclosed.

91. THE other Portion of the lower Extremity of this Muscle, continuous with the former, is fixed to the Anterior Extremity of the Crista of the Os Ilium, to its Anterior and Superior Spine, and to that part of the Ligamentum Falloppii which lies nearest it. From all this Insertion, the Fibres expand like Radii through the whole extent of the Linea Alba. Those from the Crista run toward the upper part of the Linea Alba, and afterwards they gradually change their Direction, till at length they become almost perpendicular to that Line. Those that come from the Spine and Ligamentum Falloppii, are gradually bent downward, and are inserted partly in the Spine, partly in the Symphysis of the Os Pubis, being inseparably mixed with the lower Edge of the Aponeurosis of the External Oblique.

92. THIS Anterior or Radiated Portion being at its Beginning wholly fleshy, becomes afterwards wholly Tendinous, and together with the Tendon of the other Portion, forms an Aponeurosis like that of the External Oblique, the Extremities of all the fleshy Fibres forming an oblique Line a little bent from above downward, beginning at the third false Rib, and reaching to the Ligamentum Falloppii.

93. THE Aponeurosis of the Internal Oblique thus formed, is afterwards divided into two Laminæ, from the Extremity of the second false Rib, to its lower Edge; and having by this division furnished a Vagina to the Musculus Rectus and Pyramidalis of the same side, the two Laminæ unite again at the Linea Alba, being interwoven with those belonging to the Muscle on the other side, and mixed with the Aponeurosis of the External Oblique in a very singular manner. This Aponeurosis is every where closely joined to that of the External Oblique, and the Vagina of the

Rectus

Rectus seems to be stronger above the Umbilicus than below it, and near the lower Extremity of the Linea Alba becomes so thin, that the Rectus and Pyramidalis may be seen through it.

94. IN the Passage between the Anterior and Superior Spine of the Os Ilium, and Os Pubis, at some distance above and behind the Tendinous Opening or Ring of the External Oblique; the fleshy Fibres at the lower Edge of the Internal Oblique, leave a passage for the Spermatick Vessels in Men, and for the Vascular Rope called the Round Ligaments in Women. This passage is near the place where this Muscle joins the Aponeurosis of the former; and though it appears in some subjects to be formed by a real separation of some fleshy Fibres, in others it lies between the fleshy Edge of this Muscle and the Insertion of the Obliquus Externus in the Ligamentum Fallopii. In this course a Fasciculus of fleshy Fibres is likewise detached from this Muscle, which contributes to the Formation of a small Muscle called Cremaster, as we shall afterwards see.

95. THERE is moreover a thin Plane or Series of fleshy Fibres, between the back part of this Muscle and the Aponeurosis of the Musculus Transversalis, which covers the Quadratus Lumborum, and seems to be fixed by a broad Aponeurosis to the Ligament which goes between the last Vertebra of the Loins and the Tubercle of the Crista Ossis Ilium. From thence it runs obliquely upward and forward, and contracting in breadth is fixed in the Extremity of the last false Rib. Therefore if this Series be reckoned a part of the Internal Oblique, this Muscle must be said to be inserted not only in the Crista of the Os Ilium, but also in the last Vertebra of the Loins, by means of the Ligament already mentioned.

96. THIS Muscle is likewise called Obliquus Descendens, for the same reason that the former is termed Ascendens; Obliquus Inferior and Obliquus Minor, because it does not reach so high, and is not quite so large as the External Oblique.

§ 3. Musculi Recti.

97. THE Recti are long narrow Muscles, thicker than the Obliqui. *Figure and Situation in general.* They lie near each other like two large Bands, from the lower part of the Thorax to the Os Pubis, the Linea Alba coming between them. Their breadth diminishes, and their thickness increases gradually from above downward.

98. THE superior Extremity of each Muscle is fixed to a part of the lower Extremity of the Sternum, to the three lowest true Ribs, and to the first false Rib, by the same number of Digitations, of which, that which is furthest from the Sternum is the broadest. *Insertions.*

99. THE body of the Muscle lies in the Vagina, formed by the Aponeurosis of the broad Muscles of the Abdomen. Exteriously it is divided into several Portions resembling distinct Muscles placed endwise, by transverse Tendons termed Enervations, which commonly are all above the Umbilicus, very seldom below it, and they adhere very close to the Vagina.

100. THESE

100. THESE Intersections are pretty irregular. They do not always penetrate the whole thickness of the Muscle, and in that case they do not at all appear, or but very little, on the inner Surface. Sometimes those which are seen on the outer Surface do not run quite cross the whole breadth of the Muscle.

101. THE lower Extremity of this Muscle is narrower than the upper, and ends in a thin Tendon fixed in the Internal Labium of the upper Edge of the Os Pubis near the Symphysis, and there it touches the Tendon of the other Rectus.

102. ABOVE the Umbilicus these two Muscles are at some distance from each other, according to the breadth of the Linea Alba; but below it they come nearer, the Linea Alba being there narrower, and near their lower Extremity that line is almost intirely hid by their thick Edges.

§ 4. *Musculi Pyramidales.*

Situation in general and Figure.

103. AT the lower part of the Recti we meet commonly with two small Muscles, which at first sight seem to be a Portion or Appendix of the former. They are named Pyramidales from their figure, and by Falloppius, Succenturiati.

Insertions.

104. AT the lower Extremity they are broad and thick, being there fixed to the upper Edge of the Offa Pubis, immediately before the Recti. They decrease gradually in breadth and thickness as they ascend, and end by a point in the Linea Alba, a little way below the Umbilicus.

105. THEY are partly inclosed within the Vagina of the Recti, running close by each other along the Linea Alba, to which they are fixed at different distance by Oblique Tendinous Indentations, the uppermost of which are sometimes very long.

106. SOMETIMES these Muscles are wanting, and then the lower Extremities of the Recti are thicker than usual. Sometimes there is only one Pyramidalis; and sometimes they are not both of the same size and length. We very rarely meet with three in one subject.

§ 5. *Transversales.*

Figure and Situation in general.

107. THE Transverse Muscles are nearly of the same breadth with the Obliques. Their name is taken from the Direction of their Fibres, and each of them is fixed to the Ribs, above; below, to the Os Ilium and Ligamentum Falloppii; before, to the Linea Alba; and behind, to the Vertebrae.

108. THE upper part of this Muscle is fixed to the lower part of the inner Surface of the Cartilages of the two lowest true Ribs, and of all the five false Ribs, by fleshy Digitations, the Fibres of which run more or less transversely toward the Linea Alba, at some distance from which they become Tendinous. These Digitations meet, and exactly correspond with those of the Diaphragm, but never mix with them in the Human Body.

109. THE

109. THE middle part is fixed to the three first Vertebrae of the Loins, by a double Aponeurosis or two Tendinous Planes, one Internal or Anterior, the other External or Posterior. The Internal is inserted in the Transverse Apophyses, the External in the Spinal Apophyses and Interspinal Ligaments, being closely united to the Tendinous Expansions of the neighbouring Muscles; and the external Planes of both Transversales appear to be continuous, their common Insertion in the Spinal Apophyses, by no means hindering them from sliding like a Girth, towards either side on the Processes just mentioned.

110. THE internal and external Planes having inclosed in their Duplication, the Musculus Sacro-Lumbaris and Quadratus Lumborum, unite in one strong Aponeurosis at the Edges of these Muscles. From this Aponeurosis arises the middle and greatest part of the fleshy Portion of the Transversalis, which together with the superior part, advances toward the Linea Alba, and at some distance from it becomes Tendinous.

111. THE inferior part of this Muscle is fixed by an Insertion wholly fleshy to the internal Labium of the Crista Ossis Ilium, and to a great part of the Ligamentum Fallopii. From thence many of its Fibres run towards the Linea Alba, the rest to the Os Pubis, all of them becoming more or less Tendinous before their Insertion.

112. IT is commonly said that there is a Separation in the fleshy Fibres of this Portion behind that supposed to be in the Internal Oblique, for the passage of the Spermatick Vessels, &c. There is indeed a sort of Opening, but it is so very near the Internal Oblique, as to make it very doubtful at first sight, whether it be formed by a Separation of the Fibres of the Transversalis, or lies between the fleshy Edges of that Muscle, and of the Obliquus Internus, which after a careful Examination appears to be the case.

113. THIS Proximity makes it no easy matter for many Anatomists to determine whether the fleshy Fibres of which the Cremaster Muscle partly consists, belong entirely to the Internal Oblique, or whether some of them do not likewise come from the Transversalis, as others do from the Ligamentum Fallopii.

114. THE middle part of the fleshy Plane of this Muscle ends in a very broad Aponeurosis closely adhering to that of the Obliquus Internus, the Vagina or Duplication of which, it strengthens interiorly, as that of the outer Oblique does exteriorly. Afterwards this Aponeurosis reaches the Linea Alba, and joins that of the other Transversalis by a particular sort of Intertexture, without mixing either with the Internal Oblique or with the Peritonæum. The whole Aponeurosis of the three parts of this Muscle, from the fleshy Fibres to the Linea Alba, represents a kind of Crescent, and it was for this reason that the Ancients have said that it terminated forward in a Semilunar Line.

§ 6. *Connexion of the Obliqui and Transversales.*

115. THESE three Muscles are not only united by their lower Edges, and inserted together in the Ligamentum Falloppii, but also braced by the Adhesion of the Fascia Lata to that Ligament, and by the Connexion of its Ligamentary Fibres with the Tendon of the External Oblique. This place is commonly called the Tendinous Arch of the Muscles of the Abdomen, because it appears in this shape when the Fascia Lata is removed. This Connexion is strengthened by a very thin Expansion of Tendinous Filaments which decussate the Aponeurosis of the Obliquus Externus, and reaching all the way to the Fissure, strengthen the upper Edge thereof in the manner already said.

116. WHEN this Tendinous Expansion is separated from the Aponeurosis of the External Oblique, in young subjects and in Women the Opening does not any more appear like a Ring, but simply as a void space left by the separation of the Tendinous Fibres. This Expansion seems to be formed by a continuation partly of the Tendinous Fibres of the Obliquus Externus, and partly of those of the Fascia Lata.

117. THE two Oblique Muscles and the Transversalis of each side, are disposed in a very singular manner with relation to their fleshy and Tendinous Portions; for the Tendons of some of them answer to the fleshy parts of the rest. The External Oblique is most Tendinous in the lower part and most fleshy in the upper. The Internal Oblique is most Tendinous in the upper part and most fleshy in the lower. The Transversalis is most Tendinous in the middle and most fleshy in the upper and lower parts. By this Disposition these three Muscles compose nearly an uniform Plane, the fleshy and Tendinous Fibres being equally distributed through all its parts.

118. IT is commonly said that the Linea Alba is only the Concourse or place where these three pairs of Muscles meet; but if we examine well, we find there an Intertexture not easy to be unravell'd. One Portion of the External Oblique of one side seems to be continued with a Portion of the Internal Oblique of the opposite side, these four Portions making only two Digastric Muscles, which cross each other obliquely. In the same manner, the two Transversales by the union of their Aponeurosis, form a third Digastric Muscle; so that we have here three broad Fasciæ or Bands very artfully crossing one another, formed indeed not by the whole Muscles, but only by the middle Portions of them.

119. THE Linea Alba is perforated by a small round Hole near the middle of its length; the Circumference of which is formed by Tendinous Fibres, twisted and interwoven together in such a manner, as to produce a regular and perfectly round Border. Before Birth, this Hole transmits the Funis Umbilicalis, and then it is pretty large; but in Adults it is very much contracted.

§ 7. *Uses of the Abdominal Muscles.*

120. OF these uses, some are common to all the Muscles, others peculiar to each Pair, or to each Muscle in particular.

121. THE common uses are to sustain the Viscera of the Abdomen, and to counterballance the perpetual motions of ordinary Respiration, and thereby gently and continually to act on the Viscera; which Action may be reckoned a sort of Trituration, of great importance to the Animal Oeconomy. They compress the Abdomen in order to clear it of what ought to pass off by the natural Outlets, to relieve the Stomach by Vomiting, from whatever might be hurtful to it; and lastly to drive out by a violent Expiration whatever may incommode the Organes contained in the Thorax. *Common Uses.*

122. THESE two kinds of Motion are carefully to be distinguished. The first is purely mechanical, and in a manner passive; the other is arbitrary and really active.

123. IN the first, the Viscera pressed by the Diaphragm in Inspiration, force these Muscles outward on all sides, overcoming their natural Spring; but the Diaphragm being relaxed in Expiration, and yielding to the Viscera, they recover themselves again. In the second, these Muscles really act, that is their fleshy Fibres are contracted and shortened, and thereby they compress the Viscera, especially the Stomach and Intestines, forcing out by the nearest Passages whatever is capable of Expulsion.

124. IN this latter case the Diaphragm acts while the Abdominal Muscles are in Contraction, and thereby concurs in an universal Compression of the Belly; but in the first case it does not act, as shall be fully shewn hereafter.

125. THE particular Disposition of the fleshy and Tendinous Portions of the Obliqui and Transversales, renders this Compression uniform, and thereby the Muscles resist the force of the compressed Viscera, almost equally on all sides.

126. THE Musculi Recti serve to support the Trunk of the Body when inclined backward, and to bend or bring it forward again; to raise the Body up when lying; and lastly, to climb. They serve, I say, to bend the Trunk when inclined backward or laid down; for when we stand streight, they have no hand in bending the Body forward, except we be striving to overcome some Resistance. The Weight of the Thorax, Head and superior Extremities, joined to the determinate Relaxation of the Posterior Muscles of the Back and Loins, produce this effect in all other cases, as has been already mentioned in the general Observations on the Action of the Muscles. *Proper Uses.*

127. I am not as yet convinced that the Recti can contribute any thing to the arbitrary Compression of the Abdomen, which has been already mentioned as one common use of all these Muscles.

128. THE Pyramidales seem only to assist the Action of the Recti; though when we consider the Oblique Direction of their Fibres toward the

Linea Alba, there may be some reason to think that they compress the Bladder, especially when very full of Urine, as *Fallopius* has remarked. The lower Portions of the Internal Obliques and Transversales may perhaps contribute something to this effect; for when contracted, they form a flat tight kind of Girth, by the middle of which the Superior Extremities of the Pyramidales are kept immoveable, while their Bodies being shortened and flattened by contracting, press upon the Bladder.

129. THE Oblique Muscles are capable of acting by distinct Portions. Their Posterior Portions have nearly the same uses on each side as the Recti have before; that is, they serve to support the Trunk on one side when it is inclined to the other; to bend the Body to that side on which they lie, and to raise one side of the Pelvis or one Hip, while the other is well supported.

130. THE Superior and Anterior Portions of the External Oblique of one side, together with the Inferior Portions of the Internal Oblique of the other side, serve to turn the Thorax upon the Pelvis as upon a Pivot, the Pelvis remaining fixed and immoveable by sitting. This Motion may be termed the Rotation of the Thorax on the Pelvis.

131. WHEN we stand and turn the Thorax to each side in the same manner, this Motion is not at first the Rotation already mentioned; for the Feet remaining then fixed, the Legs and Thighs turn to one side and carry the Pelvis along with them; but this Motion being carried as far as is possible, and the Pelvis being consequently in a manner fixed, the Rotation of the Thorax then takes place, by means of the two opposite Oblique Muscles in the manner already said.

132. WHEN all the Portions of these four Muscles act together, they may assist the Recti in great Efforts; as for instance, when with the Arm or Breast we push forward a very heavy Body, or drag it after us.

133. THE Transversales seem to have no other use than that of Bracing or Girding the Abdomen in different degrees; and this they may do either by their whole Plane, or by different Portions thereof, and these again may gradually succeed each other. For instance, the Superior Portion may contract separately, while the Inferior Portion is totally relaxed, as I have often observed in my self.

134. THERE are still other uses belonging to these Muscles, but they cannot be intelligibly explained till several other Muscles have been described.

A R T. III.

The Muscles which move the Bones of the Shoulder upon the Trunk.

135. **O**F these Muscles, some are inserted in the Bones of the Shoulder, others move these Bones on the Trunk without being fixed in them.

136. THE

136. THE Muscles which move the Scapula and Clavicula on the Trunk by being inserted in them are commonly the six following.

- | | |
|---|-----------------------------|
| 1. <i>Trapezius.</i> | 4. <i>Pectoralis Minor.</i> |
| 2. <i>Rhomboides.</i> | 5. <i>Serratus Major.</i> |
| 3. <i>Angularis</i> , called commonly
<i>Levator Scapulæ proprius.</i> | 6. <i>Subclavius.</i> |

137. THE Muscles, which without being inserted in the Scapula and Clavicula, move them upon the Trunk, and which therefore may be reckoned Assistants to the former, are two in number, both belonging to that Class of Muscles by which the Os Humeri is moved on the Scapula, viz.

1. *Pectoralis Major.* 2. *Latissimus Dorsi.*

138. THE Scapula in particular, besides its Motions upon the Trunk, may also be moved upon the Os Humeri, by means of some of the Muscles which move the Os Humeri on the Scapula, as we shall see hereafter.

139. IN each Class of these Muscles I shall only describe those which are actually inserted in the Bones belonging to it, leaving to another Class the Muscles which move those Bones without being fixed to them. I shall in this place, for instance, explain only the six Muscles first named, and refer the other two to the Muscles which move the Os Humeri on the Scapula.

§ 1. *Trapezius.*

140. THE Trapezius is a large, broad, thin, fleshy Plane, situated between the Occiput and lower part of the Back, and from thence extending to the Shoulder in the Figure of a large irregular Square. From this Figure the ancient Greeks took its name, and together with the Trapezius of the other side it forms a kind of Lozenge.

Situation in general and Figure.

141. ABOVE, it is fixed in the Superior Transverse Line of the Os Occipitis, by a thin series of fleshy Fibres, reaching to the Musculus Occipitalis, and appearing to cover that Muscle by a kind of Aponeurosis. Behind, it is fixed to the five Superior Spinal Apophyses of the Neck, by means of the Posterior Cervical Ligament, and immediately to the Extremities of the two lowest Spinal Apophyses of the Neck, and of all those of the Back.

Insertions.

142. THESE Insertions are by small and very short Tendinous Fibres, except between the sixth Apophysis of the Neck and the third of the Back inclusively, where these Fibres are something longer, and form a small Aponeurosis in form of a Crescent, which with that on the other side represents a kind of Ellipsis pointed at both ends. At the lower Spinal Apophysis of the Back, these Insertions are likewise Tendinous, and form

a small

a small Triangular Plane which together with that of the other side, represents a Square.

143. FROM all these Insertions, the fleshy Fibres run in different Directions and terminate by one continued Insertion in about one third part of the Clavicula, in the Posterior Edge of the Acromium, and through the whole Superior Labium of the Spine of the Scapula, all the way to the small Triangular Surface in that Spine, over which Surface the Fibres pass and slide freely, without being fixed therein.

144. THE Directions of all these Fibres are these: The Superior run obliquely downward from the Occiput to the Clavicula: The next to these run a little less obliquely, and together with some of the Superior are fixed in the Superior Articular Ligaments of the Shoulder, and in the Acromium. Here the Muscle forms a kind of Angle included in that formed by the Acromium and Extremity of the Clavicle.

145. THE rest of the Fibres that come from the Neck and those from the Superior Spines of the Back, are fixed in the Spine of the Scapula, reaching within an inch of the small Triangular Surface, becoming gradually less Oblique or more Transverse as they descend.

146. Lastly, The Fibres which come from all the other Spinal Apophyses of the Back, contract like Radii tending toward a Center, and are inserted in the Extremity of the Spine of the Scapula, passing over the small Triangular Space, the Superior being more or less Transverse, and the rest becoming gradually more and more Oblique running from below upward.

147. THIS Muscle covers immediately the Splenius or Mastoideus Superior, part of the Complexus Major, the Angularis, Rhomboides, and part of the Latissimus Dorsi. The common Insertion of the two Trapezii in the Cervical Ligament is the reason that in pulling either of them toward one side of the Neck, the other will follow it a little beyond the Spinal Apophyses.

§ 2. *Rhomboides.*

Situation in general.

148. THIS Muscle is a thin, broad and obliquely square fleshy Plane, situated between the Basis of the Scapula and the Spina Dorsi; and it is from its Figure that it has been termed Rhomboides.

Division and Insertions.

149. IT may be divided into two Portions, one Superior, the other Inferior, which sometimes appear separate. The Superior Portion which seems in some subjects to be made up of two, is fixed by an Insertion wholly fleshy in the two or three lowest Spinal Apophyses of the Neck, and partly in the Posterior Cervical Ligament. The Inferior Portion is fixed by a Tendinous Plane in the three or four uppermost Spinal Apophyses of the Back.

150. THESE two Portions, of which the Inferior is by much the broadest, being united, are inserted in the Edge of the Basis Scapulæ, from the small Triangular Space to the Inferior Angle, the Superior Portion covering a small part of the Insertion of the Angularis.

151. THIS

151. THIS whole Muscle is covered by the Trapezius, and covers immediately the Serratus Posticus Superior, being joined to each of these Muscles by a Filamentary or Cellulous Substance. *Particular Situation.*

§ 3. *Angularis, vulgo Levator Scapulæ Proprius.*

152. THIS is a long and pretty thick Muscle, about two Fingers in breadth, lying above the Superior Angle of the Scapula, along the Posterior Lateral Part of the Neck of that Bone. *Situation in general.*

153. IT is inserted above in the Extremities of the Transverse Apophyses of the four first Vertebrae of the Neck, by four fleshy Branches ending in short Tendons, sometimes the second, sometimes the third, or both, and sometimes the fourth of these Branches is wanting; these defects being made up by the largeness of the rest. *Insertions.*

154. FROM thence these Branches run down a little obliquely, and then uniting together, they are inserted in the Superior Angle of the Scapula, and in the Edge of its Basis from thence to the small Triangular Space, being there covered a little by the Rhomboides.

155. THIS Muscle is easily divided into two through its whole length. It is covered by the Trapezius, and its Insertions in the Neck, are sometimes mixed with those of the neighbouring Muscles. *Particular Situation.*

§ 4. *Pectoralis Minor.*

156. THIS is a small fleshy Muscle, something of a Triangular Shape, situated at the Superior, Lateral and Anterior Part of the Thorax. *Situation in general.*

157. BY its Basis it is inserted in the External Labium of the upper Edge of the second, third, fourth and fifth true Ribs, near their Union with the Cartilages, by the same number of Digitations or separate fleshy Portions, because of the Intervals between the Ribs; and for that reason it has been called Serratus Minor Anticus. *Insertions.*

158. FROM thence these Portions run up more or less obliquely, toward the Shoulder, and form a fleshy Belly which contracts as it passes before the two first Ribs, and then becoming a short, flat and broad Tendon, is inserted in the upper part of the Apophysis Coracoides of the Scapula, reaching all the way to the Point of that Process.

159. THIS Muscle is covered by the Pectoralis Major, and adheres very closely to the External Intercostal Muscles. The Digitations commonly taken notice of, cover and hide several others, by which the number of Fibres and thickness of this Muscle are increased. Its Tendon unites a little at the Apex of the Coracoid Apophysis, with the Insertion of the Coracobrachialis, and with that of one Portion of the Biceps. *Particular Situation.*

§ 5. *Serratus*

§ 5. *Serratus Major.**Situation in general.*

160. THIS is a broad, fleshy and pretty thick Muscle, lying on the Lateral Part of the Thorax between the Ribs and Scapula by which it is covered. Its Figure is that of an irregular Square, its greatest breadth being in the back part where it terminates by Digitations of unequal lengths, in a Radicated Disposition, their Extremities describing an Arch or Curve; and from these Digitations its name is taken.

Insertions.

161. IT is inserted backward in the Internal Labium of all the Basis of the Scapula from the Superior to the Inferior Angle. From thence running forward wholly fleshy, it increases gradually in breadth, and is inserted in all the true Ribs, and often in one or two of the false Ribs, by the same number of Digitations.

162. THE Insertion in the first true Rib is about five Fingers breadth from the Cartilage; in the second, something less; in the third about four Fingers breadth; in the fourth, three; in the fifth, two; in the sixth, one; in the seventh, one half; and in the first false Rib, two Fingers breadth; but in all these Measures some Latitude is to be allowed. The breadth of each Insertion in the Ribs is at least an inch.

Division and particular Situation.

163. THOUGH the Digitations of this Muscle give it a Radiated Appearance from the Scapula to the Ribs, yet these Radii do not at all lie in that Disposition which at first sight we would be apt to imagine. The Muscle is made up of two Planes, one great, the other small.

164. THE small Plane looks like a distinct narrow Muscle, closely adhering to the Superior Edge of the great Plane. It is fixed by one Extremity under the Superior Angle of the Scapula, and by the other to the first Rib by a small Insertion, and to the second Rib by a broad Insertion. This Plane is easily seen by turning the Scapula forward, having first separated the Rhomboides; but when that is turned back, the Pectoralis Minor being first cut off, this Plane does not appear, being covered and hid by the broad one.

165. THE broad Plane may be divided into two Portions, one Superior and one Inferior, adhering to each other by their Edges.

166. THE Superior Portion is thin, and takes up about three quarters of the Basis of the Scapula, reckoning from the Superior Angle. From thence it contracts by small degrees, and forms two Digitations very like those of the small Plane, which they cover by their Insertions in the two first true Ribs, or in the second and third, and sometimes in all the three.

167. THE Inferior Portion is fixed in the lower quarter of the Basis Scapulæ, from whence it expands itself by six or seven very long fleshy Digitations, which decrease in breadth as they descend and are inserted in the manner already said, in the six or seven Ribs which follow the two first. It must be observed, that the three first Digitations take up almost all this quarter of the Basis Scapulæ, the three last being fixed precisely in the Inferior

inferiour Angle. The Extremities of the three or four lowest Digitations mix Fibres with those of the Obliquus Externus of the Abdomen.

168. THE Direction of the Fibres and Digitations of the Serratus Major will be easily comprehended, by recollecting that the Ribs are inclined downward in different degrees from behind forward; for which reason the Fibres of the Superior Portion of the broad Plane, cross over the Ribs at less acute Angles than those below them, so that in the natural Situation of the Scapula, the lowest of these Fibres which run up very obliquely, cross over the third, fourth and fifth true Ribs.

169. THE upper Fibres of the inferior Portion of the broad Plane, run up proportionably more obliquely, and therefore cross over more Ribs and at more acute Angles than the others which are less oblique; and though some of these run transversely, yet the Ribs being oblique, they must cross over some of them, though in a lesser degree. The lowest of these Fibres or Digitations run a little downward, and consequently fall in more with the Direction of the Ribs, but not so much as may be imagined. These Digitations are very small and weak.

§ 6. *Subclavius.*

170. THIS is a small oblong Muscle lying between the Clavicle and first Rib. It is fixed by one end in all the middle lower Portion of the Clavicle, at the distance of about an inch from each Extremity; and by the other, in the Cartilage and a small part of the Bone of the first Rib. It seems likewise to adhere to the Extremity of the Clavicle next the Sternum, by a kind of broad thin Ligament.

A R T. IV.

The Muscles which move the Os Humeri on the Scapula.

171. THE Muscles which are inserted in the Os Humeri and thereby move it upon the Scapula, are commonly nine in number, viz.

- | | |
|-----------------------------|------------------------------|
| 1. <i>Pectoralis Major.</i> | 6. <i>Teres Major.</i> |
| 2. <i>Latissimus Dorsi.</i> | 7. <i>Teres Minor.</i> |
| 3. <i>Deltoides.</i> | 8. <i>Subscapularis.</i> |
| 4. <i>Supra-Spinatus.</i> | 9. <i>Coraco-Brachialis.</i> |
| 5. <i>Infra-Spinatus.</i> | |

172. THE *Pectoralis Major* is inserted in the Trunk and Clavicula; the *Latissimus Dorsi* in the Trunk and Scapula; the *Deltoides* in the two Bones of the Shoulder; and the other six Muscles in the Scapula alone.

173. Two of these nine Muscles may likewise move the Bones of the Shoulder on the Trunk ; the other seven may move the Scapula on the Os Humeri.

174. THE Muscles which without being inserted in the Os Humeri, may in some circumstances, move it upon the Scapula, are two in number belonging to the Class of Muscles which move the Bones of the Fore-Arm on the Os Humeri, viz.

10. *Biceps.*

11. *Anconæus Major*, commonly called *Extensor Cubiti Major*.

Both these Muscles may likewise move the Scapula on the Os Humeri, as shall be remarked in describing them.

§ 1. *Deltoides.*

Situation in general and figure.

175. THIS is a very thick Muscle covering the upper part of the Arm, and forming what is termed the Stump of the Shoulder. It is broad above and narrow below in a Triangular Form ; and its name is taken from the resemblance it bears to the Greek Letter Δ Delta ; but to make the comparison hold, either the Letter or the Muscle must be inverted, and the Muscle flattened.

Structure.

176. IT is made up of eighteen or twenty small single Muscles in an opposite Situation with respect to each other, and united by middle Tendons, so that taken all together they form several Penniform Muscles. The Outer Surface appears almost wholly fleshy, but on the Inner Surface we see the several Tendons.

177. ALL these small Muscles are disposed in such a manner as to form a considerable extent at the upper part, from whence they contract gradually in breadth, till they end in a thick strong Tendon, by which the whole Muscle terminates in an Angle or Point.

Insertions.

178. ABOVE, it is fixed in the whole Inferior Labium of the Spina Scapulæ, in the Convex or Long Edge of the Acromium, and in the third part of the Anterior Edge of the Clavicle next that Apophysis. It surrounds the Angle formed by the Articulation of these two Bones by a particular Slope and Fold contrived for that purpose.

179. FROM thence it runs down above one third of the length of the Os Humeri, where it is inserted by a thick Tendon in the large Muscular rough Impression below the bony Ridge which goes from the great Tuberosity of the Head of the Bone, and forms the highest Border of the Groove or Channel mentioned in the Description of the Skeleton N^o 638.

180. THIS Insertion seems to be immediately implanted in the substance of the Bone, passing through the Periosteum, which is commonly the case in all Insertions in these kinds of Impressions, Eminencies, or considerable Tuberosities. It lies below that of the Pectoralis Major, and a little more forward.

forward. Some of the Fibres of this Muscle are fixed in the Aponeurosis common to all the Muscles which cover the Arm.

181. THIS Muscle may be distinguished into three principal Portions, *Division.* one of which is fixed in the Spine of the Scapula, one in the Acromium, and one in the Clavicle. They are separated from each other by a small quantity of Fat or Cellular Substance chiefly near the Basis of the Muscle.

182. THE middle and strongest Portion runs down almost directly to its Insertion in the Os Humeri. The Lateral Portions seem to end sooner, but it is only because they turn inward toward the Bone, and thereby form the biggest and thickest part of the Tendon. The Anterior or Clavicular Portion sends off some Fibres to the Bone, before it reaches the Tendon.

183. THE Portion fixed in the Spine of the Scapula, sends backward a thin Aponeurosis, which is strengthened by another Tendinous or Ligamentary Series of Fibres. This Aponeurosis is fixed in the Basis of the Scapula below the Spine, and from thence is extended toward the Inferior Angle. The other Series begins at the Spine, and ends near the same Angle at the beginning of the Inferior Costa. These, together with the Great Tendon, seem to contribute to the Formation of the Tendinous Expansion which covers the Muscles of the Arm.

184. AT its upper part this Muscle joins the Insertion of the Trape- *Particular* zius, and below, that of the Brachialis. Anteriorly it joins the Pectoralis *Situation.* Major, being distinguished from it only by a small Line of Fat or of Cellular Substance, and a small Vein called Cephalica. It covers the Head of the Os Humeri, and adheres to the Capsular Ligament of the Joint, and it likewise covers the Insertion of the Pectoralis Major.

§ 2. *Pectoralis Major.*

185. THIS is a large, thick and fleshy Muscle covering the Forepart of *Situation in* the Breast, from the Sternum where it is very broad, to the Axilla where *general and* it contracts in its passage to the Arm. It is naturally divided into two Por- *Division.* tions, one Superior and Small, which may be termed Clavicular; the other Inferior and Large, which we may call Thoracic.

186. THE Clavicular Portion is fixed by a fleshy Insertion in almost half the Clavicle next the Sternum, ending under the Insertion of the Sternomastoidæus. From thence it runs obliquely down toward the Axilla, contracting by small degrees, and ends in a flat Tendon or Tendinous Band. In this passage, it borders on the Anterior Edge of the Deltoides, from which it is distinguished only by a Fatty or Cellulous Line, and a small Vein named Vena Cephalica.

187. THE Thoracic Portion is broad and in some measure Radiated. It is fixed by its Anterior Circumference in the Lateral part of the Outside of the Sternum, in the Outside of the Cartilages, and in a small part of the Bones of all the true Ribs, and of the first and sometimes the second false Rib. All these Insertions are like so many Digitations.

188. THE Insertions in the Sternum end by a great number of very short Tendons which run toward the middle of the Bone, meeting and decussating those from the same Muscle on the other side. The Lower Insertions are most distinctly digitated, and they mix with those belonging to the Rectus and Obliquus Externus of the Abdomen, there being likewise several Fasciculi of Fibres common to the Pectoralis with these Muscles. This Portion is also fixed to the Ribs by internal fleshy Strata covered by the external Insertions, and forming together with them, the thickness of the Muscle.

189. FROM thence all the fleshy Fibres contract in breadth and approach each other, in their passage to the Arm. The Superior Fibres run downward, joining those of the Clavicular Portion; those next them run less obliquely; the following more or less transversely, and the Inferior run upward, in the same manner. This whole Portion ends at length in a flat Tendon joined to that of the small Portion, and folded back upon it in the following manner.

190. THE inferior fleshy Fibres of the Thoracic Portion, before they reach the Tendon in their passage to the Arm, are gradually turned inward under each other, and then run up behind the Extremities of the Superior Fibres. By this Turn, the lower part of the Tendon answers to the Superior fleshy Fibres, the middle Fibres of both to each other, and the upper part of the Tendon to the lower fleshy Fibres, and so on. Thus the Tendons of both Portions adhering closely by their flat sides and united at their Edges, form a double Tendinous Plane, the Fibres crossing each other. The Anterior or External Plane belongs to the Clavicular Portion; the Internal or Posterior Plane to the Thoracic Portion.

191. THE Tendon thus formed is inserted according to its breadth, at about one fourth part of the length of the Bone from the Head, in the bony Ridge of the great Tuberosity, that is, in the outer Edge of the Groove or Channel, the Cavity of which it lines in conjunction with another Tendon, by a Stratum of very thin, shining, Transverse Fibres. This Insertion lies between that of the Tendon of the Deltoides which it touches, and that of the Latissimus Dorsi, which is on the other side of the Groove.

192. THIS Muscle, together with the Deltoides, sends off an Aponeurosis which joining that of the Biceps, is spread over the Muscles of the Arm. It partly covers the Pectoralis Minor and Serratus Major, and by its broad Tendon it covers transversely the Brachial Channel and the Tendon of the Biceps lodged there. Lastly, it forms the Anterior Border of the Hollow of the Axilla, as the Posterior is formed by the Latissimus Dorsi.

§ 3. *Latissimus Dorsi.*

Situation in general.

193. THIS is a broad, thin, and mostly fleshy Muscle lying between the Axilla where it is very narrow, and the back on which it expands itself by

by Radiated Fibres both in length and breadth, from the middle of the Back all the way to the lower part of the Regio Lumbaris; and from this Situation it has its name.

194. ITS Insertions, without reckoning that in the Arm, are partly Tendinous and partly Flefhy. In the first place it is sometimes, but not always, fixed in the inferior Costa of the Scapula near the Angle by a Fasciculus of fleshy Fibres. In the next place it is fixed by an Aponeurosis, in the Spinal Apophyses of the six or seven, and sometimes eight lowest Vertebrae of the Back, in those of all the Vertebrae of the Loins, in the Superior Spines and Lateral Parts of the Os Sacrum, and in the External Labium of the Posterior Part of the Os Ilium. *Insertions.*

195. BESIDES all this Tendinous Course, it is inserted by fleshy Digitations in the last four false Ribs. These Digitations cover those of the Serratus Inferior Posticus, and mix with those of the Obliquus Externus Abdominis, there being sometimes Fasciculi of Fibres common to both Muscles. It is not always fixed to the lowest false Rib; and sometimes that Insertion is by a particular kind of Aponeurosis which is pretty strong. I have likewise seen it fixed to the first false Rib by a very small thin Digitation.

196. FROM all these Insertions the Fibres of this Muscle tend in different Directions to the Arm. At the middle of the Back they are almost transverse, and they become more and more oblique as they descend. Towards the Region of the Loins their Obliquity decreases again, and on the Ribs they are almost longitudinal. As they run up they contract in breadth, and under the Axilla they terminate in a flat Tendon, turned almost in the same manner as that of the Pectoralis Major, but more simply, and without any Adhesion between the two Planes. The upper Edge of this flat Tendon is turned inward, answering to the lower or Lateral Part of the Muscle, and the lower Edge which hides the other by crossing a little over it, answers to the upper or Posterior Part of the Muscle.

197. THE Tendon thus formed is fixed in the Os Humeri a little below the small superior Tuberosity, in the inner Edge of the bony Groove or Channel, the Cavity of which it also lines by a transverse smooth Expansion, nearly as is done by the Tendon of the Pectoralis Major from the other Edge, so that these two Tendons meeting by their Extremities in the Groove, appear in some measure to be continued with each other, I say, in some measure, because the Tendon of this Muscle is not so broad as that of the Pectoralis Major.

198. THE Tendon of the Latissimus Dorsi is accompanied by another flat Tendon belonging to the Teres Major; but it is inserted higher up than that other Tendon and nearer the Channel, so that the lower Edge of the Tendon of the Latissimus Dorsi may be said to incroach on the upper Edge of the other Tendon. These two Tendons communicate by some Collateral Fibres, and are both strengthened by the same Ligamentary Frænum, which runs down from the Insertion of the Subscapularis below that of the Teres Major, in describing which Muscle, I shall have occasion again to mention this Frænum. *Connexion.*

199. This

Particular Situation.

199. THIS Muscle is covered by the Trapezius, from the sixth to the last Vertebra of the Back, and covers the Serratus Inferior Posticus. Its Aponeurosis is at first narrow, but increases in breadth as it descends between the Vertebrae and Os Ilium. It adheres strongly to that of the Serratus Inferior Posticus, and still more to the Transversalis, Sacro-Lumbaris and Longissimus Dorsi. This Muscle, together with the Pectoralis Major, forms the Cavity of the Axilla.

§ 3. *Teres Major.**Situation in general.*

200. THIS is a long, thick, flat Muscle, situated a little obliquely between the Inferior Angle of the Scapula, and the upper part of the Arm. This Muscle and the Teres Minor are called round, though they are considerably broader than they are thick; because they come much nearer to that Figure, than any other Muscle which moves the Os Humeri on the Scapula.

Insertions.

201. IT is fixed by its Posterior fleshy Extremity in all the large Angular Surface on the Outside of the Scapula, in the Inferior Costa of that Bone and near the Angle. From thence it advances with Longitudinal Fibres toward the upper Quarter of the Os Humeri, terminating in a broad flat Tendon intermixed with some fleshy Fibres, which at the upper Edge are continued all the way to the Insertion, lying in the same Place with the Tendon.

202. IT is inserted by its Anterior Extremity at the lower part of the bony Ridge of the small Tuberosity, along the Edge of the Channel, almost opposite to, and sometimes a little lower than the Insertion of the Pectoralis Major. It lines the Cavity of the Channel by a Tendinous Elongation, which joins that from the Pectoralis, and seems to be continued with it. This Insertion is below that of the Latissimus Dorsi, with which it communicates by a small Aponeurosis.

203. THE Tendons of these two Muscles, the Teres Major and Latissimus Dorsi, lie almost in the same Plane as has been already observed, the upper Edge of the first running up a little way on one side the lower Edge of the latter, and the two Edges crossing each other in a small degree. The Tendon of the Latissimus Dorsi lies behind, and covers that of the Teres Major.

204. These two Tendons near their Insertions have a Ligamentary Frænum belonging to them, which runs down from the Insertion of the Subscapularis, and is inserted below that of the Teres Major. It covers the two Tendons, and keeps them close to the Bone.

§ 5. *Teres Minor.**Situation in general.*

205. THIS is a very fleshy Muscle, resembling the Teres Major, but narrower and shorter. It lies above the last named Muscle, between the Costa Inferior of the Scapula and the Head of the Os Humeri.

206. IT

206. IT is fixed by one end to all the middle part of the Inferior Costa *Inserions.* of the Scapula, and to the long particular Surface immediately above that Costa, reaching from the great Angular Surface near the Neck of the Bone. From thence it runs wholly fleshy, till it changes into a flat Tendon which is inserted in the Posterior or Inferior Surface of the great Tuberosity of the Head of the Bone, and likewise a little lower down.

207. IT adheres very close to the lower Edge of the Infra-Spinatus, and *Connexion.* the Tendons of these two Muscles are united; for which reason, the Ancients confounded them together, and did not look upon this as a particular Muscle. It is covered by the Deltoides.

§ 6. *Infra-Spinatus.*

208. THIS is a triangular, fleshy and pretty broad Muscle, in some mea- *Situation in* sure Penniform, filling the whole Infra-Spinal Cavity or Fossa of the *general.* Scapula.

209. IT is fixed in the Posterior half of the Infra-Spinal Cavity or Fossa, *Inserions.* and to the corresponding part of the Basis of the Scapula.

210. FROM thence arise a great number of short fleshy Fibres, which run more or less obliquely, and end in a middle Tendinous Plane, which terminates a little below the broadest part of the Spine of the Scapula, under the Root of the Acromium.

211. THEN the fleshy Fibres leaving the Bone, unite in one fleshy Mass, which passing under the Acromium over the Articulation of the Head of the Os Humeri, and adhering to the Capsular Ligament, terminates there in a flat broad Tendon, which adhering likewise to the Capsula, is afterwards inserted in the greater middle Surface of the great Tuberosity of the Head of the Os Humeri. At the place where the Fibres leave the Infra-Spinal Fossa under the Acromium, there is a great quantity of Fat or Adipose Cells, between the Bone and the loose Portion of the fleshy Mass.

212. THIS Muscle appears double a little below the Spine and toward the *Connexion.* Basis of the Scapula, because of the middle Tendinous Plane already mentioned. It seems likewise to be confounded with the Teres Minor, to which it is very closely joined. Its Tendon is united on one side with that of the Teres Major, and on the other with that of the Supra-Spinatus, and it is covered by the Posterior Portion of the Deltoides.

§ 7. *Supra-Spinatus.*

213. THIS is a thick narrow Muscle, in some measure Penniform, filling *Situation in* all the Supra-Spinal Cavity of the Scapula. *general.*

214. IT is fixed to all the Posterior half of the Supra-Spinal Fossa, and sometimes its Insertion reaches near the Neck of the Bone. There the Fibres leave the Surface of the Bone, and being, as it were, supported by the Fat or Cellulous Substance, pass between the Acromium and Neck of the Scapula, under the Arch formed by the Acromium and Extremity of the

the Clavicle, and under the Ligament between the Acromium and Apophysis Coracoides ; being afterwards inserted in the superior Surface of the great Tuberosity of the Head of the Os Humeri, very near the bony Channel. This Muscle is covered by the Trapezius.

§ 8. *Coraco-Brachialis.*

Situation in general. 215. THIS is a long Muscle lying on the inside of the upper Half of the Os Humeri, that is, on that Side which answers directly to the Hemisphere of the Head of the Bone, and to the Prominent Internal Condyle.

Insertions. 216. IT is fixed above to the Point of the Coracoide Apophysis, between the Insertions of the Biceps and Pectoralis Minor, by a Tendon, which as it descends, adheres for a good way to the Tendons of these two Muscles. Afterwards it becomes fleshy, and is inserted by a broad thin Extremity with a small mixture of Tendinous Fibres, in the middle part of the Os Humeri, close by the Ligamentary Frænum of the Latissimus Dorsi and Teres Major. Its Insertion is continued down below the Frænum near the Internal Inter-Muscular Ligament, to which it likewise adheres a little.

Particular Situation. 217. THIS Muscle passes behind the Tendon of the Pectoralis Major ; and as it is perforated in the middle to give passage to a Nerve, it has by some been termed Perforatus Casserii, that Author being the first who gave a particular Figure of it. The other name is taken from its Insertions.

§ 9. *Subscapularis.*

Situation in general. 218. THIS Muscle is of the same breadth and length with the Scapula, of which it occupies all the Inner or Concave Side, and from this Situation it has its name. It is thick, and made up of several Penniform Portions nearly in the same manner with the Deltoides.

Insertions. 219. IT is fixed in the internal Labium of the whole Basis, and in almost the whole internal Surface of the Scapula ; its fleshy Portions lying in the intervals between the bony Lines, when these are found. Near the Neck they leave the Bone, and form a very broad Tendon which is inserted in the Surface of the small Tuberosity of the Head of the Os Humeri, close by the bony Channel. The lower Edge of this Tendon probably sends off the Ligamentary Frænum mentioned in the Description of the Latissimus Dorsi, Teres Major, and Coraco-Brachialis.

Particular Situation and Connexion. 220. THIS Muscle covers immediately the Serratus Major, being in a manner inclosed between it and the Scapula. The upper Edge of its Tendon is joined to the lower Edge of that of the Supra-Spinatus, except at the upper part of the bony Channel where they give passage to one Tendon of the Biceps. It likewise adheres to the Capsular Ligament. The Tendons of the Supra-Spinatus, Infra-Spinatus, Teres Minor and Subscapularis, being

being all joined by their Edges, form a sort of Cap which covers the upper part of the Head of the Os Humeri.

A R T. V.

The Muscles which move the Bones of the Fore-Arm on the Os Humeri.

221. **T**HESE Muscles are commonly reckoned six in number; two Flexors lying on the Foreside of the Arm, called Biceps and Brachiaëus Internus; and four Extensors situated on the Backside, named Extensor Longus, Extensor Brevis, Brachiaëus Externus and Anconæus. The terms of Brachiaëus and Extensor Brevis are now become so indeterminate as to be often taken for one another; as likewise those of Biceps Externus and Brachiaëus Externus, which the Moderns have substituted in the room of the former.

222. OF the two Anterior Muscles, I name one simply Brachiaëus with the Ancients, the other Biceps or Coraco-Radialis; and I call all the four Posterior Muscles Anconæi, distinguishing them afterwards by the Epithets of Major, Minor, Externus, Internus. These four Muscles might be reduced to two, the Anconæus and Triceps; which last may again be distinguished into Major, Longus or Medius, Externus and Internus.

223. THE Disposition and Names of these Muscles, according to what has been said, are these:

- | | |
|---|---|
| 1. <i>Biceps sive Coraco-Radialis.</i> | 4. <i>Anconæus Externus.</i> |
| 2. <i>Brachiaëus</i> , called commonly <i>Brachiaëus Internus.</i> | 5. <i>Anconæus Internus.</i> |
| 3. <i>Anconæus Major</i> , called also <i>Extensor Cubiti Longus.</i> | 6. <i>Anconæus Minor</i> , called simply <i>Anconæus.</i> |

Sometimes the Anconæus Externus, and sometimes the Internus is called Extensor Cubiti Brevis, or Brachiaëus Externus.

224. THESE Muscles move not only the Fore-Arm on the Os Humeri, but also the Os Humeri on the Fore-Arm; neither are they all confined to these two Motions alone; for the Biceps or Coraco-Radialis and Anconæus Major may move the Os Humeri on the Scapula, and the Scapula on the Os Humeri. The Biceps by its Insertion in the Radius performs likewise the Motion of Supination, and that with much more force than the Muscles commonly assigned for that Action by the Name of Supinatores.

225. THE Motions of the Fore-Arm on the Os Humeri are not all performed by these six Muscles alone. The Supinator Longus, as it is termed, assist therein, as has been already observed by *Heister*; and indeed it seems better fitted for that Motion than for Supination, as we shall afterwards see;

and for that reason I rank it among the auxiliary Muscles, which move the Fore-Arm on the Os Humeri &c. by the Name of Radialis Longus.

§ 1. *Biceps five Coraco-Radialis.*

*Situation
and Confor-
mation.*

226. THIS is a double Muscle made up of two long fleshy Bodies, more or less round, lying by the side of each other, on the middle Anterior part, and a little toward the Inside of the Arm. These two Bodies are separated above, each of them ending in a small Tendon. As they run down they become contiguous, and afterwards closely united by one common broad Tendon. The Ancients who looked upon the two Superior Extremities as two Heads, gave this Muscle the Name of Biceps, and from its Insertions I call it Coraco-Radialis.

Insertions.

227. It is fixed by one of the Superior Tendons, in the Apex of the Coracoide Apophysis of the Scapula, on one side of the Tendon of the Coraco-Brachialis, which adheres very strongly to it. This Tendon of the Biceps is broader, shorter, and situated more internally than the other; the fleshy Body belonging to this Tendon is longest, and consequently runs highest up.

228. THE other Superior Tendon is smaller and longer than the former, and the fleshy Body belonging to it, shorter and more compounded. This Tendon is lodged in the bony Channel of the Os Humeri, being surrounded by a Membranous Vagina continued from the Capsular Ligament, and ending at the fleshy Body where it is intirely closed.

229. AT the upper part of the Groove, the Tendon runs between the Insertions of the Tendons of the Supra-Spinatus and Subscapularis; passes immediately over the Head of the Bone within the Capsular Ligament; then leaving the Joint between the two Tendons just mentioned, is covered by another short Vagina, and is inserted above the Glenoide Cavity, in the superior Impression of the Neck of the Scapula, near the Basis of the Coracoide Apophysis.

230. THE two fleshy Bodies thus separately fixed by their superior Tendons, approach by degrees as they descend, and before they reach the middle of the Os Humeri are closely united, forming afterwards a common Tendon of a considerable breadth, which is inserted laterally in the Posterior Edge of the Tuberosity at the Neck of the Radius.

Aponeurosis.

231. THIS inferior or common Tendon of the Biceps, a little before its Insertion, sends off towards the internal Condyle, an Aponeurosis which increasing obliquely in breadth on the same side, covers the inner and back Parts of almost the whole Fore-Arm, especially the Muscles which lie upon the Ulna, where it is insensibly lost. It likewise strongly adheres to the Muscles named Pronator Teres and Radialis Internus on the Fore-side of the Joint of the Elbow.

232. BOTH the fleshy Bodies of the Biceps contribute to the Formation of this Aponeurosis, each of the two Portions of which the common Tendon

don is made up, furnishing a Series of Tendinous Fibres, which covering the foreside of the true Tendon, unite near the internal Condyle by a particular kind of Intertexture, and thus produce the Aponeurosis.

§ 2. *Brachialis.*

233. THIS is an oblong, thick, and broad Muscle, lying immediately on the Anterior Part of the lower half of the Os Humeri. The upper Part of it is forked or sloped, and at the bending of the Joint of the Elbow, the lower Part contracts. *Situation in general.*

234. IT is fixed to the Surface of the Os Humeri by a great number of fleshy Fibres, from the lower Insertion of the Deltoides, almost down to the two Fossæ at the lower Extremity of the Bone, and from one Edge of the Foreside of this lower Extremity to the other. The Fibres are for the most part Longitudinal, those nearest the Surface of the Muscle being longest, the more Internal growing gradually shorter. *Insertions.*

235. THE Lateral Fibres are a little oblique, and this Obliquity increases in those that lie lowest. These Lateral Fibres are partly fixed in the Intermuscular Ligaments of the Os Humeri, of which Ligaments, that which lies toward the Internal Condyle is longer and broader than that toward the External Condyle. The lowest of these Fibres are very oblique, and form on each side a kind of small separate Fasciculus.

236. IN passing over the Joint all these Fibres contract in breadth, and afterwards end in a strong flat Tendon inserted in the Muscular Impression, which is directly below the Coronoide Apophysis of the Ulna. This Muscle adheres very strongly to the Capsular Ligament, and some of its fleshy Fibres terminate therein.

237. THE sloped or forked superior Extremity of this Muscle embraces the large Tendon of the Deltoides. The internal Point of the Fork meets the inferior Insertion of the Coraco-Brachialis; and the foreside of the whole Muscle is covered by the two fleshy Bodies of the Biceps. *Connexion.*

§ 3. *Anconæus Major.*

238. THIS is a long fleshy Muscle lying on the backside of the Os Humeri. *Situation in general.*

239. IT is fixed above by a short Tendon to the inferior Impression in the Neck of the Scapula, and to a small part of the inferior Costa of that Bone. From thence it passes between the Extremities of the Subscapularis and Teres Minor, and having reached the backside of the lower Extremity of the Os Humeri, it ends obliquely in a strong broad Tendon, which adhering closely to the Capsular Ligament, is afterwards fixed by a broad Insertion in the rough Tuberosity on the upper side of the Olecranon. *Insertions.*

240. IT lies between the two Lateral Anconæi, and by its Adhesions to them, a Triceps Muscle is formed, of which this is the middle Portion. I call *Connexion.*

call all these three Muscles *Anconæi*, because of their Insertions in the Olecranium or Ancon.

§ 4. *Anconæus Externus.*

Situation in general.

241. THIS is a long Muscle lying on the outer part of the backside of the Os Humeri, from its Neck to the external Condyle.

Insertions and Connexion.

242. IT is fixed above in the Neck of the Os Humeri under the inferior Surface of the great Tuberosity, and under the Insertion of the Teres Minor, but a little more backward. It runs down by the *Anconæus Major*, adhering strongly to the Bone, except at that oblique Depression, on account of which this Bone appears contorted, as was said in the Treatise of the Skeleton. It is likewise fixed by some oblique Fibres in the external Inter-Muscular Ligament.

243. FROM all this Space the fleshy Fibres contract in breadth, being joined more or less obliquely to the outer Edge of the Tendon of the *Anconæus Major*, all the way to the Olecranium. The termination of these two Muscles in the common Tendon, forms a very acute Angle and represents a sort of Penniform Muscle.

§ 5. *Anconæus Internus.*

Situation in general.

244. THIS Muscle is shorter and more fleshy than the *Anconæus Externus*, and lies toward the inner part of the lower half of the Os Humeri.

Insertions and Connexion.

245. IT is fixed above, under the lower Extremity of the Teres Major, but a little more backward, and to the internal Inter-Muscular Ligament which makes a kind of Septum between this Muscle and the *Brachæus*. From thence the Fibres contracting in breadth, pass toward the Tendon of the *Anconæus Major*, some of them running in between it and the Bone, and are inserted in the Edge and inner Side of that Tendon.

§ 6. *Anconæus Minor.*

Situation in general.

246. THIS is a small Muscle obliquely Triangular, lying in the oblong Fossula on the outside of the Olecranium.

Insertions.

247. IT is fixed by a small but pretty strong Tendon, in the lower part of the external Condyle of the Os Humeri. From thence the fleshy Fibres run down obliquely in a Radiated form, and are inserted in the Bottom and whole Posterior Edge of the Fossula already mentioned.

Connexion.

248. IT is closely united to, and in some Subjects seems to communicate by several Fibres with the Muscle termed *Ulnaris Externus*; and its Tendon adheres very strongly to that of the *Anconæus Externus*. Some Anatomists having confounded this Muscle with the *Ulnaris Externus* have been seen to raise them together, looking afterwards in vain for the *Anconæus Minor*; which however is very easily distinguished from the other by a Fatty or Cellulous Line.

A R T. VI.

The Muscles which move the Radius upon the Ulna.

249. **T**HESE Muscles are reckoned to be four in number, viz.

- | | |
|--|-------------------------------|
| 1. <i>Supinator Longus five Major.</i> | 3. <i>Pronator Teres.</i> |
| 2. <i>Supinator Brevis five Minor.</i> | 4. <i>Pronator Quadratus.</i> |

250. THESE Muscles cannot move the Radius on the Ulna without moving it at the same time on the Os Humeri; but the Radius may be moved on the Os Humeri without being moved on the Ulna, and consequently without the assistance of the Muscles commonly assigned to the Radius.

251. I have already observed that the Supinator Longus does not belong more particularly to the Radius than to the Ulna; and that it is much better fitted for bending the Fore-Arm than for the Supination of the Radius, as shall be further shewn in describing the uses of the Muscles.

252. THERE are some Cases in which these Muscles cannot perform the Motions either of Supination or of Pronation, without the assistance of those that move the Fore-Arm on the Os Humeri, and even of some that move the Os Humeri on the Scapula, as shall be shewn in speaking of the Uses of Muscles.

§ 1. *Supinator Longus five Major.*

253. THIS is a long flat Muscle lying on the External Condyle of the Os Humeri, and on the Convex side of the Radius from one end to the other. *Situation in general.*

254. IT is fixed by fleshy Fibres to the External Inter-Muscular Ligament, and to the Crista of the External Condyle of the Os Humeri, for five or six Fingers breadth above the Condyle, between the Brachæus and Anconæus Externus. From thence it runs along the whole Convex side of the Radius, and is inserted by a flat narrow Tendon, a little above the Styloide Apophysis in the Angle between the Concave and flat Sides of the Extremity of this Bone. *Insertions and Connexion.*

§ 2. *Supinator Brevis five Minor.*

255. THIS is a small thin fleshy Muscle, surrounding a great Portion of the upper third part of the Radius. *Situation in general.*

256. IT is fixed by one end to the lower part of the External Condyle of the Os Humeri, to the External Lateral Ligament of the Joint, to the *Insertions and Connexion.*

the Annular Ligament of the Radius, and to part of the Lateral Eminence in the Head of the Ulna.

257. FROM thence it passes obliquely over the Head of the Radius, covering some part of it, and running down upon, and in some measure surrounding the Neck, it turns in under the Bicipital Tuberosity, and is inserted by the side of the Interosseous Ligament in the inside of the superior Quarter of the Bone, and even a little lower. In some Subjects we may observe the Marks of the passage of this Muscle over the outside of the Bone. It makes an Angle with the Pronator Teres, resembling the Roman V.

§ 3. *Pronator Teres sive Obliquus.*

Situation in general.

258. THIS is a small Muscle, broader than it is thick, situated on the upper part of the Ulna opposite to the Supinator Brevis, with which it forms an Angle like the Letter V.

Insertions.

259. IT is fixed to the internal Condyle of the Os Humeri, partly by fleshy Fibres, and partly by a Tendon common to it with the Ulnaris Internus. From thence it passes obliquely before the Extremity of the Tendon of the Brachialis, and reaches to the middle part of the Convex side of the Radius, where it becomes flat, and is inserted below the Supinator Brevis by an Extremity almost wholly fleshy.

260. IT is called Teres to distinguish it from the Quadratus. The name of Pronator Superior would be more proper, but that of Pronator Obliquus is the most proper of all.

§ 4. *Pronator Quadratus sive Transversus.*

Situation in general.

261. THIS is a small fleshy Muscle nearly as broad as it is long, lying transversely on the inside of the lower Extremity of the Fore-Arm.

Insertions.

262. IT is fixed by one Side or Edge in the long Eminence at the lower part of the internal Angle of the Ulna, and by the other in the broad Concave Side of the lower Extremity of the Radius.

263. IT is wholly fleshy, without any mixture of Tendinous Fibres. It is situated transversely, but that Extremity which lies on the Radius is nearer the Carpus than that on the Ulna. It is of a moderate thickness; and the Fibres nearest the Surface are the longest, the rest decreasing in proportion as they lie near the Interval between the two Bones and the Interosseous Ligament.

264. IT has a Ligamentary or Tendinous Frænum belonging to it, one end of which is fixed in the Interosseous Ligament, the other in the inner Edge of the Basis of the Radius.

PART VII.

The Muscles which move the Carpus upon the Fore-Arm.

265. **T**HE Muscles that immediately perform the Motions of the Carpus on the Fore-Arm, are six in number, viz.

- | | |
|----------------------------------|---|
| 1. <i>Ulnaris Internus.</i> | Muscles, whereof one may be termed |
| 2. <i>Radialis Internus.</i> | <i>Radialis Externus primus</i> , the other <i>Radialis Externus secundus</i> . |
| 3. <i>Ulnaris Externus.</i> | |
| 4, 5. <i>Radialis Externus</i> , | 6. <i>Ulnaris Gracilis</i> , called commonly <i>Palmaris Longus</i> . |
| which is really two | |

They have the names of *Ulnaris* and *Radialis* from their Situation, being all situated along the *Ulna* and *Radius*.

266. THESE Muscles may likewise move the Fore-Arm on the Carpus, and in some cases, they cannot without assistance perform the Motions attributed to them.

267. THE auxiliary Muscles which assist in moving the Carpus on the Fore-Arm, belong to the Class of those that move the Fingers as we shall see hereafter.

§ 1. *Ulnaris Internus.*

268. THIS is a long Muscle, fleshy at its upper Extremity and Tendinous at the other, situated on the outer part of the *Ulna*. *Situation in general.*

269. It is fixed by its upper part in the backside of the long or internal Condyle of the *Os Humeri*, in that part of the *Olecranon* which is next the Condyle, along the upper half of the *Ulna* very nearly; and to the middle common Tendon of the neighbouring Muscle, termed commonly *Profundus*. *Insertions and Connexion.*

270. It runs in the Direction of the external Angle of the *Ulna*, and ends by a long Tendon, in the *Os Pisiforme* or *Orbiculare* of the Carpus, reaching likewise to the *Os Unciforme*, being united to the Ligament common to these two Bones.

§ 2. *Radialis Internus.*

271. THIS is a long Muscle very like the foregoing, but situated more obliquely. *Situation in general.*

272. Its fleshy Portion is fixed by a short Tendon, to the outer and upper side of the inner Condyle of the *Os Humeri*. From thence it passes obliquely *Insertions and Connexion.*

obliquely toward the Radius, and running along about two thirds of that Bone, it forms a long Tendon which continues in the same course, and at the lower Extremity of the Radius, passes under a particular Annular Ligament, and under the Insertion of the Musculus Thenar.

273. THIS Tendon is at length inserted chiefly in the inside of the Basis of the first Metacarpal Bone, and often in the second likewise, and a little in the first Phalanx of the Thumb, having first passed through the Channel of the Os Trapezium, which sustains the Thumb.

§ 3. *Ulnaris Externus.*

Situation in general.

274. THIS is a long Muscle lying on the outside of the Fore-Arm, fleshy toward the Os Humeri and Tendinous toward the Carpus.

Insertions.

275. IT is fixed above to the external Condyle of the Os Humeri, being there united to the Anconæus Minor; to the Annular Ligament of the Head of the Radius, and to the upper half of the external Angle of the Ulna. From thence it advances and forms a Tendon, which passes through the external Notch at the lower Extremity of this Bone, on one side of the Styloide Apophysis.

276. THE Tendon having afterward passed under a particular Ligament situated near the Os Cuneiforme of the Carpus, is inserted in the outside of the Basis of the fourth Metacarpal Bone, sending some Tendinous Filaments to the Basis of the little Finger. It is likewise often fixed in the Basis of the third Metacarpal Bone.

§ 4. *Radialis Externus Primus & Secundus.*

Situation in general.

277. THESE are two Muscles closely united together, appearing at first sight like one Muscle lying along the external Angle of the Radius, between the Os Humeri and the Carpus, being fleshy near the former and Tendinous near the latter.

Division.

278. IN many Subjects we find these two Muscles intirely distinct from one end to the other; and they may be named Radialis Externus Primus & Radialis Externus Secundus, regard being had to the Insertion of their Tendons. Sometimes the two fleshy Portions adhere closely together, appearing to make but one Body, but the Tendons are always distinct and separate.

Insertions.

279. THE first is inserted above, in the Crista of the external Condyle of the Os Humeri, below the Insertion of the Supinator Longus. The second is inserted in the same Condyle below the Insertion of the first; and in the neighbouring Articular Ligament. From thence the two fleshy Bodies run down very close together, and having reached the middle of the outside of the Radius, each of them terminates in a long Tendon.

280. THE two Tendons accompany each other to the Extremity of the Radius, and having passed under a particular Annular Ligament, they are divided as it were into two Cornua, from whence the Ancients who looked upon them as one Muscle, gave it the name of Bicornis.

281. THE

281. ONE of these Tendons is inserted anteriorly in the Basis of the first Metacarpal Bone, the other nearly in the same place of the second Bone, which is the reason why I chose to distinguish them by the names of Primus and Secundus. The Tendon of the first is sometimes double, appearing like another Bicornis.

§ 5. *Ulnaris Gracilis vulgo Palmaris Longus.*

282. THIS is a small Muscle lying between the Os Humeri and the Situation in Carpus on the inside of the Fore-Arm, its Body being small and slender, its general Tendon very long and flat.

283. IT is fixed by its fleshy Portion, in the small Crista of the inner Condyle of the Os Humeri, sometimes closely united to the Ulnaris Internus. From thence it runs down fleshy for some Space, turning a little obliquely towards the middle of the Fore-Arm, and ends in a long, narrow, thin Tendon. *Insertions.*

284. THIS Tendon passes down the middle of the Fore-Arm, over all the other Muscles to which it slightly adheres, and advancing over the large internal Annular or Transverse Ligament of the Carpus, is inserted in the Surface thereof, sending off some Radiated Filaments to the Aponeurosis Palmaris.

285. I have found this Muscle fixed to the Condyle of the Os Humeri by a Tendon about a Finger's breadth in length, to which the fleshy Body was joined toward the middle of the Fore-Arm.

286. I have likewise seen the inferior Tendon inserted in the Os Scaphoides of the Carpus, without communicating with the large Annular Ligament; and I have seen the Aponeurosis Palmaris arise from this Ligament; from all which it may reasonably be concluded, that that Aponeurosis has no essential dependance on this Muscle.

287. SOMETIMES this Muscle appears to be only a production from the Ulnaris Internus.

§ 6. *Palmaris Cutaneus.*

288. THIS Muscle, commonly known by the name of Palmaris Brevis, does not belong to this place, where my design is to mention no Muscles but those which are solely fixed in Bones. But as it is usually ranked among the Muscles belonging to the upper Extremity; and consequently the Description of it would never be looked for any where else, I have chosen to insert it here.

289. IT is a small thin Plane of fleshy Fibres situated transversely, or more or less obliquely under the Skin of the large Eminence in the Palm of the Hand, between the Carpus and the little Finger; its Fibres adhering the Skin, and being in some measure interwoven with the Membrana Adiposa.

290. THESE Fibres are fixed along the Edge of the Aponeurosis Palmaris from the large Ligament of the Carpus toward the little Finger;

and they run in for some space on the Plane of the Aponeurosis, but without any Connexion with the Bones of the Metacarpus. Near the Aponeurosis these Fibres are more or less Tendinous, and some of them often cross each other. They are sometimes so thin and pale, as hardly to be sensible; and in some Subjects this Muscle seems to be divided into several parts.

A R T. VIII.

The Muscles which move the Bones of the Metacarpus.

291. **T**HERE is one Muscle which very visibly moves the fourth Metacarpal Bone on the Os Unciforme of the Carpus, and thereby draws the third Metacarpal Bone along with it. This Muscle, which may be termed Metacarpus, has been always hitherto looked upon as a Portion of a Muscle belonging to the little Finger.

292. THE Metacarpal Bones are likewise moved on the Carpus by the Ulnares and Radiales, and by all the Muscles in general that go to the Fingers, as by so many Auxiliaries.

293. THE number of Metacarpal Muscles would be increased, were the first Phalanx of the Thumb looked upon as a Metacarpal Bone.

Metacarpus.

Situation in general.

294. THIS is a small very fleshy Muscle, situated obliquely between the large internal Annular or Transverse Ligament of the Carpus, and the whole inside of the fourth Metacarpal Bone.

Insertions.

295. IT is fixed by a small short Tendon to the Os Orbiculare, and to the neighbouring part of the large Ligament of the Carpus. From thence its Fibres run more or less obliquely toward the inside of the fourth Metacarpal Bone, in the outer Edge of which they are inserted. The Fibres of this Muscle are of unequal lengths, and extend all the way to the Articulation of the first Phalanx of the little Finger with the fourth Metacarpal Bone, but they have no manner of relation to that Finger.

A R T. IX.

The Muscles which move the Fingers.

296. **T**HESE Muscles may be divided into those which move the Thumb, and those which move the other four Fingers. Both these may again be divided into large or long, and small or short Muscles. The Distinction of these Muscles into common and proper is not suitable, because these two terms are afterwards used as the proper names of some particular Muscles which move the four Fingers.

297. I

297. I said in the beginning of this Treatise that for Muscles solely fixed in Bones, I would make use of no names taken from the Functions attributed to them. However, as the greatest part of the Muscles of the Fingers and Toes have proper names, and only a few of them are called Flexors or Extensors, these names may still be retained, provided they be looked upon only as proper names, as shall be said at more length hereafter.

298. THE Muscles belonging to this Article are these :

- | | |
|-------------------------------------|---|
| 1. <i>Flexor Pollicis Longus.</i> | 8. <i>Extensor Digitorum Communis.</i> |
| 2. <i>Extensor Pollicis Longus.</i> | 9. <i>Extensor Indicis Proprius.</i> |
| 3. <i>Thenar.</i> | 10. <i>Extensor Minimi Digiti Proprius.</i> |
| 4. <i>Mesothenar.</i> | 11. <i>Lumbricales.</i> |
| 5. <i>Antithenar.</i> | 12. <i>Interossei.</i> |
| 6. <i>Perforatus.</i> | 13. <i>Semi-Interosseus Indicis.</i> |
| 7. <i>Perforans.</i> | 14. <i>Hypothenar Parvus.</i> |

§ 1. *Flexor Pollicis Longus.*

299. THIS is a long Muscle, fixed by short and oblique fleshy Fibres to the inside of the upper part of the Interosseous Ligament near the Radius, and along that Bone all the way down to the Pronator Quadratus. There it terminates in a flat Tendon, which is insensibly formed from the very beginning of its superior Insertion, by all the fleshy Fibres of which the Muscle is made up. *Situation and Insertions.*

300. THIS Tendon having passed under a particular Ligament, runs in between the two Portions of the Thenar, and then into a sort of Groove left between the two Sesamoide Bones fixed to the Basis of the second Phalanx of the Thumb, on that side which is turned to the Palm of the Hand. Afterwards the Tendon ends in the flat side of the third Phalanx near its Basis. It is inclosed in a ligamentary Vagina from the Annular Ligament to its Insertion, and it is divided or slit, so that it appears to be inserted by two Extremities adhering together by their Edges.

§ 2. *Extensores Pollicis.*

301. THESE are two very distinct Muscles, the first or longest of which is sometimes more, sometimes less, and sometimes altogether divided into two, in which case these Muscles are three in number. They are situated obliquely between the Ulna and Convex side of the Thumb. *Division and Situation in general.*

302. THE Extensor Primus is a long Muscle, more or less double in the manner already said. It is fixed above by fleshy Fibres, first to the outside of the Ulna near its upper Extremity, below the Anconæus Minor and Insertion of the Ulnaris Externus ; next to the Interosseous Ligament under the Supinator Brevis ; and lastly, to the middle part of the outside of the Radius.

303. FROM thence it runs down and passes anteriorly over the lower part of the Radius and Tendons of the Supinator Longus and Radialis Externus, and being gradually divided, it terminates in two long flat Tendons, more or less subdivided, which pass together under a particular Annular Ligament, being only parted by Septa or Fræna belonging to that Ligament.

304. THE first of these two principal Tendons is inserted in the Edge of the Basis of the first Phalanx, near the large Transverse Ligament of the Carpus. When this Tendon is subdivided, the other Portion of it is fixed in that Bone of the Carpus which sustains the Thumb. The other principal Tendon, which often belongs to a Muscle intirely distinct from the former, is fixed in the Convex side of the Basis of the second Phalanx, where it joins the Tendon of the Extensor Secundus. On account of these different Insertions of the two Tendons, this Muscle is by some Authors described as two.

305. THE Extensor Secundus is shorter than the first. It is fixed to the Ulna below the former, and above the Insertion of the Extensor Indicis Proprius, and likewise to the neighbouring part of the Interosseous Ligament. From thence it runs down obliquely on the middle part of the Radius, where it has likewise a small Adhesion. Afterwards it passes through the small Channel in the Styloide Apophysis of the Radius, through the Annular Ligament belonging to the Tendons of the Radialis Externus, and over these Tendons, being parted from them by a small Ligamentary Septum. It is inserted in the Convex part of the third Phalanx near its Basis, having, as it passes over the second Phalanx, joined the second or collateral Tendon of the first Extensor, more or less.

§ 3. *Thenar.*

Situation in general.

306. THIS is a very thick fleshy Muscle in some measure Pyriform, lying on the first Phalanx of the Thumb toward the Palm of the Hand, the large Eminence in which is chiefly formed by it. Its name is taken from a Greek word which signifies to Strike.

307. IT is fixed to the Bone which supports the Thumb, and to the neighbouring part of the great internal Annular or Transverse Ligament of the Carpus. It is in some measure Bicipital, two distinct Portions answering to the two Insertions already mentioned. As it runs along the first Phalanx these two Portions unite, and diminishing in thickness, are both inserted by one Tendon in the lateral internal part of the Head of the first Phalanx, in the lateral part of the Basis of the second, and in the lateral Ligament of that Joint.

308. THE void Space between the two Portions of this Muscle gives passage to the Tendon of the Flexor Pollicis Longus. That Portion which lies nearest the Hollow of the Hand, is the largest, and its Tendinous Extremity is inserted in the first Sesamoide Bone situated at the Basis of the second Phalanx.

§ 4. *Mesothenar.*

309. THIS is a flat and nearly Triangular Muscle lying between the first Phalanx of the Thumb, and the Bottom of the Palm of the Hand. *Situation in general.*

310. IT is inserted by a very broad Basis in the Ligament which connects the Os Magnum of the Carpus to that which supports the Thumb. It is likewise inserted along the internal or angular part of that Bone of the Metacarpus, which supports the middle Finger, and in the small Extremity of that which answers to the Index. *Insertions.*

311. FROM thence the Fibres contracting to an Angle, terminate in a flat Tendon of different breadths, which is inserted in that side of the Head of the first Phalanx of the Thumb, which is turned to the Hollow of the Hand, and in the neighbouring part of the Basis of the second Phalanx, by means of the second Sefamoide Bone belonging to that Joint.

§ 5. *Antithenar sive Semi-Interosseus Pollicis.*

312. THIS is a small flat fleshy Muscle situated obliquely, between the first Phalanx of the Thumb, and first Bone of the Metacarpus. *Situation in general.*

313. IT is fixed by one end toward the Basis of the first Metacarpal Bone, near the first Bone of the second row of the Carpus. From thence it runs obliquely toward the Head of the first Phalanx of the Thumb, and is inserted in the lateral external part of that Bone, or on that side which is turned to the first Metacarpal Bone. It crosses over the Semi-Interosseus Indicis, this Muscle lying toward the Back of the Hand, and the Antithenar toward the Palm. *Insertions.*

§ 6. *Perforatus vulgo Sublimis.*

314. THIS is a Muscle of a considerable Volume lying along the inside of the Fore-Arm, fleshy for the greatest part near the Articulation of the Fore-Arm with the Os Humeri, and near the Carpus terminating in four distinct Portions, which become the same number of long small Tendons. The name of Sublimis has been given to it, because it lies almost on the Surface of the Fore-Arm; and that of Perforatus from the Slits found near the Extremities of its Tendons. *Situation in general.*

315. IT is commonly made up of four Muscles closely united by their fleshy Portions representing there one large Body of Muscles. It is fixed above to the superior internal parts of the Ulna and Radius, (this last Bone being considered in its natural Situation) and to that of the Interosseus Ligament. A little below the middle of the Fore-Arm, this large fleshy Body is divided into four distinct Muscles, which on the lowest quarter of the Fore-Arm, end in four flat Tendons of different Sizes. *Division and Insertions.*

316. THESE four Tendons are inclosed in a common Membranous or Mucilaginous Vagina, which likewise furnishes each Tendon with a particular

cular thin Vagina. In this manner they advance to the Carpus, and pass under the large annular transverse Ligament. Beyond this Ligament they spread again in the Palm of the Hand, still retaining their particular Vaginae, and run between the Aponeurosis Palmaris and Metacarpus toward the Fingers, separating more and more by degrees. Sometimes there are at first only three Tendons, one of them being afterwards divided into two, in their passage to the Fingers; sometimes they communicate by a kind of Detachment, with the Tendons of the Perforans.

317. HAVING reached the Heads of the Metacarpal Bones, they pass under the four Arches or Fræna formed by the Furcæ of the Aponeurosis Palmaris, and particular Septa of the great transverse Ligament of the Palm of the Hand; and then each Tendon having got beyond the Head of one Metacarpal Bone, and beyond the Basis of the first Phalanx, enters the Ligamentary Vagina on the flat or inner side of that Phalanx, and is inserted in the flat side of the second Phalanx near its Basis, the Membranous Vagina accompanying it to its Insertion. The Ligamentary Vagina is stronger towards the Basis than toward the Head of the first Phalanx.

318. IN passing along the inside of the first Phalanx, the Tendon is divided by a long Slit which gives passage to a Tendon of the Perforans, and from thence the names of these two Muscles are taken.

319. THIS Fissure or Opening is contrived in a very singular manner; the Tendon is first of all divided in two flat Portions, and each Portion is contorted on the flat side of the Phalanx; so that the Edges which were nearest become opposite, and the opposite Edges are joined together all the way to the Extremity of the Tendon. By this Contorsion the Fissure seems to form two small oblique Grooves, which surround the Tendon in opposite Directions, one Groove being covered by the Tendon, and the other covering it.

320. THIS is not all; The two Portions having formed this double Groove by their mutual Contorsion, are not united, only by simply approaching each other at their Extremities; for each Portion is at that place again divided into two others, smaller and shorter than the former; so that in all there are four narrow Portions; the two nearest of which cross each other, and join the other two; so that from the four narrow ones are formed two broad Portions anew, which are joined by their Edges, and afterwards inserted in the Bone at a small distance from each other.

§ 7. *Perforans vulgo Profundus.*

*Situation in
general and
Division.*

321. THIS Muscle is very like the former, and it is situated much in the same manner, only it lies lower and is covered by the Perforatus. It is composed of four Muscles, which at first seem to make but one Mass, and afterwards terminate in four Tendons.

Insertions.

322. THE fleshy Portions of the first and largest and also of the second are fixed in the superior parts of the Ulna and Interosseus Ligament down to their middle; the fleshy Portion of the third is joined to the Tendon of the

the Ulnaris Internus by a sort of common Aponeurosis, and that of the fourth is fixed along the Ulna.

323. THE four Tendons have often several small collateral Tendons, sometimes five in number, united to the Tendons of the neighbouring Muscle, as they pass under the large Annular Ligament of the Carpus; but the Tendons themselves are separated from the others by thin Septa, which form a kind of particular Rings. Being thus strengthened they separate, and running along the Palm of the Hand in distinct Membranous Vaginæ, like those of the Perforatus by which they are covered, they enter the Ligamentary Vaginæ of the first Phalanges together with the former; and having passed through the Fissures thereof, and through the Ligamentary Vaginæ of the second Phalanges, they are inserted in the flat inner side of the third near their Basis.

324. THE Ligamentary Vaginæ of the second Phalanges appear sometimes stronger near the Basis than near the Heads of the Bones.

§ 8. *Extensor Digitorum Communis.*

325. THIS is a compound Muscle very much resembling the Perforatus and Perforans, lying on the outside of the Fore-Arm between the Ulnaris Externus and Radialis Externus. *Situation in general.*

326. IT is fixed above by a Tendinous Extremity, to the posterior and lower part of the external or great Condyle of the Os Humeri, and by a Tendinous Adhesion on each side, to the Ulnaris and Radialis Externus. *Insertions and Division.* It has likewise sometimes a small Insertion in the Radius. It is divided into four Muscles like the Perforatus and Perforans, and four long slender small Tendons.

327. THREE of these Tendons pass through the common external Annular Ligament of the Carpus; and the fourth which goes to the little Finger, and which has sometimes its fleshy Portion distinct from the rest, passes through a particular Ring of the same Ligament.

328. AFTERWARDS these four Tendons separate as they go to the Fingers, and in their passage communicate with each other by oblique Tendinous Series, chiefly near the Heads of the Metacarpal Bones. The Tendons of the middle and little Finger are sometimes double, and yet communicate with the rest.

329. EACH Tendon having reached the Basis of the first Phalanx, is slightly inserted therein by some lateral Expansions fixed in each side of the Basis. From thence it advances to the Head of the same Phalanx, where it is divided into two flat Portions, which at the Articulation of the first Phalanx with the second leave, some distance between them. About the Head of the second Phalanx they unite again, and are fixed in the Convex side of the third Phalanx near its Basis. The Separation of the two Portions is in some sort Rhomboidal, and each Portion is strengthened by a common Tendon of the Lumbricales and Interossei. In the void Space between them are small Tendinous Fræna, more or less transverse.

§ 9. *Extensor*

§ 9. *Extensor Indicis Proprius.**Situation in general.*

330. THIS is a small long Muscle with a long slender Tendon, lying a little obliquely on the lower and outer half of the Fore-Arm between the Ulna and Fore-Finger.

Insertions.

331. IT is fixed by its fleshy Body a little higher than the lowest third part of the outside of the Ulna, below the Insertion of the Extensor Pollicis, and it has likewise a small Adhesion to the Interosseus Ligament. From thence it runs down, ending in a distinct Tendon without any Communications, which having passed through the Annular Ligament of the Extensor Communis, afterwards joins that Tendon which goes to the Index.

§ 10. *Extensor Minimi Digiti Proprius.**Situation in general.*

332. THIS is a kind of collateral or auxiliary Muscle of the Extensor Communis, of which it appears almost always to be more or less a Portion.

Insertions.

333. IT is fixed along the superior external half of the Ulna, from whence its long small Tendon runs down in company with the fourth Tendon of the Extensor Communis, all the way to the little Finger, where it joins it, and is inserted with it. Sometimes this Muscle is wanting, in which case the Extensor Communis sends a double and sometimes a triple Tendon to the little Finger.

§ 11. *Lumbricales.**Situation in general.*

334. THESE are four very small slender Muscles lying in the Hollow of the Hand, in the same Direction with the Perforatus and Perforans.

Insertions.

335. THEY are fixed by their fleshy Bodies to the Tendons of the Perforatus on the side next the Thumb, near the large Annular Ligament of the Carpus. Near the Heads of the Metacarpal Bones they become very thin Tendons, which accompany those of the Perforans through the Furcæ of the Aponeurosis Palmaris. Then they pass on to the same sides of the first Phalanges and join the Tendons of the Extensor Communis, each of them being connected with the nearest Portion thereof, at the Articulation of the first Phalanx with the second.

336. THESE Tendons are likewise united to some of the Interossei, and their Insertions seem to vary in different Subjects; for though they lie generally on that side of the Fingers which is next the Thumb, yet if I am not mistaken, I have observed the first inserted in the Index on the side next the Thumb, the second and third on each side the middle Finger, and the fourth in that side of the Ring Finger which is farthest from the Thumb.

§ 12. *Interossei*

§ 12. *Interossei.*

337. THESE are small Muscles lying between the Metacarpal Bones, *Situation is* and filling the three Interstices left between them, both exteriorly or to- *general and* wards the back of the Hand, and interiorly or toward the Palm of the *Division.* Hand. From this Situation they have the name of Interossei, and have been divided into External and Internal. They are commonly reckoned six in number, three External and three Internal, regard being had only to the fleshy Masses in the Metacarpus, and to the six Tendinous Insertions in the Fingers; but if we consider the composition of these Masses, their number may be increased.

338. THE external Interossei are stronger, more compound, and take up more Space between the Metacarpal Bones than the internal. Each of them is made up of two Portions, one which appears almost on a level with the Bones, the other hid, and which runs in upon the internal Muscles.

339. THE apparent Portion is in some measure Penniform, being fixed along the sides of two Bones, and also by a small Extremity to the nearest Bone of the Carpus. The other Portion which lies hid appears more simple, and seems to be fixed only to the Bases of the same two Bones.

340. NEAR the Heads of the Metacarpal Bones, these two Portions of each Muscle end in broad flat Tendons, which having reached the side of the first Phalanx of one Finger, are afterwards united with the nearest Portion of the Tendon of the Extensor Communis. One Portion is likewise inserted in the Phalanx itself, by small short Tendons. These Muscles may therefore be reckoned Bicipital, especially when the Tendons of the two Portions unite.

341. THE first two external Interossei are for the most part inserted in the middle Finger. They fill the Interstices between the three first Metacarpal Bones, and surround the middle Bone all the way to the Hollow of the Hand. Their Tendons are fixed in both sides of the first Phalanx, and in both sides of the second Tendon of the Extensor Communis.

342. THE third external Interosseus lies in the Interstice betwixt the two last Metacarpal Bones, and is most commonly inserted in the Ring Finger; its Tendon being fixed in that side of the first Phalanx farthest from the Thumb, and in the corresponding Edge of the third Tendon of the Extensor Communis. The fleshy Body of this Muscle runs in between the two Bones toward the Hollow of the Hand.

343. THE internal Interossei are more simple than the former, and do not lie so much between the Bones. The Tendon of the first is inserted in the side of the first Phalanx of the Fore-Finger, next the little Finger, and in the corresponding Edge of the Extensor Communis. The Tendon of the second goes in the same manner to the side of the Ring Finger next the Thumb; and the third, to the same side of the little Finger.

344. THERE are therefore two external Interossei for the Middle Finger, one for the Ring Finger, but none for the Fore and Little Finger. The Middle Finger has no internal Interosseus; but the Index, Ring Finger and Little Finger have each of them one.

345. THE external Interossei appear sometimes to be really double, the two Muscles being separated by a fatty Line; so that in some Subjects we have six internal Interossei. But the fleshy Portions on each side of the second Metacarpal Bone belong to the two first external Muscles; and the fleshy Portion on the side of the fourth Metacarpal Bone next the Thumb, belongs to the third external Interosseus, according to the disposition in which I have described them.

§ 13. *Semi-Interosseus Indicis.*

Situation in general.

346. THIS is a small, short, flat, fleshy Muscle, very like the Antithenar or Internal Semi-Interosseus of the Thumb. It is situated obliquely on one side of that of the Thumb, between the first Phalanx thereof, and first Metacarpal Bone.

Insertions.

347. IT is fixed by one end to the outside of the Basis of the first Phalanx of the Thumb, and a little to that Bone of the Carpus by which this Phalanx is supported; and by the other end it is fixed near the Head of the first Phalanx of the Index, on that side next the Thumb. It lies almost parallel to the Antithenar, crossing over it a little; this Muscle lying on the Convex side of the Hand, and the Antithenar on the Concave side.

§ 14. *Hypothenar Minimi Digiti.*

Situation in general.

348. THIS is a small and pretty long Muscle lying on the backside of the fourth Metacarpal Bone opposite to the Thumb, where together with the Metacarpus or Hypothenar Metacarpi, it forms that large Eminence over against the Thenar or that of the Thumb. It may be called Hypothenar Minor, and that of the Metacarpus, Hypothenar Major.

Insertions.

349. IT is fixed by one end in the Os Orbiculare of the Carpus, and a little to the neighbouring part of the large Annular Ligament. The other end terminates by a short flattish Tendon fixed to that side of the Basis of the first Phalanx of the little Finger which is turned from the Thumb. This Muscle covers the Metacarpus a little, and they have both been looked upon as Portions of one Hypothenar.

A R T. X.

The Muscles which move the Os Femoris upon the Pelvis.

350. **T**HESE Muscles are commonly twenty two in number, sixteen of which are inserted in the Os Femoris, and six move it without being fixed to it.

351. THESE Muscles only which are inserted in the Os Femoris are reckoned to belong to the Thigh, and they are commonly said to be fourteen in number, but it is easy to make out sixteen very distinct from each other. Of these sixteen three lie on the fore and upper part of the Thigh, viz.

1. *Psoas.* 2. *Iliacus.* 3. *Pectineus.*

352. ON the inside of the Thigh are three, commonly reckoned one, by the name of Triceps, though according to the ancient language it has three Tails, as well as three Heads and three Bellies, and therefore might more properly be called Triplex.

4. *Triceps sive Triplex Primus.* 5. *Triceps Secundus.* 6. *Triceps Tertius.*

353. THREE form the Buttocks, and are called,

7. *Glutæus Maximus.* 8. *Glutæus Medius.* 9. *Glutæus Minimus.*

354. THERE are six very small Muscles, more or less hid under the Glutæi, the four first of which are by some termed *Quadrigemini*. The particular names of these six are :

10. *Pyriformis.*

13. *Quadratus.*

11. *Gemellus Superior.*

14. *Obturator Externus.*

12. *Gemellus Inferior.*

15. *Obturator Internus.*

355. Lastly, there is a small anterior superficial Muscle, commonly but falsely termed *Fascia Lata*, which is a large Membranous, Tendinous, or Ligamentary Covering, to which the greatest part of this small Muscle is fixed ; and therefore it ought not to be called by the name of that Membrane without restriction, that is, without the addition of *Musculus* in this manner :

16. *Musculus Fasciæ latæ sive Musculus Membranosus.*

356. THE six Muscles which move the Os Femoris without being inserted in it, belong to the Class of those which move the Leg upon the Thigh, viz.

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|---|------------------------------------|
| 17. <i>Sartorius.</i> | 20. <i>Semi-Membranosus.</i> |
| 18. <i>Rectus Gracilis.</i> | 21. <i>Semi-Nervosus.</i> |
| 19. <i>Rectus sive Gracilis internus.</i> | 22. <i>Portio Bicipitis longa.</i> |

357. ALL these Muscles, whether inserted or not inserted in the Os Femoris, not only move that Bone on the Pelvis, but may also move the Pelvis on the Os Femoris.

Fascia Lata.

358. THE Fascia Lata already mentioned surrounds more or less all these Muscles. It is a Muscular Ligament very considerable both for its extent and strength, being made up chiefly of two Planes of Fibres, of which the External are more or less Longitudinal; the Internal more or less Transverse. It is further strengthened in some places by a great number of other Fibres which augment its thickness and form particular Expansions. The Transverse Fibres are much stronger than the Longitudinal.

359. IT is fixed above to the Edge of the Crista Ossis Ilium from the large Tuberosity, to the Anterior Superior Spine; to the Ligamentum Falloppii, and to the Aponeurosis of the Obliquus Externus of the Abdomen, on which it runs up by a thin Lamina. It is likewise fixed in the lateral inferior part of the Os Sacrum, and to the neighbouring parts of the Ligaments by which that Bone is connected to the Ossa Ilium and Ischium.

360. FROM thence it advances over the Glutæi and Thigh between the Membrana Adiposa and Muscles, all the way to the anterior and outer parts of the Knee. It is very thin on the Patella, but may be separated from it. It is likewise continued over the external anterior part of the Tibia, covering the Muscles which lie there, and is strongly inserted in the Head and Crista of that Bone, and in the upper part of the Fibula.

361. IT sends off Elongations which like so many Septa, run in between the Muscles, and sometimes meet in such a manner as to form Vaginæ. It is strongest on the anterior and outer parts of the Thigh, growing gradually thinner on the inner and back parts.

362. IT is strongly inserted in the Linea Femoris Aspera between the Vastus Externus and Biceps, forming a sort of Septum between these Muscles. It furnishes particular Vaginæ to the Muscles which lie on the inside of the Thigh; and though these Vaginæ are thin, they are nevertheless pretty strong, being chiefly made up of transverse Fibres.

§ 1. *Psoas sive Lumbaris Internus.*

Situation in general.

363. THIS is a long thick Muscle situated in the Abdomen on the Lumbar Region, adhering to the Vertebrae of the Loins, from the Posterior part of the Os Ilium to the Anterior part near the Thigh.

364. IT

364. IT is fixed above to the last Vertebra of the Back and to all those of the Loins, that is, to the lateral parts of the Bodies of these Vertebrae, and to the Roots of their transverse Apophyses. The Insertions in the Bodies of the Vertebrae are by a kind of Digitations, and are very little Tendinous.

365. FROM thence the Muscle runs down laterally over the Os Ilium, on one side of the Iliack Muscle, and passes under the Ligamentum Falloppii, between the anterior inferior Spine of the Os Ilium, and that Eminence which from its Situation may be termed Ilio-Pectinea.

366. BEFORE it goes out of the Abdomen it unites with the Iliacus, and is sometimes fixed by a few fleshy Fibres, in the outside of the Eminence last mentioned. It afterwards covers the foreside of the Head of the Os Femoris, and is inserted in the forepart of the little Trochanter by an oblique Tendon, which is folded double from behind forward.

367. THIS Muscle is sometimes accompanied by another smaller Muscle, almost like it, called Psoas Parvus, which I have ranked among the Muscles of the Loins, because it seldom reaches lower than the Pelvis.

§ 2. Iliacus.

368. THIS is a broad thick Muscle lying on the whole inside of the Os Ilium. *Situation in general.*

369. IT is fixed by fleshy Fibres to the internal Labium of the Crista Offis Ilium, to that of the Slope between the two anterior Spines, to the insides of these Spines, to the superior half of the inside of this Bone, and to the neighbouring lateral part of the Os Sacrum. *Insertions.*

370. ALL these Fibres contracting by degrees run obliquely towards the lower part of the Musculus Psoas, uniting therewith, and being fixed by a kind of Aponeurosis to the outside of its Tendon all the way to the little Trochanter. They cover the Head of the Os Femoris, and some of the lowest are inserted in that Bone a little above and behind the little Trochanter, and others a little lower down.

371. ON the outside of the lower Extremity of the Iliacus, there is sometimes a small separate Muscle fixed immediately under the anterior inferior Spine of the Os Ilium, from whence it runs obliquely downward, joins the Iliacus and is inserted below the little Trochanter. It represents in some measure a Roman V with the Pectineus, and might be reckoned an Iliacus Minor, if the large Muscle had not sometimes an Insertion in the side of the Eminence called Ilio-Pectinea.

372. The Iliacus and Psoas thus united pass under the Ligamentum Falloppii, over the Slope or Channel between the anterior inferior Spine of the Os Ilium and Eminentia Ilio-Pectinea, in a sort of Ligamentary Capsula very smooth and polished, that part of it which covers the Channel appearing like a Cartilage.

§ 3. *Pectineus.**Situation in general.*

373. THIS is a small flat and pretty long Muscle, broad at the upper part and narrow at the lower, situated obliquely between the Os Pubis and upper part of the Os Femoris. It is commonly a single Muscle; but I have sometimes found it double.

Insertions.

374. IT is fixed above by fleshy Fibres to all the sharp Ridge or Crista of the Os Pubis, and to a small part of the oblong Notch or Depression on the foreside of that Crista, in which the upper Extremity of this Muscle is lodged.

375. FROM thence it runs down obliquely towards the little Trochanter, under and a little behind which, it is inserted obliquely by a flat Tendon, between the superior Insertion of the Vastus Internus and inferior Insertion of the Triceps Secundus with which it is united.

§ 4. *Glutæus Maximus.**Situation in general.*

376. THIS is a thick broad Muscle, resembling the Quadrant of a Circle in Figure, lying on the outside of the Os Ilium and upper part of the Os Femoris.

Insertions.

377. IT is fixed wholly fleshy to all the lateral Posterior parts of the Os Coccygis and Os Sacrum; to the Ligamentum Sacro-Sciaticum; to the outside of the Tuberosity of the Os Ilium; and from thence to the external Labium of the Crista of that Bone all the way to its highest part where this Muscle mixes Fibres with the Glutæus Medius.

378. IT is likewise fixed to the inside of the Fascia Lata at the places, which answer to all the Insertions already mentioned, but through a much greater Space, and by a very great number of fleshy Fibres, almost in the same manner as we shall see in the external Plane of the Musculus Temporalis. The Fibres which end in this Fascia become gradually shorter, as they are situated lower.

379. ALL these Fibres contract in breadth in a Radiated manner as they approach to the great Trochanter, and afterwards form a strong, flat, pretty broad Tendon, about an Inch in length, which is inserted a Finger's breadth or a little more below the great Trochanter, in all that large Longitudinal Impression at the upper part of the Linea Aspera on the back-side of the Os Femoris, between the Vastus Externus and largest Portion of the Triceps.

380. THIS Tendon is covered and strengthened by a production of the Fascia Lata, in which several fleshy Fibres of this Muscle are inserted at that place. It is a very strong Tendon, and in this and other respects bears some resemblance to that of the Deltoides.

Connexion.

381. THIS Muscle covers part of the Glutæus Medius; and at its Insertion in the Os Coccygis, it almost joins that of the Glutæus Maximus of the other side.

§ 5. *Glutæus*

§ 5. *Glutæus Medius.*

382. THIS is a radiated Muscle almost in the Shape of a spread Fan. *Situation in general.* It is pretty thick, and almost as broad as the whole outside of the Os Ilium, being situated between the Crista of that Bone and the great Trochanter, and covered Anteriorly by the Fascia Lata, and Posteriorly by the Glutæus Maximus.

383. IT is fixed above by fleshy Fibres to all that Space on the outside of the Os Ilium, which lies between the external Labium of the Crista, and the semicircular Impression which goes between the Superior Anterior Spine, and the great Posterior Sinus.

384. IT is likewise fixed in the Edge of that Ligament which goes between the lower part of the Os Sacrum and Os Ilium. Lastly, the inner part of it which is covered only by the Fascia Lata is inserted in the inside of that Fascia in the same manner as the Glutæus Maximus.

385. FROM thence all the Fibres contract in breadth, more or less in a radiated manner, as they advance toward the great Trochanter, and form a short thick Tendon which mixes a little anteriorly with the Tendon of the Glutæus Minimus; and the most Posterior Fibres gradually join the side of the Tendon of the Pyriformis.

386. THE Tendon is inserted in the upper Convex part of the great Trochanter, from the Apex of the large superior external rough Surface, all the way to the anterior rough Surface, encompassing in a manner all that part of the Trochanter.

387. THIS is the broadest of all the Glutæi. The Disposition of its *Connexion.* Fibres is not every where uniform; the anterior Series seeming to make a distinct Portion, not by being separated from the rest, but by being differently directed, for they descend almost parallel to each other; whereas the middle and posterior Portions are in a more Radiated Disposition; and the anterior Portion is likewise more fleshy and thick than the other two.

388. WHEN this Muscle is inverted upward, its Tendon being first cut off from its Insertion, we see a kind of Tendinous Arch running along its whole Insertion in the semicircular Line.

§ 6. *Glutæus Minimus.*

389. THIS is a small, broad, radiated Muscle situated on the outside of *Situation in general.* the Os Ilium, under the other two Glutæi.

390. IT is fixed above in all that Portion of the outside of the Os Ilium, *Insertions.* which lies between the great semicircular Line, and another small one a little above the Supercilium of the Cotyloide Cavity or Acetabulum, running between the Anterior Inferior Spine and the great Posterior Sinus. It is likewise fixed in the Edge of that Sinus, in the Spine of the Ischium and in the Orbicular Ligament of the Joint of the Hip.

391. FROM

391. FROM thence its Fibres contracting in breadth, form a short Tendon, by which the Muscle is inserted in the anterior part of the upper Edge of the great Trochanter, above the great external convex rough Surface in which the Glutæus Medius is fixed; and also in an oblique Surface which runs down a little way between that last named and the rough anterior Surface.

392. THE Tendon is increased in breadth in its oblique course downward, and is likewise inserted in the Orbicular Ligament chiefly by two particular Tendinous Productions or Expansions:

§ 7. *Triceps Primus.*

Situation in general.

393. THIS with the two following Tricipital Muscles, are fleshy and flat and of different lengths, situated between the Os Pubis and the whole length of the Os Femoris. The first and second cross each other in such a manner, as that the Muscle which is the first on the Os Pubis becomes the second on the Os Femoris, and the second on the Os Pubis is the first on the Os Femoris. The third Muscle keeps its rank.

Insertions.

394. THE Triceps Primus is fixed above by a short Tendon to the Tuberosity or Spine of the Os Pubis, and to the neighbouring part of the Symphysis, its Fibres mixing a little with those of the Pectineus. From thence it runs down, increasing in breadth, and is inserted by fleshy Fibres interiorly in the middle Portion of the Linea Femoris Aspera.

395. AT the lower part of this Insertion, a Portion of the Muscle separates from the rest and sends off a long Tendon, which together with a like Tendon from the Triceps Tertius, is inserted in the inner Condyle of the Extremity of the Os Femoris.

§ 8. *Triceps Secundus.*

Insertions.

396. THIS Muscle is fixed above by fleshy Fibres, below the superior Insertion of the Triceps Primus, in all the outside of the inferior Ramus of the Os Pubis, as low as the Foramen Ovale, but seldom so low as the Ramus of the Os Ischium. This Insertion is broader than that of the former Muscle.

397. FROM thence it runs down and is inserted in the upper part of the Linea Aspera, between the Pectineus and Triceps Primus, mixing a little with each of these Muscles. This Insertion appears sometimes divided.

§ 9. *Triceps Tertius.*

Insertions.

398. THIS Muscle is fixed above by fleshy Fibres to the anterior part of all the short Ramus of the Ischium, and to a small part of the Tuberosity of that Bone. This Insertion covers some part of the Tendon of the Semi-Membranosus, and is covered by that of the Semi-Nervosus.

399. FROM

399. FROM thence it runs down and is inserted by fleshy Fibres in the Linea Aspera almost from the little Trochanter down to the middle of the Os Femoris. It goes lower down than the first Triceps, sending off a separate Portion like that of the Muscle last mentioned.

400. THESE two Portions join together and form a common Tendon, which running down to the lower Extremity of the Os Femoris, is inserted in the back part of the Tuberosity of the inner Condyle. This separate Portion is sometimes large enough to be taken for a distinct Muscle, in which case we have a Quadriceps instead of a Triceps.

401. IN all this progress this Muscle is joined to the Vastus Internus by a perforated Aponeurosis through which the Blood-Vessels pass.

§ 10. *Pyriformis sive Pyramidalis.*

402. THIS is a small oblong Muscle of the Figure of a flat Pear or Pyramid, from whence it has its name. It is situated almost transversely between the Os Sacrum and Ischium, being covered and hid by the first two Glutæi. *Situation in general.*

403. IT is fixed to the inferior lateral part of the Os Sacrum, by fleshy Fibres, and to the neighbouring part of the Anterior or Concave side of that Bone, by three Digitations lying between the Anterior Holes. It is likewise fixed by a small Insertion to the Ligamentum Sacro-Sciaticum and Edge of the great Sinus of the Os Ilium. *Insertions.*

404. FROM thence it runs transversely toward the Joint of the Hip, its Fibres contracting in breadth, and ends in a small Tendon which is inserted in the middle of the internal Labium of the upper Edge of the great Trochanter, by two or three Branches. The upper part of this Tendon receives several Fibres from the Glutæus Medius, and its lower part is united to the Gemellus Superior, and Tendon of the Obturator Internus.

405. SOMETIMES there are two Pyriformes separated by the Nervus Sciaticus.

§ 11. *Obturator Internus.*

406. THIS is a flat Muscle almost Triangular, situated in the bottom of the Pelvis. It covers the Foramen Ovale, and almost all the inside of the Os Pubis and Ischium. It has its name from a Latin Verb which signifies to fill up, cover or stop. *Situation in general.*

407. IT is fixed to the internal Labium of all the Anterior half of the Foramen Ovale, a little to the neighbouring part of the Obturator Ligament; and also both above and below the Foramen. It is likewise fixed to the upper half of the inside of the Os Ischium from the upper oblique Notch in the Foramen Ovale, to the superior part of the great Posterior Sinus of the Os Ilium, which would be more properly named Sinus Iliacus than Sinus Ischiadicus. *Insertions.*

408. FROM all this Extent the fleshy Fibres contracting in breadth run down below the Spine of the Ischium, where they go out of the Pelvis through the Posterior Notch of the Ischium. The inside of the Body of this Muscle, or that turned to the Cavity of the Pelvis, is pretty uniform; but the outside, or that turned toward the Foramen Ovale and which touches the Bone, has four middle radiated Tendons, which uniting at the Posterior Notch of the Ischium, run over it from behind forward, as over a Pulley, each Tendon sliding in a particular Cartilaginous Channel described in the Treatise of the Skeleton.

409. AFTERWARDS the four Tendons having got out of the Pelvis, are very strictly united in one large flat Tendon, which crossing over that of the Piriformis, unites with it, having first received on each side some additional fleshy Fibres from the two Gemelli.

410. THE great Tendon slides freely in a sort of Membranous Vagina formed by these Muscles, as shall be observed hereafter, and is inserted in the middle of the superior part of the Cavity of the great Trochanter, adhering closely to the Capsular Ligament of the Joint, and being united to the Tendons of the Glutæus Minimus and Piriformis.

§ 12. Gemelli.

Situation in general.

411. THESE are two small, flat, narrow Muscles, situated almost transversely one above the other, between the Tuberosity of the Ischium and the great Trochanter, immediately below the Piriformis, and parted by the Tendon of the Obturator Internus.

412. THE superior and smallest Gemellus is fixed to the lower part of the Spine of the Ischium, to the superior part of the small Ischiatic Notch, and to a rough Line which runs cross the outside of the Ischium beginning from the Spine, and continued under the Acetabulum, where it is bent downward.

413. THE inferior and largest Gemellus is fixed to the superior and back part of the Tuberosity of the Ischium, and to a rough Impression which runs cross the outside of the Ischium from the lower Extremity of the Ischiatic Notch, and is bent upward toward the other Line, together with which it forms a sort of irregular Semi-Circle.

414. BOTH these Muscles have likewise a small Insertion in the inside of the Ischium, where being united together by a particular Membrane, one of them joins the upper side, and the other the lower side of the Obturator Internus, a little after it has passed over the Notch: They inclose it as in a Bag, and continue to be fixed to it by fleshy Fibres all the way to its Extremity.

415. THE superior Muscle terminates wholly with the Tendon of the Obturator Internus, but the inferior being broader, is inserted likewise by fleshy Fibres in the Orbicular Ligament, and under the Tendon of the same Obturator.

§ 13. *Obturator Externus.*

416. THIS is a small flat Muscle which fills up the Foramen Ovale of the Os Innominatum exteriorly, and reaches from thence to the great Trochanter of the Os Femoris, behind the Neck of that Bone. *Situation in general.*

417. IT is fixed by fleshy Fibres to the outer or anterior side of the Os Pubis, all the way to the Foramen Ovale, to the Edge of that Hole, next the small Ramus of the Ischium, and a little to the neighbouring parts of the Obturator Ligament. *Insertions.*

418. FROM thence its Fibres contracting in breadth, pass on the fore-side of the great Ramus of the Ischium, under the Acetabulum, where a Tendon is formed, which continues its course behind the Neck of the Os Femoris toward the great Trochanter, and is inserted between the Gemelli and Quadratus, in a small Fossula between the Apex of the great Trochanter, and the Basis of the Collum Femoris.

§ 14. *Quadratus.*

419. THIS is a small, flat, fleshy Muscle, of the Figure of an oblong Square, from whence it has its Name. It is situated transversely between the Tuberosity of the Ischium and the great Trochanter. *Situation in general.*

420. IT is fixed by one Extremity along that obtuse Line which runs from under the Acetabulum, toward the lower part of the Tuberosity of the Ischium. From thence it runs directly toward the great Trochanter, and is inserted in almost all the lower half of the oblong Eminence in that Apophysis; but chiefly in the small rising or Tuberosity in the middle of that Eminence. *Insertions.*

§ 15. *Musculus Fasciæ Latæ.*

421. THIS is a small and pretty long Muscle, situated a little obliquely upward and downward on the forepart of the Hip. *Situation in general.*

422. IT is fixed above to the outside of the anterior superior Spine of the Os Ilium, between the Insertions of the Glutæus Medius and Sartorius. From thence its fleshy Fibres run down a little obliquely backward, forming a very flat Body, four Fingers breadth in length, and two in breadth. *Insertions.*

423. THIS Body lies between two Laminæ of the Fascia Lata, and is inserted therein by short Tendinous Fibres, which disappear at that place where the Fascia adheres to the great Trochanter and Tendon of the Glutæus Maximus. We ought by no means therefore to look upon the Fascia as a Tendinous Expansion of this Muscle.

A R T. XI.

The Muscles which move the Bones of the Leg on the Os Femoris.

424. **T**EN Muscles are commonly reckoned to belong to this Article. Most of them are very long, and situated lengthwise near each other, quite round the Os Femoris.

- | | |
|---|---|
| 1. <i>Rectus Anterior sive Gracilis Anterior.</i> | 6. <i>Gracilis Internus sive Rectus Internus.</i> |
| 2. <i>Vastus Externus.</i> | 7. <i>Biceps.</i> |
| 3. <i>Vastus Internus.</i> | 8. <i>Semi-Nervosus.</i> |
| 4. <i>Crureus.</i> | 9. <i>Semi-Membranosus.</i> |
| 5. <i>Sartorius.</i> | 10. <i>Popliteus.</i> |

425. OF these ten Muscles, the Popliteus only is small, and lies as it were out of the rank of the rest, being situated below the Thigh. One Portion of the Biceps is likewise small.

426. THESE Muscles not only move the Leg upon the Thigh, but also the Thigh upon the Leg, the Popliteus excepted. Some of them likewise move the Thigh upon the Pelvis, and the Pelvis upon the Thigh, viz. The Gracilis Anterior, Sartorius, Gracilis Interior, the great Portion of the Biceps, Semi-Nervosus, and Semi-Membranosus.

427. THESE are not the only Muscles which move the Leg upon the Thigh and the Thigh upon the Leg. The Gastrocnemii may likewise perform these Motions, though commonly confined to the Extension of the Foot.

§ 1. *Rectus Anterior sive Gracilis Anterior.*

Situation in general.

428. THIS Muscle is as long as the Os Femoris, and lies directly along the foreside of the Thigh, from whence it has the name of Rectus Anterior. The greatest part of it is fleshy, and the middle is broader than the two Extremities. It is called Gracilis, from its thinness or flatness.

Insertions.

429. IT terminates above, by a pretty strong Tendon which is divided into two Branches, one short and streight, the other long and bent. The short Branch running up in a streight Line, is inserted in the anterior inferior Spine of the Os Ilium.

430. THE long Branch is inflected backward over the Supercilium of the Acetabulum, and runs in the Direction thereof from the Spine toward the great Ischiatic Sinus. It is strong and flat, adhering very closely to the Bone and covered by the Orbicular Ligament and the Glutæus Minimus; and

and therefore they who follow the common method, in dissecting, often cut it off, and observe only the small Branch of the Tendon.

431. FROM thence the Muscle runs down wholly fleshy, and partly Penniform, some of its Fibres meeting above and separating below. It is narrow at the upper Extremity, and grows gradually broader toward the middle. Afterwards it contracts again in the same manner, and at the lower Extremity of the Os Femoris ends in a flat broad Tendon.

432. THROUGH its whole course it lies between the two Vasti and covers the Crureus; and its inferior Tendon is inserted in the upper Edge of the Patella, from whence it sends down a small Plane of Tendinous Fibres which adhere very closely to the Convex side of that Bone, and having reached the great Ligament, seem to be lost therein.

§ 2. *Vastus Externus.*

433. THIS is a very large fleshy Muscle, almost as long as the Os Femoris, broad at the Extremities and thick in the middle, lying on the outside of the Thigh. *Situation in general.*

434. Its upper Insertion being something Tendinous, is in the Posterior or Convex rough Surface of the great Trochanter. It is likewise fixed by a fleshy Insertion along the outside of the Os Femoris for above two thirds of its length downward, in the corresponding part of the Linea Aspera, and in the neighbouring Portion of the Fascia Lata. *Insertions.*

435. FROM all this Extent the fleshy Fibres running downward, and a little obliquely forward toward the Rectus Anterior, terminate insensibly in a kind of short Aponeurosis, which is fixed in all the nearest Edge of the Tendon of the Rectus, in the side of the Patella, in the Edge of the Ligament of that Bone, and in the neighbouring lateral part of the Head of the Tibia.

436. THE Body or Belly of this Muscle grows bigger gradually from its upper Extremity to the middle, and from thence diminishes again by degrees. Its lowest Fibres run in a little behind the Rectus and are inserted there.

§ 3. *Vastus Internus.*

437. THIS Muscle is very like the former, and situated in the same manner on the inside of the Os Femoris. *Situation in general.*

438. IT is fixed above by a short flat Tendon, in the anterior rough Surface of the great Trochanter, and by fleshy Fibres in that oblique Line which terminates the Basis of the Collum Femoris anteriorly, on the fore-side of the Insertions of the Psoas and Iliacus; in the whole inside of the Os Femoris, and in the Linea Aspera on one side of the Insertions of the three Tricipites, almost down to the internal Condyle. *Insertions.*

439. FROM all this Extent the Fibres run downward, and a little obliquely forward, and the Body of the Muscle increases in the same manner as

as the Vastus Internus. It terminates below in an Aponeurosis, which is fixed in the Edge of the Tendon of the Rectus Anterior, in the side of the Patella, and of its Tendinous Ligament, and in the side of the Head or upper Extremity of the Tibia.

§ 4. *Crureus.*

Situation in general.

440. THIS is a fleshy Mass, covering almost all the foreside of the Os Femoris between the two Vasti, which likewise cover the Edges of this Muscle on each side.

Insertions.

441. IT is fixed to the foreside of the Os Femoris, from the Anterior Surface of the great Trochanter down to the lowest Quarter of the Bone, by fleshy Fibres which run down successively over each other, between the two Vasti, and are partly united to these two Muscles, so as not to seem to form a distinct Muscle.

442. IT is not so thick as the two Vasti; and as it is covered by them on each side, a sort of fleshy Channel is formed by all the three, in which the Rectus is lodged, covering the forepart of the Crureus.

443. IT terminates below in a Tendinous Aponeurosis which joins the backside of the Tendon of the Rectus Anterior, and the neighbouring Edges of the Extremities of the two Vasti. Thus these four Muscles form a common Tendon, which is inserted in the places already mentioned.

§ 5. *Sartorius.*

Situation in general.

444. THIS is the longest Muscle of the Human Body. It is flat, and about two Fingers in breadth, situated obliquely along the inside of the Thigh. It is called Sartorius for a reason which shall be given in describing its uses.

Insertions.

445. IT is fixed above by a very short Tendon, in the lower part of the anterior superior Spine of the Os Ilium, before the Musculus Fasciæ Latæ. The beginning of its Body lies in the Notch between the two Anterior Spines of that Bone.

446. FROM thence it runs down obliquely over the Vastus Internus and other Muscles that lie near it, all the way to the inside of the Knee, where it terminates in a small Tendon which grows broader near its Extremity, and is inserted obliquely and a little transversely, in the forepart of the inside of the Head of the Tibia, near the Spine or Tuberosity of that Bone, immediately above the Insertion of the Gracilis Interior.

447. THE fleshy Body of this Muscle is inclosed in a Vagina formed by an Expansion of the Fascia Lata. Its Fibres in general are Longitudinal, and where its lower Tendon turns obliquely round toward the Head of the Tibia, it seems to be braced down and secured in its place, by a Tendinous Frænum or Vagina. A little before it is inserted, it detaches a distinct Aponeurosis or Tendinous Branch, which runs obliquely downward on the inside of the Tibia.

§ 6. *Gracilis Interior sive Rectus Interior.*

448. THIS is a long thin Muscle lying in a streight Line on the inside of the Thigh, between the Os Pubis and the Knee ; and from this Situation and Structure its names are taken. *Situation in general.*

449. IT is fixed in the Edge of the Inferior Branch of the Os Pubis near the Symphysis, by a broad and very short Tendon, on one side of the Insertion of the Triceps Secundus, but a little lower down. *Insertions.*

450. FROM thence the fleshy Fibres contracting a little in breadth, run down to the internal Condyle of the Os Femoris, where they terminate in a thin Tendon, which afterwards degenerates into a kind of Aponeurosis, and is inserted in the forepart of the inside of the Head of the Tibia.

451. THIS Tendon is inserted immediately below the Sartorius, by which it is partly covered, and above the Semi-Tendinosus which it partly covers, mixing some Fibres with it. Before it ends, it makes the same oblique Turn, and is braced down in the same manner as the Tendon of the Sartorius, and it sends the same kind of Aponeurosis obliquely downward, on the inside of the Tibia.

§ 7. *Biceps.*

452. THIS Muscle is made up of two Portions, one long, the other short, and they end in a common Tendon. Both Portions are fleshy and considerably thick, being situated on the back and outside of the Thigh between the Buttock and Ham. *Situation in general.*

453. THE great Portion is fixed above by a strong Tendon in the posterior and lower part of the Tuberosity of the Ischium under the Insertion of the inferior Gemellus, and close behind that of the Semi-Nervosus. From thence it runs down toward the lower Extremity of the Thigh, where it meets the other Portion, and joins with it in forming a common Tendon.

454. THE small Portion is fixed by fleshy Fibres to the outside of the Linea Aspera below its middle, and to the Fascia Lata where it forms a Septum between the Triceps and Vastus Externus. From thence the Fibres run down a little way, and then meeting the great Portion, a common Tendon is formed between them.

455. THIS strong Tendon runs down to the outer and back part of the Knee, and is inserted in the lateral Ligament of the Joint and in the Head of the Fibula by two very short Tendinous Branches. It sometimes sends off a Tendinous Expansion, which is often unskilfully cut off with the Fat.

§ 8. *Semi-Nervosus.*

456. THIS is a long Muscle, half fleshy and half Tendinous, or like a Nerve, from whence it has its name. It is situated a little obliquely on the posterior and inner part of the Thigh. *Situation in general.*

457. IT

Insertions.

457. It is fixed above to the posterior part of the Tuberosity of the Ischium, immediately before and a little more inward than the Biceps. It is afterwards fixed by fleshy Fibres to the Tendon of the Biceps for about the breadth of three Fingers much in the same manner as the Coraco-Brachialis is fixed to the Biceps of the Arm.

458. FROM thence it runs down fleshy toward the lower part of the inside of the Thigh, having a sort of Tendinous Interfection in the inner part of its fleshy Portion. Having reached below the middle of the Thigh, it terminates in a small, long, round Tendon, which runs down to the inside of the Knee behind that of the Gracilis, where it expands in breadth.

459. It is inserted in the inside of the upper part of the Tibia about two or three Fingers breadth below the Tuberosity or Spine, immediately under the Tendon of the Gracilis Internus with which it communicates. It has the same oblique Turn with the Gracilis and Sartorius, and sends off a like kind of Aponeurosis.

§ 9. *Semi-Membranosus.*

Situation in general.

460. THIS is a long, thin Muscle, partly Tendinous, from whence it has its name, and situated on the backside of the Thigh a little towards the inside.

Insertions.

461. It is fixed above by a broad Tendon or long Aponeurosis in the irregular, obtuse, prominent Line which goes from the Acetabulum to the Tuberosity of the Ischium, a little above the Insertion of the Semi-Nervosus, and between those of the Gemellus Inferior and Quadratus, mixing some Fibres with the Triceps Tertius.

462. FROM thence it runs down fleshy in an oblique Direction behind the inner Condyle of the Os Femoris, below which it terminates in a thick Tendon, which is inserted in the posterior and interior side of the inner Condyle of the Tibia, by three short Branches, the first or uppermost of which goes a little toward the inside, the second, more backward, and the third, lower down. Before it is inserted, it sends off sometimes an Aponeurosis like that of the Biceps.

§ 10. *Popliteus.*

Situation in general.

463. THIS is a small Muscle, obliquely Pyramidal, situated under the Ham, from whence it has its name.

Insertions.

464. It is fixed above by a strong narrow Tendon to the outer Edge of the inner Condyle of the Os Femoris, and to the neighbouring Posterior Ligament of the Joint. From thence it runs obliquely downward under the inner Condyle of the Os Femoris; its flat and pretty thick fleshy Body increasing gradually in breadth, till it is fixed in the backside of the Head of the Tibia all the way to the oblique Line or Impression observable on that side.

A R T. XII.

The Muscles which move the Tarsus on the Leg.

465. **T**HE Motions of the Tarsus are supposed to be performed by nine Muscles situated in the Leg; three on the foreside and six on the backside, viz.

- | | |
|-----------------------------|--|
| 1. <i>Tibialis Anticus.</i> | 6. <i>Soleus.</i> |
| 2. <i>Peronæus Medius.</i> | 7. <i>Tibialis Gracilis vulgo Plantaris.</i> |
| 3. <i>Peronæus Minimus.</i> | 8. <i>Tibialis Posticus.</i> |
| 4, 5. <i>Gastrocnemii.</i> | 9. <i>Peronæus Maximus.</i> |

466. THESE Muscles, three of which are Anterior and six Posterior, not only move the Tarsus on the Leg, but also the Leg on the Tarsus, except the *Tibialis Gracilis* or *Plantaris*. These Motions may likewise be performed by four Muscles which belong to the Toes, the names of which are these:

- | | |
|---------------------------------------|-------------------------------------|
| 10. <i>Extensor Pollicis Longus.</i> | 12. <i>Flexor Pollicis Longus.</i> |
| 11. <i>Extensor Digitorum Longus.</i> | 13. <i>Flexor Digitorum Longus.</i> |

§ 1. *Tibialis Anticus.*

467. THIS is a long Muscle fleshy at the upper part and Tendinous at the lower, situated on the foreside of the Leg between the Tibia and the *Extensor Digitorum Longus*. *Situation in general.*

468. IT is fixed above by fleshy Fibres in the upper third part of the external Labium of the Crista Tibiæ, and of the inside of the Aponeurosis *Tibialis*, or of that Ligamentary Expansion which goes between the Crista Tibiæ and the Anterior Angle of the Fibula. It is likewise fixed obliquely in the upper two thirds of the outside of the Tibia or that next the Fibula. *Insertions.*

469. FROM thence it runs down and ends in a Tendon which first passes through a Ring of the common Annular Ligament, and then through another separate Ring situated lower down. Afterwards the Tendon is fixed partly in the upper and inner part of the Os Cuboides, and partly in the inside of the first Bone of the Metatarsus.

§ 2. *Peronæus Medius vulgo Peronæus Anticus.*

470. THIS is a long Muscle, situated anteriorly on the middle part of the Fibula. *Situation in general.*

Insertions.

471. IT is fixed above by fleshy Fibres, to more than the middle third part of the anterior or outside of the Fibula, and to the neighbouring part of the Aponeurosis Tibialis.

472. IT is likewise fixed to a Production from the inside of that Aponeurosis which runs to the upper part of the Tibia, and there serves for a middle Septum between this Muscle and the Extensor Digitorum Longus.

473. FROM thence it runs down and forms a Tendon, which going in the Direction of the oblique Line on the Fibula, passes behind the External Malleolus, and then through an Annular Ligament common to it and to the Peronæus Maximus, and is afterwards inserted in the Tuberosity at the Basis of the fifth Metatarsal Bone, sending off a small Tendon to the first Phalanx of the little Toe.

§ 3. *Peronæus Minimus.**Situation in general.*

474. THIS is a small Muscle, commonly thought to be a Portion of the Extensor Digitorum Longus, though it is easily separable from it.

Insertions.

475. IT is fixed by fleshy Fibres in the lower half of the inside of the Fibula, between two oblique bony Lines, on one side of the lower part of the Extensor Digitorum Longus, to which Muscle it is simply contiguous.

476. FROM thence it runs down, contracting in breadth, and passes with the Extensor Longus through the common Annular Ligament, forming a flat Tendon, which soon separates from those of the Extensor, and is inserted near the Basis of the fifth Metatarsal Bone.

477. IT is distinguished from the other two Peronæi by a Septum or Production of the Ligamentary Aponeurosis of the Tibia.

§ 4. *Gastrocnemii.**Situation in general.*

478. THESE are two thick, pretty broad and oblong Muscles, situated laterally with respect to each other, in the same Plane, under the Poples, and forming a great part of what is called the Calf of the Leg. That which lies next the Tibia is called Internus, and that next the Fibula, Externus; and because they form, as it were, the Belly of the Leg, they have been termed in Greek, Gastrocnemii.

Insertions.

479. EACH Muscle is fixed above by a flat Tendon, to the posterior part of the lower Extremity of the Os Femoris, behind the lateral Tuberosity of each Condyle, adhering closely to the Posterior Ligaments of the Joint of the Knee.

480. FROM thence they run down, each forming a large and pretty broad fleshy Body, irregularly Oval. The Externus covers the Popliteus, being larger and broader, spreading more laterally, and running lower down than the Internus, the fleshy Body of which begins higher up than the other.

481. ABOUT the middle of the Leg they end in a strong, broad, common Tendon, which contracts a little in breadth as it descends, and is inserted in the Posterior Extremity of the Os Calcis, together with the Tendon of the Soleus.

482. THE

482. THE superior Tendons of these Muscles, become gradually Cartilaginous in aged Persons, and at last ossify near the Condyles; the bony Portions looking like Sefamoide Bones. It is sometimes very late before they are hardened in this manner, and sometimes one grows hard before the other.

§ 5. Soleus.

483. THIS is a large, fleshy, flat Muscle, nearly of an oval Figure, and thicker in the Middle than at the Edges. It has its name from its supposed likeness to a Sole. It is situated on the backside of the Leg, lower down than the Gastrocnemii by which it is covered, and these three Muscles form the Calf of the Leg. *Situation in general.*

484. It is fixed above, partly to the Tibia and partly to the Fibula. It is fixed to above one third of the upper part of the backside of the Fibula, and a little to the Articular Ligament of the Head of this Bone. It is likewise fixed to the backside of the Tibia from the oblique Line or Impression which terminates the Insertion of the Popliteus, down to the middle of the internal Angle of the Bone. *Insertions.*

485. AFTERWARDS leaving these two Bones it ends in a broad strong Tendon, which together with that of the Gastrocnemii, forms what is called Tendo Achillis. This strong Tendon contracts a little in its passage to the Os Calcis, and then expanding a little, it is inserted obliquely in the backside of that Bone all the way to the Tuberosity. The outer or posterior Fibres of this large Tendon are the longest, the inner or anterior Fibres shortest, and the rest are longer or shorter in proportion to their nearness to these two Portions.

486. THE fleshy Body of the Soleus seems to consist of two Planes of Fibres at least, that on the backside of the Muscle being the most simple; and the other, or that next the Bone, being Penniform.

487. THIS Muscle and the two Gastrocnemii form what Anatomists call a true Triceps.

§ 6. Tibialis Gracilis vulgo Plantaris.

488. THIS is a small Pyriform Muscle, situated obliquely in the Ham below the external Condyle of the Os Femoris, between the Popliteus and Gastrocnemius Externus; and its Tendon which is long, flat and very small, runs down on the side of the Gastrocnemius Internus all the way to the Heel. *Situation in general.*

489. THE fleshy Body which is only about two Inches in length and one in breadth, is fixed by a short flat Tendon above the outer Edge of the exterior Condyle of the Os Femoris, on one side of the Gastrocnemius Externus. From thence the fleshy Body runs obliquely over the Edge of the Popliteus, and terminates in a very small, long, flat Tendon. *Insertions.*

490. THIS Tendon runs between the Body of the Gastrocnemius Externus and Soleus, all the way to the inner Edge of the upper part of the

Tendo Achillis ; and from thence continuing its course downward, it joins this Tendon and is inserted together with it, in the outside of the posterior part of the Os Calcis, without communicating with the Aponeurosis Plantaris.

491. SOMETIMES this Muscle is wanting, and sometimes it is situated lower down.

§ 7. *Tibialis Posticus.*

Situation in general. 492. THIS is a long fleshy Penniform Muscle, broader above than below, situated between the Tibia and Fibula on the backside of the Leg and covered by the Extensor Digitorum Longus.

Insertions. 493. IT is fixed above by fleshy Fibres, immediately under the Articulation of the Tibia and Fibula, to the nearest parts of these two Bones, chiefly to the Tibia, reaching to the lateral parts of that Bone, above the Interosseous Ligament which is here wanting.

494. FROM thence its Insertion is extended below the oblique Line or Impression in the Tibia, over all the neighbouring part of the Interosseous Ligament, and through more than the upper half of the internal Angle of the Fibula.

495. THROUGH all this Space it is fleshy, penniform and covered by the Extensor Digitorum Longus, which sometimes communicates with it by a middle Tendon, and sends off an Aponeurosis to it, which does the office of a Frænum.

496. AFTER this, it forms a Tendon which runs down behind the inner Malleolus, through a Cartilaginous Groove and an Annular Ligament, and passing under the Malleolus, is inserted in the Tuberosity or lower part of the Os Scaphoides. This Tendon is sometimes divided into two, one of which crossing a little over that of the Peronæus Longus is fixed in the Os Cuboides.

§ 8. *Peronæus Maximus vulgo Peronæus Posterior.*

Situation in general. 497. THIS is a long Penniform Muscle lying on the Fibula.

Insertions. 498. IT is fixed above to the anterior and outer part of the Head of the Fibula, and to a small Portion of the Head of the Tibia ; then to the outside of the Neck of the Fibula, to the upper half of the external Angle of that Bone, and to the Aponeurosis Tibialis, which at that place makes a Septum between this Muscle and the Extensor Pollicis.

499. FROM thence turning a little backward according to the Direction of the Bone, it forms a considerable Tendon, which running down behind the external Malleolus, passes through a kind of hollow Groove, and through an Annular Ligament common to it, and to the Tendon of the Peronæus Medius which lies before it. It passes likewise through an Annular Ligament on the outer and anterior part of the Os Calcis, and under the small lateral Tuberosity sometimes found there.

500. AFTER-

500. AFTERWARDS running through the oblique Groove in the lower side of the Os Cuboides, it is inserted in the side of the Basis of the first Metatarsal Bone, and also a little in the Basis of the Os Cuneiforme Majus.

501. THE fleshy Body of this Muscle cannot always be distinguished from that of the Peronæus Medius.

A R T. XIII.

The Muscles which move the Metatarsus and Toes.

§ 1. *Extensor Pollicis Longus.*

502. **T**HIS is a thin single Muscle lying between the Tibialis Anticus and Extensor Digitorum Longus, by which it is almost hid. *Situation in general.*

503. IT is fixed to the inside of the Fibula near the Interosseous Ligament, from the Neck down to the lowest Quarter of that Bone; to the Interosseous Ligament through the same Space, and a little to the lower Extremity of the Tibia next the Fibula. *Insertions.*

504. THERE it ends in a considerable Tendon, which passing through a distinct Ring of the common Annular Ligament, and then through a Membranous Vagina, is inserted in the Basis of the first Phalanx of the Great Toe, and continued from thence up to the second.

§ 2. *Flexor Pollicis Longus.*

505. THIS is a pretty long Muscle situated in the posterior and lower part of the Leg. *Situation in general.*

506. IT is fixed in the lower half of the backside of the Fibula, its Insertion reaching almost as far as the External Malleolus. The fleshy Body advances on the inside of that Bone towards the Tibia, according to the oblique Direction of that side, and ends in a large Tendon. *Insertions.*

507. THIS Tendon passes behind the lower Extremity of the Tibia, toward the inner Ankle, then through a small Notch in the inner and backside of the Astragalus, and through an Annular Ligament or Ligamentary Vagina continued under the lateral Arch of the Os Calcis.

508. FROM thence it advances to the great Toe, and passing through the Interstice between the two Sesamoide Bones, in the Ligamentary Vagina of the first Phalanx, is inserted in the lower part of the second. In some Subjects, this Vagina is almost Cartilaginous.

509. THE two Sesamoide Bones are strongly connected together by Ligaments, and also to the lower Edge of the first Phalanx, in such a manner as to slide easily on the two inferior Depressions or double Pulley of the Head of the first Metatarsal Bone. The Ligament by which they are fixed to the first Phalanx is very thick, and has the Appearance of a Cartilage as much as the Vagina.

§ 3. *Thenar*

§ 6. *Thenar.**Situation in general.*

510. THIS Muscle is made up of several Portions, and lies on the inner Edge of the Sole of the Foot.

Insertions.

511. IT is fixed by three or four fleshy Fasciculi to the lower and inner part of the Os Calcis, Os Scaphoides and Os Cuneiforme Majus. It is likewise fixed a little in the Annular Ligament under the inner Ankle, which belongs to the Tendon of the Flexor Longus.

512. FROM all these different Insertions the fleshy Fasciculi approach each other as they advance forward under the first Bone of the Metatarsus, and are fixed partly in the internal Sesamoide Bone and partly in the inside of the first Phalanx near its Basis.

513. THERE is another Fasciculus fixed by one end to the Os Scaphoides and Os Cuneiforme Majus, and by the other to the external Sesamoide Bone, and outside of the first Phalanx of the Great Toe.

§ 4. *Antithenar.**Situation in general.*

514. THIS is a small compound Muscle, lying obliquely under the Metatarsal Bones.

Insertions.

515. IT is fixed posteriorly in the lower parts of the second, third and fourth Metatarsal Bones near their Bases, in the Ligament belonging to the first and second of these Bones; in the neighbouring Ligaments belonging to the Bones of the Tarsus; and lastly, in a lateral Aponeurosis of the Muscle commonly called Hypothenar.

516. ALL these Portions contracting into a small compass, are inserted in the outside of the external Sesamoide Bone and of the first Phalanx of the Great Toe.

§ 5. *Extensor Digitorum Longus.**Situation in general.*

517. THIS is a long Muscle fleshy in the upper part, and Tendinous in the lower, lying between the Tibialis Anticus and Peronæus Maximus.

Insertions.

518. IT is fixed above by fleshy Fibres, in the outside of the Head of the Tibia, and inside of the Head of the Fibula; in the upper part of the Interosseous Ligament, through three fourths of the length of the Fibula; and through the same Space, in the Tendinous Septum belonging to the Anterior Angle of that Bone.

519. IT seems to mix some Fibres on each side with the two first Peronæi and Tibialis Anticus; and it is very closely united with the Peronæus Minimus, which has for that reason been looked upon as a Portion of this Extensor.

520. IT contracts in breadth a little above the Annular Ligament, and in passing through it, is divided into three Tendons, the first of which is afterwards

afterwards divided into two. These four Tendons are inserted along the upper or Convex side of the four small Toes.

§ 6. *Extensor Digitorum Brevis.*

521. THIS is a small Complex Muscle lying obliquely on the Convex side of the Foot, being likewise termed *Pedieus*. *Situation in general.*

522. IT is fixed in the upper and outer side of the Anterior Apophysis of the Astragalus, and in the neighbouring part of the upper side of that Bone. From thence it runs obliquely from without inwards, under the Tendons of the Peronæus Minimus and Extensor Digitorum Longus, being divided into four fleshy Portions which terminate in the same number of Tendons. *Insertions.*

523. THE first Tendon is inserted in the upper or Convex part of the first Phalanx of the Great Toe. The other three joining with those of the Extensor Longus are inserted along the Convex sides of all the Phalanges of the three following Toes; and when there is a fifth Tendon, which happens very seldom, it goes in the same manner to the Little Toe.

524. As this Muscle is situated obliquely, its Tendons and those of the Extensor Longus cross each other a little; and after their common Insertion in the first Phalanges of the Toes, those of the short Extensor run along the two other Phalanges, almost on the outside of the others. All these Tendons communicate by Aponeuroses in the same manner as those of the Hand.

§ 7. *Flexor Digitorum Brevis sive Perforatus Pedis.*

525. THIS is the undermost of all the common Muscles of the Toes, being situated immediately above the Aponeurosis Plantaris, which it resembles something in Figure; and hence we see that it has been very improperly termed *Sublimis*. *Situation in general.*

526. IT is fixed by fleshy Fibres to the anterior and lower part of the great Tuberosity of the Os Calcis; and to the neighbouring part of the upper side of the Aponeurosis Plantaris. *Insertions.*

527. FROM thence it runs forward, being divided into four fleshy Portions, which terminate in the same number of Tendons, split at their Extremities in the same manner as those of the *Sublimis* or *Perforatus* of the Hand, and inserted in the second Phalanges of the four small Toes, a little nearer the inside than in the Hand.

§ 8. *Flexor Digitorum Longus sive Perforans Pedis.*

528. THIS is a long Muscle, fleshy above and Tendinous below, lying on the backside of the Leg between the Tibia and the Flexor Pollicis Longus, covered by the Soleus, and covering the Tibialis Posticus. *Situation in general.*

Insertions.

529. IT is fixed above by fleshy Fibres to a little more than the middle third part of the backside of the Tibia near its external Angle, below the Insertion of the Soleus; and also to a kind of Ligament which runs down from the middle of the Tibia. It afterwards ends in a Tendon which passes behind the inner Ankle, on one side and a little behind the Tibialis Posticus, in a separate Annular Ligament.

530. FROM thence it runs under the Sole of the Foot sending off a Detachment, by which it communicates with the Flexor Pollicis Longus. There it is divided into four small flat Tendons, which go to the third Phalanges of the four small Toes in the same manner as the Perforans of the Hand.

531. THESE four Tendons agree likewise in this with those of the Hand, that they give Insertions to the Lumbricales; but they differ from them in this, that before their Separation they are joined laterally by an Auxiliary fleshy Body, which I name Flexor Digitorum Accessorius.

§ 9. *Flexor Digitorum Accessorius.*

Situation in general.

532. THIS is a flat and pretty long fleshy Mass, situated obliquely under the Sole of the Foot; which from its Situation and Figure was formerly termed Caro Plantæ Pedis Quadrata.

Insertions.

533. THIS Muscle is fixed posteriorly by one fleshy Portion, in the lower side of the Os Calcis, and in the anterior Tuberosity on that side; and by the other in the neighbouring Ligament which joins this Bone to the Astragalus.

534. FROM thence the two Portions run obliquely to the middle of the Sole of the Foot, and there unite in a flat long and irregularly square Muscular Mass which is fixed to the outer Edge of the Fasciculus of Tendons of the Flexor Longus, to which it serves as a Frenum at that place.

535. THIS Muscle might more properly be named Plantaris, than that which is commonly so called, to which I have given the name of Tibialis Gracilis.

§ 10. *Lumbricales.*

Situation in general.

536. THESE are four small Muscles, situated more or less longitudinally under the Sole of the Foot.

Insertions.

537. THEY are fixed by their fleshy Extremities to the four Tendons of the Flexor Digitorum Longus near the Insertion of the Flexor Accessorius. The first Muscle is fixed to the inside of the first Tendon; the second, to the Tendinous Fork formed by the two first Tendons; the third, to the Tendinous Fork made by the second and third Tendons; and the fourth, in the same manner to the third and fourth Tendons, but commonly most to the third.

538. FROM thence these four Muscles run to the Toes, and there terminate in the same number of small Tendons which are inserted in the first Phalanges

Phalanges of the Toes much after the same manner as in the Hand. They are termed Lumbricales or Vermiculares, because of the resemblance they bear to Worms.

§ 11. *Transversalis Digitorum.*

539. THIS is a small Muscle which lies transversely under the Basis of the first Phalanges, and which at first sight appears to be a simple Muscular Body fixed by one end to the Great Toe, and by the other to the Little Toe. *Situation in general.*

540. WHEN this Muscle is carefully examined, we find that it is fixed by a very short common Tendon to the outside of the Basis of the first Phalanx of the Great Toe, conjointly with the Antithenar; and by three different Portions or Digitations, to the three Interosseous Ligaments which connect the Heads of the four Metatarsal Bones next the Great Toe, laterally to each other. These three Portions are very slender, and gradually cover each other. *Insertions.*

541. THIS Muscle might be reckoned a second Antithenar.

§ 12. *Interossei.*

542. THESE are seven small Muscles which fill up the four Interstices between the Metatarsal Bones, much after the same manner as in the Hand. The four largest are Superior, the other three, Inferior. The common Division of them into External and Internal is very improper. *Situation in general.*

543. THE first of the superior Muscles is fixed posteriorly by fleshy Fibres, in the Ligament which connects the Basis of the two first Metatarsal Bones; in the outside of the first Bone, and in the upper part of the inside of the second. It ends in a small Tendon, which is inserted in the inside of the first Phalanx of the second Toe. *Insertions.*

544. THE other three are fixed by fleshy Fibres in the inner and upper parts of the last three Metatarsal Bones, and in the outer and upper parts of the second, third and fourth Bones. They likewise end in Tendons which are inserted in the outsides of the first Phalanges of the second, third, and fourth Toes.

545. THE three inferior Muscles are fixed proportionably by fleshy Fibres to the lower parts of these Bones, chiefly to the third, fourth and fifth, and to the Ligaments belonging to their Bases. The first inferior Interosseus is likewise fixed by some Fibres to the Tendon of the Peronæus Maximus. The Tendons of these three Muscles are inserted in the insides of the Bases of the first Phalanges of the last three Toes.

§ 13. *Metatarsius.*

546. THIS is a fleshy Mass lying under the Sole of the Foot. It is fixed by one end, in the forepart of the great Tuberosity of the Os Calcis; and by the other, to the first Phalanx of the Little Toe. It is running

running forward from thence, it terminates in a kind of short Tendon which is fixed in the Tuberosity and posterior part of the lower side of the fifth Bone of the Metatarsus. It may move this Bone much after the same manner as the Metacarpus moves the fourth Bone of the Metacarpus.

§ 14. *Parathenar Major.*

Situation. 547. THIS is a pretty long Muscle forming part of the outer Edge of the Sole of the Foot. It is commonly termed Hypothenar, but very improperly, according to the signification of that Word.

Insertions. 548. It is fixed backwards by a fleshy Body, to the outer part of the lower side of the Os Calcis, from the small Posterior External Tuberosity all the way to the Anterior Tuberosity. There, it joins the Metatarsus, and at the Basis of the fifth Metatarsal Bone, separates from it again, and forms a Tendon which is inserted in the outside of the first Phalanx of the Little Toe near its Basis, and near the Insertion of the Parathenar Minor.

§ 15. *Parathenar Minor.*

549. THIS is a fleshy Muscle fixed along the Posterior half of the outer and lower side of the fifth Bone of the Metatarsus. It terminates under the Head of that Bone, in a Tendon which is inserted in the lower part of the Basis of the first Phalanx of the Little Toe.

550. The Tendinous Insertion of this Muscle is very closely united to the Cartilaginous Ligament mentioned in the Description of the Fresh Bones. The same thing is to be observed concerning the other Muscles which go to the lower parts of the Basis of the first and second Phalanges of the Toes. In aged Persons some parts of these Ligaments are often turned to Bone, and thereby form these bony Portions which are taken for distinct Sesamoide Bones, as has been already said.

A R T. XIII.

The Muscles employed in Respiration.

551. **I** Reduce these Muscles to a smaller number than is commonly done, viz.

- | | |
|---------------------------------------|---|
| 1. <i>Diaphragma.</i> | 6. <i>Supra-Costales.</i> |
| 2. <i>Scaleni.</i> | 7. <i>Infra-Costales.</i> |
| 3. <i>Serrati Postici Superiores.</i> | 8. <i>Sterno-Costales vulgo Triangulares.</i> |
| 4. <i>Serrati Postici Inferiores.</i> | |
| 5. <i>Inter-Costales.</i> | |

552. THE

552. THE Diaphragm is one Muscle in a middle Situation in the Body. All the rest are regularly disposed in Pairs on the two sides of the Thorax, and several of them are in great numbers. The Subclavii and Sacro-Lumbares are commonly joined to these Muscles, and some Anatomists add the Pectorales Minores, and Serrati Majores. I have already ranked the Subclavii, Pectorales Minores, and Serrati Majores among the Muscles that move the Shoulders; and I place the Sacro-Lumbares among those that perform the particular Motions of the Back.

§ 1. *Diaphragma.*

553. THIS is a very broad and thin Muscle, situated at the Basis of the Thorax, and serving as a transverse Partition to separate that Cavity from the Abdomen. For this reason the Greeks termed it Diaphragma, and the Latins, Septum Transversum. It forms an oblique inclined Arch, the forepart of which is highest, and the posterior part lowest, making a very acute Angle with the Back. *Situation in general and Figure.*

554. IT is looked upon as a double and Digastric Muscle, made up of two different Portions, one large and superior, called the Great Muscle of the Diaphragm; the other small and inferior, appearing like an Appendix to the other, called the Small or Inferior Muscle of the Diaphragm. *Division.*

555. THE great or principal Muscle is fleshy in its Circumference, and Tendinous and Aponeurotic in the middle, which for that reason is commonly called Centrum Nerveum sive Tendinosum. It must not however be imagined that this middle part is of small extent, or that it is round, because Anatomists have named it the Center; for in so doing, they had regard only to its Situation, not to its Form or to the Space it takes up. It is of a considerable breadth, and represents in some measure a Trefoil Leaf, supposing the part to which the Footstalk is fixed, to be sloped, and that this Slope is turned backward, and the middle Convex part, forward; and therefore in the publick Courses which I gave at the Royal Garden for the Space of twelve Years, I chose to call it simply the middle Aponeurosis or Aponeurotic Plane of the Diaphragm.

556. THE fleshy Circumference is Radiated, the Fibres of which it is made up, being fixed by one Extremity to the Edge of the middle Aponeurosis, and by the other to all the Basis of the Cavity of the Thorax, being inserted by Digitations in the lower parts of the Appendix of the Sternum, of the lowest true Ribs, of all the false Ribs, and in the neighbouring Vertebrae. *Insertions.*

557. WE have therefore three kinds of Insertions, one Sternal, twelve Costal, six on each side, and two Vertebral, one on each side. These last are very small and sometimes scarcely perceivable. The Costal Insertions join those of the Transversalis Abdominis, but do not mix with them, as they seem to do, before the Membrane which covers them is removed. I need not mention here some communicating Fibres of the same nature with

those found in other Muscles, as for instance, between the *Obliquus Externus* and *Pectoralis Major*.

558. THE Fibres inserted in the *Appendix Ensisformis*, run from behind directly forward, and form a small parallel Plane. I have sometimes observed a *Fasciculus* of Fibres detached from the under side of this Plane, to run down on the inside of the *Linea Alba*, in which it is inserted near the *Umbilicus*.

559. THE first Costal Insertion runs a little obliquely towards the Cartilage of the seventh true Rib, a triangular Space being left between this and the Sternal Insertion, at which the *Pleura* and *Peritonæum* meet, as shall be said hereafter. The Insertion of these Fibres is very broad, taking up about two thirds of the Cartilage of the seventh Rib, and a small part of the Bone, from whence it reaches beyond the Angle of the Cartilage.

560. THE second Insertion is into the whole Cartilage of the first false Rib; the third partly in the Bone and partly in the Cartilage of the second false Rib; the fourth in the Bone, and sometimes a little in the Cartilage of the third false Rib; the fifth in the Bone and a little in the Cartilage of the fourth false Rib, being broader than the rest.

561. THE sixth is in the Cartilage of the last false Rib, and almost through the whole length of the Bone. At the Head of this Rib, it joins the Vertebral Insertion which runs from the lateral part of the last Vertebra of the Back, to the first Vertebra of the Loins.

562. BETWEEN this Vertebral Insertion and the second Muscle of the Diaphragm, a small triangular Interstice is sometimes left, like that which I mentioned in speaking of the first Insertion. This Insertion and that in the last false Rib, join the upper Extremities of the *Psoas* and *Triangularis* or *Quadratus Lumborum*, and sends off to them some communicating Fibres. The common Plane of these last Insertions, by the separation of their Fibres, form a Hole, through which a bundle of Nerves passes.

563. IT is to be observed, that the lateral Insertions of the great Muscle of the Diaphragm on the right side appear to be lower than those on the left side; and that the right lateral Portion appears to be larger than the left, as being more arched.

564. THE small Muscle of the Diaphragm is thicker than the other, but of much less extent. It is situated along the fore-side of the Bodies of the last Vertebra of the Back and several of those of the Loins, being turned a little to the left Hand. It is of an ablong Form, representing in some measure a fleshy Collar, the two lateral Portions of which cross each other, and afterwards become Tendinous toward the lower part.

565. THE upper part of the Body of this Muscle is fixed in the Slope of the middle Aponeurosis of the great Muscle. The outer Edges of the *Alæ* or lateral Portions join the posterior Plane of the great Muscle, and these Portions, adhere to the Body of the last Vertebra of the Back. The Extremities called likewise Pillars or *Crura*, are inserted by several Tendinous Digitations in the Vertebrae of the Loins.

566. THE upper part of the fleshy Body is formed by a particular Intertexture of Fibres belonging to the two Alæ. These two Alæ, whereof that toward the right Hand is generally the most considerable, part from each other and form an oval Hole, terminated on the lower part by Fibres detached from the inside of each Ala, immediately above the last Vertebra of the Back. These Fibres decussate and cross each other, and afterwards those that come from each Ala, join that on the other side, so that each of the Crura is a Production of both Alæ.

567. THE Fibres that come from the left Ala, cross over those from the right Ala, and this again sends a small Fasciculus of Fibres over those of the left Ala; afterwards the two Crura part from each other.

568. THE right Crus is larger and longer than the left, and is always inserted in the four upper Vertebrae of the Loins, and often in the fifth likewise, by the same number of Digitations which become more and more Tendinous as they descend, and at length are expanded in form of an Aponeurosis. This Crus lies more on the middle of the Bodies of the Vertebrae than on the right side.

569. THE left Crus is smaller and shorter, and lies more on the sides of the Vertebrae. It is fixed by Digitations to the three upper Vertebrae of the Loins, seldom reaching lower. The lower part of it is expanded in the same manner as the other; and the two Expansions sometimes meet together.

570. THE oval Opening of this inferior Muscle of the Diaphragm, gives passage to the Extremity of the Œsophagus, and the Aorta lies in the Interstice between the two Crura. Immediately above the Opening or Hole, a thin Fasciculus of Fibres is sent off to the Stomach; and I have sometimes observed a larger Fasciculus at the lower Extremity of the Hole, sent off chiefly from the right Ala, and accompanied by some Tendinous Fibres from the left; which seemed to run to the Mesentery.

571. IN the middle Aponeurosis of the great Muscle, a little to the right of the Anterior part of the Slope, near the small Muscle, is a round Opening which transmits the Trunk of the lower Vena Cava. The Border or Circumference of this Opening, is very artfully formed by an oblique and successive Intertexture of Tendinous Fibres, almost like the Edge of a Wicker Basket; and is consequently incapable either of Dilatation or Contraction, by the Action of the Diaphragm.

572. WE find therefore three considerable Openings in the Diaphragm; one round and Tendinous for the passage of the Vena Cava; one oval and fleshy for the Extremity of the Œsophagus; and one fork'd, partly fleshy and partly Tendinous, for the Aorta. The round Opening is to the right Hand, close to the upper part of the right Ala of the small Muscle; the oval Opening is a little to the left, so that the right Ala which is between these two Holes, lies almost directly over against the middle of the Body of the eleventh Vertebra of the Back; the Tendinous Fork is under the oval Opening, but a little more toward the middle.

573. THIS

573. THIS Situation well considered, will serve to justify in some measure, the Descriptions and Figures of the ancient Anatomists, especially since the right Ala of the small Muscle is larger than the left, and since it was an easy matter in taking out the Diaphragm, and spreading it on a Board, to extend it too much toward both sides.

§ 2. *Scaleni.*

*Situation in
general and
Division.*

574. THESE are compound Muscles, irregularly triangular, and from this Figure, the ancient Greeks gave them their name. They reckoned them to be only two in number, situated laterally on the Vertebrae of the Neck, all the way down to the first and second true Ribs. Afterwards they were divided into six, three lying on each side; but I have commonly found no more than two on each side, one lying upon the other; the first of which I name *Scalenus Primus* or *Primæ Costæ*, the other *Scalenus Secundus* or *Secundæ Costæ*.

575. THE *Scalenus Primus* is fixed to the upper part of the outside of the first Rib, by two distinct Portions, called commonly Branches, one Anterior, the other Posterior. The Anterior Branch is fixed to the middle Portion of the Rib, about an Inch from the Cartilage. From thence it runs obliquely upward, and is inserted in the transverse Apophysis of the sixth, fifth, and sometimes of the third Vertebra of the Neck.

576. THE posterior Branch is fixed more backward in the first Rib, an Interstice of about an Inch, being left between it and the other Branch, through which the Axillary Artery and Brachial Nerves are transmitted. From thence it runs up obliquely behind the former, and is inserted in all the transverse Apophyses of the Neck.

577. THE *Scalenus Secundus* is fixed a little more backward in the external Labium of the upper Edge of the second Rib, sometimes by two separate Portions, and sometimes without any Division. The Anterior Portion is fixed immediately under the Posterior Portion of the first *Scalenus*, by a short flat Tendon, united a little with the first Intercostal Muscle. From thence it runs up over the Posterior Portion of the first *Scalenus*, communicating likewise with that Muscle, and is fixed by Insertions partly Tendinous and partly fleshy, in the transverse Apophyses of the four first Vertebrae of the Neck.

578. THE Posterior Portion is fixed in the second Rib more backward than the other. From thence it runs up, being divided into two Portions, whereof one is inserted in the transverse Apophyses of the three first Vertebrae of the Neck, behind the *Scalenus Primus*. The other Portion runs up behind the former, and is inserted in the transverse Apophyses of the two first Vertebrae.

579. THE Vertebral Insertions of both *Scaleni*, vary, they being sometimes confounded with each other, and sometimes with those of the neighbouring Muscles. Behind the *Scalenus Secundus*, there is a small fleshy Plane inserted in the transverse Apophysis of the last Vertebra of the

the Neck, and in the second Rib. This does not belong to the Scaleni, but is the first of the Musculi Supra-Costales, or Levatores Costarum, as they are commonly called.

580. IN dissecting the Anterior Portion of the second Scalenus, I have observed a small Muscle fixed to the Extremity of the transverse Apophysis of the last Vertebra of the Neck, which having run down from thence to the inner and lower part of the first true Rib, was slightly inserted there, and seemed to continue its course to the Convex side of the Pleura. I have likewise seen all the Scaleni inserted in the first Rib.

§ 3. *Serratus Posticus Superior.*

581. THIS is a flat thin Muscle, situated on the upper part of the Back. It is fixed on one side by a broad Aponeurosis, to the lower part of the Posterior Cervical Ligament, and to the Spinal Apophyses of the two last Vertebrae of the Neck, and two first of the Back. *Situation in general and Insertions.*

582. FROM thence it runs down a little obliquely forward, and is inserted by broad fleshy Digitations, in the Posterior part of the second, third, fourth, and sometimes of the fifth true Ribs, near their Angles; but sometimes it has no Insertion in the second Rib. It is covered by and closely united with the Rhomboides.

§ 4. *Serratus Posticus Inferior.*

583. THIS is a flat thin Muscle lying on the lower part of the Back. It is fixed in the last Spinal Apophysis of the Back, and in the three first of the Loins by a broad Aponeurosis. From thence it runs up a little obliquely, and is fixed by fleshy broad Digitations in the last four false Ribs. Its Insertions in the lowest Rib is near the Cartilage, and in the other three near their Angles. It is covered by the Latissimus Dorsi, to which it adheres very closely, and it covers the Sacro-Lumbaris and Longissimus Dorsi. *Situation in general and Insertions.*

§ 5. *Intercostales.*

584. THE Intercostal Muscles are thin fleshy Planes, lying in the Interstices between the Ribs, their Fibres running obliquely from one Rib to another. In each Interstice lie two Planes, an External and an Internal, closely joined together, nothing but a thin, fine, cellular, membranous Web coming between them. *Situation in general and Division.*

585. ACCORDING to this natural Division, there must be forty four Intercostal Muscles, in the twenty two Interstices left between the twenty four Ribs; and of these there are eleven External, and eleven Internal on each side. The Fibres of the external Intercostals run down from behind forward, and those of the internal Intercostals from before backward; so that the Fibres of these two Series of Muscles cross each other.

586. THE external Intercostals extend commonly from the Vertebrae to the Extremity of the upper Labium of the bony Portion of each Rib, and go no further. The Internal begin forward near the Sternum, and end backward at the Angle of each Rib.

587. THEREFORE between these Angles and the Cartilages, these fleshy Planes are double, the Fibres by their opposite Directions representing this kind of Figure X. But from the Vertebrae to the bony Angles, and in the Interstices between the Cartilaginous Portions, the Plane is single, being that of the external Muscles, backward, and of the internal, forward.

588. THE Fibres of the external Intercostals are very oblique near the Vertebrae; but this Obliquity decreases insensibly towards the Anterior Extremities of the Ribs. Their Insertions begin at the Ligaments by which the Ribs are fastened to the transverse Apophyses. They are a little Tendinous, and run a small Space beyond the Edge, on the outside of each Rib.

589. THE Fibres of the internal Intercostals are in general shorter and less oblique than the former. They fill almost intirely the Interstices between the Cartilaginous Portions, and they are covered on the outside by a Ligamentary Membrane, the Fibres of which running in an opposite Direction to those of the Muscles, have been mistaken for Continuations of the external Intercostals, over which this Membrane is likewise spread, only a little diminished in thickness.

590. ANY Portion of the Breast of an Animal may be boiled so much, as that the Flesh shall easily part from the Bones, and the Ribs may be drawn out, disordering neither the Muscles nor Membranes. But we are not from thence to conclude, that all the Intercostals on one side of the Thorax, make but one Muscle, because by the same way of reasoning it might be proved that all the Muscles which immediately surround the Os Femoris are but one, since by a like Experiment, they together with the Periosteum, may be intirely separated from the Bone, without breaking their Fibres.

§ 6. *Supra-Costales.*

Situation in general.

591. THESE Muscles are commonly called Levatores Costarum, which name was first given them by *Steno*, but he did not pretend to have discovered them. They are irregularly Triangular, and situated on the back part of the Ribs near the Vertebrae.

Insertions.

592. EACH of these Muscles is fixed by one Tendinous Extremity in the transverse Apophysis which lies above the Articulation of each Rib, and to the neighbouring Ligament; the first being inserted in the transverse Apophysis of the last Vertebra of the Neck, and the last, in that of the eleventh Vertebra of the Back.

593. FROM thence the fleshy Fibres run down obliquely, increasing in breadth as they descend, and are inserted in the back part of the outside of the following Rib. Some of the Fibres often pass beyond that Rib,

and

and are fixed in one or more of the Ribs below it by several Digitations, which lie at a greater distance from the Vertebrae in proportion as they run lower. In the inferior Ribs these Digitations are more considerable than in the superior.

§ 7. *Sub-Costales.*

594. THESE are fleshy Planes of different breadths and very thin, situated more or less obliquely on the insides of the Ribs near their bony Angles, and running in the same Direction with the external Intercostals. *Situation in general.*

595. THEY are fixed by both Extremities in the Ribs; the inferior Extremity being always at a greater distance from the Vertebrae, than the superior, and several Ribs lying between the two Insertions. *Insertions.*

596. THESE Muscles are more sensible in the lower Ribs than in the upper, and they adhere closely to the Ribs that lie between their Insertions.

§ 8. *Sterno-Costales vulgo Triangularis Sterni.*

597. THESE are five Pairs of fleshy Planes disposed more or less obliquely on each side the Sternum, on the inside of the Cartilages of the second, third, fourth, fifth and sixth true Ribs. *Situation in general.*

598. THEY are inserted by one Extremity in the Edges of the inside of all the lower half of the Sternum. From thence the first Muscle on each side runs up obliquely, and is fixed in the Cartilage of the second Rib. The second runs less obliquely to its Insertion in the Cartilage of the third Rib. The rest are inserted in the same manner in the Cartilages of the following Ribs; their Obliquity decreasing, and their length increasing in proportion as they are situated lower down; so that the lowest is almost transverse. *Insertions.*

599. THIS last Muscle which is fixed by one Extremity in the Cartilage of the sixth true Rib near the Bone, and seems to pass the Appendix Ensigiformis, immediately above the Insertion of the Diaphragm in that Appendix, and to join the Muscle on the other side. The superior Portions of the transverse Muscles of the Abdomen, united with the lowest Sterno-Costales, have nearly the same appearance, so that these might be reckoned to belong to the Transversales, did not the Insertion of the Diaphragm come between them.

A R T. XIV.

The Muscles which move the Head on the Trunk.

600. THE Head has proper Motions distinct from those of the Neck, and others common to it with the Neck. The Muscles which serve particularly for these Motions are of two kinds, some of them

being fixed by one Extremity in the Head, and the rest having no Insertion in that part. Those of the first kind are commonly twenty in number, to which four more are added, though they have no Insertion in the Head.

Enumeration 601. THEIR number therefore amounts to twenty four, twelve lying on each side, viz.

- | | |
|---|--|
| 1. <i>Sterno-Mastoidæus five Mastoidæus Anterior.</i> | 7. <i>Obliquus Minor five Superior.</i> |
| 2. <i>Splenius five Mastoidæus Posterior.</i> | 8. <i>Obliquus Major five Inferior.</i> |
| 3. <i>Complexus.</i> | 9. <i>Rectus Anticus Longus.</i> |
| 4. <i>Complexus Minor five Mastoidæus Lateralis.</i> | 10. <i>Rectus Anticus Brevis.</i> |
| 5. <i>Rectus Major.</i> | 11. <i>Transversalis Anticus Primus.</i> |
| 6. <i>Rectus Minor.</i> | 12. <i>Transversalis Anticus Secundus.</i> |

Situation in general. 602. OF these twelve Muscles five are Anterior, six Posterior, and one Lateral.

603. THE five Anterior are the Sterno-Mastoidæus, Rectus Anticus Longus, Rectus Anticus Brevis, Transversalis Anticus Primus, Transversalis Anticus Secundus, which last is not inserted in the Head.

604. THE six Posterior are the Splenius, Complexus Major, Rectus Major, Rectus Minor, Obliquus Superior, Obliquus Inferior, which last is not fixed in the Head. The Lateral Muscle is the Complexus Minor.

605. THERE are besides these, sometimes, small supernumerary Muscles, which I shall mention after those to which they belong; and I shall likewise give the reason why I retain the Obliquus Inferior, and Transversalis Anticus Secundus, though they belong more properly to the Neck than to the Head.

§ 1. *Sterno-Mastoidæus five Mastoidæus Anterior.*

Situation in general and Division. 606. THIS is a long, narrow, pretty thick and mostly fleshy Muscle, situated obliquely between the back part of the Ear, and lower part of the Throat. It is in a manner composed of two Muscles united at the upper part through their whole breadth and separated at the lower.

Insertions. 607. IT has two Insertions below, both of them flat and a little Tendinous. The first is in the upper Edge of the Sternum near the Articulation of the Clavicula; the other in the Clavicula at a small distance from the Sternum. These two Portions run up obliquely, and unite together at about an Inch above their lower Insertions, the triangular Space left between them being filled by a Membrane.

608. THE Sternal Portion passes foremost and covers the Clavicular, both forming one Body or Belly, which running in the same oblique Direction to

to the Apophysis Mastoidæus, is inserted in the upper and back part of that Process; over which it likewise sends off a very broad Aponeurosis, which covers the Splenius and is inserted in the Os Occipitis.

609. THE two Anterior Mastoidæi represent a great Roman V, the Angle being at the lower part of the Throat, and the two Crura running up behind the Ears, as may be plainly seen without Dissection.

§ 2. *Splenius five Mastoidæus Posterior.*

610. THIS is a flat, broad, oblong Muscle, situated obliquely between the back part of the Ear and the posterior and lower part of the Neck. It is partly single, and partly made up of two Portions, one Superior, the other Inferior. These two Portions are closely united backward, making only one Plane, but they are divided above. *Situation in general and Division.*

611. THE superior Portion is fixed to the Extremities of the three or four lowest Spinal Apophyses of the Neck, and of the first, or first and second of the Back. It is not fixed immediately to the Apophyses of the Neck which are above the last, but only by the Intervention of the Posterior Cervical Ligament.

612. IT is likewise fixed to the Edge of the Inter-Spinal Ligaments of the other Vertebrae, and therefore its Insertions in the Spinal Apophyses are not interrupted by the distances between these Apophyses, but form one thin continued Plane a little Tendinous.

613. FROM thence it runs up obliquely toward the Mastoide Apophysis, partly under the upper Extremity of the Sterno-Mastoidæus, and is inserted in the upper part of that Process, and along the neighbouring Curve Portion of the transverse Ridge of the Os Occipitis.

614. THE inferior Portion of the Splenius is fixed to three or four Spinal Apophyses of the Back, beginning by the second or third. From thence it runs up, being closely united to the other Portion, till it reaches the superior and lateral part of the Neck, where it separates from it and is inserted in the transverse Apophyses of the three or four superior Vertebrae of the Neck, by the same number of Extremities a little Tendinous, which however are sometimes only two in number. This Portion of the Splenius belongs rather to the Neck than to the Head.

615. THE two Splenii represent a great Roman V; and the Splenius and Sterno-Mastoidæus of the same side, form a Figure like a Roman A or the Legs of a Pair of Compasses, the Points whereof are in an Horizontal Plane. Thus these four Muscles surrounding the Neck, meet alternately at their upper and lower Extremities.

§ 3. *Complexus.*

616. THIS is a pretty long and broad Muscle lying on the posterior lateral part of the Neck, all the way to the Occiput. It is complicated by *Situation in general.*

reason of the Decussations of its different Portions, from which it has its name, but is commonly looked upon to be one Muscle.

Insertions.

617. It is fixed below by small short Tendons to the transverse Apophyses of all the Vertebrae of the Neck except the first, to which it is fixed only near the Root of its transverse Apophysis. From thence it runs up obliquely backward, crossing under the Splenius, and often communicating with it by some Fasciculi of Fibres.

618. It is afterwards inserted above by a broad fleshy Plane in the posterior part of the superior transverse Line of the Os Occipitis, near the Crista or Spine of that Bone. At its Insertion it joins by one Edge the Complexus of the other side, and by the other, the Splenius which covers it a little.

619. BEFORE we dissect the Splenii, we may see in the Interstice left between their superior Portions, the two Complexi united together on the Spine of the Os Occipitis.

§ 4. *Complexus Minor sive Mastoidæus Lateralis.*

Situation in general.

620. THIS is a long, slender, narrow, indented Muscle, lying along all the side of the Neck up to the Ear, where it increases a little in breadth. It is something like the Complexus Major, and *Vesalius* took it to be a Portion of that Muscle.

Insertions.

621. It is fixed by one Extremity in all the transverse Apophyses of the Neck, except the first, by the same number of Digitations or Branches mostly fleshy and disposed obliquely.

622. FROM thence it ascends, and having reached above the transverse Apophysis of the first Vertebra, it forms a small broad Plane, by which it is inserted in the posterior part of the Apophysis Mastoidæus. It is here covered by the Splenius, and covers a little the Obliquus Superior.

623. THIS Muscle is often mistaken for a Portion of the Longissimus Dorsi.

§ 5. *Rectus Major.*

Situation in general.

624. THIS is a small, flat, short Muscle, broad at the upper part and narrow at the lower; and though it is called Rectus, it is situated obliquely between the Occiput and second Vertebra of the Neck.

Insertions.

625. It is fixed below to one Branch of the Bifurcated Spine of the second Vertebra of the Neck, at a Tuberosity which is often found at the upper part of that Branch. From thence it ascends a little obliquely outward, and is inserted in the posterior part of the inferior transverse Line of the Os Occipitis, at a small distance from the Crista, being a little covered by the Obliquus Superior.

§ 6. *Rectus*

§ 6. *Rectus Minor.*

626. THIS Muscle is like the former, and it has also a small Insertion *Situation and*
below, in the posterior Eminence of the first Vertebra. From thence it *Insertions.*
ascends laterally and is inserted immediately under the posterior part of the
inferior transverse Line of the Os Occipitis, in a superficial Fossula on one
side of the Crista Occipitalis.

§ 7. *Obliquus Superior sive Minor.*

627. THIS Muscle is situated laterally between the Occiput and first Ver- *Situation and*
tebra, being nearly of the same Figure with the two Recti. It is fixed to *Insertions.*
the end of the transverse Apophysis of the first Vertebra; from whence it
runs upward and very obliquely backward, and is inserted in the transverse
Line of the Os Occipitis, almost at an equal distance from the Crista and
Mastoide Apophysis, between the Rectus Major and Complexus Minor,
which covers it a little.

§ 8. *Obliquus Inferior sive Major.*

628. IT is situated in a contrary Direction to the Obliquus Superior, *Situation in*
between the first and second Vertebra of the Neck, resembling that Muscle *general and*
in every thing but the size. It is fixed below to one Ramus of the bifur- *Insertions.*
cated Spinal Apophysis of the second Vertebra, near the Insertion of the
Rectus Major; from whence it runs obliquely upward and outward, and
is inserted in the end of the transverse Apophysis of the first Vertebra under
the lower Insertion of the Obliquus Superior.

§ 9. *Rectus Anticus Longus.*

629. THIS Muscle is in some measure of a Pyramidal Figure, lying *Situation in*
along the anterior and lateral parts of the Vertebrae of the Neck, all the *general.*
way up to the Basis Cranii.

630. IT is fixed to the anterior parts of the transverse Apophyses of the *Insertions.*
third, fourth, fifth and sixth Vertebrae in a digitated manner. From thence
it runs up obliquely inward towards the lateral parts of the Bodies of the
Vertebrae, passes on the fore side of the first and second without being in-
serted in them, and approaching gradually towards the same Muscle on the
other side, it is inserted near it, in the forepart of the lower side of the Apo-
physis Basilaris, or great Apophysis of the Os Occipitis.

§ 10. *Rectus Anticus Brevis.*

631. THIS is a small flat Muscle, about the breadth of one Finger, *Situation*
situated laterally on the anterior part of the Body of the first Vertebra. *It and Inser-*
is tions.

is fixed below to the Basis or Root of the transverse Apophysis of that Vertebra, near the anterior Eminence.

632. FROM thence it runs obliquely upward and inward to a transverse Impression in the lower side of the Apophysis Basilaris of the Occipital Bone, immediately before the Condyle on the same side, being covered by the Rectus Anticus Longus.

§ 11. *Transversalis Anticus Primus.*

*Situation
and Inserti-
ons.*

633. THIS is a small, pretty thick and wholly fleshy Muscle, about the breadth of a Finger, situated between the Basis of the Os Occipitis and the transverse Apophysis of the first Vertebra. It is fixed by one end in the anterior part of that Apophysis; and from thence running up a little obliquely, it is inserted by the other end in a particular Impression between the Condyle of the Os Occipitis and the Mastoide Apophysis of the same side, behind the Apophysis Styloides and under the Edge of the Jugular Fossula.

§ 12. *Transversalis Anticus Secundus.*

634. THIS is a small Muscle situated between the transverse Apophyses of the first two Vertebrae of the Neck. It is fixed by one Extremity very near the middle of the second Apophysis, and by the other near the Root or Basis of the first; and therefore it is a Muscle of the Neck rather than of the Head.

§ 13. *Musculi Accessorii.*

635. WE sometimes meet with a small Muscle fixed by one end to the Extremity of the first transverse Apophysis of the Neck near the Insertions of the two Obliqui; from whence running up obliquely it is again inserted behind the Mastoide Apophysis. This Muscle is commonly thought to be a third small Transversalis on that side where it is found, but it seems rather to be an additional Muscle to the Obliquus Superior. The Recti and other Obliqui are likewise sometimes found double.

636. I call all these Muscles Accessorii or Supernumerary, because they are sometimes wanting, and because when they are found, they vary both in Number and Situation.

A R T. XV.

The Vertebral Muscles in general.

637. **T**HE Muscles which lie along the Spine, the greatest part whereof serve for the Motions of the Neck, Back, and Loins, have by the greatest Anatomists been thought very difficult to be well dissected and clearly described, especially those of the Back. All these Muscles are very complex, interwoven with each other, and multiplied in various manners, so that it becomes necessary either to make their number much greater than that of the Vertebrae, or to reduce them to a small number of long Muscles intersected at different places.

638. *STENO*, in order to facilitate the Knowledge, Dissection and Description of these Muscles, thought proper to rank them in the following manner. By Vertebral Muscles he understands those which are fixed in the Vertebrae alone; and he distinguishes them all into Recti and Obliqui. The Recti are those which run parallel to the Medulla Spinalis, or whose Direction is longitudinal. The Obliqui are those which run obliquely between the Spinal and transverse Apophyses.

639. **H**E divides the Recti into Middle and Lateral. The middle Recti are those which are fixed to the Spinal Apophyses; the lateral those fixed to the transverse Apophyses. He moreover divides all these Muscles into Simple and Compound; the Simple being those which are fixed in two Vertebrae only; the Compound, those fixed in more than two.

640. **T**HE Obliqui according to him are of two kinds. Some run up from the Transverse to the Spinal Apophyses, approaching each other; and some run up from the Spinal to the Transverse Apophyses, diverging from each other. The first sort he terms *ad Medium Vergentes*; the second *a Medio recedentes*. These terms are borrowed from Optics, and accordingly these two kinds of Muscles might be named Converging and Diverging Muscles. Lastly he adds, that several Muscles of the first kind go from one Transverse to several Spinal Apophyses; and from several Transverse to one Spinal Apophysis.

641. **A**CCORDING to this account of the Vertebral Muscles, the ancient terms Spinales, Transversales and Semi-Spinales, may still be applied to them; understanding by Spinales those Muscles which are wholly fixed in the Spinal Apophyses; by Transversales those which are wholly fixed in the Transverse Apophyses; and by Semi-Spinales those which are fixed in the Spinal Apophyses by one Extremity only. At present the two kinds of oblique Vertebral Muscles are better expressed by the two compound terms Transverso-Spinales and Spino-Transversales.

642. **I**T is however necessary still to retain the general names of Vertebrales Recti, Vertebrales Obliqui, &c. because though the terms already mentioned agree very well to the Posterior Obliqui, they cannot be applied

to.

to the Anterior Obliqui, one end of which is fixed not in the Spinal Apophyses, but in the Bodies of the Vertebrae.

643. THE small simple Muscles that go only between two Vertebrae, may be termed *Vertebrales Minores*; and the large compound Muscles that reach several Vertebrae, *Vertebrales Majores*, both sorts being afterwards divided into *Spinales* and *Transversales Majores* and *Minores*. The small Muscles are likewise called *Inter-Spinales* and *Inter-Transversales*; and as there are some small oblique Muscles which cannot be said to reach either the Transverse or Spinal Apophyses; these may be termed simply *Inter-Vertebrales*.

644. THE *Transverso-Spinales* that go from several Transverse to one Spinal Apophysis are disposed in this manner. The Portion that comes from the most distant Transverse Apophysis is inserted in the Extremity of the Spinal Apophysis, the Portion from the next Transverse Apophysis is inserted more laterally, and the same Rule holds in all the other Portions, except in that which comes from the Transverse Apophysis which is nearest the Spinal Apophysis.

645. THIS last Portion is not fixed in the Spinal Apophysis, but rather in its Root or Basis, and likewise very near the Basis of Transverse Apophysis, so that it is more properly *Inter-Vertebralis* than *Transverso-Spinalis*. Thus in the *Transverso-Spinales* that go from the ninth, eighth, seventh and sixth Transverse Apophyses of the Back, to the fifth Spinal Apophysis of the same Class, we find that the last and smallest is fixed in the Basis of the sixth Transverse and of the fifth Spinal Apophysis.

646. THE *Transverso-Spinales* which go from one Transverse to several Spinal Apophyses, are disposed in this manner. The Portion that goes from the Basis, or near the Basis of the Transverse Apophysis, is fixed either in or near the Basis of the Spinal Apophysis immediately above it. The next Portion which is more distant from the Basis of the Transverse Apophysis, runs up beyond the next Spinal Apophysis, and is inserted in that above it, a little further from the Basis.

647. THE other Portions observe the same order, that which comes from the Apex of the Transverse Apophysis, being inserted in the Apex of the most distant Spinal Apophysis. From this Disposition we see that the most superior Vertebral Muscles which go from one Transverse to several Spinal Apophyses, are the most inferior of those which go from several Transverse to one Spinal Apophysis.

648. IT must be observed, that in speaking of the oblique Vertebral Muscles, I consider their Direction from below upward, and not from above downward, because the inferior Vertebrae commonly support those above them, except when a Person stands upon his Head, with his Feet erect, in which case the superior Vertebrae sustain the inferior.

649. WE ought likewise to remark, that in speaking of these Muscles the term *Transversalis* is more proper than *Transversus*, which last points out a certain Direction very different from that which these Muscles have; whereas the other Marks the relation which they have to the Transverse Apophyses.

650. BESIDES

650. BESIDES the Vertebral Muscles properly so called, several other Muscles not inserted wholly in the Vertebrae, serve to move them. Some of the Ancients called these Semi-Spinales, to distinguish them from those they termed Spinales, which included all the Vertebral Muscles; and therefore as we have termed these Vertebrales, the others may be named Semi-Vertebrales.

651. AMONG the Vertebrales properly so called, some from their Insertions, seem to be common to the Neck and the Back, some to the Back and Loins; but for Distinction's sake I reckon among those of the Neck, not only the Muscles intirely fixed in the Vertebrae thereof, but also those whose superior Insertion is in the seventh Vertebra of the Neck, though all their other Insertions be in those of the Back; and I observe the same Method with respect to the Loins.

652. ALL these Muscles vary very much in their Insertions and reciprocal Communications; by which last they are often so much confounded together, that it is a very difficult matter to distinguish them for those who are not previously acquainted with them. In general they are more easily distinguished in Children than in Adults, and in Adults than in very aged Persons.

653. IN describing these Muscles I confine my self chiefly to what I have most commonly observed my self; without pretending to contradict or discredit what other very great Anatomists have published about them.

ART. XVI.

The Vertebral Muscles in particular.

654. **T**HE Muscles that move the Neck in particular, are very many in number, as has been already observed in speaking of the Vertebral Muscles in general; but in order to shun all confusion and easily to form an Idea of them, they may be taken collectively, and thereby be reduced to twelve, six on each side, of which one is situated on the fore-side of the Neck, the rest on the backside. *Muscles of the Neck.*

655. THE Muscle, which with its fellow lies on the fore-side of the Neck, is named

1. *Longus Colli.*

656. THOSE on the backside are

2. *Transversalis Colli Major.*

3. *Transversalis Gracilis sive Collateralis Colli.*

4. *Semi-Spinalis sive Transverso-Spinalis Colli.*

5. *Spinales Colli parvi sive Inter-Spinales.*

6. *Transversales Colli Minores sive Inter-Transversales.*

657. THE Spinales Minores and Transversales Minores are here reckoned collectively ; for if we take them separately, there are six or seven of each sort on each side of the Neck ; neither is the number of them always the same. The Transversalis Gracilis has often been looked upon as a Portion of that long Muscular Mass termed Longissimus Dorsi. It has likewise been taken by some for the Cervicalis Descendens of Diemerbroek, and by others it has been called Accessorius Stenonis.

658. WE ought likewise to reckon among the Muscles of the Neck, two which have been described among those of the Head, viz.

7. *Obliquus Major.*

8. *Rectus Minor.*

659. I do not speak here of other Muscles which assist in moving the Neck, that is, all those that move the Head, except the small ones inserted in the Cranium, and in the first Vertebra of the Neck.

§ 1. *Longus Colli.*

*Situation in
general and
Insertions.*

660. THIS Vertebral Muscle is made up of several others, situated laterally along the foreside of all the Vertebrae of the Neck, and some of the upper Vertebrae of the Back.

Division.

661. IT may be divided into two Portions ; one Superior, consisting of oblique Converging Muscles, and one Inferior, composed of oblique Diverging Muscles.

662. THE Superior Portion is covered by the Rectus Anticus Longus of the Head. The Muscles of which it consists are fixed below, to all the Transverse Apophyses that lie between the first Vertebra and the last. From thence they run up obliquely, and are inserted in the Anterior Eminence of the first Vertebra, and in the Bodies of the three following. The Insertion in the Eminence is so closely united to the Ligament which goes to the Os Occipitis, that it can hardly be distinguished from it.

663. THE Inferior Portion appears almost straight, and yet all the Muscles that compose it are Diverging, or directed obliquely outward. They are fixed below, to the Anterior lateral part of the Body of the last Vertebra of the Neck, and of the first three of the Back, and sometimes of more. From thence they run upward and a little obliquely outward, and are inserted near the Transverse Apophyses of all the Vertebrae of the Neck, except the first and last.

664. THOUGH these two Portions seem to be confounded with each other, they may nevertheless be easily distinguished by an oblique Line that runs between them from the Transverse Apophysis of the second Vertebra to the Body of the sixth.

665. ALL the Insertions of this Muscle are more or less Tendinous.

§ 2. *Transversalis Colli Major.*

666. THIS is a long thin Muscle, placed along all the Transverse Apophyses of the Neck, and the four, five or six upper Apophyses of the Back, *Situation in general.* between the Complexus Major and Minor, lying, as it were, on the Insertions of the first of these Muscles.

667. It is composed of several small Muscular Fasciculi which run directly from one or more Transverse Apophyses, and are inserted sometimes in the Apophysis nearest to these, sometimes in others more remote, the several Fasciculi crossing each other between the Insertions of the two Complexi, which are likewise crossed by them. They have sometimes a Communication with the Longissimus Dorsi, but this is not uniform. *Insertions.*

§ 3. *Transversalis Gracilis sive Collateralis Colli.*

668. THIS is a long thin Muscle, resembling the Transversalis Major in every thing but Size, and situated on the side of that Muscle. It is commonly taken for a Portion or Continuation of the Sacro-Lumbaris. *Diemerbroek* distinguished it by the name of Cervicalis Descendens; and *Steno* and others after him, have called it Accessorius Musculi Sacro-Lumbaris, in speaking of which Muscle I shall have occasion to mention it again.

§ 4. *Semi-Spinalis sive Transverso-Spinalis Colli.*

669. THIS name is given to all that fleshy Mass which lies between the Transverse and Spinal Apophyses from the second Vertebra of the Neck to the middle of the Back; the Splenius and Complexus Major which cover it, having been raised. *Situation.*

670. It is composed of several oblique Converging Muscles, which may be divided into External and Internal, and of these the External are the longest. *Division.*

671. THE External are fixed below, to the Transverse Apophyses of the six, seven, eight or nine upper Vertebrae of the Back, by Tendinous Extremities, which, as they ascend, become fleshy, and mix with each other. Their Superior Insertions in the Neck are six in number, whereof the first which is Tendinous, is in the seventh Spinal Apophysis; the rest which are fleshy are in the five next Spinal Apophyses.

672. THE lowest of these External Muscles mix more or less by some communicating fleshy Fibres, with the Spinalis, Longissimus, and Semi-Spinalis Dorsi.

673. THE Internal are shorter and more oblique than the External, and partly covered by them. They are fixed by their lower Extremities to the Transverse Apophyses of the three or four upper Vertebrae of the Back, and to the Oblique Apophyses of the four or five lower Vertebrae of the Neck;

Neck; and by their other Extremities they are inserted in the six Spinal Apophyses of the Neck.

674. SOME of these internal Muscles are very short, lying wholly between the Spinal Apophyses and the Oblique or Transverse Apophyses next them.

§ 5. *Spinales Colli Minores.*

*Situation
and Inserti-
ons.*

675. THESE Muscles lie between the six Spinal Apophyses of the Neck, and between the last of the Neck and first of the Back, being inserted in these Apophyses by both Extremities on one side of the posterior Cervical Ligament, which parts them from those on the other side. They are likewise termed Inter-Spinales.

§ 6. *Transversales Colli Minores.*

676. THESE are very small short Muscles, found in the Interstices of several Transverse Apophyses in which they are inserted. They are likewise termed Inter-Transversales.

*Muscles of
the Back,
Loins and
Os Coccygis.*

677. THE Muscles which move the Vertebrae of the Back and Loins would amount to a much greater number, and be much more difficult to conceive than those of the Neck, were they to be reckoned separately as Vertebral or Semi-Vertebral Muscles. It is therefore proper to reduce them to a collective number which may conveniently enough be fixed to twenty four, twelve on each side, viz.

- | | |
|---|---|
| 1. <i>Sacro-Lumbaris.</i> | 8. <i>Semi-Spinalis sive Transverso-Spinalis Lumborum, Sacer Veterum.</i> |
| 2. <i>Longissimus Dorfi.</i> | 9. 10. <i>Spinales & Transversales Lumborum.</i> |
| 3. <i>Spinalis Dorfi Major.</i> | 11. <i>Quadratus Lumborum sive Lumbaris Externus.</i> |
| 4. <i>Spinales Dorfi Minores.</i> | 12. <i>Coccygæi.</i> |
| 5. <i>Transversalis Dorfi Major.</i> | |
| 6. <i>Transversales Dorfi Minores.</i> | |
| 7. <i>Semi Spinalis sive Transverso-Spinalis Dorfi.</i> | |

678. THE Vertebrae of the Back, and especially those of the Loins, may likewise be moved by the Muscles of the Abdomen, as has been already observed. The inferior Portion of the Longus Colli may contribute something to the Motion of the upper Vertebrae of the Back; the Psoas to that of the Vertebrae of the Loins, and the Glutæus Maximus to that of the Os Coccygis.

§ 7. *Sacro-Lumbaris.*

*Situation
and Name.*

679. THIS is a long Complex Muscle, narrow and thin at the upper part, broad and thick at the lower, representing a kind of flat Pyramid.

It

It lies between the Spine and posterior part of all the Ribs, and along the back part of the Regio Lumbaris, all the way to the Os Sacrum.

680. THROUGH all this Space it is closely accompanied by the Longissimus Dorfi, which lies between it and the Spinal Apophyses of the Vertebrae, a narrow, fatty or cellular Line running between them. The name of Lumbo-Costalis would better express the Situation of this Muscle than that of the Sacro-Lumbaris. It might be termed Medius Dorfi to distinguish it from the Latissimus and Longissimus Dorfi, between which it is placed.

681. IT is fixed below by a broad thin Tendinous Aponeurosis to the superior Spines of the Os Sacrum, and to the neighbouring lateral parts of that Bone; and lastly, to the external Labium of the posterior part of the Crista Ossis Ilium, all the way to the great Tuberosity. The Aponeurosis covers and adheres very closely to the lower part of the Longissimus Dorfi, and where it is fixed to the Os Sacrum it is a little covered by some Insertions of the Glutæus Maximus.

682. FROM thence this Muscle runs upward and a little laterally over all the Regio Lumbaris, the Aponeurosis sending off from its inside a Mass of fleshy Fibres, which are divided from below upwards, into several large Fasciculi inserted in all the Transverse Apophyses of the Loins.

683. AFTERWARDS it runs up obliquely over all the Ribs, sometimes as high as the two or three lowest Vertebrae of the Neck, sometimes higher, and sometimes it ends at the first Vertebra of the Back.

684. THROUGH all this extent the side of the Muscle next the Longissimus Dorfi or Vertebrae, is very even, but that next the Ribs is divided into several Portions in an oblique Disposition from below upwards, resembling in some measure the Branch of a Palm-Tree. These Portions or Digitations are fixed in the Transverse Apophyses of the Neck, in the Tuberosity of the first Rib, in the lower part of the angular Impressions of the ten following Ribs, and near the Extremity of the last Rib.

685. THIS Digitation belonging to the last Rib is broad and more fleshy than Tendinous. Those of the other Ribs are Tendinous, flat and narrow, and those of the Neck are something fleshy, but very slender. The most superior Portions are longer and narrower than those below them, they growing gradually shorter and broader as they descend.

686. IN dissecting this Muscle with care, between these Portions and the Ribs, we meet with several long thin Muscular Fasciculi, which crossing the Portions and adhering to them, are afterwards fixed in the Ribs above and behind the Insertions of the several Portions.

687. THESE Muscular Fasciculi begin at the Transverse Apophyses of the same Vertebrae of the Neck, from whence they run down and are fixed in the eight or nine following Ribs. Sometimes they pass over several Ribs without being inserted in them; but this varies in different Subjects, and sometimes in the two sides of the same Subject.

688. IN this manner these Fasciculi form a particular Plane, which some take for the internal Portion of the Sacro-Lumbaris; others after *Steno*, call it

it *Musculus Accessorius Sacro-Lumbaris*. Some take it for a distinct Muscle, calling it the *Cervicalis Descendens* of *Diemerbroeck*. I have already mentioned it among the Muscles which move the *Vertebrae* of the Neck by the name of *Transversalis Gracilis Colli*.

§ 8. *Longissimus Dorsi*.

Situation in general.

689. THIS is a very complex, long and narrow Muscle, something like the *Sacro-Lumbaris*, but more fleshy and thicker, situated between the *Spinal Apophyses* and the Muscle just mentioned, from which it is divided by a small, fatty or cellular Line, but at the lower part they are confounded together. It covers the *Semi-Spinalis* or *Transverso-Spinalis Dorsi* and the *Semi-Spinalis Lumborum*. Its upper part lies between the *Sacro-Lumbaris* and *Transversalis Colli*.

Insertions.

690. ITS inferior Insertions are partly by distinct *Tendinous Portions*, and by a broad *Aponeurosis* common to it with the *Sacro-Lumbaris*, and partly by large *Fasciculi* of fleshy *Fibres*, which at first sight seem to compose one uniform Mass. It is fixed by the long, flat, *Tendinous Portions* of different breadths, to the last *Spinal Apophysis* of the Back, to all those of the *Loins*, and to one or two of the superior *Spines* of the *Os Sacrum*. These *Portions* lie at different distances from each other, but are all connected by a thin *Aponeurosis* fixed to their Edges.

691. FROM thence they run up obliquely, diverging from the *Apophyses*, and beginning to be fleshy at their inner or anterior sides, they terminate above in small roundish *Tendons*, inserted in the *Extremities* of the seven upper *Transverse Apophyses* of the Back, and in the neighbouring *Ligaments* of all the true *Ribs*. Sometimes one Insertion in the *Vertebrae* of the Back is wanting, and sometimes there is one in the *Transverse Apophysis* of the last *Vertebra* of the Neck.

692. THE other inferior Insertion wholly fleshy, is partly in the inner or fore-side of the *Aponeurosis* of the *Sacro-Lumbaris*, and partly in the upper *Portion* of the *Os Sacrum*, being from thence continued to the great *Tuberosity* of the *Os Ilium*, so that the *Aponeurosis* of the *Sacro-Lumbaris* seems to afford a third Insertion to the *Longissimus Dorsi*.

693. FROM thence this uniform Mass of fleshy *Fibres* runs up in a course almost direct, crossing the *Tendinous Portions* which are more oblique; and join the inferior *Fibres* of the *Sacro-Lumbaris* by large *Fasciculi* inserted in the *transverse* and *oblique Apophyses* of the *Vertebrae* of the *Loins*. The *Fibres* of this *Portion* go afterwards to the *Ribs*, being inserted by *Planes* more or less fleshy in the lower convex Edge of all the false *Ribs*, between the *Condyles* or *Tuberosities* and the *Angles*.

694. AT the sixth or seventh *Vertebra* of the Back, one or more of the *Tendinous Portions* often communicate with some *Fasciculi* of the *Semi-Spinalis* or *Transverso-Spinalis Dorsi*.

695. By

695. BY this Description we see that the Longissimus Dorfi is in part a great Semi-Spinalis Divergens or Spino-Transversalis, much in the same manner as the inferior Portion of the Splenius.

696. IN examining the Dorsal Insertions of this Muscle, we meet with several Muscular Fasciculi which cross the Tendinous Portions near the Spine, but without adhering so strongly to them as those already mentioned do to the Sacro-Lumbaris, which they resemble in every other circumstance. These Fasciculi are fixed above, to the Transverse Apophyses of the three or four first Vertebrae of the Back, and below to those of the sixth and seventh.

697. I have observed other such Fasciculi fixed in the Transverse Apophyses of the Back from the first to the ninth inclusively, and situated between the Extremities of the Transversalis Major Colli, and of the Longissimus Dorfi with which they communicate at the third Vertebra or thereabouts.

698. THESE Fasciculi might be reckoned a Musculus Accessorius Longissimi Dorfi, or a Transversalis Dorfi, in the same manner as that of the Sacro-Lumbaris already mentioned.

699. SOME Anatomists imagine that the Longissimus Dorfi is continued all the way to the Apophysis Mastoidæa of the Cranium, taking the Complexus Minor or Mastoidæus Lateralis to be a Portion of this Muscle.

700. THIS Muscle and the Sacro-Lumbaris are common to the Back and Loins.

§ 6. Spinalis Dorfi Major.

701. THIS is a pretty long and slender Muscle, lying upon the lateral part of the Extremities of the Spinal Apophyses of the Back. *Situation in general.*

702. IT is composed of several Muscular Fasciculi of different lengths, which crossing each other, are inserted laterally by small Tendons in the Spinal Apophyses from the second, third, or fourth Vertebra of the Back, and sometimes, though seldom, from the last of the Neck or first of the Back; all the way to the first or second Vertebra of the Loins, with several irregular Decussations which vary in different Subjects. *Insertions.*

703. THE longest Fasciculi are a little incurvated, because they inclose the rest, which are gradually disposed between the long ones and the Spinal Apophyses; so that this Muscle which terminates by both Extremities in Points, is of some considerable breadth in the middle.

704. IT communicates by some Fibres with the Longissimus Dorfi and Semi-Spinalis or Transverso-Spinalis; and it sends off Fasciculi to several Transverse Apophyses of the Back from the fourth to the eleventh.

705. IT is commonly named Semi-Spinalis, but very improperly, as appears from what has been said about the Vertebral Muscles in general.

§ 10. *Spinales Dorſi Minores.*

*Division and
Insertions.*

706. THESE Muscles are of two kinds. Some go laterally from the Extremity of one Spinal Apophysis to another; being often mixed with the short Fasciculi of the Spinalis Major. The rest lie directly between the Extremities of two neighbouring Spinal Apophyses, being separated from their Fellows on the other side, by the Spinal Ligament. They are smaller and thinner than those of the Neck, and are properly enough termed Inter-Spinales.

§ 11. *Transversalis Dorſi Major.*

707. THIS Muscle was described together with the Longissimus Dorſi.

§ 12. *Transversales Dorſi Minores.*

708. I have found some particular Muscles of this kind fixed to the Extremities of the three lowest Transverse Apophyses of the Back. The rest are all in some measure Continuations of the Transversalis Major; but these few which are distinct, and which lie in the Interstice between two Apophyses, may justly enough be termed Inter-Transversales.

§ 13. *Semi-Spinalis five Transverso-Spinalis Dorſi.*

*Situation in
general.*

709. THIS is a fleshy Mass, which from all the Spinal and Transverse Apophyses of the Back and Loins, is extended in distinct Fasciculi over the Vertebrae themselves.

Insertions.

710. IT is made up like that of the Neck, of several oblique Converging Vertebral Muscles, the uppermost of which is fixed below, to the third Transverse Apophysis of the Back, and above to the first Spinal Apophysis. The lowest is fixed below, to the third Transverse Apophysis of the Loins, and above to the last Spinal Apophysis of the Back.

Division.

711. THEY may be divided into External, which are first discovered, and Internal, which lie immediately on the Vertebrae. The External from the first Vertebra to the seventh inclusively, appear to be longer than the Internal, which are covered by them. They may likewise be distinguished into those which go from one Transverse to several Spinal Apophyses, and those which go from several Transverse to one Spinal Apophysis.

§ 14. *Transverso-Spinalis Lumborum, Sacer Veteribus.*

*Situation in
general.*

712. THIS Muscle is composed of several oblique Converging or Transverso-Spinal Muscles in the same manner as in the Back and Neck; and it lies between the Spinal and Oblique Apophyses of the Loins, reaching to the Os Sacrum.

713. THE lowest of these Muscles are fixed to the superior lateral parts of the Os Sacrum, to the Ligamentum Sacro-Iliacum, and to the posterior superior Spine of the Os Ilium. The rest are fixed to the three lowest Transverse Apophyses, and to the four lowest Oblique Apophyses of the Loins, and to their lateral Tuberosities. From thence they run up to all the Spinal Apophyses of these Vertebrae, the External or those that appear first, being longer than the Internal which lie immediately on the Vertebrae, especially toward the lower part.

§ 15. *Spinales & Transversales Lumborum.*

714. THERE are some Fasciculi which run up from the superior false Spines of the Os Sacrum, to the lower Spinal Apophyses of the Loins, which may be looked upon as so many Spinales Lumborum Majores. There are likewise some Spinales Minores between the Spinal Apophyses of the Loins, and Transversales Minores between the Transverse Apophyses, which are sometimes of a considerable breadth.

§ 16. *Quadratus Lumborum sive Lumbaris Externus.*

715. THIS is a small, oblong, flat Muscle, irregularly square, narrower at its upper than at its lower part, lying along the sides of the Vertebrae Lumborum between the last false Rib and the Os Ilium. Situation in general.

716. It is fixed below to the external Labium of almost all the posterior half of the Crista Ossis Ilium, to the Ligamentum Sacro-Iliacum, and a little to the Os Sacrum, by a fleshy Plane, the Fibres whereof run obliquely backward. Insertions.

717. FROM thence it runs up between the Sacro-Lumbaris and Psoas, by both which it is partly hid, and is inserted in the Extremities of all the Transverse Apophyses of the Loins by oblique Tendinous Digitations. It is likewise fixed by a broad Insertion in the twelfth Rib, on the inside of the Ligament that lies between it and the Longissimus Dorsi, by which that Rib is connected to the first Vertebra of the Loins.

718. I have observed likewise a small Lumbaris Externus adhering very closely to the backside of the Quadratus, and fixed by Tendinous Digitations to the Extremities of the second, third and fourth Transverse Apophyses of the Loins. From thence its fleshy Fibres run up obliquely over the Quadratus, and then mix with it at its Insertion in the last false Rib.

§ 17. *Musculi Ossis Coccygis.*

719. THESE are small, thin, radiated Muscles lying on the inner or concave side of the Os Sacrum, and neighbouring parts of the Pelvis. They are four in number, two on each side, whereof one is placed more forward the other more backward; for which reason the first may be termed Coc-

cygæus Anterior five Ilchio-Coccygæus; the other Coccygæus Posterior five Sacro-Coccygæus.

720. THE Coccygæus Anterior is fixed by a broad Insertion in the Anterior Portion of the small Transverse Ligament at the upper part of the Foramen Ovale of the Os Innominatum, which, as was observed in the Description of the fresh Bones, is no more than a particular Fold of the great Transverse Ligament of the Pelvis. From thence it runs between this great Ligament and the Musculus Obturator Internus, with which it is often confounded by Anatomists, and contracting in breadth, it is inserted in the lower part of the Os Coccygis.

721. THE Coccygæus Posterior or Sacro-Coccygæus is fixed to the inner or concave Edge of the two first Vertebrae of the Os Sacrum, to the inner and lower Edge of the Ligamentum Sacro-Sciaticum, and to the Spine of the Os Ischium. From thence contracting in breadth, it is inserted in the inside of the Os Coccygis above the former Muscle.

§ 18. *Psoas Parvus.*

Situation.

722. THIS is a long slender Muscle lying upon the Psoas Major. It is sometimes wanting, and *Riolan* who met with it often in Men, takes notice of his having found it once in a Woman, as a thing very extraordinary. As for my own part I found it several times in Women before I ever met with it in Men, and I still continue to observe it most frequently in that Sex.

723. It is fixed above by a short Tendon, sometimes to the last Transverse Apophysis of the Back, or higher; sometimes to the first of the Loins, and sometimes to both. From thence it runs down wholly fleshy, and more or less complex, on the great Psoas in a Direction a little oblique.

724. HAVING reached the middle of the Regio Lumbaris or thereabouts, it forms a slender flat Tendon, which gradually increasing in breadth, like a thin Aponeurosis, runs over the Psoas Major and Iliacus Internus at their Union, and from thence down to the Symphysis of the Os Pubis and Os Ilium, and is inserted chiefly in the Crista of the Os Pubis above the Insertion of the Pectineus, sometimes sending an Aponeurotic Lamina further down.

725. BESIDES this Psoas Parvus, there is another still smaller, between it and the Vertebrae, inserted much in the same manner. This Muscle I discovered in the Year 1713.

ART. XVII.

The Muscles which move the Lower Jaw.

726. **T**HESE Muscles are ten in number, five on each side, viz.

- | | |
|---|-----------------------------------|
| 1. <i>Masseter.</i> | 4. <i>Pterygoidæus Minor five</i> |
| 2. <i>Temporalis.</i> | <i>Externus.</i> |
| 3. <i>Pterygoidæus Major five Internus.</i> | 5. <i>Digastricus.</i> |

727. To these some add the two Musculi Cutanei; but very improperly, for a reason which shall be given in another place.

§ 1. *Masseter.*

728. **T**HIS is a very thick fleshy Muscle, situated at the back part of the *Situation.* Cheek. It seems to be made up of three Portions, like a Triceps, viz. one large and external Portion, one middle, and one small and internal.

729. **T**HE External Portion is fixed by one Tendinous Extremity to all the Inferior Edge of the Os Malæ, and a little to the neighbouring parts of the Os Maxillare and Apophysis Zygomatica of the Os Temporum. From thence it runs down obliquely backward, being wholly fleshy, and is inserted by the other Extremity in the rough Impression on the outside of the Angle of the Lower Jaw.

730. **T**HE Middle Portion is fixed by one end to the lower Edge of the whole Apophysis Zygomatica of the Os Temporum, and a very little to that of the Os Malæ. From thence it runs down a little obliquely forward in an opposite Direction to the first Portion, under which it crosses; and is inserted by its other Extremity in the middle of the inside of the Ramus of the Lower Jaw, near the Insertion of the External Portion, with which it mixes.

731. **T**HE third Portion which is least and most internal, is fixed by one Extremity to the inner Labium of the lower Edge, and also to the inside of almost all the Zygomatic Arch; and by the other, to the Root or Basis of the Coronoide Apophysis, where it mixes wholly fleshy with the Insertion of the middle Portion. This third Portion, by its nearness of Situation, seems sometimes to be an Appendix of the Temporal Muscle.

§ 2. *Temporalis.*

732. **T**HIS is a broad flat Muscle, resembling the Quadrant of a Circle *Situation in* in Figure. It occupies all the Semi-Circular or Semi-Oval Plane of the *general.* lateral Region of the Cranium, the Temporal Fossa and part of the Zygomatic

gomatic Fossa. From this Situation it has its name, and likewise that of Crotaphites, which is sometimes given to it.

Insertions.

733. To conceive justly the Insertions of this Muscle, it must be observed, that through all the Circumference of the Semi-Circular Plane already mentioned, the Pericranium is divided into two Laminæ. The Internal Lamina sometimes taken for a particular Periosteum, covers immediately all the bony parts of this Region. The External Lamina separated from the other, is spread out like an Aponeurotic or Ligamentary Tent, by means of its Adhesions to the external Angular Apophysis of the Os Frontis, to the posterior Edge of the superior Apophysis of the Os Malæ, and to the upper Edge of all the Zygomatic Arch, all the way to the Root of the Mastoide Apophysis.

Division.

734. THIS Muscle is composed of two Planes of fleshy Fibres, fixed to the two sides of a Tendinous Plane nearly of the same breadth with them, by which they are separated, it being spread quite through the Muscle like a concealed middle Tendon; as may be plainly seen by dividing the Muscle all the way to the Bone, according to the Direction of its Fibres. The Body of the Muscle thus formed is inclosed between the two Aponeurotic or Ligamentary Laminæ in the following manner.

735. THE Internal fleshy Plane is fixed by a broad radiated Insertion, to all the Semi-Circular Plane of the Cranium, by the Intervention of the Internal Lamina of the Periosteum.

736. THUS it is fixed to the lateral external part of the Os Frontis, and to its external Angular Apophysis, to the lower part of the Os Parietale, to the Squamous Portion of the Os Temporis, to the great Ala or Temporal Apophysis of the Sphenoidal Bone, by which the Temporal Fossa is formed; and a little to the backside of the internal Orbital Apophysis of the Os Malæ which forms part of the Zygomatic Fossa.

737. THROUGH all this Space the fleshy Fibres contract gradually, by means of their Adhesions to the Tendinous Plane which diminishes in breadth and increases in thickness in proportion as it descends.

738. THE external fleshy Plane is fixed in the same radiated manner to the inside of the external Lamina of the Pericranium, from the great Semi-Circular Circumference, all the way to a small Portion of this Lamina more or less Semi-Circular, above its Insertion in the Zygomatic Arch. Here the fleshy Fibres leave the external Lamina, and the void Space thus formed between the small Semi-Circular Portion, and the fleshy Fibres, is commonly filled with Fat.

739. THROUGH the whole extent of this Insertion the fleshy Fibres gradually contract, and adhere to the outside of the middle Tendinous Plane in the same manner as the internal Plane adheres to the other side, but in a contrary Direction.

740. THE middle Tendinous Plane continuing to contract by degrees, ends at length in a very considerable Tendon, the Extremity whereof, which is in a manner double, incloses the Coronoide Apophysis of the Lower Jaw, being strongly inserted in the Edges and inside thereof, and also

also a little in that part of the Bone which lies between the two Apophyses. The Internal Portion of this Insertion is thicker, and has more fleshy Fibres than the External, which is almost wholly Tendinous or Aponeurotic.

741. THERE is another small Plane reckoned by some to be a Portion of this Muscle, which in reality is no more than the third Portion of the Masseter, as may easily be perceived by sawing off the Zygomatic Arch at the two ends, and then turning it down; for this small Muscle parts from the Temporalis without difficulty, and continues to adhere to the Masseter.

§ 3. *Pterygoideus Major sive Internus.*

742. THIS Muscle lies on the inside of the Lower Jaw almost in the *Situation in* same manner as the Masseter does on the outside, being of the same Figure *general.* with that Muscle, only smaller and narrower.

743. IT is fixed above in the Pterygoide Cavity, chiefly to the inside of *Insertions,* the external Ala of the Apophysis Pterygoide. This Insertion is wholly fleshy, and from thence the Muscle has its name.

744. IT runs down obliquely toward the Angle of the lower Jaw, and is inserted a little Tendinous in the Inequalities on the inside thereof, opposite to the Insertion of the Masseter. It might be called Masseter Internus.

§ 4. *Pterygoideus Minor sive Externus.*

745. THIS is an oblong fleshy Muscle, much smaller than the other, and *Situation in* situated almost Horizontally between the outside of the Apophysis Ptery- *general.* goide, and the Condylode Apophysis of the Lower Jaw, the Subject being considered in an erect Posture.

746. IT is fixed by one Extremity to the Outside and Edge of the outer Ala of the Pterygoide Apophysis, filling the Fossula which is at the Basis of this Apophysis, near the Basis of the Temporal Apophysis of the Sphenoidal Bone.

747. FROM thence it runs backward and a little outward, into the void Space between the two Apophyses of the lower Jaw, and is inserted Anteriorly in the Condylode Apophysis at a small Fossula immediately under the inner Angle of the Condyle. It is also fixed to the Capsular Ligament of the Joint.

§ 5. *Digastricus.*

748. THIS is a small long Muscle situated laterally between the whole *Situation in* Basis of the Jaw and the Throat. It is fleshy at both Extremities and Ten- *general.* dinous in the middle, as if it consisted of two small Muscles joined endwise by a Tendon, and from thence it is called Digastricus in Greek and Biventer in Latin.

749. IT

Insertions.

749. It is fixed by one fleshy Extremity in the Sulcus of the Mastoide Apophysis. From thence it runs forward, inclining towards the Os Hyoides, where the first fleshy Body ends in a round Tendon, which is connected to the lateral Part and Root of the Cornua of that Bone by a kind of Aponeurotic Ligament, and not by a Vagina or Pulley, as appears at first sight, because of its passage by the Extremity of the Musculus Styloglossus, of which hereafter.

750. HERE the Tendon is incurvated, and presently joins in the other fleshy Body, which is fixed immediately above the internal Labium of the Basis of the Chin near the Symphysis, in a small unequal Depression. This Insertion is broader than that of the other Extremity. Sometimes the Anterior Insertions of the two Digastrici touch each other, and sometimes several of their Fibres cross each other considerably.

A R T. XVIII.

The Muscles which move the Os Hyoides.

751. **T**HESE Muscles are nine in number, one Anterior without a fellow, and eight Lateral disposed in four Pairs, viz.

- | | |
|---------------------------|-------------------------------|
| 1. <i>Mylo-Hyoidæus.</i> | 4. <i>Omo-plato-Hyoidæus.</i> |
| 2. <i>Genio-Hyoidæus.</i> | 5. <i>Sterno-Hyoidæus.</i> |
| 3. <i>Stylo-Hyoidæus.</i> | |

752. THESE names are borrowed from the Greek, and express the Parts in which the Muscles are inserted.

753. THE Os Hyoides is likewise moved by the Digastricus of the Lower Jaw; and it may in certain circumstances be moved a little by some other Muscles, of which hereafter.

§ 1. *Mylo-Hyoidæus.*

Situation in general.

754. THIS is a broad, thin, penniform Muscle, situated transversely between the internal lateral parts of the Basis of the Lower Jaw, and lying on the Anterior Portions of the two Digastric Muscles.

Structure and Insertions.

755. It is made up of two equal fleshy Portions, one lying on the right side, the other on the left, both in the same Plane, and joined to a small middle Tendon, which is inserted Anteriorly in the middle of the Basis of the Os Hyoides, and from thence runs directly forward, diminishing gradually in its course. This is therefore a true Digastric Muscle, and cannot be divided into two.

756. EACH Portion is fixed by fleshy Fibres to the internal lateral part of the lower Jaw, between the oblique prominent Line and the Basis, under the first four Dentes Molares, and Caninus. The Anterior and the greatest part

part of the other Fibres of each Portion run obliquely from before backward, to the middle Tendon, in which they are regularly fixed, the Anterior Fibres being the shortest, and a small triangular void Space being formed between them and the Symphysis of the Chin.

757. THE Posterior Fibres of each Portion which make about a fourth part of the whole, run likewise on each side to the Basis of the Os Hyoides, and are inserted along the lower Edge of its anterior or convex side, and from thence a little upward.

§ 2. *Genio-Hyoidæus.*

758. THIS is a small and pretty long fleshy Muscle, situated between the Symphysis of the Chin and the Os Hyoides, close by its fellow. *Situation is general.*

759. IT is fixed by its Anterior Extremity to a rough and sometimes prominent Surface, on the inner or posterior side of the Symphysis of the Lower Jaw, a little above the Chin. From thence it runs backward, and is inserted anteriorly in the upper Edge of the Basis of the Os Hyoides, having first sent off a small lateral Portion which is fixed a little higher to the Root of the Cornu. *Insertions.*

760. THIS Portion is distinguished from the rest by a Nerve of the ninth Pair; and it makes the Muscle appear a little oblique. The two Genio-Hyoidæi lie very close together, except at their upper Edge, where they are a little separated, but every where else they look as if they were but one Muscle.

§ 3. *Stylo-Hyoidæus.*

761. THIS is a small fleshy Muscle lying obliquely between the Apophysis Styloides and Os Hyoides. *Situation is general.*

762. IT is fixed laterally by one Extremity to the Root or Basis of the Apophysis Styloides, and by the other to the Os Hyoides, at the place where the Basis and Cornu unite, and likewise to the Cornu itself, from whence it has been called Stylo-Cerato-Hyoidæus. *Insertions.*

763. THE fleshy Fibres of this Extremity are often parted, and inclose the middle Tendon of the Digastricus.

§ 4. *Omo-plato-Hyoidæus sive Omo-Hyoidæus vulgo Coraco-Hyoidæus.*

764. THIS is a very long, small Muscle, much narrower than the Sterno-Hyoidæus, and situated obliquely on the side of the Neck or Throat, between the Scapula and Os Hyoides. It is a Digastric Muscle, being divided into two fleshy Portions joined endwise to a short middle Tendon. *Situation is general.*

765. IT is commonly fixed by the lower Extremity, to the superior Costa of the Scapula, between the small Notch and the Angle, and sometimes very near the Angle, and from thence some Anatomists have given it the barbarous name of Costo-Hyoidæus. *Insertions.*

767. FROM

766. FROM thence it passes over the Coracoide Apophysis, adhering sometimes to it by a kind of Aponeurosis or Membranous Ligament, and from this Adhesion the name of Coraco-Hyoidæus was given it by some who had not discovered its main Insertion.

767. IT is likewise often fixed to the Clavicula by Ligamentary or fleshy Fibres; and I have sometimes seen it inserted in the whole middle Portion of that Bone, being inseparably united with the Sterno-Hyoidæus. In one Subject I found it to be a kind of Biceps, one Portion of it being fixed to the Angle of the Scapula, the other to the Extremity of the Clavicula.

768. HAVING passed the Clavicle it is bent forward, and runs between the Sterno-Mastoidæus, and internal Jugular Vein, the small middle Tendon being situated in this place. From thence it runs up to its Insertion in the inferior lateral part of the Basis of the Os Hyoides, near the Cornu, and Insertion of the Sterno-Hyoidæus which it covers a little.

§ 5. *Sterno-Hyoidæus sive Sterno-Cleido-Hyoidæus.*

Situation in general.

769. THIS is a long, thin, flat Muscle, broader at the lower than at the upper part, and situated together with its fellow, on the foreside of the Throat, from whence some have very improperly termed it Musculus Bronchialis.

Insertions.

770. IT is fixed by its lower Extremity, in the superior and lateral part of the inner or posterior side of the Sternum, in the posterior part of the Sternal Extremity of the Clavicula, in the transverse Ligament which connects these two Bones, and in the inner or backside of the Cartilage of the first Rib. All these other Insertions are more considerable than that in the Sternum, which is sometimes scarce perceivable.

771. FROM thence it runs up on the foreside of the Aspera Arteria, joined to its fellow by a Membrane which forms a sort of Linea Alba, and is inserted laterally in the lower Edge of the Basis of the Os Hyoides.

772. THERE is sometimes a transverse Tendinous Line about the middle of the backside of this Muscle.

773. ACCORDING to the Method commonly observed in compleat Treatises of Myology, the following Muscles remain still to be described, viz. The Muscles of the Forehead, Occiput, Palpebræ, Eye, External Ear, Nose, Lips, Tongue, Uvula, Ductus, Eustachianus, Pharynx, Larynx, Parts of Generation, Anus and Bladder; and to these we ought even to add the Heart, as Mr. Coxer has done in the late Edition of his Myotomy.

774. THIS Method may be followed in Treatises on the Muscles alone, in which all the Parts that have any relation to them, are supposed to be known. But in a compleat System of Anatomy, it is neither proper for Beginners, nor even for those who believe they have made a considerable progress in this Science. For such a Treatise of all the Muscles of the Body, must be placed either before the Description of the Viscera and other particular Organs, or after it.

775. IF it goes before, we must be obliged to speak of many Parts altogether unknown, and thereby occasion false Ideas and dangerous Mistakes. If it comes after, the inconveniency will be equally great, it being impossible to give any true Idea of many of the Viscera without a previous knowledge of the Muscles that lie near them; neither can the Learner be made acquainted with these Muscles, till he knows the Bones, Cartilages, &c. which sustain and surround them, as we shall see afterwards.

776. IT may be objected, that I have here described the *Palmaris Brevis* which is inserted in no Bone, and that I have omitted the Muscles of the Bones of the Ear, which are intirely fixed in Bones. I have already answered the first Objection, and the second shall be answered in the proper place.

A R T. XIX.

A Compendious View of all the Muscles which are wholly inserted in Bones; with an Enumeration of the Bones in which each Muscle is inserted.

1. *Obliquus Externus.*

Muscles of the Abdomen.

THE fifth, sixth and seventh true Ribs; seldom the fourth. All the false Ribs. The Os Ilium. The Os Pubis.

2. *Obliquus Internus.*

THE sixth and seventh true Ribs and their Cartilages. All the false Ribs and their Cartilages. The last Vertebra of the Loins. The Os Ilium. The Os Pubis.

3. *Transversalis.*

THE Cartilages of the sixth and seventh true Ribs. The Cartilages of all the false Ribs. The three first Vertebrae of the Loins.

4. *Rectus.*

THE Extremity of the Body or second Bone of the Sternum. The Cartilages of the fifth, sixth and seventh true Ribs. The Cartilage of the first false Rib. The Os Pubis.

5. *Pyramidalis.*

THE Os Pubis.

Muscles

*which move
the Bones of
the Shoulder
on the Trunk.*

THE Os Occipitis. The Spinal Apophyses of all the Vertebrae of the Neck. The Spinal Apophyses of all the Vertebrae of the Back. The Scapula; its Spine and Acromium. The Clavicle; its Humeral Portion.

6. *Trapezius.*7. *Rhomboides.*

THE two or three lowest Vertebrae of the Neck; their Spinal Apophyses. The three or four upper Vertebrae of the Back; their Spinal Apophyses. The Scapula; the Sub-Spinal Portion of the Basis.

8. *Angularis vulgo Levator Proprius.*

THE Transverse Apophyses of the four first Vertebrae of the Neck. The Scapula; the superior Angle and Supra-Spinal Portion of the Basis.

9. *Pectoralis Minor.*

THE second, third, fourth and fifth true Ribs. The Scapula; the Coracoide Apophysis.

10. *Serratus Major.*

THE Scapula; the whole Basis. All the true Ribs. Sometimes one or two of the false Ribs.

11. *Subclavius.*

THE first Rib and its Cartilage. The Middle and Sternal Portions of the Clavicle.

12. *Deltoides.**Muscles*

*which move
the Os Hu-
meri on the
Scapula.*

THE Scapula; the Spine and Acromium. The Clavicle. The Os Humeri, under the Channel of the Biceps.

13. *Pectoralis Major.*

THE Clavicle near the Sternum. The Sternum. All the true Ribs. The first false Rib and sometimes the second. The Os Humeri, below the middle of the Channel of the Biceps.

14. *Latissimus*

14. *Latissimus Dorsi.*

THE six, seven and sometimes eight lower Vertebrae of the Back ; the Spinal Apophyses. All the Vertebrae of the Loins ; the Spinal Apophyses. The Os Sacrum. The Os Ilium. The four lowest false Ribs. The Scapula ; the inferior Angle. The Os Humeri, near the upper part of the Channel of the Biceps.

15. *Teres Major.*

THE Scapula ; the inferior Angle. The Os Humeri ; about the middle of the Channel of the Biceps.

16. *Teres Minor.*

THE Scapula ; the inferior Costa. The Os Humeri ; the inferior Surface of the great Tuberosity of the Head.

17. *Infra-Spinatus.*

THE Scapula ; the Sub-Spinal Cavity or Fossa. The Os Humeri ; the middle part of the Head.

18. *Supra-Spinatus.*

THE Scapula ; the Supra-Spinal Cavity or Fossa. The Os Humeri ; the superior part of the Head.

19. *Subscapularis.*

THE inside of the Scapula. The Os Humeri ; the small Tuberosity of the Head.

20. *Coraco-Brachialis.*

THE Coracoide Apophysis of the Scapula. The Os Humeri ; the middle Portion.

21. *Biceps.*

THE Scapula ; above the Glenoide Cavity, and at the Coracoide Apophysis. The Radius ; at the Tuberosity.

*Muscles
which move
the Fore-
Arm upon
the Os Hu-
meri.*

22. *Brachialis.*

THE Os Humeri ; below the Insertion of the Deltoides. The Ulna ;
below the Coronoide Apophysis.

23. *Anconæus Major.*

THE Scapula ; at the lower part of the Neck. The Ulna ; at the
Top of the Olecranium.

24. *Anconæus Externus.*

THE Os Humeri ; below the great Tuberosity of the Head. The
Ulna ; at the Olecranium.

25. *Anconæus Internus.*

THE Os Humeri ; above the middle. The Ulna ; at the
Olecranium.

26. *Anconæus Minor.*

THE Os Humeri ; at the External Condyle. The Ulna ; the exter-
nal oblong Fossula of the Head.

27. *Supinator Longus.*

*Muscles
which move
the Radius on
the Ulna.*

THE Os Humeri at the Crista of the external Condyle. The Radius ;
near the Styloide Apophysis.

28. *Supinator Brevis.*

THE Os Humeri ; at the lower part of the external Condyle. The
Radius ; the upper Quarter of its inside.

29. *Pronator Teres.*

THE Os Humeri ; at the internal Condyle. The Radius ; at the
middle convex Portion.

30. *Pronator Quadratus.*

THE Ulna ; at the long Eminence of the lower Extremity. The
Radius ; at the broad Surface of the lower Extremity.

31. *Ulnaris*

31. *Ulnaris Internus.*

THE Os Humeri; at the internal Condyle. The Ulna; at the Olecranon, and almost the upper half of the Bone. The Os Pisiforme.

Muscles which move the Carpus on the Fore-Arm.

32. *Radialis Internus.*

THE Os Humeri; at the inner Condyle. The first Bone of the Metacarpus, and sometimes the second. The first Phalanx of the Thumb.

33. *Ulnaris Externus.*

THE Os Humeri, at the outer Condyle. The fourth and sometimes the third Bone of the Metacarpus. The first Phalanx of the Little Finger; at the Basis.

34. *Radialis Externus Primus & Secundus.*

THE Os Humeri; at the outer Condyle. The first and second Bones of the Metacarpus.

35. *Ulnaris Gracilis vulgo Palmaris Longus.*

THE Os Humeri; at the inner Condyle. The Os Scaphoides; sometimes immediately; but most commonly by the Intervention of the great Annular Ligament.

36. *Palmaris Cutaneus.*

THE Aponeurosis Palmaris; but in no Bone.

37. *Metacarpus.*

THE Os Pisiforme. The fourth Metacarpal Bone.

Muscles which move the Metacarpus.

38. *Flexor Pollicis Longus.*

THE Radius; the inside. The third Phalanx of the Thumb.

Muscles which move the Fingers.

39. *Extensor Pollicis Primus.*

THE Ulna; the outside near the Head. The Radius; the middle Portion of its outside. The first and second Phalanges of the Thumb.

40. *Extensor*

40. *Extensor Pollicis Secundus.*

THE Ulna; the Outside, nearer the Middle than the Head. The Radius; the Outside, between the Middle and the lower Extremity. The third Phalanx of the Thumb.

41. *Thenar.*

THE Os Trapezium. The Head of the first, and the Basis of the second Phalanx of the Thumb.

42. *Mesothenar.*

THE first Metacarpal Bone; the Body. The second Metacarpal Bone, near the Head. The Head of the first, and the Basis of the second Phalanx of the Thumb.

43. *Antithenar.*

THE first Bone of the Metacarpus; near the Basis. The first Phalanx of the Thumb near the Head.

44. *Perforatus.*

THE Ulna; near the Head, and the Inside. The Radius, in the same manner. The second Phalanges of the four Fingers; the flat sides.

45. *Perforans.*

THE Ulna; the Inside, from the Head to the lower third part of the Bone. The third Phalanges of the four Fingers; the flat sides.

46. *Extensor Digitorum.*

THE Os Humeri; the external Condyle. The Radius; sometimes a little. The first and third Phalanges of the four Fingers; the convex sides.

47. *Extensor Indicis Proprius.*

THE Ulna; the inside, between the middle and the lower Extremity. The first and third Phalanx of the Index; the convex side.

48. *Extensor Minimi Digiti Proprius.*

48. THE upper half of the Ulna; the inside. The Phalanges of the Little Finger; the convex sides.

49. *Lum-*

49. *Lumbricales.*

THE Tendons of the Perforatus. The first and third Phalanges; the convex sides.

50. *Interossei Externi.*

THE Bones of the Metacarpus; near their convex sides. The first and third Phalanges; the convex sides.

51. *Interossei Interni.*

THE Bones of the Metacarpus; the outer and inner sides. The first and third Phalanges.

52. *Semi-Interosseus Indicis.*

THE first Phalanx of the Thumb; the outside of the Basis. The Os Trapezium. The first Phalanx of the Index; near the Head.

53. *Hypothenar Minor.*

THE Os Pisiforme. The first Phalanx of the Little Finger.

54. *Psoas five Lumbaris Internus.*

THE last Vertebra of the Back; the Body and transverse Apophysis. All the Vertebrae of the Loins; in the same manner. The Os Femoris; the little Trochanter.

Muscles which move the Os Femoris on the Pelvis.

55. *Iliacus.*

THE Os Ilium; the Crista, Anterior Spines, the Space between these, and the inside of the Bone. The Os Sacrum; the part of its concave side nearest the Os Ilium. The Os Femoris; the Trochanter Minor.

56. *Pectineus.*

THE Os Pubis; the Crista. The Os Femoris; below the little Trochanter.

57. *Glutæus Maximus.*

THE Os Ilium; the Crista and Tuberosity. The Os Sacrum; the lateral part of the convex side. The Os Coccygis; in the same manner. The Os Femoris; the long Impression below the great Trochanter.

58. *Glutæus*

59. *Gluteus Minimus.*

THE Os Ilium ; the outside, between the great and small Semi-Circular Impressions. The Os Ischium ; the Spine. The Os Femoris ; the upper part of the Trochanter Major.

60. *Triceps Primus.*

THE Os Pubis ; the Tuberosity or Spine, and the Symphysis. The Os Femoris ; the middle part of the Linea Aspera.

61. *Triceps Secundus.*

THE Os Pubis ; the inferior Ramus. The Os Femoris ; the upper part of the Linea Aspera.

62. *Triceps Tertius.*

THE Os Ischium ; the small Ramus, and the Tuberosity. The Os Femoris ; the middle part of the Linea Aspera, and something more, and the Tuberosity of the inner Condyle.

63. *Pyriformis.*

THE Os Ilium ; the Posterior Sinus. The Os Sacrum, the lateral part. The Os Femoris ; the upper part of the great Trochanter.

64. *Obturator Internus.*

THE Os Ilium. The Os Pubis. The Os Ischium ; the insides of these three Bones, near the Foramen Ovale, and great Sinus. The Os Femoris ; near the upper part of the Cavity of the great Trochanter.

65. *Gemelli.*

THE Os Ischium ; the Spine, Notch and Tuberosity. The Os Femoris ; about the middle of the Cavity of the great Trochanter.

66. *Obturator Externus.*

THE Os Pubis ; the inside all the way to the Foramen Ovale. The Os Ischium ; the Edge of the Foramen Ovale. The Os Femoris, the middle of the Cavity of the great Trochanter.

67. *Quadratus.*

67. *Quadratus.*

THE Os Ischium ; between the Acetabulum and the Tuberosity.
The Os Femoris ; the lower half of the oblong Eminence of the Trochanter Major.

68. *Musculus Fasciæ Latæ.*

THE Os Ilium ; the Superior Anterior Spine. The Os Femoris ; below the great Trochanter.

69. *Rectus Anterior.*

THE Os Ilium ; the Superior Anterior Spine, and superior part of the Supercilium Acetabuli. The Patella ; the upper Edge.

*Muscles
which move
the Leg on
the Os Fe-
moris.*

70. *Vastus Externus.*

THE Os Femoris ; the posterior rough Surface of the great Trochanter.
The Patella ; the outer Edge. The Tibia ; the outside of the Head.

71. *Vastus Internus.*

THE Os Femoris ; the anterior rough Surface of the great Trochanter.
The Patella ; the inside. The Tibia ; the inside of the Head.

72. *Crureus.*

The Os Femoris ; along the foreside. The Patella ; the upper Edge.

73. *Sartorius.*

THE Os Ilium ; the superior anterior Spine. The Tibia, the inner and forepart of the Head.

74. *Gracilis Internus.*

The Os Pubis ; the small Ramus near the Symphysis. The Tibia ; the inner and forepart of the Head, below the Insertion of the Sartorius.

75. *Biceps.*

The Os Ischium ; the posterior and lower part of the Tuberosity. The Os Femoris ; the lower half of the Linea Aspera. The Head of the Fibula.

76. *Semi-Nervosus.*

THE Os Ischium; the upper and posterior part of the Tuberosity. The Tibia; the inside of the upper Extremity, below the Insertion of the Gracilis Internus.

77. *Semi-Membranosus.*

THE Os Ischium; the bony Line between the Acetabulum and the Tuberosity. The Tibia; the posterior Impression of the inner Condyle.

78. *Popliteus.*

THE Os Femoris; the outer Edge of the external Condyle. The Tibia; the oblique Line on the backside of the Head.

*Muscles
which move
the Tarsus on
the Leg.*

79. *Tibialis Anticus.*

THE Tibia; the upper third part of the Crista, and the upper two thirds of the outer flat side. The Os Cuneiforme Majus; the inside. The first Bone of the Metatarsus; the inside.

80. *Peronæus Medius.*

THE Fibula; the outer or anterior side. The fifth Bone of the Metatarsus; the Tuberosity of the Basis.

81. *Peronæus Minimus.*

THE Fibula; the lower half of the inside, between the two oblique Lines. The fifth Bone of the Metatarsus, above and near the Basis.

82. *Gastrocnemii.*

THE Os Femoris; above the Condyles, and behind their lateral Tuberosities. The Os Calcis; the posterior Extremity.

83. *Soleus.*

The Tibia; the backside from the superior oblique Line, to the middle of the Bone. The Fibula; more than the upper third part of the backside. The Os Calcis; the posterior Extremity.

84. *Tibialis*

84. *Tibialis Gracilis, vulgo Plantaris.*

THE Os Femoris; the outer Edge of the external Condyle. The Os Calcis; the posterior Extremity, near the inner Edge.

85. *Tibialis Posticus.*

THE Tibia; the upper part of the backside. The Fibula; the upper half of the internal Angle. The Os Scaphoides; the Tuberosity or lower part.

86. *Peronæus Maximus.*

The Tibia; near its Articulation with the Fibula on the foreside. The Fibula; the outer and foreside of the Head and Neck, and the upper half of the external Angle. The Os Cuneiforme Majus; a little toward the lower Part. The first Bone of the Metatarsus; the lateral Impression of the Basis.

87. *Extensor Pollicis Longus.*

THE Tibia; near the lower Extremity, toward the Fibula. The Fibula; the upper three fourth Parts. The first and second Phalanges of the Great Toe; the Bases.

Muscles which move the Metatarsus and Toes.

88. *Flexor Pollicis Longus.*

THE Fibula; the lower half of the backside. The second Phalanx of the Great Toe; the under side.

89. *Thenar.*

THE Os Calcis; the lower Part. The Os Scaphoides; the lower Part. The Os Cuneiforme Majus; the lower Part. The first Phalanx of the great Toe; the inside. The internal Sefamoide Bone.

90. *Antithenar.*

THE second, third and fourth Bones of the Metatarsus; near their Bases. The first Phalanx of the Great Toe; the outside. The external Sefamoide Bone.

91. *Extensor Digitorum Longus.*

THE Tibia; the outside of the Head. The Fibula; the upper three fourths of the inside. The four Small Toes; along their upper sides.

* Q 2

92. *Extensor*

92. *Extensor Digitorum Brevis.*

THE Astragalus; the upper side of the anterior Apophysis. The first Phalanx of the Great Toe; the upper side. The three following Toes, rarely the fifth; the upper sides of all the Phalanges.

93. *Flexor Digitorum Brevis.*

THE Os Calcis; the lower and foreside of the great Tuberosity. The second Phalanges of the four Small Toes; the inner part of the under side.

94. *Flexor Digitorum Longus.*

THE Tibia; a little more than the middle third part of the backside. The third Phalanges of the four Small Toes; the under side.

95. *Flexor Digitorum Accessorius.*

THE Os Calcis; the Eminences of the lower side.

96. *Lumbricales.*

THE first Phalanges of the Toes; laterally.

97. *Transversalis Pedis.*

THE last three Bones of the Metatarsus; the lower sides of the Heads, by the Intervention of the Interosseous Ligaments. The first Phalanx of the Great Toe; the outside of the Basis.

98. *Interossei Superiores.*

THE five Bones of the Metatarsus; near their upper sides. The first Phalanx of the second Toe; the outer and inner sides. The third and fourth Toes; the outsides.

99. *Interossei Inferiores.*

FOUR Bones of the Metatarsus; toward the under sides. The first Phalanges of the last three Toes; the insides.

100. *Metatarsus.*

THE Os Calcis; the great inferior Tuberosity. The fifth Bone of the Metatarsus; the under side.

101. *Parathenar Major.*

THE Os Calcis; the outer part of the lower side. The first Phalanx of the Little Toe; the under side.

102. *Parathenar Minor.*

THE fifth Bone of the Metatarsus; the under part of the outside. The first Phalanx of the Little Toe; the under side of the Basis.

103. *Diaphragma.*

THE Sternum; the Appendix Ensiformis. All the Ribs; their bony Extremities and Cartilages, and almost all the last false Rib. The last Vertebra of the Back; the Body. The first three or four Vertebrae of the Loins; the Bodies.

Muscles employed in Respiration.

104. *Scaleni.*

ALL the Vertebrae of the Neck; the transverse Apophyses. The first two Ribs; the middle and posterior part of the convex side.

105. *Serratus Posticus Superior.*

THE last two Vertebrae of the Neck; the Spinal Apophyses. The first two Vertebrae of the Back; in the same manner. The second, third, fourth, and sometimes the fifth true Ribs; near the Angles.

106. *Serratus Posticus Inferior.*

THE last Vertebra of the Back; the Spinal Apophysis. The first three Vertebrae of the Loins; the Spinal Apophyses. The last four false Ribs.

107. *Intercostales.*

ALL the Ribs and their Cartilages; the Edges.

108. *Supra-Costales.*

THE last Vertebra of the Neck; the Transverse Apophysis. All the Vertebrae of the Back, except the last; in the same manner. All the Ribs; the posterior part of the outside.

109. *Sub-*

109. *Sub-Costales.*

THE true Ribs, from the fourth downward ; the concave or insides. The false Ribs from the fourth upward ; in the same manner.

110. *Sterno-Costales.*

THE Sternum ; the Edge of the lower half of the inside. The second, third, fourth, fifth and sixth true Ribs ; the Cartilages near the bony Portions.

111. *Sterno-Mastoidæus.*

*Muscles
which move
the Head on
the Trunk.*

THE Sternum ; the upper Edge, near the Clavicular Notch. The Clavicula ; near the Sternal Extremity. The Mastoide Apophysis ; the upper and back part.

112. *Splenius.*

THE Os Occipitis ; the lateral crooked Portion of the transverse Line. The Mastoide Apophysis ; the upper part. The first three or four Vertebrae of the Neck ; the Transverse and Spinal Apophyses. The first three or more Vertebrae of the Back ; the Spinal Apophyses.

113. *Complexus Major.*

THE first Vertebra of the Neck ; backward near the Transverse Apophysis. The six following Vertebrae ; the Transverse Apophyses. The Os Occipitis ; the posterior Portion of the superior transverse Line.

114. *Complexus Minor.*

THE six lower Vertebrae of the Neck ; the Transverse Apophyses. The Mastoide Apophysis ; posteriorly.

115. *Rectus Major.*

THE second Vertebra of the Neck ; the Spinal Apophysis. The Os Occipitis ; the posterior part of the inferior transverse Line.

116. *Rectus Minor.*

THE first Vertebra of the Neck ; the posterior Tubercle. The Os Occipitis ; below the posterior part of the lower transverse Line, in a Fossula near the Crista.

117. *Obliquus*

117. *Obliquus Superior.*

THE first Vertebra of the Neck; the Extremity of the Transverse Apophysis. The Os Occipitis; the middle Portion of the inferior transverse Line.

118. *Obliquus Inferior.*

THE first Vertebra of the Neck; the Transverse Apophysis. The second Vertebra; the Spinal Apophysis.

119. *Rectus Anticus Longus.*

THE third, fourth, fifth and sixth Vertebrae of the Neck; the forepart of the Transverse Apophyses. The Os Occipitis; the lower and anterior part of the Apophysis Basilaris.

120. *Rectus Anticus Brevis.*

THE first Vertebra of the Neck; on one side of the anterior middle Eminence. The Os Occipitis; the Apophysis Basilaris, a little more forward than the Condyle.

121. *Transversalis Anticus Primus.*

THE first Vertebra of the Neck; the foreside of the Transverse Apophysis. The Basis of the Occipital Bone; below the Edge of the Jugular Fossula.

122. *Transversalis Anticus Secundus.*

THE second Vertebra of the Neck; the middle of the Transverse Apophysis, anteriorly. The first Vertebra; the Basis of the Transverse Apophysis, anteriorly.

123. *Musculi Accessorii.*

THE Basis of the Os Occipitis. The first two Vertebrae of the Neck.

THE several Classes of the Vertebral Muscles are these. (1.) Spinales *Vertebral*.
 Simples. (2.) Spinales *Compositi*. (3.) Transversales *Muscles in*
 Simples. (4.) Transversales *Compositi*. (5.) Spino-Trans- *general*.
 versales. (6.) Transverso-Spinales. (7.) Obliqui which go
 from one Transverse, to several Spinal Apophyses. (8.) Obliqui
 which go from several Transverse, to one Spinal Apophysis.

124. *Longus.*

*Vertebral
Muscles in
particular.*

124. *Longus Colli.*

THE first Vertebra of the Neck; the middle Tubercle. The three following Vertebrae; the Bodies anteriorly. The second, third, fourth, fifth, and sixth Vertebrae of the Neck; the Bodies near the Transverse Apophyses, and these Apophyses anteriorly. The last Vertebra of the Neck; the anterior lateral part of the Body. The first three, and sometimes the fourth Vertebra of the Back, in the same manner.

125. *Transversalis Colli Major.*

ALL the Vertebrae of the Neck; the Transverse Apophyses. The first four, five or six Vertebrae of the Back; in the same manner.

126. *Transversalis Colli Minor.*

ON one side of the Transversalis Major.

127. *Semi-Spinalis.*

ALL the Vertebrae of the Neck, except the first. The six upper Vertebrae of the Back, or more.

128. *Spinales Colli Minores.*

ALL the Vertebrae of the Neck, except the first; the Spinal Apophyses. The first Vertebra of the Back; in the same manner.

129. *Transversales Colli Minores.*

THE Vertebrae of the Neck; the Transverse Apophyses. The first Vertebra of the Back; the Spinal Apophysis.

130. *Sacro-Lumbaris.*

THE Vertebrae of the Neck; the Transverse Apophyses. The Ribs; the angular Marks. The Os Sacrum; the Superior Spines, and contiguous lateral Parts. The Os Ilium; the posterior Portion of the Crista and the Tuberosity.

131. *Longissimus Dorsi.*

THE last Vertebra of the Neck; the Transverse Apophysis. The first seven Vertebrae of the Back; the Transverse Apophyses. The last Vertebra

tebra of the Back ; the Spinal Apophysis. All the Vertebrae of the Loins ; the Spinal Apophyses. The Os Sacrum ; the Superior Spines, and upper lateral part. All the true Ribs ; the Tuberosities. All the false Ribs ; between the Tuberosities and the angular Marks.

132. *Spinalis Dorsi Major.*

ALL the Vertebrae of the Back, except the first, and sometimes the second ; the Spinal Apophyses. The first and sometimes the second Vertebra of the Loins ; the Spinal Apophyses.

133. *Spinales Dorsi Minores.*

ALL the Vertebrae of the Back ; the Spinal Apophyses. The first Vertebra of the Loins ; in the same manner.

134. *Transversalis Dorsi Major.*

Vide Longissimus Dorsi.

135. *Transversales Dorsi Minores.*

THE Vertebrae of the Back ; the Transverse Apophyses.

136. *Semi-Spinalis Dorsi.*

THE Vertebrae of the Back ; the twelve Spinal, and ten lowest Transverse Apophyses. The first three Vertebrae of the Loins ; the Transverse Apophyses.

137. *Semi-Spinalis Lumborum.*

THE three lowest Vertebrae of the Loins ; the Transverse and Articular Apophyses. The Os Sacrum ; the superior lateral Parts. The Os Ilium ; the superior posterior Spine.

138. *Quadratus Lumborum.*

THE last false Rib. The Vertebrae of the Loins ; the Transverse Apophyses. The Os Sacrum ; the upper lateral Part. The Os Ilium ; almost the posterior half of the Crista.

139. *Spinales & Transversales Lumborum.*

THE Os Sacrum ; the superior Spines. The Vertebrae of the Loins ; the Spinal and Transverse Apophyses.

140. *Coccygæus Anterior.*

THE Os Ilium ; the inside. The Os Ischium ; the inside of the Body of the Bone, behind the Foramen Ovale. The Os Coccygis ; the lateral and lower part of the Inside.

141. *Coccygæus Posterior.*

THE Os Sacrum ; the foreside of the first two Vertebrae. The Os Ischium ; the inside of the Spine. The Os Coccygis ; the lateral middle part of the Inside.

142. *Psoas Parvus.*

THE last Vertebra of the Back, or first of the Loins, or both ; the Transverse Apophyses. The Os Pubis ; the Crista.

*Muscles
which move
the Lower
Jaw.*

143. *Masseter.*

THE Os Temporum ; the Zygomatic Apophysis. The Os Maxillare ; near the Os Malæ. The Os Malæ ; the lower Edge. The Lower Jaw ; at the Angle, above the Angle, and at the Root of the Coronoide Apophysis ; all on the outside.

144. *Temporalis.*

THE Os Frontis ; the outside, behind the angular Apophysis. The Os Parietale ; the outside, between the Semi-Circular Impression, and the Squamous Slope. The Os Temporum ; the outside of the Squamous Portion. The Os Sphenoidale ; the outside of the great Temporal Ala. The Os Malæ ; the Zygomatic Fossa. The Maxilla Inferior ; the Coronoide Apophysis.

145. *Pterygoideus Internus.*

THE Os Sphenoides ; the Pterygoide Apophysis, at the inside of the external Ala. The Maxilla Inferior ; the inside near the Angle.

146. *Pterygoideus Externus.*

THE Os Sphenoidale ; the Apophysis Pterygoides, at the outside of the external Ala. The Maxilla Inferior ; the Fossula of the Condylode Apophysis.

147. *Digastricus.*

147. *Digastricus.*

THE Os Temporum ; the Mastoide Sulcus. The Lower Jaw, the inner Labium of the Basis of the Chin. The Os Hyoides ; the lateral Part.

148. *Mylo-Hyoidæus.*

THE Maxilla Inferior ; the inside, above the oblique prominent Line. The Os Hyoides ; the Basis, anteriorly.

Muscles which move the Os Hyoides.

149. *Genio-Hyoidæus.*

THE Maxilla Inferior ; the inside of the Chin, at the inferior rough Impression, near the Symphysis. The Os Hyoides ; the upper part of the Basis anteriorly, and the Root of the Cornu.

150. *Stylo-Hyoidæus.*

THE Os Temporum ; the Basis of the Apophysis Styloides. The Os Hyoides ; the lateral part of the Basis, and the Symphysis of the Cornu.

151. *Omo-Hyoidæus.*

THE Scapula ; the Superior Costa, and sometimes the Coracoide Apophysis. The Os Hyoides ; the lateral inferior part of the Basis, near the Cornu.

152. *Sterno-Hyoidæus.*

THE Sternum ; the upper part toward the inside, near the Notch. The Clavicula sometimes ; the Sternal Extremity. The Os Hyoides ; the lower Edge of the Basis.

A R T. XX.

An Enumeration of the Bones mentioned in the Description of the Muscles; and of the Muscles inserted in each Bone.

1. *Os Frontis.*

Temporalis.

2. *Os Parietale.*

Temporalis.

3. *Os Temporum.*

Temporalis.	Maffeter.	Digastricus.	Stylo-Hyoidæus.	Sterno-
Mastoidæus.	Splenius.	Complexus Minor.		

4. *Os Sphenoidale.*

Temporalis.	Pterygoidæus Externus.	Pterygoidæus Internus.
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5. *Os Occipitis.*

Splenius.	Complexus Major.	Complexus Minor.	Rectus Ma-
jor Posticus.	Rectus Minor Posticus.	Obliquus Minor.	Sterno-
Mastoidæus.	Rectus Anticus Longus.	Rectus Anticus Brevis.	
Transversalis	Anticus Primus.	Trapezius Scapulæ.	

6. *Os Malæ.*

Temporalis.	Maffeter.
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7. *Maxilla Inferior.*

Maffeter.	Temporalis.	Pterygoidæus Internus.	Pterygoidæus
Externus.	Digastricus.	Genio-Hyoidæus.	Mylo-Hyoidæus.

8. *Os Hyoides..*

Stylo-Hyoidæus.	Genio-Hyoidæus.	Mylo-Hyoidæus.	Omo-
Hyoidæus.	Sterno-Hyoidæus.		

9. *Vertebræ Colli.*

Splenius. Complexus Major. Complexus Minor. Rectus Major Posticus. Rectus Minor Posticus. Obliquus Superior. Obliquus Inferior. Rectus Anticus Longus. Rectus Anticus Brevis. Transversalis Anticus Primus. Transversalis Anticus Secundus. Longus Colli. Transversalis Major Colli. Transversalis Gracilis Colli. Semi-Spinalis Colli. Spinales Colli Minores. Transversales Colli Minores. Scalenii. Trapezii Scapulæ. Rhomboides. Angularis. Longissimus Dorsi. Serratus Superior Posticus. Sacro-Lumbaris. Supra-Costales.

10. *Vertebræ Dorsi.*

Trapezius. Latissimus Dorsi. Rhomboides. Serratus Superior Posticus. Splenius. Complexus Major. Complexus Minor. Longus Colli. Transversalis Colli Major. Transversalis Colli Gracilis. Semi-Spinalis Colli. Transversalium Colli Minorum unus. Sacro-Lumbaris. Longissimus Dorsi. Longissimi Dorsi Accessorius. Spinalis Dorsi Major. Transversalis Dorsi Major. Transversales Dorsi Minores. Supra-Costales. Semi-Spinalis Dorsi. Diaphragma. Serratus Posticus Inferior. Psoas Major. Psoas Parvus. Psoas Parvus Accessorius.

11. *Vertebræ Lumborum.*

Transversalis Abdominis. Latissimus Dorsi. Quadratus Lumborum. Lumbaris Externus Minor. Diaphragma. Semi-Spinalis Lumborum. Spinales Lumborum. Psoas Parvus. Serratus Inferior Posticus.

12. *Os Sacrum.*

Latissimus Dorsi. Sacro-Lumbaris. Longissimus Dorsi. Semi-Spinalis Lumborum. Spinalium & Transversalium Lumborum unus. Sacro-Coccygæus. Glutæus Maximus.

13. *Os Coccygis.*

Sacro-Coccygæus. Ischio-Coccygæus. Glutæus Maximus.

14. *Sternum.*

Sterno-Mastoidæus. Sterno-Hyoidæus. Subclavius. Pectoralis Major. Sterno-Costales. Diaphragma. Transversalis Abdominis. Rectus Abdominis. 15. *Costæ.*

15. *Costæ.*

Supra-Costales.	Inter-Costales.	Sub-Costales.	Sterno-Costales.
Scaleni.	Serratus Posticus Superior.	Serratus Posticus Inferior.	Sacro-Lumbaris.
Lumborum.	Longissimus Dorfi.	Diaphragma.	Quadratus Lumborum.
Serratus Major.	Subclavius.	Pectoralis Minor.	Pectoralis Major.
Obliquus Internus Abdominis.	Latissimus Dorfi.	Obliquus Externus Abdominis.	Transversalis Abdominis.
Abdominis.			Rectus Abdominis.

16. *Os Ilium.*

Obliquus Externus Abdominis.	Obliquus Internus Abdominis.
Transversalis Abdominis.	Latissimus Dorfi.
Longissimus Dorfi.	Sacro-Lumbaris.
Maximus.	Quadratus Lumborum.
Obturator Internus.	Iliacus.
Gracilis.	Glutæus Medius.
	Glutæus Minimus.
	Pyriformis.
	Musculus Fasciæ Latæ.
	Sartorius.
	Rectus

17. *Os Pubis.*

Obliquus Abdominis Externus.	Obliquus Internus Abdominis.
Transversalis Abdominis (<i>sometimes</i>).	Rectus Abdominis.
Abdominis.	Pyramidalis
Pfoas Parvus.	Pectineus.
Obturator Internus.	Obturator Externus.
Triceps Secundus.	Rectus sive Gracilis Internus.
	Triceps Primus.

18. *Os Ischium.*

Coccygæus Anterior.	Obturator Internus.	Gemelli.	Obturator Externus.
Triceps Tertius.	Quadratus Femoris.	Triceps Secundus (<i>sometimes</i>).	
	Biceps Tibiæ.	Semi-Nervosus.	Semi-Membranosus.

19. *Scapula.*

Omo-Hyoidæus.	Trapezius.	Rhomboides.	Angularis.	Pectoralis Minor.
Teres Major.	Serratus Major.	Supra-Spinatus.	Infra-Spinatus.	
Biceps.	Teres Minor.	Sub-Scapularis.	Latissimus Dorfi.	
	Anconæus Maximus.	Deltoides.		

20. *Clavicula.*

Sterno-Mastoidæus.	Sterno-Hyoidæus.	Trapezius.	Subclavius.
Deltoides.	Pectoralis Major.		

21. *Os Humeri.*

Deltoides.	Pectoralis Major.	Latissimus Dorsi.	Teres Major.
Supra-Spinatus.	Infra-Spinatus.	Biceps.	Brachialis.
Anconæus Externus.	Anconæus Internus.	Anconæus Minim.	Ulnaris Internus.
Radialis Externus.	Supinator Longus.	Supinator Brevis.	Ulnaris Externus.
Pronator Teres.	Extensor Digitorum Communis.		

22. *Ulna.*

Brachialis.	Anconæus Major.	Anconæus Externus.	Anconæus Internus.
Anconæus Minor.	Pronator Quadratus.	Ulnaris Internus.	Ulnaris Externus.
Extensor Pollicis Proprius.	Extensor Minimi Digiti Proprius.		

23. *Radius.*

Biceps.	Supinator Longus.	Supinator Brevis.	Pronator Teres.
Pronator Quadratus.	Ulnaris Externus (<i>in the Annular Ligament at the Head of the Radius.</i>)	Flexor Pollicis Longus.	Perforatus.
Extensor Digitorum Communis.			

24. *Os Pisiforme & Unciforme.*

Ulnaris Internus.

25. *Os Scaphoides.*

Ulnaris Gracilis five Palmaris Longus.

26. *Os Naviculare, Magnum & Trapezoides.*

Interossei.

27. *Bones of the Metacarpus.*

Interossei.	Radiales Externi.	Mesothenar.	Metacarpus.
Hypothenar Minor.			

28. *First Phalanx of the Thumb.*

Extensor Pollicis Primus.	Thenar.	Mesothenar.	Antithenar.
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29. *Second*

29. *Second Phalanx of the Thumb.*

Extensor Pollicis Primus & Secundus. Thenar. Mesothenar.

30. *Third Phalanx of the Thumb.*

Flexor Pollicis Longus.

31. *First Phalanges of the Fingers.*

Extensor Digitorum Communis. Interossei.

32. *Second Phalanges of the Fingers.*

Perforatus.

33. *Third Phalanges of the Fingers.*

Extensor Digitorum Communis. Perforans.

34. *Index.*

Extensor Indicis Proprius.

35. *Little Finger.*

Extensor Minimi Digiti Proprius.

36. *Os Femoris.*

Psoas.	Iliacus.	Pectineus.	Glutæus Maximus, Medius, & Minimus.
Musculus Fasciæ Latæ.	Triceps Primus, Secundus, & Tertius.		
Vastus Externus.	Vastus Internus.	Crureus.	Biceps.
Popliteus.	Gastrocnemii.	Tibialis Gracilis.	

37. *Patella.*

Vastus Externus. Vastus Internus. Crureus. Rectus Anterior.

38. *Tibia.*

Vastus Externus.	Vastus Internus.	Rectus Anterior.	Semi-Membranosus.
Semi-Nervosus.	Gracilis Internus.	Sartorius.	
Popliteus.	Tibialis Anticus.	Extensor Pollicis Longus.	Extensor Digitorum Longus.
Soleus.	Tibialis Posticus.	Peronæus Longus.	
Flexor Digitorum Longus.			

39. *Fibula.*

39. *Fibula.*

Biceps. Peronæus Medius. Peronæus Minimus. Soleus. Peronæus Longus. Extensor Pollicis Longus. Flexor Pollicis Longus. Extensor Digitorum Longus.

40. *Astragalus.*

Extensor Digitorum Brevis.

41. *Os Calcis.*

Gastrocnemii. Soleus. Tibialis Gracilis. Tibialis Posticus. Thenar. Perforatus five Flexor Digitorum Brevis. Flexor Digitorum Accessorius. Metatarsius. Parathenar Major.

42. *Os Scaphoides.*

Tibialis Posticus. Thenar.

43. *Os Cuneiforme Majus.*

Tibialis Anticus. Peronæus Maximus. Thenar.

44. *Bones of the Metatarsus.*

Tibialis Anticus. Peronæus Maximus. Antithenar. Transversalis Pedis. Interossei. Peronæus Medius. Peronæus Minimus. Metatarsius. Parathenar Minor.

45. *Bones of the Great Toe.*

Extensor Pollicis Longus. Extensor Pollicis Brevis. Transversalis Pedis. Thenar. Antithenar. Flexor Pollicis Longus.

46. *Bones of the Small Toes.*

Flexor Digitorum Longus. Interossei. Flexor Digitorum Brevis. Parathenar Major. Extensor Digitorum Longus. Extensor Digitorum Brevis.

A R T. XXI.

The particular Uses of the Muscles which are wholly inserted in Bones.

777. **I** Observed in the beginning of this Section N^o 34. that the Use of each Muscle in particular, is confined to the Motion of one or more moveable Parts; and that some Parts require a certain number of Muscles to move them, whereof some act one way and some another. Several Muscles, for instance, move the Os Humeri upon the Scapula, and of these, some raise, others depress it; some turn it forward, some backward, and others round its Axis, &c.

778. I took notice N^o 37. of the Inconveniencies of the common Language of Anatomists, with respect to the names of many Muscles; with respect to the Uses attributed to them, they being limited to these, as if they could not have any other; and with respect to the Bones, the changes of Situation of which, are confined to the Action of a certain number of Muscles, as if no other Muscles were capable of producing them.

779. I remarked N^o 38, 39. that in order to shun these inconveniencies, it would be proper to distribute and enumerate the Muscles in another manner than is commonly done. Thus, for instance, instead of this Title: The Muscles of the Arm, I would put the following: The Muscles which move the Os Humeri on the Scapula, and the Scapula on the Os Humeri. But lest such Titles might be reckoned too long, I have omitted the reciprocal Motions, mentioning them only in the Description of each Muscle; and there I have likewise pointed out the other Muscles which may have the same uses with those I treat of; and also the other uses which these Muscles may have. The Muscles which may move certain Bones without being inserted in them, I term Assistant or Auxiliary Muscles.

780. BEFORE we enter upon the detail of these particular uses, it is likewise proper to call to mind what I said N^o 41. 42. 43. concerning the Congeneres and Antagonist Muscles; concerning simple and direct Motions, and those that are combined or compounded; concerning Tonic Motions; concerning the Co-operation of Muscles, and concerning the distinction of principal Movers, Moderators and Directors.

781. IT will not be amiss to repeat here what I said N^o 56. and 58. that in order to comprehend all the uses and contrivances of each Muscle in particular, we ought to examine its Place or Situation in general, its external Conformation, Structure or Composition, particular Situation, Direction, lateral Connexions; how it is disposed with respect to the neighbouring Muscles, for the production of simple Motions; and with respect to the Muscles at a greater distance, for the production of compound Motions; and lastly, with respect to the Bones, as a moving Power, applied to the different kinds of Levers.

782. THESE Inquiries very necessary for Philosophical Reasonings, Physical Prescriptions and Surgical Operations, will be very much facilitated by the help of the two foregoing Tables; in the first of which we see at one view, in what Bones, in how many Bones, and in what parts of Bones, each Muscle is inserted; and in the second, to what Muscles, and to what number of Muscles, each Bone gives Insertions.

783. BUT to make a due use of these two Tables, we ought to be previously acquainted with the Articulations of Bones, especially those of fresh Subjects, and from thence be able exactly to determine, in how many different Directions each Bone is capable of being moved. We ought likewise to know not only the general Direction of each Muscle, but also all the possible Situations or different Attitudes of the Bones in which each Muscle is inserted.

784. THE Experiments made on dead Bodies, by pulling the Muscles after they have been raised, are very fallacious; especially in the long Muscles parted from all their lateral Connexions; and still more when the natural Direction of these Muscles is oblique, or when they are naturally designed for oblique Motions; not to mention how much by this way of management, a dissected Muscle may be increased in length. We have instances of such mistakes in the Sterno-Mastoidæus, Supinator Longus, Sartorius, Peronæus Longus, &c. as we shall see hereafter.

785. THE terms of raising, depressing, bringing forward, backward, &c. used here, are to be considered as applied to the Subject in an erect Posture; and I understand by them not only the effects of a real Motion, or a real change of Situation; but also the Force employed to keep any part in the same Situation against a Resistance or contrary Force.

786. THUS when I say that the Biceps bends the Fore-Arm, I mean likewise that its Action tends to preserve that part in any given Situation against a contrary Force applied to extend it; and we see from experience, that in these kinds of Efforts, without any real Motion, in proportion as the Resistance increases, the Muscle grows stiffer or harder, without producing any change of Place.

§ 1. *Uses of the Muscles which move the Bones of the Shoulder on the Trunk.*

787. THE Mechanism of the Scapula in relation to its Motions and Changes of Situation, is very different from that of all the other Bones of the Body, except the Os Hyoides, of which I shall speak hereafter. All the other Bones have solid Fulcra or fixed Points, on which they are either moved or fixed by the Muscles; but the motions of the Scapula, its changes of Situation, and its continuance in any one given Attitude, are brought about without the help of any solid Fulcrum. The Muscles alone sustain it and brace it down, in all its different Motions and Situations.

788. THE Scapula has this peculiarity likewise belonging to it, that it is the Fulcrum and Basis of all the Motions of the Os Humeri, of some Motions of the Fore-Arm; and even of all the most violent Efforts made

with these Bones; without being itself either moved or fixed on any solid Basis.

789. WE ought not here to have any regard to the Clavicula, which seems to be only a kind of Os Accessorium in Men, and such other Animals as can turn their Fore-Fet forward, to lay hold of any thing, almost in the same manner as we turn the Hand in Supination and Pronation. In all other Animals, no Claviculæ are to be found; and therefore the Scapula is the principal, or rather the only Piece of which the Shoulder is formed.

790. THE Motions and different Situations of the Shoulder in Men, depend chiefly on the Scapula. The Clavicle is pushed or pulled in different Directions by the other Bone, and intirely follows its Motions, serving in some circumstances to regulate or limit them.

791. IT is necessary to examine with attention all the Motions of which the Scapula can be capable. It is not enough to say that it may be raised, brought down, forward, backward, &c. which Language, as commonly understood, has given rise to several false Ideas concerning the Action of the Muscles to which the Motions of this Bone are attributed.

792. WHEN we raise the Shoulder, this Motion is not ordinarily made by an uniform Elevation of the Scapula, or as it were, in a direction parallel to itself. It is the Acromium which rises, and while the superior Angle descends, the inferior Angle is removed to a greater distance from the Spina Dorfi. When the Shoulder is depressed, the Acromium falls down more or less, the superior Angle rises in proportion, and the inferior Angle is brought nearer the Vertebrae.

793. THE Shoulder can scarcely be brought forward or toward the fore-side of the Thorax, without being proportionably raised; and there is the same difficulty in drawing it back without depressing it more or less. Every one may soon satisfy himself as to the truth of these facts. All these different Attitudes are regulated by the Clavicula, the Angle which it naturally makes with the Scapula, being lessened or made more acute in raising the Shoulder, or in bringing it forward; and increased or made more obtuse when the Shoulder is depressed or drawn backward.

794. THEREFORE in most of the Motions or Changes of Situation performed by the Scapula, this Bone turns more or less upon its own Plane, and that in two contrary Directions. It cannot indeed be absolutely denied but that the Scapula may be brought directly forward or backward, without being raised or depressed; but these are very constrained and very inconsiderable Motions. In the first case, the Acromium together with the Humeral Extremity of the Clavicula, is removed to a greater distance from the Ribs, and in the second, it is brought nearer the Ribs.

795. WE ought to consider with particular attention, the Situation and Motion of the Shoulder when we raise it to support a Burden, or apply it to any other Resistance. It is the Acromium alone which is exposed, and loaded, and with which we endeavour to overcome the Resistance or support the Burden without sinking under it. There must be Muscles proper for

for making all these Efforts, and capable of producing all the different Motions.

796. THE three different Portions of the Trapezius, may all have the same use, according to what I have observed concerning the different turns of the Scapula in its Motions. This use is to raise the Shoulder and to keep it from sinking. The upper Portion draws the Acromium and Extremity of the Clavicula upward. The inferior Portion draws downward the small Extremity of the Spine of the Scapula. By these two contrary Motions, the Situation of the Spine is changed; and as the Acromium by reason of its Articulation with the Clavicle, cannot move backward while it rises, the small Extremity of the Spine must be removed to a greater distance from the Vertebrae while it descends. *Trapezius.*

797. THE middle Portion, by its superior and longest Fibres, concurs with the Action of the upper Portion, more or less, according to the Extent and Direction of these Fibres. The other Fibres which become gradually shorter and more transverse, partly join in the same Action by reason of the Obliquity of the Spine in which they are inserted, and partly serve to regulate and limit the removal of the Spine from the Vertebrae already mentioned.

798. THE upper Fibres of this middle Portion may likewise in some circumstances supply the place of the superior Portion; as when we would raise the Shoulder, the Head being inclined to the same side; for then, the Fibres of the superior Portion which are inserted in the Os Occipitis, have not room enough to contract. The Obliquity of the upper Fibres of the middle Portion, and of the Spine of the Scapula in which they are inserted, facilitates their Action in this case.

799. THE use of the Trapezius therefore, regard being had to the Direction and Insertion of its Fibres, is to raise the Shoulder, or rather to turn the Top of the Scapula upward, and to hinder it from sinking. But it is too thin and consists of too few Fibres, to be able to overcome or bear up against some Resistances, without the Co-operation of the Serratus Major, as we shall see presently.

800. FROM this account of the use of the Trapezius, we see how improper it is to say with the generality of Anatomists, that the superior Portion of this Muscle draws the Scapula obliquely upward; the inferior Portion obliquely downward; and all the three Portions, directly backward. This way of speaking is not only improper, but likewise leads us to imagine that by the Action of the Trapezius all the parts of the Scapula are raised, depressed or carried backward.

801. THE Serratus Major raises the Shoulder or Top of the Scapula, brings it forward and hinders it from sinking. In all these, it is the principal Actor; and it is impossible to conceive how Labourers raise and support, by the Shoulder alone, the heavy Burdens with which they are loaded, without the assistance of this Muscle. *Serratus Major.*

802. THE thickness, length and particular Disposition of its Fibres; but above all, the Insertion of the greatest Portion of them, near the Angle of

of the *Basis Scapulæ*, prove sufficiently what I advance ; and the general Action of the radiated Portions is to draw the inferior Angle from the *Spina Dorsi*, toward the lateral parts of the *Thorax*.

803. THE uppermost and strongest Portions pull this Angle upwards at the same time, and consequently raise the *Acromium*, which cannot be pushed forward, by reason of its Connexion with the *Clavicula*.

804. THESE superior Portions cross over the greatest part of the true Ribs ; and accordingly in raising great Burdens, we find our selves obliged to hold in our Breath, that is to lessen Expiration as much as we can, in order to fix the Ribs, and to hinder them from sinking, that they may serve for a solid *Fulcrum* to this Muscle in proportion to the force with which it acts.

805. THE next Portions run according to the length of the Ribs, and consequently do not much constrain them in their reciprocal Motions, not being in a condition either to raise or depress them ; and the most inferior and weakest Portions are only Assistants to the rest in bringing the lower Angle of the *Scapula* forward, toward the lateral part of the *Thorax*.

806. THE small distinct Plane described N^o 164. is not an assistant to the radiated Portions or inferior part of the great Plane. It seems designed to regulate the Motion of the superior Angle backward and downward, while the inferior is carried forward and upward by the radiated Portions ; and when their Action ceases, to bring the *Scapula* back to its natural Place.

807. THE superior Portion of the great Plane is an Assistant partly to the radiated Portion, and partly to the small Plane, according to the different Places of its Insertions in the *Basis* of the *Scapula*.

808. FROM all this we see that the principal use of the *Serratus Major* is to raise the Shoulder, and not for Respiration. When both Planes act together, this Muscle may in some cases bring the Shoulder directly forward, or rather hinder it from going back ; as when we push any thing with great force directly forward, with the Hand, especially when the Arm is extended.

809. A whole Treatise might be written on the numerous Phænomena observable in the Motion of the Shoulder by the Action of this Muscle ; as I have shewn in the *Memoirs* of the *Royal Academy of Sciences*. Some of these shall be mentioned in describing the uses of the other Muscles that move the Shoulder ; and when I come to those which are employed in Respiration, I shall explain more at length, why this Muscle can have no part therein.

Rhomboides. 810. ACCORDING to the Insertions and Direction of the *Rhomboides*, its general use must be to draw backward and upward the Sub-Spinal Portion of the *Basis Scapulæ*.

811. IT is likewise a Moderator to the *Trapezius* and *Serratus Major*, when they raise the Shoulder or carry the *Acromium* upward ; and it brings the *Scapula* back to its natural Situation, when the Action of these Muscles ceases.

812. IT may draw the Scapula directly backward, if the inferior Portion of the Trapezius acts at the same time. For as this Portion draws obliquely downward and toward the Spina Dorſi, and the Rhomboides, obliquely upward and toward the ſame Spine; the joint Action of both muſt produce a Motion directly backward, as it happens when we pull back both Shoulders equally in order to diſengage them.

813. IT may likewise together with the radiated Portion of the Serratus Major, draw the Baſis of the Scapula directly backward. This however is but an inconfiderable Motion, and not ſo eaſy as the reſt, for the Serratus Major contributes to it only in proportion to the Action of the Rhomboides, which is but very ſmall; and in this caſe the Acromium can riſe but a very little way.

814. THE Angularis by its Inſertion in the ſuperior Angle of the Scapula, moderates the deſcent of that Angle, while the Trapezius, and Serratus Major raiſe the Acromium. Afterwards when theſe two Muſcles ceaſe to act, the Angularis raiſes the ſuperior Angle, and by that means depreſſes the Acromium, much in the ſame manner as was obſerved of the Rhomboides. *Angularis.*

815. FROM hence we ſee that this Muſcle is very improperly call'd Levator Scapulæ Proprius, ſince it does not raiſe but depreſſes the Scapula. That name would agree better to the Serratus Major. Whether this Muſcle can have any ſhare in moving the Neck, the Scapula in which it is inſerted being kept immoveable by other Muſcles, I cannot at preſent determine.

816. THE Pectoralis Minor aſſiſts the Rhomboides and Angularis as Moderators of the Action of the Trapezius and Serratus Major, in turning the Point of the Acromium upward, the ſuperior Angle downward, and the inferior Angle forward. *Pectoralis Minor.*

817. IT is likewise an Aſſiſtant to the Rhomboides and Angularis, in reſtoring the Scapula to its natural Situation, when the Trapezius and Serratus Major ceaſe to act; by drawing downward the Apophyſis Coracoides in which it is inſerted.

818. IT has been reckoned among the Muſcles employed in Reſpiration, by ſome who imagine that in ſome caſes the Shoulder may be kept ſo ſteady, as that this Muſcle may be able to raiſe the Ribs in which it is fixed. But as the Serratus Major which muſt principally be employed in keeping the Shoulder in a fixed Poſition, is partly inſerted in the ſame Ribs, and in this Action, muſt keep them depreſſed, it will be impoſſible for the Pectoralis Minor to raiſe them.

819. THE Subclavius can have no other ordinary uſe, but to bring down the Clavicula, after it has been raiſed together with the Acromium, by the Action of the Trapezius and Serratus Major. It may likewise hinder not only the Clavicula in which it is inſerted, but likewise the Acromium from riſing, eſpecially when aſſiſted by the Pectoralis Minor, Rhomboides and Angularis. *Subclavius.*

820. WHEN we ſtand or ſit, the weight of the Arm alone ſeems to be ſufficient to bring down the Clavicula when raiſed; and therefore in this caſe

case there would be no occasion for the Subclavius to act upon the Clavicle, nor for the Pectoralis Minor, Rhomboides and Angularis act upon to the Acromium. But when we lie or are situated in any other manner, the Weight of the Arm has no such effect; and in these cases these four Muscles become more or less necessary.

821. THE Subclavius therefore is a proper Depressor of the Clavicula; and an assistant Depressor of the Acromium, or of the Shoulder in general, together with the Pectoralis Minor, Rhomboides and Angularis, all which in their turns, assist the Subclavius in its Action on the Clavicula.

822. I cannot conceive what has led several great Anatomists to rank this among the Muscles of Respiration; since it is inserted not only in the Bone but in the Cartilage of the first Rib; since this Cartilage is not articulated with the Sternum, but joined to it as immovably as to the Bone of the Rib by its other Extremity; and lastly, since this Cartilage is much shorter, much broader, and much less pliable than the Cartilages of all the other Ribs, of equal thickness.

§ 2. *Uses of the Muscles which move the Os Humeri on the Scapula.*

Deltoides.

823. THIS Muscle, from the disposition of its Insertions in the Scapula and Clavicle, may raise the Arm or separate it from the Ribs not only directly, but likewise obliquely in many different ways. The Arm being lifted directly upward, the lateral, anterior and posterior Portions of this Muscle, may bring the Arm so raised, forward and backward. In that case the middle Portion of the Muscle is the principal Mover, and the lateral Portions are the Directors or Collateral Muscles.

824. WHEN we stand or sit, this Muscle alone, without the help of any other, regulates the Depression of the Arm, by means only of the Weight of the Part. This Depression is brought about meerly by the Relaxation of this Muscle, proportionable to the degree of Velocity it has acquired, according as the will directs.

825. BUT when we lie, other Muscles are necessary to bring the Arm near the Ribs, when the Deltoides has carried it to any distance from them. Yet even in this case, when the Arm is laid close to the Ribs, the lateral Portions of the Deltoides may press it harder against them, by reason of the change of Direction of the Fibres in this Situation.

826. BY reason of the multiplicity of fleshy Fibres, this Muscle must act with a very considerable force.

*Latissimus
Dorsi.*

827. THE Latissimus Dorsi serves in general to bring down the Arm when raised; and this it does chiefly by its inferior Portion. By the same Portion and by the Connexion of the Scapula with the Os Humeri, it serves to depress the Shoulder, or to maintain it in that Situation against any Force that endeavours to raise it; as when we lean upon the Elbow in sitting, or walk upon Crutches.

828. BY its Dorsal Insertion, by the Passage of its Tendon on the inside of the Os Humeri, and by its Insertion in the foreside of that Bone, it may turn the

the Arm round its Axis, called Rotation by Anatomists; as it happens when having bent the Fore-Arm, we turn it behind our Back.

829. BY its Insertion in the Crista of the Os Ilium, and in the false Ribs, it becomes necessary to raise the Head laterally to one side, when we lie on the other. For the Shoulder being then depressed and brought near the Thorax, the Clavicle becomes the fixed Point of one or two of the Muscles which raise the Head in this Situation, as shall be shewn more at length in speaking of the uses of these Muscles. Any Person may make the Experiment in Bed, by lying at full length on his side; for if while he raises his Head in this posture, he lay his Hand on the anterior Edge of this Muscle, he will find it considerably stretched, and also that this Tension ceases whenever he ceases to lift his Head.

830. THE Connexion of this Muscle with the false Ribs is the cause of that uneasiness which we find in breathing, when the Arm is pulled strongly downward to press upon any thing, as when we seal a Letter, or lean upon a short Cane, the Fore-Arm being extended.

831. THE small Portion inserted in the inferior Angle of the Scapula, may be an Assistant to the Teres Major, as shall be shewn hereafter.

832. THIS Muscle sustains the Weight of the whole Body, when with the Arms raised, we hang by the Hands, as when we grasp the Branch of a Tree in climbing.

833. IT performs the same Office, when we either sit or stand with the whole Arm more or less extended horizontally, and press the Hand from above downward against any Resistance; as when we support our selves in this Situation, by a very long Cane grasped by the Hand; or lay hold of the upper part of an Halbard, and press the lower end strongly against the Ground.

834. THESE last three Uses cannot however be well executed by this Muscle alone, without the assistance of the Pectoralis Major.

835. THE Pectoralis Major serves in general to bring the Arm near the Ribs, to press it strongly against them, and to carry it towards the forepart of the Thorax. This last Motion may be performed without separating the Arm from the Ribs, as when one Arm is crossed over the other; and it may likewise be done with the Arm raised, as when the Hand of one side is laid over the Shoulder of the other side; and in that case the anterior Portion of the Deltoides may assist this Muscle in great Efforts.

836. BY means of the Fold in its Tendon, the superior and inferior Portions may act as two distinct Muscles, that is, one may act without the other. The superior fleshy Portion which answers to the lower Portion of the Tendon, serves chiefly to raise the Arm forward.

837. THE inferior fleshy Portion which is joined to the upper Portion of the Tendon, by its Insertion in the Os Humeri, and by the Connexion of that Bone with the Scapula, may depress the Shoulder or keep it from rising, with more or less force, much after the same manner as the inferior Portion of the Latissimus Dorsi; the inferior Portions of these two Mus-

cles concurring in the same use ; as when we support our selves upon our Hands or walk with Crutches, as has been already said.

838. It is likewise by means of the lower Portion of this Muscle, that we can suspend the whole Body by the Hands grasping the Branch of a Tree in climbing, &c. In this case also the Latissimus Dorsi acts in concert with the Pectoralis ; and this Co-operation, the Painters and Carvers have taken care to express in Crucifixes.

839. THE inferior Portion of this Muscle cannot perform these two uses without the assistance of the Muscles of the Abdomen, which, by pulling the Ribs downward, become in a manner a continuation of the Insertion of this Portion. The same thing may be observed concerning that part of the inferior Portion of the Latissimus Dorsi, which is inserted in the false Ribs.

840. THE Uses of the superior Portion and of all the Body of the Pectoralis, cannot take place without the Co-operation of the Muscles which move the Scapula on the Trunk, especially the Serratus Major ; because the Scapula must be securely fixed, before it can be a Fulcrum for the Os Humeri to move upon. The same thing is to be observed concerning the Deltoides, and all the other Muscles which move the Os Humeri on the Scapula.

Teres Major.

841. THE Teres Major, by being inserted in the Os Humeri in a Direction parallel to the Latissimus Dorsi, becomes a Congener to the superior and posterior Portion of that Muscle ; and accordingly moves the Os Humeri in the same manner with it. It turns the Bone round its Axis, when the Fore-Arm is carried behind the Back.

842. It likewise pulls the Arm directly backward without moving it round its Axis. But neither this Muscle nor the Latissimus Dorsi can perform this simple Motion, because of the incurvated Direction of their Tendons, without the assistance of other Muscles, which like Antagonists, prevent the Rotation already mentioned ; and of this number is the Teres Minor, as we shall see presently.

843. THE nearness of the Tendon of this Muscle to that of the Latissimus Dorsi deserves our attention. They are both inserted according to their breadth, in the same Line, along the Edge of the bony Channel of the Os Humeri, opposite to the Insertion of the Pectoralis Major in the other Edge of the same Channel. These two Tendons cross each other in the same Plane, that of the Teres Major running obliquely from above downward, and that of the Latissimus Dorsi, obliquely from below upward.

844. BY this disposition, these two Tendons resemble in a great measure, the Duplicature or Fold of the Tendon of the Pectoralis Major ; and therefore the Teres Major may become a particular Antagonist to the superior Portion of the Pectoralis Major ; and the Latissimus Dorsi to the inferior Portion ; and both Muscles taken together may be a common Antagonist to the Pectoralis Major, when that whole Muscle acts at the same time.

845. I observed N^o 198. 204. that these two Tendons were bound down by Ligamentary Frænum, which from the Insertion of the Subscapularis runs down below that of the Teres Major; and that this Frænum covers the two Tendons and braces them down close to the Bone. The use of this Frænum seems to be to prevent the separation of the two Tendons from the Edge of the Groove in violent Rotations of the Arm.

846. THE Teres Major may likewise move the Scapula on the Os Humeri, by drawing the inferior Angle downward and bringing it nearer the Arm; but in order to this, the Arm must be kept immovable by some considerable Force or Resistance; as when in standing with the whole Arm hanging down, the Hand supports a great Weight. By this Action the Teres Major may likewise assist in raising the Shoulder, or in hindering it from sinking.

847. THE Coraco-Brachialis brings the Arm to the fore-side of the Thorax, raising it at the same time; and in this case it may be reckoned a Con- *Coraco-Brachialis.* gener or Assistant to the Pectoralis Major in great Efforts; and may perform the same Motion by itself, when no great Force is necessary; as when the whole Arm hangs down, and is moved backward and forward like a Pendulum, the Motion forward being performed by the Coraco-Brachialis, and the Motion backward by the Teres Major, its Antagonist.

848. THIS Muscle may likewise move the Scapula on the Os Humeri kept firmly depress'd, as when sitting in a Chair we take fast hold of the Edge of it with the Hand. In this case the Coraco-Brachialis may bring the Acromium downward, and the inferior Angle of the Scapula, near the Vertebrae. It serves likewise to bring the Arm to its former Situation, after it has been turned by the Latissimus Dorsi in order to apply the Hand to the Back; and then it turns the Os Humeri upon its Axis in a contrary Direction to that given it by the other Muscle.

849. THE Supra-Spinatus is commonly supposed to join with the Del- *Supra-Spinatus.* toides in lifting up the Arm; this Muscle beginning that Action, and the Deltoides continuing it. But besides that this Muscle is very small, it seems to be too near the Articulation of the Head of the Os Humeri, to be able to raise the whole upper Extremity, which is of a considerable Weight and Length. It has however two other very remarkable Uses, when the Arm is raised from the Thorax to the Head by the Action of the Deltoides.

850. To understand these Uses it must be remembered (1.) That the Cartilaginous convex part of the Head of the Os Humeri, is much larger than the Glenoide Cavity of the Scapula. (2.) That the most superior part of this Convexity lies out of the Cavity when the Arm is depressed or near the Ribs. (3.) That the Orbicular Ligament of the Joint is very broad, being proportioned to the distance between the Edges of the convex part of the Head of the Os Humeri, and of the Glenoide Cavity of the Scapula; and that therefore it cannot check the Os Humeri in any of its Motions.

851. FROM thence it is plain that the strong Deltoide Muscle in the first instant of its Action to raise the Arm, would thrust the Head of the

Os Humeri upwards out of the Cavity; if something did not supply the place either of a bony Fulcrum or Ligamentary Frænum. The Arch of the Acromium is of no use in this case, for the Bone must be first luxated, before it can reach so far, and the neighbouring parts must suffer a Friction, and even a Contusion, which would be very prejudicial.

852. It is likewise plain that the broad Orbicular Ligament would be very apt to be intangled and bruised between the Edges of the two articulated Bones, were not this inconveniency prevented by some means or other; because it is not elastick enough to contract of itself in proportion as these two Edges approach each other.

853. The Supra-Spinatus answers both these ends. When it contracts its Tendon, which runs over the convex part of the Head of the Os Humeri, to be inserted in the upper Surface of the great Tuberosity, it presses very strongly on the Head of the Bone, thereby supplying the place of a Fulcrum, and hindering the Head to rise, during the beginning of the Action of the Deltoides; and in this Action, it is assisted by the Ligamentary annular Rope mentioned in the Description of the fresh Bones No. 250.

854. I find likewise in this Muscle a singular contrivance to prevent the second inconveniency. Its Tendon is a kind of Band, which adheres closely to the outside of the orbicular Ligament; and when we examine it narrowly, we observe that several of its Fibres do not go so far as the Head of the Os Humeri, but are gradually inserted in the outer Surface of the Ligament. These Tendinous Fibres are continuous with those which lie nearest the Bone or Bottom of the Supra-Spinal Cavity of the Scapula.

855. THIS Portion may therefore be reckoned a distinct Muscle belonging to the orbicular Ligament, notwithstanding of its close union with the other Portion, which is inserted in the Os Humeri. And indeed we might very justly establish a new Species of Muscles by the name of Articular Muscles, which belong chiefly to the Capsular Ligaments of those Joints which have large degrees of Motion; several examples of which we shall meet with hereafter.

856. THE Mechanism of this kind of Muscles consists in this. The Extremities of the Tendons are inserted very obliquely in the Surface of the Ligament, and the Fibres take up a great deal more Space there, than in the Body of the Tendon; and they are commonly the innermost, or deepest and shortest Portions of the ordinary Muscles inserted near the Articulations.

857. THE use of these Muscles, or Portions of Muscles is to pull the orbicular Ligaments uniformly, and thereby to prevent their running into irregular Folds, and their being intangled between the two articulated Bones.

Infra-Spinatus.

858. THE Infra-Spinatus being inserted by its Tendon in the middle Surface of the great Tuberosity of the Os Humeri, must perform different Motions according to the different Situations of that Bone. If it acts while the Arm hangs down, parallel to the Trunk of the Body, it may move the Os Humeri round its Axis from before outward, and consequently, if the

Fore-

Fore-Arm be at the same time bent, it will turn the Hand from the Body.

859. IF while the Arm is kept raised by the Deltoides, the posterior Portion of that Muscle draws the Arm backward; the Infra-Spinatus has the same use with respect to the orbicular Ligament, as the Supra-Spinatus already described. And as these two Muscles adhere closely by the Edges of their Tendons, they may in some measure co-operate in their Action on that Ligament.

860. WHEN the Arm raised in the manner already said, is strongly pulled forward by the Pectoralis Major, a considerable Force is necessary to prevent the Head of the Os Humeri from being thrown backward out of the Glenoide Cavity. The Structure of the Infra-Spinatus and the number of its Fibres, which is much greater than in the Supra-Spinatus, fit it for answering this purpose; in which it is likewise assisted by the flat, broad, thin Ligament mentioned in the Description of the fresh Bones N^o 250. This Muscle may likewise assist the Teres Major in great Efforts.

861. THE use commonly ascribed to the Subscapularis, of pressing the Arm against the Ribs, from which it has the name of *Porte-feuille* in *French*, is without foundation. When the Arm hangs down in its natural Situation, this Muscle may turn it round its Axis, from without forward, as it happens, when in this Situation we beat the Breast with the Fore-Arm bent; and it likewise strongly assists the Latissimus Dorsi, when we turn the Hand behind the Back.

862. WHEN the Arm being raised, we move it backward, as in giving a back stroke with the Elbow or Fist; the Subscapularis hinders the Head of the Os Humeri from being luxated forward; for which purpose it is well fitted both by its Structure and number of its Fibres, this Motion being sometimes performed with great Violence.

863. IT may likewise, by means of the nearness and lateral union of its Tendon with that of the Supra-Spinatus, assist that Muscle in keeping the Head of the Os Humeri in the Glenoide Cavity, when the other Extremity of the Bone is raised.

864. THE Teres Minor may turn the Arm when depressed round its Axis, *Teres Minor*, from before outward; as it happens when the Fore-Arm being bent and applied to the lower part of the Breast, is removed from thence, without moving the Elbow from the Side. This Rotation is in a contrary Direction to that performed by the Subscapularis and Teres Major.

865. THIS Muscle may likewise pull the Arm directly backward, whether raised or depressed; but in order to this, the Subscapularis must act at the same time as a Moderator to prevent the Rotation. The Co-operation of Muscles is necessary in all particular Motions, but in some more than in others.

§ 3. *Uses of the Muscles which move the Fore-Arm on the Os Humeri.**Biceps.*

866. THE Biceps which I likewise name Coraco-Radialis, because one of its two superior Insertions is in the Coracoide Apophysis, the other near the Basis of that Apophysis, moves the Fore-Arm in two different manners; that is, it bends both Bones, and turns the Radius upon the Ulna; performing both Motions by its Insertion in the Radius alone. It likewise moves the Os Humeri on the Fore-Arm, the Scapula on the Os Humeri, and the Os Humeri on the Scapula.

867. THESE five Uses belong to this Muscle, though it is commonly limited to that of bending the Fore-Arm; and to these we may add a sixth, by means of the Passage of one of its superior Tendons over the Articulation of the Os Humeri with the Scapula, through a Ligamentary Vagina which serves as a Frænum, and may be looked upon as an Annular Ligament produced.

868. WHEN it bends the Fore-Arm upon the Os Humeri, the Scapula must be kept steady by the Muscles which move it on the Trunk; and in this Function it is a Congener or Assistant to the Brachialis, which is inserted in the Ulna; and when the Brachialis becomes incapable of acting by a Wound or any other Disease, the Biceps alone may perform the Flexion of the Fore-Arm, by being inserted in the Radius, and by the Connexion of that Bone with the Ulna.

869. To be satisfied that it turns the Radius, and performs the Motion called Supination, we need only consider the manner of its Insertion in the Tuberosity of the Radius, already described, and then look on a Skeleton: And even without these Assistances the following Experiment will prove this Use.

870. IF when the Fore-Arm is moderately bent, and in a pronated Situation, we perform the Motion of Supination with the Hand, and lay the other Hand on the Biceps at the same time, we will perceive it to swell and grow hard in proportion as the Supination advances. This Muscle is therefore a true Supinator.

871. THE third Use of the Biceps which is to move the Os Humeri on the Fore-Arm, cannot have place till the Fore-Arm is fixed by some exterior Force, as when we hold the Branch of a Tree with the Hands, the Arm being extended, and afterwards bend the Arm in order to climb. In this case, part of the Flexion is performed by the Motion of the Os Humeri on the Fore-Arm. And though this whole Action is not owing to the Biceps, yet it as really contributes to it, as the Brachialis.

872. THE fourth Use of the Biceps is to move the Scapula on the Os Humeri. In order to this the whole Arm must be kept fixed much in the same manner as was mentioned in describing a like use of the Coraco-Brachialis; whether this be done by any exterior Resistance applied to the Fore-Arm or Hand; or by pressing the two Hands strongly against each other behind the lower part of the Back. In these cases, the Contraction

of these Muscles will draw down the Acromia, and bring the Bases of the Scapulæ nearer each other.

873. THE fifth Use of this Muscle is to move the Os Humeri on the Scapula, by raising it much in the same manner as is done by the Coraco-Brachialis. The manner how this is performed is easily conceived ; as also that it is done most readily when the Fore-Arm is extended.

874. THE particular Use of the Tendon which passes through the Ligamentary Vagina, over the Articulation of the Scapula with the Os Humeri, is to co-operate with the Tendon of the Supra-Spinatus in hindering the Head of the Os Humeri from getting out of the Glenoide Cavity, in the first Efforts of the Deltoides to raise the Arm.

875. THOUGH this Tendon of the Biceps be very small, and though it passes over a very smooth polished convex Surface, yet it cannot slip to either side, because of the thick Vagina which lies between the two Tuberosities of the Head of the Os Humeri, and there chiefly confines it. Besides, in proportion as the Arm is raised, that part of the Tendon which passes over the Joint becomes gradually shorter, because the Frænum approaches by the same degrees, to the place where it is inserted.

876. THE Brachialis serves to bend the Fore-Arm on the Os Humeri, *Brachialis.* by its Insertion in the Ulna, and by the Connexion of that Bone with the Radius. It serves also to move the Os Humeri on the Fore-Arm.

877. THE small lateral Portions of the lower Extremity of the fleshy Body of this Muscle, and the fleshy Fibres between these Portions, nearest the Bone, are very short, and seem to make a distinct Muscle, which does not reach to the Ulna, but is inserted in the Capsular Ligament of the Joint of the Elbow.

878. THESE Insertions in the Ligament are very apparent in many Subjects, and their Use seems to be much the same with what I ascribed to the like Fibres in the Supra-Spinatus, that is to prevent the Ligament from being caught and squeezed between the Bones, in great Flexions of the Arm.

879. THE Anconæus Maximus serves to extend the Fore-Arm, by bringing the Ulna to a straight Line with the Os Humeri. It serves likewise to extend the Os Humeri on the Ulna, when the last named Bone is fixed by some exterior Resistance, as when being laid upon the Ground, we rise by supporting our selves on our Hand. In this case likewise, the Scapula must be kept steady by the Coraco-Brachialis. *Anconæus Maximus.*

880. IT may likewise move the Scapula on the Os Humeri by its Insertion in the Neck of the first of these Bones, by means of which it may draw the Basis downward and raise the Top of the Shoulder.

881. BY its Insertion in the Scapula, it may likewise draw the Arm backward in a more direct Line than can be done by the Teres Major and Minor.

882. THE two lateral Anconæi co-operate with and assist the Anconæus Maximus in extending the Fore-Arm on the Os Humeri, and the Os Humeri on the Fore-Arm. *Anconæi Laterales.*

883. THE

*Anconæus
Minimus.*

883. THE *Anconæus Minimus* may concur with the other Muscles of that name, in extending the Fore-Arm on the *Os Humeri* and the *Os Humeri* on the Fore-Arm; but its Action does not reach to all the degrees of Flexion of these Bones; for when the Fore-Arm is very much bent, if we examine carefully the Situation of this Muscle, we will find it more disposed to maintain these Bones in that Posture, by co-operating with the *Brachialis*, than to extend them by assisting the other *Anconæi*.

§ 4. *The Uses of the Muscles which move the Radius on the Ulna.*

*Supinator
Longus.*

884. THE *Supinator Longus* was believed to be concerned only in the Motion of Supination, till M. *Heister* very justly observed that it was likewise a Flexor of the Fore-Arm. And indeed a very small degree of attention to its Insertions and Situation, must convince us that it is much better fitted for this last use than for the first. For before it can act as a Supinator, the Hand must be in the greatest degree of Pronation, and even then, it can do little more than bring the Radius back to its natural Situation, without completing the Supination except it be by Jerks. It would therefore be much more properly named *Radialis Longus*, than *Supinator Longus*.

885. THIS Muscle may bend the Fore-Arm by means of the Connexion of the Radius with the Ulna in several different Situations, that is, when the Fore-Arm is fully extended, the Radius being either in a Motion of Pronation or Supination, or in a middle Situation between both.

886. ON this occasion it is proper to observe that the Method of examining the Uses of the Muscles on dead Bodies, by pulling them in order to move the Bones in which they are inserted, is very uncertain, except particular care be taken to pull them in their true natural Direction, which is often different from what it appears to be when they are dissected, by reason of the lateral Connexions, *Fræna*, &c.

887. SUPINATION performed when the Fore-Arm is fully extended, is commonly attributed in part to the Rotation of the *Os Humeri*, by means of its Articulation with the Scapula, as if this Supination when the Fore-Arm is extended were greater than when it is bent; whereas the difference in Supination is really but very small, though it be very considerable in the Motions of Pronation, as we shall see hereafter.

*Supinator
Brevis.*

888. THE *Supinator Brevis* seems to have no other Use than what is expressed by its name; and as it is a short small Muscle, it must be very weak. Its Use is chiefly owing to the Obliquity of its Fibres; but still neither this nor the former Muscle would be able to perform Supination, where a great Force is required without the assistance of the *Biceps*, which is the most powerful of all the Supinators, and the chief Actor in this Motion, as I have already proved.

*Pronator
Teres.*

889. THE *Pronator Teres* can have no other Action but that of Pronation, in the different Situations of the Radius, whether that Bone be in a middle state between Pronation and Supination, or in the greatest degree of

of Supination; and in this case, though it is but a small weak Muscle, it overcomes the Supinator Longus.

890. THE Pronator Quadratus is capable of no other Motion but Pronation, and it acts with much more Force than its Congener the Pronator Teres; both because of the Number and Direction of its Fibres, and because it acts upon the Radius near the lower Extremity, where its Effects in Pronation are much greater than if it acted near the Head of that Bone. The Fibres lie almost in the same Direction in which the Bone moves; and in this it has the advantage not only over the other Pronator, but over all the Supinators, the Biceps itself not excepted.

*Pronator
Quadratus.*

891. THE Fibres of which this Muscle is composed are so disposed as that the longest adhere to the internal Angles of both Bones of the Fore-Arm; the shortest lie nearest the Interosseous Ligament, and the intermediate Fibres are longer or shorter according to their greater or less distance from the Ligament.

892. BY these different degrees of length, the whole number of Fibres is advantageously disposed, and their Action rendered uniform. In the greatest degree of Supination, the Extremity of these Fibres inserted in the two Bones make a very oblique Plane, which becomes almost streight in the greatest degree of Pronation. We shall have other Examples of this kind of Mechanism hereafter, and it shall then be explained and accounted for.

893. THE Motions of Pronation and Supination are commonly attributed to the Radius alone; and the Ulna is believed to have no other share therein, than to serve as a Fulcrum or Basis on which these reciprocal Turns or Rotations of the Radius are made; and lastly, these Motions are said to be the effects of four Muscles, or at most of five, the Biceps being included.

*Remarks on
the Motions
of Pronation
and Supina-
tion.*

894. ANATOMISTS likewise pretend that they have seen others demonstrate; that they have demonstrated themselves; and that they are able at any time to demonstrate both on the Skeleton and on fresh Subjects, these two reciprocal Motions, without any Motion in the Ulna; and they have even gone so far both in publick and private, as to make Experiments on their own Arms, to prove that the Radius alone performs these Motions, and that the Ulna has no share in them.

895. ALL this notwithstanding, I have observed and demonstrated to the Royal Academy of Sciences, that in these Motions, when free and unconstrained, the two Bones of the Fore-Arm move always at the same time. Thus, for instance, when we turn the Radius toward the Breast in Pronation, the Ulna is at the same time turned from the Breast; and when we turn the Radius from the Breast in Supination, the Ulna is at the same time brought nearer it, supposing in both these Motions that the Fore-Arm is bent.

896. IN these Motions the Radius rolls simply from one side to the other; its Extremity in a compleat Pronation or Supination, describing a kind of Semi-Circle; and at the same time the Extremity of the Ulna moving

moving in a contrary Direction, describes another Semi-Circle. Thus in Pronation we raise the Extremity of the Ulna, and remove it from the Breast at the same time; and in Supination we first depress it, and then raise it again, as it is brought nearer the Breast.

897. NEITHER is this all; for these small Motions of Raising and Lowering, of Adduction and Abduction in the Extremity of the Ulna, cannot be brought about without the Rotation of the Os Humeri, because of the Ginglymus, by which these two Bones are articulated. Therefore in all unconstrained Pronations and Supinations, three Bones must move, and all the Muscles concerned in these Motions must act; and likewise during this Action, the Scapula must be kept fixed.

§ 5. *Uses of the Muscles which move the Carpus on the Fore-Arm.*

898. THE Motion of the Carpus is made principally on the Extremity of the Radius; and on the Ulna, only by the Intervention of the Inter-articular Cartilage or Cartilaginous Production of the Radius. We are not to have regard only to the Carpus in general in these Motions, because some of them relate also to the Metacarpus, and others to particular Bones of the Carpus. The Motions of the Carpus affect likewise the whole Hand which is thereby carried different ways and put in different Situations.

899. THE chief Motions of the Carpus are expressed by Terms not altogether proper, but which may be retained, as having been long in use, provided they be well explained to those who are not accustomed to them. Turning the Hand toward the inside of the two Bones of the Fore-Arm is called bending the Wrist; and the Wrist is said to be extended when the Hand is turned toward the outside of the Fore-Arm. When it is turned toward the Radius alone, that Motion is termed Adduction with regard to the Os Humeri; and Abduction in the same sense, is when the Hand is turned toward the Ulna alone.

900. THESE Motions are attributed to four Muscles; the Ulnaris Internus, Radialis Internus, Ulnaris Externus, and Radialis Externus, or Bicornis. Flexion is performed by the two internal Muscles; Extension by the two External; Abduction by the two Ulnares, and Adduction by the two Radiales.

901. THESE Muscles may likewise successively perform several subaltern or oblique Motions of the Carpus and Hand, by the Combination of two principal or direct Motions. Thus, the Radius being fixed in its natural Situation between Pronation and Supination, we may by a Motion of Flexion and Abduction together, turn the Hand obliquely, and at the same time partly towards the Fold of the Arm, and partly toward the external Condyle.

902. THESE combined Motions cannot however be performed with near so much freedom as the simple Motions of Flexion, &c. because of the oblong Figure of the Joint of the Wrist; and the ease and readiness with which

which they seem to be performed, is owing to the assistance of the Motions of Supination and Pronation.

903. WHEN the Ulnaris Internus acts alone, or as the principal Mover, *Ulnaris In-* it brings the Hand obliquely toward the internal Condyle, and toward the *ternus.* Olecranon, though with difficulty, for the reason already given.

904. WHEN it acts together with the Radialis Internus, it turns the Hand equally towards the two Extremities of the Bones of the Fore-Arm; and thereby moves not only the Carpus in general on the Fore-Arm, but also the second Row of the Carpus on the first, and the Metacarpal Bones on the second.

905. WHEN it acts with the Ulnaris Externus, it turns the outer Edge of the Hand toward the Olecranon.

906. WHEN the Ulnaris Externus acts with the Ulnaris Internus, it *Ulnaris Ex-* turns the outer Edge of the Hand toward the Olecranon, as already said. *ternus.*

907. WITH the Radiales Externi, it turns the Back of the Hand toward the outer Condyle. This Motion is termed Extension, but very improperly when applied to the Hand; for the Metacarpus which is naturally bent this way, will be still more bent by the Action of these Muscles. I should choose therefore to term this Motion the Inversion rather than the Extension of the Hand. The Carpus indeed may in some sense be said to be extended because the Bones of the second Row are brought to a straighter Line with those of the first.

908. WHEN this Muscle acts alone, it brings the outer Edge of the Hand obliquely toward the Olecranon and the external Condyle at the same time, but this is performed with difficulty, as has been already observed.

909. THE Radialis Internus, together with the Ulnaris Internus has the *Radialis In-* uses already mentioned. *ternus.*

910. WITH the Radialis Externus, it carries the inner Edge of the Hand, or that next the Thumb, towards the Extremity of the Radius, and toward the Fold made by the Ulna and Os Humeri.

911. ALONE, it moves that part of the Hand which is next the Thumb obliquely, toward the internal Angle of the Radius, but with the same difficulty as the rest, when they act singly.

912. IT seems likewise to deserve the name of a third Pronator. What first gave me a notion of this use was the consideration of the Obliquity of its Direction between its two Insertions, which is greater in proportion than that of the Supinator Longus, which therefore must be less fitted for Supination, than the other is for Pronation. I look upon the annular Ligament through which the Tendon of the Radialis Internus passes, as a sort of Insertion with respect to the Direction of the Muscle, and we plainly perceive the Tendon to be stretched in a strong Motion of Pronation.

913. THE Radialis Externus together with the Radialis Internus, turns *Radialis Ex-* the inner Edge of the Hand directly toward the Styloide Apophysis of the *ternus.* Radius.

914. WITH the Ulnaris Externus it inverts the Hand, turning the convex side of the Metacarpus toward the lower Extremity of the Bones of the Fore-Arm. It likewise moves the second Row of the Carpus on the first, and thereby increases the transverse Fold on the convex side of the Carpus, mentioned in the general Observations on the Situation of the Bones of the upper Extremity. This Motion likewise increases the Angle which the Back of the Hand naturally makes with the outside of the Fore-Arm; and therefore according to the common Language, it would be more properly termed a Flexion outward than an Extension.

915. THIS Muscle acting alone draws obliquely, and toward the external Angle of the Radius, that Portion of the Hand which answers to the first Metacarpal Bone and to the Index; but this is done with the same difficulty that has been already taken notice of in the other Muscles.

916. EACH of the two Radiales Externi may act separately, and consequently have distinct Uses, since their Tendons having passed the Annular Ligament, are inserted at some distance from each other; and thereby one of them seems to be fitted to co-operate with the Radialis Internus, the other, with the Ulnaris Externus; and they both serve conjointly to keep the Hand in its true natural Situation mentioned in the Description of the Skeleton.

Ulnaris Gracilis.

917. THE Ulnaris Gracilis, commonly called Palmaris Longus, seems to be an Assistant to the Ulnaris and Radialis Interni in bending the Wrist; and it seems likewise particularly to assist the Radialis Internus in the Motion of Pronation.

Metacarpinus

918. THE Metacarpus serves to turn the fourth Bone of the Metacarpus toward the Thumb, and at the same time to increase the Convexity of the back of the Hand, which is called making *Diogenes's* Cup. The fourth Bone thus moved carries the third along with it by reason of their Connexion, which still augments the Hollow on one side and the Convexity on the other.

§ 6. Uses of the Muscles which move the Fingers.

Perforatus.

919. THE Perforatus serves to bend the second Phalanges of all the Fingers except the Thumb; and the particular Muscles of which it is made up, may act separately, by reason of their distinct Insertions in these Phalanges. The Union of the fleshy Bodies by middle Tendinous Septa may have several uses, the chief of which is, that these Septa being very broad and thin, give Insertion to a great number of fleshy Fibres in a very small compass, and thereby supply the place of four large Tendons, which would have taken up much more room; but by this Union, these four Muscles are more disposed to act jointly than separately.

920. THEY not only bend the second Phalanges on the first, but also the first on the Metacarpal Bones, and the Metacarpus and Carpus on the Fore-Arm. To conceive the Mechanism and Force of these Muscles, which is very great and necessary in certain circumstances, we must call to mind

mind an Observation already made concerning the Muscles of the Scapula ; that every Muscle which can move a Bone in any given Direction, is likewise able with the same Force to keep it immovable in any Situation against whatever tends to move it in a contrary Direction. The following Examples will sufficiently illustrate this Observation.

921. IT is by bending the Fingers that we raise the greatest Weights, that Sailors pull large Oars, that Printers turn the Screws of their Presses, and that Climbers support their whole Bodies, even with an additional Burden upon them. It is by means of the Fingers when bent, that we tear, pull up, bruise, &c. things that require a very great Force to tear, pull up, or bruise them.

922. I observed in the beginning of this Description of the Muscles No. 54, 55. that the strength of Muscles depends on the multitude of their fleshy Fibres, and the extent of their Motions, on the length of these Fibres ; and consequently wherever Strength is more necessary than large degrees of Motion, there we find the Fibres of Muscles proportionably increased in number ; and wherever there is more occasion for a large degree of Motion than for Strength, the fleshy Fibres are of a proportionable length.

923. IN the Perforatus we meet with both these Contrivances, a great number of Fibres for strength of Motion, and a great length of Fibres for extent of Motion. The different Tendinous Septa serve to give Insertions to a number of moving Fibres sufficient for the Strength required in the cases already mentioned.

924. LARGE degrees of Motion are likewise sometimes very necessary in this Muscle, as for instance, when we bend the Fingers at the same time that the Metacarpus and Carpus are bent on the Fore-Arm ; and in this case certain Fasciculi of Fibres are chiefly employed, which appear to be longer than the rest.

925. THE particular use of the Tendons of this Muscle will be better understood with that of the Perforans.

926. THE Perforans bends particularly the third Phalanges in which it *Perforans* is inserted ; and by the same Motion it may likewise bend the first and second Phalanges. We may apply to this Muscle all that has been said concerning the Tendinous Septa in the Perforatus, and concerning its Action, which is sometimes common to all the four Subaltern Muscles, sometimes peculiar to one or more of them.

927. IT may likewise be esteemed an Assistant to the Ulnaris and Radialis Interni in great Efforts ; and these Muscles may reciprocally be looked upon as Assistants to the Perforatus and Perforans.

928. EACH of these four Tendons passes under a distinct Annular Ligament as under a Pulley ; for having accompanied that of the Perforatus through the great Ligament of the Carpus, through the Furcæ of the Aponeurosis Palmaris, and through the Ligamentary Vaginæ of the first Phalanx, and having passed through the Slits of the Perforatus, it leaves
this

this Tendon, and continues its course to the third Phalanx through the Ligamentary Vagina of the second.

929. IN its passage through the Slit of the Perforatus, it is liable to no Compression even in the most violent Efforts of that Muscle. The reciprocal Contorsions of the two flat Portions of the Fissure and their crucial Insertion in the flat side of the third Phalanx, hinder the little oblique Grooves mentioned in the Description, from closing, and the two lateral Portions of the Fissure from coming together, even after the Tendon of the Perforans has been removed. And the more this part of the Tendon is pulled, the more perfectly does the Fissure form a sort of a Channel with solid Sides, and with the two Ends cut obliquely. All this I demonstrated in the Royal Academy on a fresh Subject, and I imitated it artificially with a Ribbon.

930. WITHOUT such an artful Structure as this, the Tendon of the Perforans would have been continually exposed to Compressions and Contusions by the sides of an ordinary Fissure; and without passing through the Tendon of the Perforatus, it could not have been inserted in the middle of the flat side of the third Phalanx, but near one of the Edges.

931. IN the Insertion of these two Tendons in the Phalanges, we may observe still a farther contrivance. This Insertion is Angular in both, that is, the Extremities of the Tendons are not inserted according to their breadth, in a transverse Line, but the sides of their breadth make an Angle with the middle. I omitted this circumstance in the Description, for fear of running out to too great a length, a Treatise which is designed more for instruction than for curiosity.

*Extensor
Digitorum
Communis.*

932. THE Extensor Digitorum Communis serves to extend the four Fingers, to keep them in any degree of Extension, and to moderate their Flexion in all the determinate degrees of Action of the Perforatus and Perforans. The Composition of the Fibres of this Muscle, and its Division into several subaltern Muscles, are much the same with what we have already seen in the two former. Each of these subordinate Muscles may act separately, but with more difficulty than the other two, because of the collateral Series between the Tendons.

933. THE particular Use of these communicating Portions, is to move the Fingers laterally, when extended, to draw them nearer or to a greater distance from each other, and also to serve as Fræna instead of Vaginæ. These Motions being unnecessary when the Fingers are bent, the Perforatus and Perforans have none of these communicating Portions.

934. EACH Tendon serves to extend a whole Finger, that is, all the three Phalanges together; and likewise each Phalanx by itself, though not with the same Facility. The three Phalanges being bent, we can easily extend the first without the other two, but it is difficult to extend the second Phalanx without extending the third.

935. THE contrivance for the general Extension of the three Phalanges by one Tendon, consists chiefly in the Rhomboidal Fissure in that Tendon on the second Joint, or that of the second Phalanx with the first, and in the

the Tendinous Expansions on the sides of the Bases of the first Phalanx. To these we must add a short Tendinous Production from the inside of the Tendon near the first Angle of the Rhomboidal Fissure, inserted in the Basis of the second Phalanx. This Production I omitted in the Description.

936. THE lateral Expansions extend the first Phalanx, the Production just mentioned extends the second, and the last Angle of the Rhomboidal Fissure, the third; two other Angles being kept separate by Auxiliary Muscles, of which hereafter.

937. THE difficulty we find in extending the second Phalanges without extending the third, and in extending the third without the second, is partly owing to the two strong Flexors inserted in these Phalanges, which are seldom contracted or relaxed separately without a particular Habit; and it is for the same reason that we cannot easily bend one of these Phalanges without bending the other, except we have been long accustomed to it.

938. THE proper Extensors of the Fore and Little Finger are Assistants to two subaltern Muscles of the Extensor Communis that go to these Fingers, which consequently we extend separately with more ease, than either of the other two. These Muscles likewise serve to bring the Fingers in which they are inserted nearer the other Fingers.

*Extensores
Indicis &
Minimi Di-
giti Proprii.*

939. WE may be convinced of this last Use, by touching these Muscles when we hold our Fingers close together, or move them laterally, whether extended, or in any other unconstrained Posture between Extension and Flexion. The same Experiment may be made with relation to the Middle and Ring Fingers.

940. AMONG the long Muscles which cover the Bones of the Fore-Arm, those which extend the Carpus and Fingers are fixed in the outer Condyle of the Os Humeri, or near it on the same side. Those which bend the same Parts, are fixed in the internal Condyle, or near it on the same side.

*Remarks on
the Situation
of the long
Muscles
which lie up-
on the Fore-
Arm.*

941. THIS Disposition is very favourable to the Action of the Pronators and Supinators, which otherwise must have been obstructed, and these Muscles must likewise have hindered the Action of the Flexors and Extensors; and they would mutually have been exposed to Contusions and Bruises.

942. FOR were the Flexors fixed on the side of the external Condyle, they must cross over the Radius, because of their Insertions near the Palm of the Hand; and if the Extensors were fixed near the internal Condyle, they must cross over the Ulna in Pronation, and in that case could not act freely.

943. THE Flexor Pollicis Longus serves chiefly to bend the third Phalanx of the Thumb in which it is inserted by the Extremity of its Tendon. It likewise bends the second Phalanx, by vertue of the Ligamentary-Vagina through which it passes, as through an Annular Ligament.

*Flexor Pol-
licis Longus.*

944. As the fleshy Body of this Muscle is very thin and narrow, it does not at first sight appear to bear a sufficient Proportion to the great Force with which we constantly find it to act. But when we consider its Structure more narrowly, we find therein a beautiful example of a very great number of Fibres artfully placed in a small Space, only by the oblique Distribution thereof; as I observed in the beginning of this Treatise of the Muscles N^o 14. 54. 55.

*Extensores
Pollicis.*

945. THE first Extensor of the Thumb alone, when there are three, or a Portion of the first, when there are but two, serves to draw the first Phalanx from the Palm of the Hand, or to keep it at a distance therefrom.

946. THE word Extension made use of to express this Motion is very improper; for the first Phalanx of the Thumb in its natural Situation makes an Angle with the Radius, and consequently is in a state of Flexion. It ought therefore more properly to be said to be extended when it is drawn near the Palm of the Hand. However the common Terms may still be retained, if we be previously made acquainted with their true meaning, as I already observed, speaking of the Uses of the Ulnaris and Radialis Externi.

947. THE second of these Muscles when there are three, or the second Portion of the first, when there are but two, serves to extend the second Phalanx on the first, and this Motion is a true Extension.

948. THE third, when there are three, or the second, when there are but two, extends the third Phalanx on the second.

949. WHEN they act all together, they assist each other by the graduated Insertions of their small subaltern Tendons.

950. THESE Muscles may likewise assist in the common Action of the two Radiales, that is in bringing the great or inner Edge of the Hand towards the convex side of the Radius; and they probably have some share likewise in the Motion of Supination.

§ 7. *Uses of the small Muscles inserted in the Bones of the Metacarpus and Fingers.*

Thenar.

951. THE Thenar by its Insertion in the first Phalanx of the Thumb, serves to draw it from the first Bone of the Metacarpus, more or less directly, as one of its Portions acts more than the other, or as they both act equally.

952. BY the Insertion of the large Portion in the Basis of the second Phalanx by the Intervention of the Sesamoide Bone of the same side, it may bend this Phalanx laterally on the first, and thereby bring the Thumb to a greater distance from the Index. Neither does this distance hinder it from sometimes bending, and sometimes extending the Thumb in the ordinary manner.

953. WHEN

953. WHEN the small Portion acts alone, it may give the second Phalanx a small degree of Rotation on the first, these two Bones not being articulated by a Ginglymus.

954. THE Mesothenar moves the first Phalanx of the Thumb towards the Hollow of the Hand, more or less obliquely, as it acts either alone or with the large Portion of the Thenar, or even with the Antithenar. By its Insertion in the Sesamoide Bone of the second Phalanx, it likewise moves that Phalanx on the first, and thereby assists the Flexor Longus. *Mesothenar.*

955. THE Antithenar moves the first Phalanx of the Thumb toward the first Bone of the Metacarpus, and thereby presses the Thumb laterally against the Index. This Motion becomes more or less oblique by the Co-operation of the Mesothenar. *Antithenar.*

956. THE Hypothenar Minor serves to separate the Little Finger from the rest; which Motion is commonly called Abduction. It likewise keeps this Finger separated in all Situations, that is, in all degrees of Flexion or Extension. *Hypothenar Minor.*

957. THE Interossei may have two different Uses according to their different Insertions, and the different Situations of the Fingers in which they are inserted. *Interossei.*

958. In general, they assist the Extensor Communis by their Insertions in the lateral Angles of the Rhomboidal Fissures; for thereby they act like lateral Ropes, which together with the Tendons of the Extensor, serve to extend the third Phalanx of each Finger.

959. By the same lateral Insertions they perform the lateral Motions of the Fingers, that is, they press them all close against each other, but do not separate them all, nor move each Finger in particular towards or from the Thumb. In a general separation of all the Fingers, the Interossei move only the Middle and Ring Fingers; the Index and Little Finger being separated by other Muscles. In the Motion of the Fingers toward the Thumb, which is termed Adduction, they act only on three Fingers, the Middle, Ring and Little Fingers. In the contrary Motion or Abduction of the Fingers, they move likewise three, viz. the Index, Middle and Ring Fingers.

960. THE Uses of the Interossei in particular, whether external or internal, may be different in different Subjects, according to the variety of their Insertions, and therefore in living Bodies, nothing can be determined about them.

961. ACCORDING to the Situation in which I have described them, the first and second external Interossei, perform alternately the Adduction and Abduction of the Middle Finger; the third performs the Abduction of the Ring Finger; that is, moves it toward the Little Finger.

962. THE first internal Interosseus makes the Abduction of the Index, or moves it toward the Middle Finger; the second makes the Adduction of the Ring Finger, by moving it likewise toward the Middle Finger; and the third performs the Adduction of the Little Finger, or moves it toward the Middle Finger.

963. *Heister* in his *Compendium Anatomicum* published 1727. p. 316. makes me say that the internal Interossei by their Insertions in the Ring and Little Finger, perform the Abduction of these Fingers; adding, that he does not conceive how an internal Interosseous Muscle can perform the Abduction of the Little Finger, since by that term Anatomists understand a Motion from the Thumb. He quotes for this, the *Memoirs of the Royal Academy* for the Year 1720; but it is plain he had not seen the *Paris Edition*, and that in that which he consulted, b had been substituted for d.

*Semi-Inter-
osseus Indicis.*

964. THE Use of the Semi-Interosseus Indicis is to move the first Phalanx of the Index more or less directly toward the great Edge of the Metacarpus, by removing it from the Middle Finger. This Motion is not a true Adduction of the Index toward the Thumb. And indeed the terms of Adduction and Abduction are very improper to convey a just Idea of the lateral Motions not only of the Index, but of all the other Fingers.

Lumbricales.

965. THE Lumbricales by the union of their Tendons with those of the Interossei, are Coadjutors to these Muscles, not only in the lateral Motions of the four Fingers, but also in bending and extending them. In the lateral Motions, they co-operate according to their Situation in each Subject; and it is possible that the variety of their Insertions answers to that of the Interossei, so that the reciprocal Co-operation continues still to be equal.

966. THEY assist the great common Flexor to which they are fixed, only in bending the first Phalanges; which Motion that Muscle principally performs by means of the Ligamentary Vaginae, especially that Portion of them which is next the Metacarpus.

967. THEY may assist the Extensor Communis in extending the third Phalanges, together with the Interossei, by the concurrence of their Tendons. But here the variety of their Insertions is likewise to be regarded; and in some Subjects the want of them in that side of the Index next the Thumb, and side of the Little Finger furthest from the Thumb, may be supplied by the proper Extensors of these Fingers.

§ 8. Uses of the Muscles which move the Os Femoris on the Pelvis.

*Glutæus
Maximus.*

968. THE Glutæus Maximus serves chiefly by its Posterior Portion, to extend the Os Femoris and to draw it backward. Neither of the other Glutæi can have this Use, though it is commonly attributed to all the three. By its Anterior Portion, it may co-operate with the rest in performing the Abduction of the Thigh, that is, in separating it from the other when we stand, but when we sit, it can do this Office only by its Posterior Portion.

969. BY its Insertion in the Os Coccygis, it may on some occasions bring it forward, and hinder it from being thrust too far backward, as in the Excretion of hardened Fæces, or in difficult Births.

970. THE

970. THE *Glutæus Medius* is commonly but falsely reckoned an Ex-*Glutæus Medius.* tensor of the Thigh. Its use is to separate one Thigh from the other, when we stand, and that more or less directly according to the Action of its Anterior, Posterior or Middle Portions. In this Situation therefore it is a true Abductor, but by only viewing its Insertions we may be assured that it cannot be an Extensor.

971. WHEN we sit, the only Use of this Muscle is to perform the Rotation of the *Os Femoris* about its Axis, in such a manner, that if the Leg be bent at the same time it shall be separated from the other. This Rotation is not altogether direct, but must be more or less oblique, because of the crookedness of the Bone, and of the Angle which its Head makes with the Body.

972. THE *Glutæus Minimus* has likewise been reckoned an Extensor of the Thigh, but without any foundation. It assists the *Glutæus Medius* in the Abduction of the Thigh when we stand, and in the Rotation when we sit. Therefore of these three Muscles commonly called Extensors of the Thigh, only one deserves that name.

973. WHAT I have said of the Use of these Muscles when we stand, will equally hold in all other Situations in which the Thighs are stretched out; as for instance, when we lie at full length. And what has been said of their Uses when we sit, will agree to all other Situations in which the Thighs are bent, as when we lie with the Knees drawn up toward the Abdomen. *Remarks on the Uses of the Glutæi.*

974. THE *Glutæi* not only perform these Motions of the Thigh on the Pelvis, but reciprocally move the Pelvis on the Thighs in the same manner. The *Glutæus Maximus*, for instance, not only extends the *Os Femoris* but sustains the Pelvis on the Thighs, and hinders it from being carried along with the rest of the Trunk when the Body is inclined forward, while we stand; and likewise raises it, when the rest of the Body is raised.

975. THE other two *Glutæi* likewise move the Pelvis on the Thigh, as they move the Thigh on the Pelvis. For instance, when we stand upon one Leg, the two Muscles on that side draw the Pelvis laterally toward the Thigh, and hinder it from giving way or falling toward the other side, whither the Weight of the Pelvis itself, and of the other Leg which is not supported, endeavours to bring it.

976. THE *Psoas* bends the Thigh on the Pelvis, or brings it forward. *Psoas.* It may likewise move the Pelvis on the Thighs, and hinder it from being carried along with the rest of the Trunk, when the Body is inclined backward while we sit, having the lower Extremities fixed by some external Force. In this Situation it may likewise move the *Vertebræ* of the Loins.

977. THE *Iliacus* is a Congener or Assistant to the *Psoas*, in bringing the Thigh forward and upward. It may likewise move the Pelvis in the same manner with the former. *Iliacus.*

978. THE *Pectineus* is an Assistant to the two former Muscles in moving both the Thigh and the Pelvis. It may likewise assist in bringing the Thigh *Pectineus.*

Thigh inward, or toward the other, whether it be extended or bent at the same time.

Tricipites.

979. THE three Triceps Muscles join in the same Use, that is, to move the Thigh inward, and bring the two Thighs near each other; as when in riding, we press the Thighs close against the Saddle; when in sitting, we hold any thing close between the Knees; when we cross the Thighs; or when in standing, we bring the Legs close together in order to jump.

980. THE Use of these Muscles is likewise to hinder the Thighs from separating more than is convenient, especially in great Efforts and Jerks. This might happen for instance, when in mounting a Horse, or laying the Leg over any Height, we raise one Thigh hastily, and support the Body on the other. It might likewise happen by the weight of the Body alone, when in standing we separate both Legs at once, or jump hastily to one side.

981. THIS Use of bringing the Thighs together and hindering their separation, has place in all possible Situations of the Body or Thighs, that is in standing, sitting and lying, and when bent, extended, or turned backward or outward. This shews the great necessity of providing for this Function, not only by a strong moving Force, but also by distributing this Force in such a manner as that it may be able to act through almost all the degrees of a very long Lever of one kind.

982. THE longest Portion of the Triceps Tertius being inserted in the side of the inner Condyle of the Os Femoris, seems to counterbalance the other Portions which are inserted more posteriorly in the Linea Aspera.

*Pyriformis,
Gemelli, &
Quadratus.*

983. THESE four Muscles called likewise by the common name of Quadrigemini, are Congeneres in their Uses; and these have been confined by Anatomists to the Rotation of the Os Femoris about its Axis from before outwards. I demonstrated many Years ago, that they cannot have this Use, except when we stand or lie at full length; and likewise that in sitting, or when the Thigh is bent in any other Posture, they carry the Thigh outward, or separate the two Thighs from each other when bent.

984. ALL the four co-operate in these two Uses of Rotation and Abduction; but they co-operate equally or unequally, according to the different degrees of the Extension or Flexion of the Thigh. For instance, when we stand streight up, they all perform the Rotation equally, but if the Thigh be then carried a little forward, the Pyriformis is more in Action than the Quadratus; and if the Thigh be carried backward, the Quadratus acts most.

985. THESE Muscles, by means of their Adhesion to the Orbicular Ligament of the Joint of the Hip, may likewise serve to hinder that Ligament from being squeezed between the Bones in the different Motions of the Thigh.

*Obturator
Internus.*

986. THE Obturator Internus has nearly the same Uses with the Quadrigemini, in making the Rotation of the Thigh when extended, and the Abduction, when bent. But the Mechanism of this Muscle is singular in this respect, that by the passage of its Tendon over the small Ischiatic Notch,

Notch, it acquires a different Direction from that of the Belly or fleshy Body.

987. THIS Notch supplies the place of a Pulley, over which a Rope is thrown, one end of which is fastened to a moveable Object which by pulling the other end, may be brought nearer the Pulley. In this the Pulley performs the Office of a fixed Point or Fulcrum with respect to the moveable Body; and in like manner the Ischiatic Notch is a Fulcrum for the Motion of the Thigh by the Obturator Internus.

988. THE Obturator Externus concurs with the Internus in the same *Obturator Externus.* Uses, though in a more simple manner, and in a more uniform Direction. It acts chiefly when the Thigh is extended more or less; for when the Thigh is bent, it only seems to co-operate with the Obturator Internus in its Action on the Orbicular Ligament; because in other respects it is rather an Assistant to the Triceps and performs the Motion of Rotation the other way.

989. THE Musculus Fasciæ Latæ has been falsely supposed to be an *Musculus Fasciæ Latæ.* Abductor of the Thigh; for the Direction of its moving Fibres is very contrary to such a Motion. It is very proper for making a Rotation from before inwards, that is, in a contrary Direction to that made by the Quadrigemi and Obturator Internus; and this Rotation is not so much confined as that of the Quadrigemi, because it may have place whether the Thigh be bent or extended.

990. IT may likewise assist in the great Efforts of Flexion or Adduction, provided that its different Antagonists act as Moderators, according to the different Situations of the Thigh, as shall be explained at more length in another place.

[§ 9. *Uses of the Muscles which move the Bones of the Leg on the Os Femoris.*

991. To be able to conceive the Uses of these Muscles, we ought first to be well instructed in all that relates to the Bones concerned, especially their Articulations and intermediate Cartilages, as I have described them in the Treatise of the Skeleton and of the fresh Bones; and in particular I desire the Reader to review the Description of the Os Femoris, Tibia and Patella.

992. THE two Vasti and Crureus ought to be looked upon as a true *Vastus Externus, Vastus Internus and Crureus.* Triceps, the Uses of which in relation to the Bones, are only to extend the Tibia on the Os Femoris, and the Os Femoris on the Tibia. The Extension of the Tibia on the Os Femoris, happens chiefly when we sit or lie, and that of the Os Femoris on the Tibia, when we stand or walk. All the three Muscles move the Patella uniformly in the Direction of the Os Femoris, on the Pulley at the lower Extremity of that Bone. The external or broad Portion of this Pulley and of the Patella, answers to this Direction, and seems to be more exposed to the Action of these Muscles, than the internal and narrow Portion on which the necessary Obliquity of that Pulley depends.

993. THE

993. THE Insertion of both the Vasti immediately in the Head of the Tibia, prevents the Patella from being luxated laterally on some occasions, in which the Muscles may act with more Force on one side than on the other, or remain without Action, in which case the Patella is loose and floating.

994. To be convinced of this Inaction, and of the Moveableness of the Patella at the same time, let us either in sitting or standing with the Leg extended, rest the Leg only upon the backside of the Heel, so as that the whole lower Extremity may be supported on the Heel and on the Head of the Os Femoris, the Knee and the Body of the Os Femoris resting on nothing, and the Extension being made only by the Weight of the Bones, without any assistance from the Muscles. If in this Situation, we lay the Thumb on the Basis of the Patella and the Fore-Finger on the Apex, and press these two parts alternately, the Patella will be perceived to be raised and depressed.

995. IN the Description of these Muscles, I forgot an Observation which I have made on the Insertion of several Fibres immediately in the Capsular Ligament of the Joint of the Knee. I have seen these Fibres run down, as if they came chiefly from the Crureus; and their Insertion in the Ligament was oblique and made by degrees. And from hence, I first took the hint of that new Species of Muscles already mentioned in describing those which surround the Articulation of the Head of the Os Humeri, of the Ulna, and of the Os Femoris; and in some Articulations the Adhesion of the Tendons or Tendinous Fibres supplies the place of fleshy Fibres.

996. BY the Insertion of these Muscles in the Patella, their Line of Direction is removed to a greater distance from the Center or Axis of Motion of the Joint, which facilitates their Action, and defends their common Tendon from Compression and Contusions.

Rectus Anterior.

997. THE Rectus Anterior by its Insertion in the Patella is a Congener to the last three Muscles, and serves to extend the Leg. By its Insertion in the Os Ilium, it bends the Thigh and assists the Psoas, Iliacus and Pectineus, whether the Leg be extended or bent. It likewise moves the Pelvis forward on the Os Femoris, and hinders it from falling back when we sit.

998. BEING partly Penniform and partly Simple, it is capable of sustaining great Efforts, and of producing large Motions; and its Line of Direction which is raised to a considerable distance from the Center of Motion of the Hip and Knee, increases these advantages. The particular disposition and largeness of its second superior Tendon, answer principally to all the degrees of Flexion.

999. THE other Tendon commonly described, would not alone have been sufficient for that purpose; but its Obliquity is convenient for the Extension of the Leg, when the Thigh is extended or but little bent. But when the Thigh is very much bent, this Obliquity would remove the small Tendon to too great a distance from the Bone, and thereby expose it

to be torn off, in the same manner as we tear off the Branch of a Tree, by separating it from the Trunk. The Obliquity here mentioned, is with respect to the Os Femoris, this superior Tendon lying out of the Direction of that Bone.

1000. THE Sartorius performs the Rotation of the Thigh from before, *Sartorius*, outward, whether extended or bent; being an Antagonist to the Musculus Fasciæ Latæ, and a Congener to the Quadrigemini.

1001. IF during this Rotation the Leg be extended, the Toes are turned outward; but if the Leg be bent, it is turned toward the other Leg, as when we lay it over the other Leg or Knee, in the manner that Taylors sit at work, from whence this Muscle got the name of Sartorius.

1002. IT likewise bends the Thigh or raises it forward; it moves the Pelvis forward on the Os Femoris, and when the Pelvis rests on the two Tuberosities of the Ischium in sitting, it keeps it in that Situation. In this Action it is a Congener to the Rectus Anterior, but acts with much more Force, as having its Line of Direction further from the Center of Motion.

1003. LASTLY it bends the Leg, whether it performs the Rotation of the Thigh at the same time or not. In this latter case, it is directed by the Co-operation of some Congener, or counterbalanced by the Action of the Musculus Fasciæ Latæ.

1004. THE Length and Obliquity of its fleshy Portion, the passage of the inferior Tendon through the Aponeurotic Vagina, the particular Insertion of this Tendon, and the Extent of the Aponeurosis which it sends over the Tibia, contribute very much to these different Uses.

1005. BESIDES all these Uses, it may in some cases assist the Popliteus, as shall be shewn in speaking of that Muscle.

1006. THE Gracilis Internus bends the Leg much in the same manner *Gracilis Internus*, with the Sartorius which it assists in this Function, but not in that of turning the Leg; and it is more proper to continue the Flexion than to begin it, it being chiefly when the Thigh is turned by the Sartorius, that the Gracilis contributes to this Action.

1007. IT may likewise assist the Triceps in the Adduction of the Thigh, which it performs with much more Facility than it begins the Flexion of the Leg without the Rotation of the Thigh. This Facility in all Situations of the Thigh, is procured by the distance of the superior Insertion of this Muscle from the Joint of the Hip; but it cannot with the same ease bend the Leg when the Thigh is not turned, for this reason.

1008. WHILE the Thigh is only extended, the Line of Direction of this whole Muscle is nearly in the same Plane with the Axis of Motion of the Knee, and therefore the distance of its superior Insertion gives it no advantage. But when the Thigh is turned round by the Sartorius, the Plane of its Direction changes and crosses the Axis of the Ginglymus of the Knee, and then the lateral distance of its superior Insertion facilitates its Action on the Leg.

Semi-Nervosus.

1009. THE *Semi-Nervosus* bends the Leg, and may likewise bend the Thigh on the Leg. By its Insertion in the Tuberosity of the Ischium, it likewise extends the Thigh on the Pelvis, and carries it backward; and may also extend the Pelvis on the Thigh, when it has been inclined forward with the rest of the Trunk; and consequently prevent its being carried too far along with the Trunk, when we stoop forward, either standing or sitting.

Semi-Membranosus.

1010. THE *Semi-Membranosus* has the same Uses with the *Semi-Nervosus*. It bends the Leg on the Thigh, and the Thigh on the Leg; it extends the Thigh on the Pelvis, and the Pelvis on the Thigh, and sustains the Pelvis when it is inclined forward. It differs in this one thing from the three Muscles last mentioned, that its Insertion is not on one side but behind the Joint; and for that reason it is better disposed both to begin and continue the Flexion of the Leg than they are.

Biceps.

1011. THE two Portions of the *Biceps* bend the Leg on the Thigh, and the Thigh on the Leg. The superior Portion likewise extends the Thigh on the Pelvis, and the Pelvis on the Thigh. These four Uses in general are common to this Muscle with the *Semi-Membranosus*, and in some measure with the *Semi-Tendinosus*.

1012. THE particular Use of the *Biceps*, and which seems to belong more to the short Portion than to the other, is to perform the Rotation of the Leg when bent, by which Motion the Toes are turned outward, and the Heel inward. It has no share in the Rotation of the Leg when extended, which depends intirely on that of the Thigh, the Motions of which, the Leg only follows as if these two Bones were cemented together.

1013. THE Mechanism of the Rotation of the Leg when bent, depends chiefly on the Structure of the *Semi-Lunar Cartilages*, and on the Situation of the lateral and crucial Ligaments. These Cartilages are hollowed on the upper side in proportion to the Convexity of the Condyles of the *Os Femoris*; and on the under side they are flattened in proportion to the Surface of the *Tibia*. The Lateral Ligaments are not in the middle of each side of the Head of the *Tibia*, but more backward. The Crucial Ligaments are disposed in such a manner, as that in turning the Leg when bent, from before outward, they separate from each other, and in turning it from before inward, they approach each other. See the Description of the Fresh Bones N^o 154. 160. 162.

1014. WHEN the Leg is extended or bent, the *Semi-Lunar Cartilages* perform the Office of Hinges, because the Condyles of the *Os Femoris* turn in their Cavities; and in this case these Cartilages may be considered as making in some measure but one piece with the *Tibia*. And when the Leg is strongly extended, the Lateral Ligaments by their Situation backward, limit this Extension, and hinder the Leg from being bent forward.

1015. IN making the two Motions of Rotation with the Leg when bent, the *Semi-Lunar Cartilages* may be considered as being fixed to the *Os*

Os Femoris, and that the Tibia slides both ways under them. In this case, the Lateral Ligaments are very much relaxed, and no ways hinder this Rotation; and the Crucial Ligaments separate from each other, when we turn the Toes outward, the Leg being bent; but they strike against each other, when the Toes are turned inward, which seems to render the Rotation inward, more confined than the Rotation outward.

1016. THESE two reciprocal Motions of the Leg when bent, may be compared to those of the Radius on the Ulna. The Rotation inward answers to Pronation, and the Rotation outward to Supination. The Biceps of the Tibia may be likewise compared to the Biceps of the Fore-Arm, both being Flexors and Rotators; for Pronation and Supination are only two Species of Rotation.

1017. THE want of Motion in the Fibula on these occasions, is made up by the moveableness of the Patella; without which the Rotation of the Leg, when bent, would be impossible; for in making this Motion, the Patella remains perfectly at rest on the Condyles of the Os Femoris; the great Ligament only giving way by a sort of small reciprocal Contorsion of its lower Extremity. It is necessary here to review what was said in the Description of the Skeleton.

1018. THE Popliteus performs the Rotation of the Leg when bent, in a Direction contrary to that of the Biceps. The Biceps turns the Leg from before outward; the Popliteus from before inward. This Rotation therefore answers to the Pronation of the Radius by the Pronator Teres; as that made by the Biceps Tibiæ does to the Supination made by the Biceps of the Arm. *Popliteus.*

1019. THIS Muscle is commonly reckoned among the Flexors of the Leg, but it seems very ill contrived for such a Function, because of the Obliquity of its Situation, and because its Insertion is so near the Center of Motion of the Joint. By its Connexion with the Capsular Ligament, it may serve to prevent its being caught between the two Bones in the Flexions of the Leg.

§ 10. *Uses of the Muscles which move the Tarsus and the other Bones of the Foot.*

1020. THE Tibialis Anticus bends the Foot, that is, turns the Point of the Foot toward the Leg; which Motion is performed by the Ginglymoide Articulation of the Astragalus with the Tibia and Fibula. It likewise bends the Leg on the Foot, or hinders its Extension. The first of these uses is generally known; and we have an instance of the second every time we stand or walk. When we stand, the Feet being turned directly forward, this Muscle, like a Frænum, keeps the Leg in Æquilibrio, and hinders it from falling backward. This use is still more evident when we walk backward. *Tibialis Anticus.*

1021. BY its lateral Insertion in the Os Cuneiforme Maximum, it moves this Bone in particular over the anterior Extremity of the Os Calcis; by which the Sole of the Foot is turned inward toward the other. This lateral Situation of its Insertion is the reason why it cannot bend the Foot directly, without the help of the Anterior Peronæi; neither can it alone keep the Leg in *Æquilibrium* when we stand on one Foot.

*Peronæus
Medius &
Minimus.*

1022. THE *Peronæus Medius* bends the Foot, and hinders the Leg from falling back in the same manner as the *Tibialis Anticus*. By its Insertion in the Tuberosity of the fifth Metatarsal Bone, it turns the Sole of the Foot outward at the same time that it bends it, when it acts without the assistance of the *Tibialis Anticus*; the Co-operation of which Muscle is likewise necessary to enable it to counterbalance the Force with which the Leg would be carried backward when we stand upon one Foot.

1023. THE *Peronæus Minimus* is an Assistant to the *Medius* in the Flexion of the Foot, in preserving the *Æquilibrium* of the Leg, and in turning the Sole of the Foot outward; neither can it perform the first two of these Motions uniformly without the Co-operation of the *Tibialis Anticus*.

1024. THE uniform Flexion of the Foot furnishes an example of all the three kinds of Levers; of the first, when we bend the Foot while off the Ground, in which case the Fulcrum is in the Articulation between the two Extremities of the Lever; of the second, when we walk upon the Heels or Toes, for then the Weight is between the Power and the Fulcrum; of the third, when we raise a Weight by the Toes, for then the Power is between the Weight and the Fulcrum.

*Gastrocnemii
& Soleus.*

1025. THE *Gastrocnemii* and *Soleus* make a kind of Triceps, and by their common Tendon extend the Foot and keep it extended against the strongest Resistance. It is by their means that we raise the whole Body even with an additional Burden, when we stand a Tip-Toes; and that we walk, run and jump. The length of the posterior Portion of the Os Calcis gives them a great advantage in acting, by removing the Line of their Direction from the Axis of Motion.

1026. THE Motions of the Foot performed by these Muscles may be referred to the first two kinds of Levers. When we stand a Tip-Toes, the Foot represents a Lever of the second kind, the Fulcrum being then at one end, the Power at the other, and the Weight between them; and we have a Lever of the first kind, when the Leg being fixed, we endeavour to overcome any moveable Resistance with the Toes, or whenever we move the Foot held off the Ground.

1027. THESE Muscles not only extend the Foot on the Leg, but likewise the Leg on the Foot, as appears evidently when after a moderate Genuflexion, we raise our Bodies; for then the Foot remains fixed while these Muscles extend the Leg; and it is here to be observed that this Genuflexion is not made by the Action of any Flexors, but only by the Relaxation of the proper Extensors, according to what was taken notice in the beginning of this Section N^o 51.

1028. THE Gastrocnemii by their Insertion in the Os Femoris may in great Efforts move the Leg on the Thigh, and the Thigh on the Leg, as Assistants to the Biceps, Semi-Membranosus, Semi-Tendinosus, Gracilis Internus, and Sartorius. In these Motions the superior Extremities of the Gastrocnemii cross under the lower Extremities of the Muscles last named. The fleshy Fibres of the Gastrocnemii are very long, and there is a great distance between their two Insertions; and on this account these Muscles are better fitted for large Degrees of Motion than for Strength.

1029. THE Soleus by the Multitude of its fleshy Fibres and its penniform Structure, is more proper for strong than large Motions, and seems principally to sustain the Gastrocnemii in the Motions begun by them. The Tendinous Portions of this Muscle and of the Gastrocnemii, though they form a strong Tendon altogether, seem nevertheless to slide a little upon each other in the different Flexions and Extensions of the Foot.

1030. FROM the Description of the Tibialis Gracilis we see evidently that it can have no use with relation to the Sole of the Foot. The use assigned to it by others, of extending the Tarsus and thereby assisting the Gastrocnemii and Soleus, seems to me to be very uncertain, both because of the great Disproportion in its Size, and the Obliquity of its Course. If the Soleus were not covered by the Gastrocnemii, the Tibialis Gracilis might be imagined to serve as a Frænum in bracing down that Muscle and hindering it from swelling too much; but the small Number and Direction of its Fibres would still render it unfit for that Function.

1031. TILL its true Use is evidently discovered by some lucky Observation, there is in the mean time some ground to think that it hinders the Capsular Ligament of the Knee from being compressed in the Flexion of that Joint; both because of its adhesion to that Ligament, and because of the Obliquity of its Course, especially since the neighbouring Portion of the same Ligament seems to receive the same assistance from a Tendinous Expansion of the Semi-Membranosus.

1032. WHEN the Tibialis Posticus acts alone, it extends the Foot obliquely inward. When it acts together with the Gastrocnemii and Soleus, it changes the streight Direction of their Motion to an oblique one. When it acts with the Tibialis Anticus, the Sole of the Foot is turned more directly inward or toward the other Foot.

1033. WHEN the Peronæus Longus or Maximus acts alone, it may extend the Foot hanging freely in the Air; but then this Extension is obliquely outward. Together with the Gastrocnemii and Soleus, it likewise changes their Direction to an oblique Extension outward.

1034. THIS Muscle and the Tibialis Posticus acting without the Gastrocnemii and Soleus, may extend the Foot almost directly, but they can overcome but a very small Resistance. When it acts with the other two Peronæi, the Sole of the Foot is turned more or less directly outward toward the external Malleolus.

1035. I cannot help repeating once more, that in order to conceive these Uses as we ought, it is very necessary to review the Description of these

Muscles, and what was said concerning the Mechanism and Uses of the Bones of the Tarsus.

Extensor

Pollicis Longus, Flexor Pollicis Longus, Thenar & Antithenar.

1036. THE Extensor Pollicis Longus extends the two Phalanges of the Great Toe; and it may likewise be an Assistant to the Tibialis Anticus.

1037. THE Flexor Pollicis Longus not only bends the second Phalanx of the Great Toe, but may likewise serve in great Efforts, as an Assistant to the Extensors of the Tarsus. This Muscle is of great use in climbing up a steep place.

1038. THE Thenar bends the first Phalanx of the Great Toe. When the Portion nearest the inner Edge of the Foot either acts alone, or acts more than the rest, the Great Toe is separated from the other Toes, especially if it be at the same time extended. This Separation may be greater or less, according to the degrees of Action of the other Portions of the Thenar.

1039. THE Antithenar acting with the Thenar, bends the first Phalanx of the Great Toe. When it acts alone, especially if the Great Toe is bent, it brings it nearer the other Toes, in proportion to the degrees of Action of its different Portions.

Extensor Digitorum Longus & Brevis.

1040. THE two Extensores Digitorum Communes concur in extending the four small Toes; and as the Extensor Longus is not near so fleshy as that of the Hand, this difference is made up by the Extensor Brevis. The Longus alone seems to extend the first Phalanges; and they both join in the Extension of the second and third Phalanges; the Brevis by the Obliquity of its Direction moderating the Action of the Longus, which otherwise would have turned the Toes obliquely the contrary way.

1041. THE Extensor Longus may likewise assist the Tibialis Anticus and Peronæus Anticus in great Efforts, or in keeping the Foot bent; as when we would raise a Weight upon the Toes, or overcome any other Resistance. Lastly, one Extensor alone would not have been sufficient to counterbalance the common Flexors.

Perforatus, Perforans, Flexor Accessorius & Lumbricales.

1042. THE Perforatus or Flexor Digitorum Brevis, bends the second Phalanges; and the Perforans or Flexor Longus, the third; the use of these Muscles being nearly the same with those of the Perforatus and Perforans of the Hand.

1043. THE Flexor Accessorius, which might very justly be termed Plantaris, is an Assistant to the Perforans, increasing its Force on some occasions. It likewise directs the Tendon of that Muscle; for by contracting at the same time that the fleshy Belly of the Perforans is in Action, it makes the Tendons go in a straighter Line to the Toes than they would otherwise do, because of their Obliquity. It has likewise another use with relation to the Lumbricales.

1044. THE Lumbricales have nearly the same functions in the Foot as in the Hand; and they are partly assisted and partly directed by the Flexor Accessorius.

1045. THE Interossei of the Foot have the same uses as in the Hand. *Interossei.* The first superior Muscle brings the second Toe near the Great Toe; the other three bring the second, third and fourth Toes near the Little Toe. The three inferior Muscles move the last three Toes toward the other two. I here speak according to the Situation which I have most frequently observed; but as that Situation varies, the uses must likewise be different.

1046. THE Metatarsius moves the last Bone of the Metatarsus, much *Metatarsius,* in the same manner as the Metacarpus does that of the Metacarpus. By *Transversalis, Parathenar Major & Minor.* this Action it draws likewise the fourth Bone along with it, and contracts the Sole of the Foot, increasing the Convexity of the upper side; provided that the Foot is not become inflexible by long wearing strait Shoes, by old Age, or by any other constraint or indisposition.

1047. THE Transversalis may assist the Metatarsius in this Action, which is supposed to be of use to Tilers in climbing. The Antithenar may likewise concur, and the Peronæus Minimus may serve to counterbalance these Muscles, and to bring the Metatarsus back to its natural Situation. The common Extensors by their nearest Tendons, may likewise be Antagonists to the Metatarsius and Transversalis.

1048. THE Parathenar Major serves particularly to separate the Little Toe from the rest; and the Parathenar Minor bends the first Phalanx of that Toe. Both these Muscles seem to be too large and strong, for the necessary Motions of so small a part on so weak a Joint. But as the Little Toe makes a part of the outer Edge of the Sole of the Foot, which is very much exposed to external Violence when we walk barefooted, and no part of it so much exposed as the Little Toe, very powerful Muscles were necessary to strengthen it on these occasions.

1049. BESIDES the two Uses already mentioned, the great and small Parathenar may have another in which they may likewise be assisted by the Thenar; and that is to bend the Sole of the Foot according to its breadth, which Action is very requisite in walking a Tip-Toes, in going up a Ladder, and in Climbing; on which account the two Parathenars deserve the name of the Tiler's Muscles, much better than the Transversalis Pedis.

§ 11. Uses of the Muscles employed in Respiration.

1050. IN describing these Muscles I began by the Diaphragm, but in giving their Uses, all the other Muscles must go before it, for a reason which will appear hereafter.

1051. THE Scaleni seem better fitted for the Motions of the Neck *Scaleni.* than for those of Respiration; and I frankly acknowledge that in reflecting on this, while this Page was in the Press, I began to doubt of this latter use, especially when I called to mind what I said about the Uses of the Subclavius N^o 822. viz. that I could not believe this Muscle to be employed in Respiration, because of its Insertion in the Cartilaginous Portion of the first Rib, which is immoveably fixed to the Sternum, and likewise much shorter,

shorter, much broader, and consequently much less flexible than the Cartilages of the other Ribs.

1052. MOREOVER, the Neck in many Situations cannot serve as a fixed Point to the Scaleni for the Motion of the Ribs; as for instance, when it is bent forward over the Sternum, or inclined very much to either Shoulder; and yet we find that none of these Situations do in the least hinder the Motions of Respiration.

1053. FROM this time therefore, I shall rank the Scaleni among the Muscles which move the Vertebrae of the Neck; because the Articulation of the first Rib on both sides, with the first Vertebra of the Back, seems to serve only for the Motion of that Vertebra on the Rib, and not of the Rib on the Vertebra. In this manner ought Truth to be embraced whenever it presents itself.

Serrati Posteriori.

1054. THE Serratus Posticus Superior is disposed to move upwards the three or four upper Ribs next the first. And if any Portion of this Muscle should be observed to be inserted in the first Rib, that could only serve for the Motion of the Vertebrae with which that Rib is articulated, and not for the Motion of the Rib itself, because of the Stiffness and Immobility of its Cartilaginous Portion.

1055. THE Serratus Posticus Inferior is still better disposed for depressing and keeping down the last three or four false Ribs.

1056. THE Use which has been assigned to these two Muscles, of being Vaginae or moveable Fræna to the Longissimus Dorsi and Sacro-Lumbaris is without foundation; for the Portions of these Muscles covered by the Serrati, have no more need of such a contrivance, than those which are not covered by them.

Intercostales, & Supracostales.

1057. THE Posterior Fibres of the external Intercostals, are fixed by their upper Extremities so near the Articulation of the Ribs with the Vertebrae, that they cannot depress that Rib in which they are so inserted; whereas the Insertions of their lower Extremities in the following Rib, being at a greater distance from the Articulation, they may move that Rib upward. And from thence it follows, that all the remaining part of each external Intercostal which terminates at the bony Extremity of each Rib, can only serve to raise the lower Rib toward the upper.

1058. THE Anterior Fibres of the internal Intercostals are so near the Articulation of the Ribs with the Sternum, that they cannot depress that Cartilage in which each of them is inserted; whereas the inferior Insertions of these Fibres being at a greater distance from the Articulation, they are in a condition to raise the Cartilages in which they are so inserted. From whence it follows, that all the internal Intercostal Muscles have the same Use with the external, and that they can have no other.

1059. THE Portions which lie between the two Extremities of the Ribs serve to increase the Force of the same uniform Action. And the first Rib being immoveable, serves for a fixed Point for the Motions of all the other Ribs, and each Rib in particular, serves for a fixed Point for the Motion of that below it.

1060. THE

1060. THE Supra-Costales are powerful Assistants to the Intercostals in their common Action, and are therefore very justly termed Levatores Costarum. But we must not confound with these, a small Muscle immediately above the first Rib, which by its Insertion in that Rib, looks like them at first sight.

1061. THE Insertions and Direction of the Sterno-Costales being carefully examined, it will be found that their Use is to depress the Cartilaginous Portions, and Anterior Extremities of the Ribs, especially the superior Ribs, except the first; and at the same time to draw the Cartilages of the inferior Ribs near the Sternum, by reason of the Curvature. They may therefore very well be called Depressores Costarum, as the Supra-Costales are named Levatores. *Sterno-Costales & Sub-Costales.*

1062. THE Sub-Costales having the superior Extremities of their Fibres much more distant from the Vertebral Articulations of the Ribs, than the lower Extremities; it follows that they can more easily move the upper than the lower Ribs, and consequently that they are Assistants to the Sterno-Costales.

1063. THE Diaphragm, together with the Intercostal Muscles, the Ribs, Sternum and Vertebrae of the Back, forms the Cavity of the Thorax, and it divides this Cavity from that of the Abdomen. *Diaphragma.*

1064. Its particular Use is to be the principal Organ of Respiration, that is, of the alternate Expansion and Contraction of the Thorax. The other Muscles already mentioned are to be considered only as Assistants and Directors in order to facilitate and regulate these Motions, which in the ordinary state are perpetual, but which may by the Action of these other Muscles be accelerated, retarded, or even be suspended for some space of time.

1065. THE Diaphragm may move when the Ribs are at rest, and consequently without the assistance of the Muscles which move the Ribs; and this Motion may be sufficient to keep up the alternate Dilatation and Contraction of the Thorax without which the Animal cannot live.

1066. IN a word, we may continually expire and inspire by means of the Diaphragm, whether the Ribs move or remain at rest; and whether the Thorax be kept for a considerable time in a state of great Dilatation or of great Contraction; for this does not hinder the Diaphragm from continuing its Motions.

1067. WE cannot explain this Mechanism, till we have first described several other Organs on which it depends; and therefore it must be referred to the Treatise of the Thorax.

§ 11. *Uses of the Muscles which move the Head on the Trunk.*

1068. THE Action of the Sterno-Mastoidæi is different, according as either both Muscles or only one of them acts, and according to the different Situation of the Head and Trunk. *Sterno-Mastoidæi.*

1069. WHEN we keep the Head and Trunk streight, whether in standing or sitting, both Muscles preserve the Head in that Posture against any Force by which it would otherwise be moved backward. This we may be convinced of by laying the Hand on these Muscles while we endeavour to resist a Force which pushes back the Head.

1070. ONE of these Muscles acting alone, may have the same Use, if the Force to push the Head back be applied between the anterior and lateral Parts of it. In that case the Sterno-Mastoidæus on the same side would oppose this Force; but if it were applied directly on the side of the Head, that opposition would have no effect without the assistance of the Splenius on the same side.

1071. THEY both serve likewise to perform the Rotations of the Head, that is, to make it turn to either side as on a Pivot; and in this case when we turn the Head to one side, the Sterno-Mastoidæus on the other side acts, and not that on the same side; this is an Observation of consequence in Paralytical Disorders.

1072. THEY both serve in the next place, to bring the Head near the Thorax when we lie on the Back, or bend backward in sitting. And the lower the Head is in these Situations, the more Force must these Muscles exert to raise it. In this case the Sternum being the fixed Point, must remain immoveable; but as its Connexion with the first Rib, and the Inflexibility of the Cartilage of that Rib, are not always sufficient for this; the Musculi Recti of the Abdomen must lend their assistance in great Efforts.

1073. IN most People, we may feel this Co-operation of the Abdominal Muscles, in raising the Head when they lie on their Back, by laying the Hand on these Muscles. But when the Cartilage of the first Rib is very much hardened, and the Articulation quite deprived of Motion, as where the first and second Ribs are partly confounded together, of which I have seen instances; in such People, the Sternum does not want any other assistance to keep it immoveable, and therefore the Co-operation of the Muscles of the Abdomen would not be perceivable.

1074. WHEN being in an erect Posture, either standing or sitting, we lower the Head, the Sterno-Mastoidæi do not act, neither have they any share in that Posture. It is produced only by the Relaxation of the posterior Muscles, by which alone the Head is sustained in this erect Posture, and without which it would naturally fall forward, as we see in those who fall a-sleep, or are taken suddenly ill, while sitting.

1075. THE Insertions of these Muscles in the posterior part of the Mastoide Apophyses, has made some Anatomists believe that they are more proper to bend the Head backward than forward; their Insertions being behind the Condylode Articulation of the Os Occipitis; and to this they might have added, that the Neck, from the natural disposition of the Vertebrae, is better fitted for Flexion backward than forward.

1076. BUT

1076. BUT in the first place, as these Insertions take up a great deal of room, the moveable Point can only be determined to that part which is nearest the fleshy Body, and the most anterior; and consequently not situated so far back as is imagined.

1077. IN the second place, as the Motion of the Head forward, by these Muscles, is distinct from that of the Neck, the anterior Muscles of the Vertebrae of the Neck must act at the same time, and hinder them from bending backward; so that in this case the Neck may be looked upon as a Pillar, the upper part of which supports the Head, while the Head acted upon by the Muscles, carries the lower part of it forward. It is for want of this Co-operation that Experiments made on dead Bodies have been apt to mislead.

1078. THE two Splenii serve to support the Head in an erect Posture, whether in standing or sitting; to moderate the Flexion of the Head forward, and to bring it back again to its natural Posture. *Splenius & Complexus.*

1079. THEY serve alternately to co-operate with either of the Sterno-Mastoidæi for the Rotation of the Head: Thus when the right Sterno-Mastoidæus turns the Head, the left Splenius corresponds with it by its upper part; while the lower part at the same time turns the Vertebrae of the Neck.

1080. WHEN we lie on one side and raise the Head laterally, the Splenius and Sterno-Mastoidæus of the opposite side, act in concert. Also when we stand and incline the Head to one side, it is the Splenius and Sterno-Mastoidæus of the other side which moderate that lateral Flexion, and afterwards extend the Head. And as the Sterno-Mastoidæus is partly inserted in the Clavicula, the Latissimus Dorsi concurs likewise in this Action, and fixes the Clavicle by means of its Connexion with the Os Humeri, which is of considerable advantage in the Action of the Sterno-Mastoidæus.

1081. THE Complexi are Assistants to the Splenii, to keep the Head streight in sitting or standing, to hinder it from inclining forward, and to raise it when inclined. When they act together, they as well as the Splenii, may move the Head backward, while the Trunk is bent forward, or when we lie upon the Belly. This latter Motion is commonly named Extension, the other, Flexion.

1082. WHEN the Splenius and Complexus of one side act together, they may support the Head when obliquely inclined to the opposite side; bring it back again to its natural Situation, and incline it obliquely toward the side on which they lie.

1083. THE Recti Majores and Minores Postici, and Obliqui Superiores turn the Head a little backward on the first Vertebra of the Neck; and they can neither act otherwise nor separately. The Recti Majores contribute most to this Motion; and the Minores seem likewise to hinder the Articular Membranes from being pinched between the Bones in great Motions. *Recti Postici, Obliqui Superiores, &c.*

Recti Antici & Transversales Antici. 1084. THE *Recti Majores* and *Minores Antici*, and the two *Transversales Antici* move the Head forward on the first Vertebra; and the *Recti Minores* and *Transversales Breves*, likewise defend the Capsular Ligaments.

Obliqui Inferiores. 1085. THE *Obliqui Inferiores* or *Majores* are true Rotators of the Head, by turning the first Vertebra upon the *Odontoide Apophysis* of the second; all which alternate Motions, the Head follows, without being hindered in the Motions forward and backward in any degree of Rotation.

1086. THESE oblique Muscles cannot perform any other Motions, being only Assistants to the *Splenii* and *Sterno-Mastoidæi*. The *Obliqui Minores* can have no share therein, they being limited to the Inflexion backward, as has been already said. The Obliquity of their Direction which may have deceived some Anatomists, seems only to be contrived to make way for the Insertions of the *Complexi Minores*.

1087. OF the *Transversales Antici*, the first only move the Head in the manner abovementioned; neither can they perform any other Motions, their Insertions being confined to the *Os Occipitis* and first Vertebra. The *Transversales Antici Secundi* have no share in the particular Motions of the Head, but ought rather to be ranked among the Muscles which move the Vertebrae of the Neck.

1088. THE *Complexi Minores* belong to the Head only by their superior Portions; the other Portions belonging rather to the Neck. They may serve alternately in the lateral Motions of the Head, and thereby co-operate with the *Splenius* and *Sterno-Mastoidæus* of the same side, when these two act together; and they may likewise be of use to preserve the Capsular Ligaments to which they adhere.

1089. THE small *Accessorii* when they are found, have the same uses with the Muscles to which they are supernumerary.

§ 13. Uses of the Muscles which move the Vertebrae.

1090. THE particular Motions of the Neck seem always to be accompanied by those of the Head; but there are several of these Motions in which the Head is only carried along with the first Vertebra, as if it adhered immovably to it. The Neck thus considered may be bent forward, streightened, bent backward, inclined to each Shoulder, and turned as on a Pivot, by a Rotation different from that of the first Vertebra on the second.

Scaleni.

1091. THE *Scaleni*, when they act on each side at the same time, may assist in bringing the Neck forward, when we lean back in any respect. When those of one side act by themselves, they make a lateral Inflexion either of all the Vertebrae of the Neck together, as in bending the middle of the Neck; or of some only, as in bending the lower part of the Neck alone. These lateral Inflexions cannot be made indirectly with the help of the inferior Portion of the *Splenius*.

1092. THE Longi Colli bring the Neck forward by the lower part of *Longi Colli*. their inferior Portions. When one of them acts alone, or acts more than the other, this Motion is more or less oblique. The remaining part of these Muscles has no Hand in these Motions, which seem to be peculiar to the last Vertebrae of the Neck on the first of the Back.

1093. BY the upper and greatest part of the lower Portion, they counterbalance the posterior Muscles of these Vertebrae, and hinder the Neck from bending backward by the Contraction of the Sterno-Mastoidæi, when, lying on the Back, we raise the Head.

1094. IT must here be remembered that the natural Situation of the Bones of the Neck, is oblique on the forepart, and that the Neck is bent in such a manner, as that the convex side of the Curvature lies forward, and the concave side backward. Therefore when we would hold the Neck streight, and bridle it, as it is called, this Curvature must be destroyed. This is done by these two Muscles which in this case make an Extension, in a manner, in opposite Directions, and fix all the Vertebrae of the Neck close to each other, as if they were but one Bone.

1095. THE Longus Colli of one side performs these Motions obliquely, and may likewise co-operate in the lateral Inflexions of the Neck with the Scaleni and other Muscles which perform these Motions, as we shall see afterwards.

1096. THE Transversalis Major, Transversalis Gracilis, and the Little *Transversales*. Transversales, acting on one side, can have no other use but to bend the Neck laterally; and to hinder these Inflexions when they act on both sides. The small Transversales may likewise preserve the Capsular Membranes of the Joints from being compressed, or otherwise hurt by the Motions of the oblique Apophyses.

1097. THE Semi-Spinales or Transverso-Spinales of both sides acting together, extend the Neck upon the Trunk, to keep it from inclining forward in standing or sitting, and bend it backward. The Semi-Spinales of one side acting alone, produce the same Motions in an oblique Direction, and in that case they are assisted by the inferior or vertebral Portion of the neighbouring Splenius under which they cross. *Semi-Spinales*.

1098. THE Semi-Spinales of both sides may likewise serve for the Rotation of the Neck, but then the inferior Splenius of the opposite side must assist them. This Motion is made in the ordinary Situation of the Neck, chiefly on the fourth and fifth Vertebra. They may likewise perform the lateral Inflexions of the Neck, by assisting the Longus Colli and Anterior Vertebral Muscles of the same side.

1099. THE Inter-Spinales are Assistants to the Semi-Spinales in their mutual Action, and may likewise serve to bring back the Neck to its natural *Inter-Spinales*. Situation, after small Motions of Rotation.

1100. THE Vertebrae of the Back are moved by being bent forward, by being extended or streightened, and by being inflected directly or obliquely toward each side. The Motion of Rotation has no place here, be-

cause of the particular Structure of the Joints of these Vertebrae and their Connexion with the Ribs, which likewise hinder the Flexion backward. Flexion and Extension are the two principal Motions and much more apparent than the others.

1101. THE Flexion of the Back forward is not performed by any particular Muscles, but depends both in standing and sitting, on the Relaxation of the Muscles that extend or streighten it, and keep it in that erect Posture. In that case the Weight of the Head obliges the Vertebrae to bend forward more or less in proportion to the degree of Relaxation of the Extensor Muscles.

1102. To facilitate this Flexion, we commonly raise the Shoulders; which being done by the Action of the Serratus Major, the Rhomboides must be relaxed at the same time, by which the upper part of the Back is left at liberty. The lower part is most easily bent, because the false Ribs not being fixed by their anterior Extremities, advance forward sliding a little upon each other.

1103. WHEN we lie upon the Back or Side, this Flexion is performed chiefly by the Abdominal Muscles; so that the greatest part of the Uses of all the Muscles belonging to the Vertebrae of the Back, is confined to Extension alone.

Sacro-Lumbaris.

1104. THE two Sacro-Lumbaris maintain the Back and the Regio Lumbaris in their natural Situation when we stand or sit; and by the Relaxation of their Fibres more or less, the Trunk is proportionably bent forward by the Weight of the Head and Breast. They likewise extend the Back and Loins in all Postures, keep them steady and fixed under the Weight of Burdens, and bend the Loins backward.

1105. ONE of them acting alone, may have the same Uses of bending forward, extending, resisting and bending backward, but with less Strength, and in an oblique Direction, as when the Body is inclined obliquely forward, and to one side at the same time, or extended from that Posture. They likewise serve to counterbalance the oblique Muscles of the Abdomen, in turning the Thorax upon the Pelvis, as mentioned N^o 130.

1106. THESE Muscles may in some respects be compared with the Splenii; i. e. their Superior Insertions with the Mastoide Insertions of the Splenii; and their Inferior Insertions with the Vertebral Insertions of these Muscles. The Mastoide Portion of the Splenius is longer, more distant from the Articulation, and more disposed to perform large Motions and to resist great Efforts than the Vertebral Portion. In like manner the Costal Portion of the Sacro-Lumbaris, by the length of the Tendinous Series, by their graduated Insertions in the Ribs, and by their Obliquity, is better disposed for the Uses already mentioned, than the Vertebral Portion.

1107. THE small Muscular Fasciculi which cross these Tendinous Portions, called Musculus Sacro-Lumbaris Accessorius, seem to counterbalance and moderate the Depression of the Ribs in the great Efforts of the Sacro-Lumbaris.

1108. THE use of these Muscles in progressive Motion, is not sufficiently demonstrated. It is supposed that while we lift one Leg to make a Step, the Sacro-Lumbaris of the other side sustains the Vertebrae of the Loins and Back, to prevent their yielding to the Psoas which lifts the Leg, and puts it in Motion; but the Direction of the greatest part of the Fibres of the Sacro-Lumbaris is very improper for such an Use.

1109. THE use of the Sacro-Lumbaris in Respiration is likewise attended with difficulties; for when the Body is very much inclined forward, and even much loaded, the Ribs continue still to be raised with the same ease as they are depressed, though the Sacro-Lumbaris is chiefly employed in this case; but it is to be remembered that I speak here only of bending and loading the Back, not of loading the Shoulders. In the first case the Ribs move easily, but not in the second.

1110. THE Longissimus Dorfi is an Assistant to the Sacro-Lumbaris, especially to the Vertebral Portion of that Muscle, which it helps very powerfully both by the Multiplicity and Insertions of its Fibres, in sustaining the Vertebrae of the Back and Loins while extended, whether in sitting or standing, and in preventing their sinking under the Weight of the Body, or of any additional Burden. It assists in performing and in counterbalancing all the Motions and Inflexions of which these Vertebrae, especially those of the Loins, are capable in all Postures of the Body; and in this it bears likewise some resemblance to the inferior or vertebral Portion of the Splenius; and it must here be remembered that these two Muscles on each side, and the Sacro-Lumbares, are of the number of those called Vertebrales Obliqui Divergentes. *Longissimus Dorfi.*

1111. ALL the Spinales and Transversales of the Back and Loins belonging to the Class of the Vertebrales Recti; the Spinales, to the middle Muscles, and the Transversales, to the lateral, according to the Idea given of them when I spoke of the Vertebral Muscles in general, their chief Uses must be to assist, moderate and maintain the Motions of Extension and lateral Inflexion, whether simple and direct, or oblique and compound; much in the same manner as is done by the like Muscles of the Neck. *Spinales & Transversales Dorfi & Lumborum.*

1112. THE Spinales Majores and Transversales Majores have this peculiar to them, that their fleshy Portions not lying in a straight Line between their Insertions, they may perform not only direct Motions when they act in even numbers, but also oblique Motions, when the numbers on each side are unequal. The small Spinales and Transversales being confined between two neighbouring Vertebrae, cannot co-operate but in direct Extensions and Inflexions.

1113. THE Semi-Spinales or Transverso-Spinales being oblique, converging, vertebral Muscles, are Assistants to the Sacro-Lumbaris and Longissimus Dorfi, which they cross on each side. By this Decussation joined to the Multiplicity, and graduated Distribution of their Insertions, they increase the Strength of the other Muscles considerably, whether they act equally. *Semi-Spinales Dorfi & Lumborum.*

equally and uniformly with them, or alternately. The Lumbar Semi-Spinales, called by the Ancients, *Musculus Sacer*, because of their Insertions in the *Os Sacrum*, are more exposed to Motions and Strains than those of the Back, and are likewise larger and thicker. They are much better fitted than the *Sacro-Lumbares* for supporting the Pelvis on both sides in walking, and on one side, when we raise the Foot on that side, and support our selves on the other.

*Quadratus
Lumborum
& Psoas
Parvus.*

1114. THE *Quadratus Lumborum* and *Psoas Parvus* are of the same use to the *Vertebræ* of the Loins as the *Scaleni* to those of the Neck. When both *Quadrati* act, they keep the Lumbar Pillar streight, that is so as not to incline to either side, and then they may assist the *Recti* of the Abdomen in the Inflexions forward, and the superior Portions of the *Obliqui* in lateral Inflexions.

1115. THEY may likewise serve to support the Hanches alternately in walking; and in standing on one Foot the *Quadratus* of the opposite side may support the Hanch of that side; in which Action they co-operate with the *Transverso-Spinales* and posterior Parts of the *Obliqui Abdominis*.

1116. THE *Psoas Parvus* when it is found, serves to sustain the Pelvis much in the same manner with the *Musculi Recti* of the Abdomen, in climbing, &c. But when we stand, we have no need of such a Support, the Pelvis resting then upon the *Ossa Femoris*, in such a manner as that the largest Portion thereof, and that which supports the whole Body, lies behind that Fulcrum, and the smallest Part, before. It may likewise serve to hinder the Vertebral Pillar from bending backward on some occasions.

*Coccygæus
Anterior.*

1117. THE *Coccygæus Anterior* may sustain the *Coccyx* in *Æquilibrio*, and hinder it from being bent backward, and from being luxated in great Strains, as in the Excretion of hardened *Fæces*, &c.

*Coccygæus
Posterior.*

1118. THE *Coccygæus Posterior* can only serve to replace the *Os Coccygis* when it has been forced backward, and to hinder it from being luxated backward.

§ 14. *Uses of the Muscles which move the Lower Jaw.*

Temporalis.

1119. THE two *Temporales* acting together, raise the Lower Jaw, press the Teeth in that Jaw against the upper Teeth, and pull it back when it has been carried so far forward, as that the lower *Incisores* get before the upper. They perform the last Motion by their most posterior Portion which passes over the Root of the *Zygomatic Apophysis*, and the other Motions by the Co-operation of all their Muscular Radii.

Masseter.

1120. THE two *Masseteres* serve to raise the Lower Jaw, and to push the lower Teeth against the upper, in which use they co-operate with the *Temporales*. They likewise bring this Jaw forward by their external and largest Portion; draw it back by their middle Portion; and move it laterally by their superior Portions acting alternately. By the Co-operation

tion of all the three Portions, they press the lower Teeth against the upper.

1121. BOTH Pterygoidæi Interni serve to raise the Lower Jaw, to bring the lower Teeth near the upper, and to move the Jaw laterally, as in grinding the Food. They cannot bring the Jaw a great way forward, in order to set the lower Incisores before the upper, and they can be of no use in bringing it back. *Pterygoidæus Internus.*

1122. THE two Pterygoidæi Externi bring the Lower Jaw forward, in order to set the lower Incisores before the upper, in which Action they are Antagonists to the posterior Portion of the Temporales and the great Portion of the Masseteres. When one of them acts, it carries the Chin obliquely forward, or turns it towards the other side. This oblique Motion is performed alternately by these two Muscles acting singly. *Pterygoidæus Externus.*

1123. THE two Digastrici serve to depress the Lower Jaw and to open the Mouth; in doing which, the Mechanism of these Muscles has appeared to all Anatomists to be very singular, on account of their middle Tendons, their Insertions, Adhesions, and their manner of passing by another Muscle. The Incurvation of this middle Tendon has not only been looked upon as necessary to change the Direction of the Muscles, but it has been believed that without this change of Direction, they could not have depressed the Jaw any further than the Weight of the Jaw would contribute to that Action. *Digastricus.*

1124. THIS Incurvation and Passage has been compared to that of a Rope over a Pulley, without which advantage it was thought that these Muscles could not resist the continual Efforts of their powerful Antagonists, nor overcome any exterior Opposition, such as that of the Hand pressing upon the Chin. But when we examine carefully the Structure of the Jaw and the Insertions of these Muscles, it appears evidently that their Connexion with the Os Hyoides is not necessary for the Use assigned to them of depressing the Jaw; as may be proved both on a Skeleton and on a fresh Subject.

1125. IN a Skeleton in which the Motion of the Lower Jaw is preserved by Art, we need only tie a piece of Packthread to the lower part of the Chin where the Digastricus is inserted, and then keeping the Lower Jaw close to the upper by any proper contrivance, pass the other end of the String through the Mastoide Groove, and we will perceive by pulling the String in a straight Direction between these two places, that the Jaw will be depressed.

1126. THIS Experiment may be made without the help of a Spring, or any other contrivance to keep the Jaw shut, by simply inverting a proper Skull, so that the Lower Jaw may by its own Weight fall on the upper; for by drawing the String as before, the Lower Jaw will be raised, that is, parted from the other, and by letting the String go, it will fall back again to its first Situation.

1127. ON

1127. ON a fresh Subject the Experiment may be made in the following manner. The Connexion of the Digastricus with the Os Hyoides and Musculus Stylo-Hyoidæus being intirely destroyed; let it be pulled by its posterior Extremity directly toward the Mastoide Groove, in the same manner as the String was drawn, in the foregoing Experiments.

1128. ANATOMISTS have not considered that the two Rami of the Lower Jaw are crooked or angular Levers, and that each Digastricus passing by the Angle in that Bone, ought to be looked upon as being inserted therein, so that the Action of the Lever is to be confined to that Portion which lies between the Angle and the Condyle, without taking in what lies between the Angle and the Chin.

1129. IT may be asked therefore why the anterior Insertion of the Digastricus reaches so far as the Chin, since it might have been in the Angle of the Bone; and what is the use of its Connexion with the Os Hyoides, of its Incurvation and Change of Direction. The first question is answered by calling to mind what has been said about the extent or largeness of Motion, about the necessity of long Fibres for large degrees of Motion, and about lateral Motions. Had this Muscle been inserted in the Angle, its Fibres would not have been proportioned to the degrees of Motion required, and for the same reason the lateral Motions would have been obstructed.

1130. IN answer to the second question about the Connexion of this Muscle with the Os Hyoides and its Incurvation, it is to be remembered that the Digastricus has another use besides that of depressing the Lower Jaw; which is to assist in Deglutition, of which it is one of the principal Organs. I demonstrated this use of the Digastricus above eight Years ago in my publick Courses in the Physick Schools, and at the Royal Garden; but as the whole Mechanism of Deglutition cannot be explained till the Tongue, Larynx and Pharynx have been described, I shall only add in this place the following Remarks, to prove the use of the Digastrici in that Action.

1131. WE cannot swallow without raising the Larynx or Pomum Adami, as it is commonly called, at the same time, as every one may satisfy himself by laying his Hand on that part of the Throat in the time of Deglutition. We are likewise obliged to keep the Lower Jaw raised while we swallow, and when it is depressed we find that Action impossible. Lastly, the Larynx cannot be raised but by means of its Connexion with the Os Hyoides; and the Muscles of that Bone are too weak to resist the Efforts of the Basis of the Tongue, and of the solid Food which we swallow.

1132. THEREFORE while the Temporal and Masseter Muscles keep the Lower Jaw closely applied to the upper, in Deglutition, the Digastrici contract at the same time, as may be felt by putting the end of the Finger upon the place where they are inserted in the Edge of the Chin. And as the Lower Jaw remains immoveable, the Digastrici are streightened

ened by their Contraction, and by the Connexion of their middle Tendons with the Os Hyoides, they raise that Bone and the Larynx together with it.

1134. THE Force of these Muscles is very considerable, as may be shewn by laying the Elbow on a Table, and leaning with the Chin on the Hand, while we endeavour at the same time to depress the Lower Jaw; for as in that case this Jaw cannot descend, the Digastrici by their Insertions in the Apophysis Mastoidæa, raise the upper Jaw by bending the Head backward on the Condyles of the Lower Jaw. A piece of Wood supporting the Chin in place of the Arm, will render this Experiment more sensible and more certain. The involuntary Motion termed Yawning, is likewise a proof of the Strength of these Muscles.

1135. IN the Action of the Digastrici in Deglutition, we meet with one very singular Phænomenon, of which there is hardly another example to be found among all the Muscles of the Human Body. For in all other instances, wherever Antagonist Muscles act at the same time, they all co-operate in producing what is called a Tonic Motion; but in this case the Levators and Depressors of the Lower Jaw act together for different uses; that is, the Temporal and Pterygoide Muscles are in Action to raise the Jaw and to keep it in that Situation, while the Digastrici their Antagonists perform an Office which has no relation to that Bone.

1136. Two Eminences in one Bone articulated with two Cavities in another, allow only of two contrary Motions as in a Ginglymus, and in the Articulation of the Os Occipitis with the first Vertebra. But the Lower Jaw, though articulated by its two Condyles with the Glenoide Cavities of the Offa Temporum, has four direct Motions, one forward, one backward, one downward and one upward; and two lateral Motions, one to the right, the other to the left. And lastly, in all degrees of the direct Motions, it may at the same time have any degree of lateral Motions.

*Contrivance
of the Inter-
articular
Cartilages.*

1137. THIS Contrivance depends on the Inter-articular Cartilages described among the fresh Bones N^o 348. 349. In the lower side of each of these Cartilages, there is but one Cavity suited to the Convexity of the Condyle which it receives; and it is not turned directly downward, but obliquely backward; as the Condyle is not turned directly upward, but obliquely forward. The upper side is hollow on the forepart, and convex on the backpart, answering to the articular Eminence and Fossula of the Os Temporis.

1138. IN the natural Situation of the Lower Jaw, and while it remains in Inaction, it is so disposed as that the anterior Convexity of the Condyles answers obliquely to the posterior articular Eminences of the Offa Temporum, and with this Disposition that of the Inter-articular Cartilages agrees.

1139. IN the direct Motions upward, the Cartilages slide backward and upward toward the Meatus Auditorius, the Condyles still continuing in the Cavity of their lower sides; as is most evidently perceived when we press the Teeth hard against each other; and the same thing happens in the direct Motions forward. In the direct Motions downward, the Cartilages

slide downward and forward ; the Condyles still remaining in their inferior Cavities, and the same happens in the direct Motions backward.

1140. IN the lateral Motions, the Condyles are carried alternately to the right and left sides, and the Cartilages follow their Motions ; so that the Condyle on that side toward which the Jaw is turned, juts outward, and that on the opposite side sinks inward ; the prominent Condyle having at the same time a small Motion backward, and the other Condyle, forward.

1141. FROM these Observations we learn that the Ginglymoide Motions of the Lower Jaw, depend particularly on the inferior Cavities of the Inter-articular Cartilages, and that the Motions forward, backward, and to either Hand, depend on the upper side of these Cartilages. The Pterygoidæi Externi move the Lower Jaw forward ; the posterior Portions of the Temporales move it backward ; the left Pterygoidæus Internus turns it to the right Hand ; and the right Pterygoidæus Internus, to the left Hand. The Pterygoidæus Externus of one side and the posterior Portion of the Temporalis of the other side, may at the same time perform the small Motions mentioned at the end of the last N^o.

§ 15. *Uses of the Muscles which move the Os Hyoides.*

1142. THE Mechanism observed in the Motions of the Os Hyoides, as well as in those of the Scapula, is very particular and very different from what we find in all the other Bones of the human Body. All these Bones have solid Fulcra, on which they are either moved or kept fixed by the proper Muscles, after the manner of a Lever or otherwise ; whereas the Os Hyoides is merely suspended, having nothing to fix it, but these very Muscles which move it in different manners.

Mylo-Hyoidæus.

1143. THE Mylo-Hyoidæus represents a moveable Floor or Bed which sustains the Tongue with its Muscles and Glands, and forms the bottom of the Cavity of the Mouth. When the two Portions of this Muscle act together, they draw the Os Hyoides a little forward, and fix it in that Situation, raising the whole Tongue at the same time, and compressing the Glandulæ Sub-Linguales. If one lateral Portion acts more than the other, it puts the Os Hyoides in an oblique Situation ; and in a condition to serve as a fixed Point for the Motions of the Tongue.

Genio-Hyoidæi.

1144. THE Genio-Hyoidæi pull the Os Hyoides much more forward than the Mylo-Hyoidæus ; and as they are very narrow, and closely united together, there seems to be very little occasion for one of them to act without the other.

Stylo-Hyoidæi.

1145. THE Stylo-Hyoidæi move the Os Hyoides upward and backward in a middle Direction, between those in which they lie ; and they draw it more upward and backward when they act freely, that is, without being checked or confined by other Muscles, in the manner which we shall see hereafter. When one acts more than the other, the Bone is moved obliquely.

1146. THE

1146. THE Omo-Hyoidæi or Coraco-Hyoidæi act as the Stylo-Hyoidæi in a middle Direction between the oblique Directions in which they lie, and draw the Os Hyoides downward and backward, when they are not counterbalanced by the Stylo-Hyoidæi. When one acts more than the other, the Bone is drawn obliquely to the right or left Hand.

1147. WHEN these Muscles and the Stylo-Hyoidæi act together, the Os Hyoides is drawn backward by a direct Motion compounded of four oblique Motions. This compound Motion is directed more upward or more laterally according to the degree of Action of the Stylo-Hyoidæi or Omo-Hyoidæi, or of any one Muscle of each Pair; and in all these Motions, the four Muscles are counterbalanced by the Genio-Hyoidæi.

1148. THE length and direction of these two thin Muscles, as well as their Insertion in the Scapula, deserve our attention. To me it seems evident, that for the Uses already mentioned, they could not have been inserted any where else; and therefore that they are fixed in the Scapula by a mechanical Necessity, and must consequently be very long. Their incurvated Direction and Situation behind the Sterno-Mastoidæi, enables them to perform their several Motions in all the different Postures of the Head; the lateral Motions not excepted; for when we turn the Head to either side, the Sterno-Mastoidæus of the same side does the Office of a Pulley to the Omo-Hyoidæus behind it.

1149. THE Sterno-Hyoidæi draw the Os Hyoides directly downward, and serve to counterbalance the different Motions of the Stylo-Hyoidæi, Omo-Hyoidæi and Genio-Hyoidæi. They may in some cases be assisted by the Sterno-Thyroidæi and Thyro-Hyoidæi, as we shall see hereafter.

§ 16. *Observations on the Co-operation of Muscles.*

1150. I took notice N° 43. that in order to move any part, or to keep it in a determinate Situation, all the Muscles belonging to that part, must co-operate, and with respect to this Co-operation, I distinguished the Muscles into principal Movers, Moderators or Antagonists, and Directors or collateral Movers.

1151. IN N° 44. I observed that all these kinds are to be found in the Articulations by Enarthrosis, and in many of those by Arthrodia; but that in those by Ginglymus, the Director Muscles are wanting. Lastly, that in some cases the Moderators do not act; the want of their Action being then supplied by the Weight of the Part to which they are fixed, or by the additional Weight or Resistance of some other Body.

1152. THE Remarks which were made on the Motions of Supination and Pronation N° 894. furnish us with a very singular example of the Co-operation of Muscles; and it is likewise evidently seen in the Motions of the Scapula on the Trunk, and of the Os Hyoides. But it is chiefly in Standing, Sitting, Progression, and in the Motions of the Arm, that

we observe the Co-operation of a great number of Muscles proportionable to the Situation of the Parts.

1153. WHEN we stand in the most common and natural way, the Soles of the Feet are placed horizontally as the common Bases of the whole Body. To support the Legs like immoveable Pillars upon this Basis, the Muscles which either cover or are fixed in them, must co-operate. The principal Movers are the *Gastrocnemii* and *Soleus*; the Moderators are the *Tibialis Anticus*, and *Peronæus Medius*, and *Minimus*; and the Directors are the *Tibialis Posticus*, and *Peronæus Maximus*.

1154. THE Legs supported in a Vertical Situation by the Co-operation of all these Muscles, as by so many Ropes more or less stretched, support the *Ossa Femoris* which are fixed in the proper Situation by the Action of the two *Vasti* and *Crureus*; the *Rectus Anterior* being of no use to the *Os Femoris* in this Situation. The *Vasti* and *Crureus* are here the principal Movers, and they act without Moderators or Directors; for as these Bones are bent backward, the Weight of the Body supplies the place of very strong Antagonists.

1155. THE Thighs in this Situation support the Pelvis; in order to fix which, the principal Movers, Moderators and Directors are all employed. But these different Offices change in proportion as we stand more or less erect. When we stand very streight, the Co-operation of all the Muscles which can move the Pelvis on the *Ossa Femoris*, may be looked upon as uniform, or as a kind of Tonic Motion, especially the Co-operation of the *Glutæi*, *Tricipites*, *Recti Anteriores*, *Sartorii*, *Semi-Nervosi*, *Semi-Membranosi*, and of the *Bicipites* chiefly when the Head is a little inclined forward.

1156. THE *Spina Dorsi* and *Thorax* are supported in standing by the Co-operation of the Vertebral Muscles and *Longissimi Dorsi* which are here the principal Movers; of the *Sacro-Lumbares*, which are partly principal Movers and partly Directors, and of the *Quadrati Lumborum*, which are wholly Directors. In this Situation of the Spine, the Weight of the *Thorax* and of the Head, which naturally inclines forward, counterbalances the *Vertebrales*, *Longissimi Dorsi*, and *Sacro-Lumbares*, and therefore acts in place of Moderators.

1157. THE Head and Neck are supported in an erect Posture, by the proportionate Co-operation of all the Muscles which move the Head by itself, or together with the Neck. The *Obliqui Majores* are the only Muscles which can be supposed to remain in Inaction, while the Head is kept streight without moving either that or the Neck.

1158. THE *Splenii* and *Complexi* are here the principal Movers, together with the *Spinales* and *Semi-Spinales Colli*. The Anterior Vertebral Muscles of the Neck are rather Assistants than Moderators in respect of the Head, but with regard to the Neck they are compleat Antagonists, without the assistance of which, the Neck would bend forwards and the Head fall backward, as has been already observed.

1159. IN this Posture the Sterno-Mastoidæi act neither as Flexors nor as Moderators of the uniform Action of the Splenii, Complexi, and Posterior Vertebrales; the Action of these Muscles being counterbalanced by the Weight of the Head. Yet the Sterno-Mastoidæus of one side, together with the Splenius next to it; and the other Sterno-Mastoidæus and Splenius likewise taken together, are reciprocally principal Movers and lateral Moderators, assisted by the Transversales and Scalenii.

1160. FROM what has been said about standing, we see not only an eminent instance of the Co-operation of Muscles, but the variety of their Uses, and the impropriety of their common Denominations. The Gastrocnemii, Soleus, and Tibialis Posticus are in this case Extensors of the Leg and not of the Foot. The Vasti and Crureus extend the Thigh and not the Leg. The Recti Anteriores do not extend the Leg, nor the Sartorii bend it, but are all employed in fixing the Pelvis on the Ossa Femoris.

1161. PROGRESSION or the Motion of walking, demonstrates still more palpably, the Co-operation of Muscles, and at the same time the variety of their Functions. In that case the whole Body is alternately supported on one lower Extremity, while the other hangs in the Air. This makes a kind of imperfect standing, in which the Co-operation of the Muscles is much the same as in ordinary standing with respect to the Foot, Leg and Thigh; but with respect to the Pelvis, there is a considerable difference.

1162. To stand streight on the two Extremities, the Pelvis is only to be kept from falling backward, and sometimes from falling forward. But when we stand upon one Extremity, the Pelvis must not only be fixed upon the Thigh, to hinder it from falling toward the side of the other raised Extremity; but the Spine must likewise be kept from inclining toward that side.

1163. THE Pelvis is supported in this case by a very strong Co-operation of the Glutæus Medius & Minimus, as principal Movers; and by the Glutæus Maximus and Musculus Fasciæ Latæ, as Assistants; and at the same time the Spine is supported by the Sacro-Lumbaris, Latissimus Dorsi and Quadratus Lumborum of the same side.

1164. IN sitting, the Pelvis rests on the two Tuberosities of the Os Ischium, and so cannot fall to either side; but it must be hindered from falling either backward or forward; which is done by the Co-operation of the Recti Anteriores, Sartorii, Semi-Membranosi, Semi-Tendinosi, and the long Portions of the Bicipites; and to these might be added the Iliaci, and the Psoai, both ordinary and extraordinary.

1165. THESE Observations are sufficient to shew the usefulness and necessity of being well acquainted with the Co-operation of Muscles; because without this knowledge, it is impossible to explain the particular Motions of some Bones, or to discover or remove the Disorders or Impediments to which these Motions may be liable.

1166. I shall only mention one case to shew the importance of such Observations. A Person complains of a Pain at the lower part of the Scapula,

pula, and that this Pain is very acute in every Motion of Supination or Pronation, though he keep the Fore-Arm bent, which is the most natural, most commodious, and most favourable Posture in this case, and holds it close to his side, by means of a Scarf, or otherwise.

1167. IF we are not acquainted with the Co-operation of the Rotator Muscles of the Os Humeri, in the ordinary Motions of Supination and Pronation, which I explained in giving the Uses of the Muscles which move the Radius, we can never be able to explain or remove this disorder.

1168. THE common recourse, when we are without this necessary knowledge, would be to indeterminate Ideas of some communication between the Nerves and Vessels of the Fore-Arm and those of the Shoulder; and the Disorder would be imputed to some Obstruction in the Vessels, or Irritation or Strain of the Nerves, &c. On this Foundation, we would order the Application of Remedies to the Parts answering to these Vessels and Nerves; and when a great length of time had been employed in the Cure, the true unknown cause would either diminish or quite disappear of itself, or perhaps increase, and thereby occasion other Disorders of worse consequence and sometimes mortal.

1169. BUT a Person well acquainted with the Muscular Co-operations, and who knows precisely how to distinguish the Muscles proper for each Co-operation, can never commit such Mistakes.

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AN ANATOMICAL
EXPOSITION
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STRUCTURE
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HUMAN BODY.

BY
JAMES BENIGNUS WINSLOW,
PROFESSOR OF PHYSICK, ANATOMY AND SURGERY
IN THE UNIVERSITY OF PARIS,

MEMBER OF THE ROYAL ACADEMY OF SCIENCES, AND OF
THE ROYAL SOCIETY AT BERLIN, &c.

Translated from the French Original,

By **G. DOUGLAS, M.D.**

VOL. II.



LONDON:

Printed for N. PREVOST, at the *Ship*, in the *Strand*.

M.DCC.XXXIII.

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MDCCLXXII.

DEDICATION (iii) iv
them of Anatomy that has hitherto ap-
peared. I have the Honour to be, with
the greatest Respect,
SECOND VOLUME
Dr. BROXOLME.

SIR,

AN *English* Physician, eminent in
all the Branches of his Profes-
sion, is undoubtedly the most
proper Person to recommend a lauda-
ble Attempt made by an obscure Be-
ginner, toward the Improvement of Phy-
sick in the *English* Dominions. I shall
make no farther Apology for prefix-
ing Your Name to this Physical Part
of an *English* Edition of the best Sy-
stem

A 2

DEDICATION.

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SIR,

Your Most Obedient,

Bow-Lane,
Nov. 1. 1732.

Most Obliged Servant,

G. DOUGLAS.

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A N

Anatomical Exposition OF THE STRUCTURE OF THE HUMAN BODY.

SECT. IV.

A Description of the Arteries.

1. **T**HE Heart throws the Blood into two great, Arteries; one of *Introduction* which is named Aorta, the other, Arteria Pulmonalis.

2. THE Aorta distributes the Blood to all the parts of the Body, for the nourishment of the parts and for the Secretion of different Fluids.

3. THE Arteria Pulmonalis carries the venal Blood through all the capillary Vessels of the Lungs.

4. BOTH these great or general Arteries are subdivided into several Branches, and into a great number of Ramifications. In this Section, I shall describe the Distributions of the Aorta, leaving the pulmonary Artery to the particular History of the Lungs.

5. THE Basis of the Heart being very much inclined to the right Side, *The Aorta* and turned a little backward, the Aorta goes out from it in a direct course, *in general* nearly over-against the fourth Vertebra of the Back. Its course, I say, is direct with respect to the Heart, but with respect to all the rest of the

Body, it ascends obliquely from the left to the right Hand, and from before, backward.

6. Soon after this, it bends obliquely from the right hand to the left, and from before, backward, reaching as high as the second Vertebra of the Back; from whence it runs down again in the same Direction, forming an oblique Arch. The middle of this Arch is almost opposite to the right side or edge of the superiour Portion of the Sternum, between the cartilaginous Extremities or sternal Articulations of the first two Ribs.

7. FROM thence the Aorta descends in a direct course along the anterior part of the Vertebrae, all the way to the Os Sacrum, lying a little toward the left hand; and there it terminates in two subordinate or collateral Trunks, call'd Arteriæ Iliacæ.

*General
Division of
the Aorta.*

8. THE Aorta is by Anatomists, generally divided into the Aorta Ascendens and Aorta Descendens, tho' both are but one and the same Trunk. It is termed Ascendens, from where it leaves the Heart to the Extremity of the great Curvature or Arch. The remaining part of this Trunk from the Arch to the Os Sacrum or Bifurcation already mentioned, is named Descendens.

9. THE Aorta Descendens is further divided into the superiour and inferiour Portions; the first taking in all that lies above the Diaphragm; the other, all that lies between the Diaphragm and the Bifurcation.

10. THE Aorta Ascendens is chiefly distributed to part of the Thorax, to the Head and upper Extremities. The superiour Portion of the Aorta Descendens furnishes the rest of the Thorax; the inferiour Portion furnishes the Abdomen and lower Extremities.

11. THE great Trunk of the Aorta through its whole length, sends off immediately several Branches which are afterwards differently ramified; and these arterial Branches may be looked upon as so many Trunks with respect to the other Ramifications; which again may be considered as small Trunks, with regard to the Ramifications that they send off.

12. THE Branches which go out immediately from the Trunk of the Aorta, may be termed original or capital Branches; and of these some are large and others very small.

13. THE large capital Branches of the Aorta are these: two Arteriæ Subclaviæ: two Carotides, one Cæliaca, one Mesenterica Superior, two Renales, formerly termed Emulgentes, one Mesenterica Inferior, and two Iliacæ.

14. THE small capital Branches are chiefly the Arteriæ Coronariæ Cordis, Bronchiales, Œsophagææ, Intercostales, Diaphragmaticæ Inferiores, Spermaticæ, Lumbares, and Sacræ.

15. THESE capital Branches or Arteries are for the most part disposed in Pairs; there being none in odd numbers but the Cæliaca, the two Mesentericæ, some of the Œsophagææ, the Bronchialis, and sometimes the Sacræ.

16. THE Ramifications of each capital Branch are in uneven numbers with respect to their particular Trunks; but with respect to the Ramifications of the like capital Trunks on the other side, they are disposed in Pairs. Among the Branches there are in odd numbers, none but the Arteria Sacra when it is single, and the Œsophagææ, the Ramifications of which are sometimes found in Pairs.

17. BEFORE I enter upon the detail of each of these particular Arteries, many of which have proper Names; it will be convenient to give a short View of the Disposition and Distribution of the principal arterial Branches, as a general Plan to which all the particularities of each distribution may afterwards be referred: for I have found by Experience, that the common Method of describing the Course of all the Ramifications of these Vessels, without having first given a general Idea of the principal Branches, is very troublesome to Beginners.

18. THE Aorta gives rise to two small Arteries, called Coronariæ Cordis, which go to the Heart and its Auricles; one of which is situated anteriorly, the other posteriorly, and sometimes they are three in number. *General Distribution of the Branches of the Aorta.*

19. FROM the upper part of the Arch or Curvature, the Aorta sends out commonly three, sometimes four large capital Branches, their Origins being very near each other. When there are four, the two middle Branches are termed Arteriæ Carotides; the other two, Subclaviæ; and both are distinguished into Right and Left.

20. WHEN there are but three Branches, which is ofteneft the Case, the first is a short Trunk, common to the right Subclavian and Carotid, the second is the left Subclavian, and the third the left Carotid. Sometimes, tho' very rarely, these four Arteries unite in two Trunks.

21. THE Origin of the left Subclavian, terminates the Aorta Ascendens; but I have sometimes observed four Branches, the first three of which were those already mention'd, and the fourth a distinct Trunk of the left vertebral Artery.

22. IT must be observed that these large Branches which arise from the Curvature of the Aorta, are situated obliquely; the first, or that which is most on the right hand, lying more forward than the rest, and the last, which is most on the left hand, more backward. The first and second or middle Branches, are generally in the middle of the Arch, and the third lower down. Sometimes the first alone is in the middle; all which Varieties depend on the Obliquity of the Arch.

23. THE Carotid Arteries run up directly to the Head, each of them being first divided into two, one external, the other internal. The external Artery goes chiefly to the outer parts of the Head and Dura Mater or first covering of the Brain. The internal enters the Cranium, through the bony Canal of the Os Petrosum; and is distributed through the Brain by a great number of Ramifications.

24. THE subclavian Arteries separate laterally and almost transversely, each toward that side on which it lies, behind and under the Claviculæ, from whence they have their Name. The left seems to be shorter, and runs more obliquely than the right.

25. THE Subclavian on each side terminates at the upper Edge of the first Rib, between the lower Insertions of the first Scalenus Muscle; and there, as it goes out of the Thorax, takes the name of Arteria Axillaris.

26. DURING this Course of the subclavian Artery, taking in the common Trunk of the right Subclavian, several Arteries arise from it, viz. the Mam-

maria Interna, Mediastina, Pericardia, Diaphragmatica minor five superior, Thymica and Trachealis.

27. THE Thymica and Trachealis on each side are in some Subjects only Branches of one small Trunk which springs from the common Trunk of the right Subclavian and Carotid.

28. THEY are generally small Arteries which run sometimes separate, and sometimes partly separate and partly joined.

29. THE Subclavian sends off likewise the Mammaria Interna, Vertebrales, Cervicales, and sometimes several of the upper Inter-costales.

30. THE Axillary Artery which is only a Continuation of the Subclavian, from where it goes out of the Thorax, to the Axilla, detaches chiefly the Mammaria Externa or Thoracica Superior, Thoracica Inferior, Scapulares Externæ, Scapularis Interna, Humeralis or Muscularis, &c. Afterwards it is continued by different Ramifications and under different Names, over the whole Arm, all the way to the ends of the Fingers.

31. THE superior Portion of the Aorta Descendens gives off the Arteriæ Bronchiales, which arise sometimes by a small common Trunk, sometimes separate, and sometimes do not come immediately from the Aorta. It next sends off the Œsophagææ, which may be looked upon as Mediastinæ Posteriores; and then the Inter-costales from its posterior Part, which in some Subjects come all from this Portion of the Aorta, in others only the lowest eight or nine.

32. THE small antierour Arteries here mentioned are generally at their Origins, single and in uneven Numbers, but they divide soon after, toward the Right and Left.

33. THE inferior Portion of the descending Aorta, as it passes through the Diaphragm, gives off the Diaphragmaticæ Inferiores or Phrenicæ, which however do not always come immediately from the Aorta. Afterwards it sends off several Branches antierourly, posterierourly and laterally.

34. THE anterior Branches are the Cæliaca which supplies the Stomach, Liver, Spleen, Pancreas, &c. the Mesenterica Superior which goes chiefly to the Mesentery, to the small Intestines, and to that part of the great Intestines, which lies on the right side of the Abdomen; the Mesenterica Inferior, which goes to the great Intestines on the left Side and produces the Hemorrhoidalis Interna; and lastly, the right and left Arteriæ Spermaticæ.

35. THE posterior Branches are the Arteriæ Lumbares, of which there are several Pairs, and the Sacræ which do not always come from the Trunk of the Aorta.

36. THE lateral Branches are the Capsulares and Adiposæ, the Origin of which often varies; the Renales formerly termed Emulgentes, and the Iliacæ which terminate the Aorta by the Bifurcation already mention'd.

37. THE Iliac Artery on each side is commonly divided into the external or antierour, and internal or posterierour.

38. THE internal Iliaca is likewise named Arteria Hypogastrica; and its Ramifications are distributed to the Viscera contained in the Pelvis, and to the neighbouring Parts, both internal and external.

39. THE Iliaca Externa, which is the true Continuation of the Iliac Trunk and alone deserves that name, goes on to the Inguen, and then out of the Abdomen, under the Ligamentum Falloppii; having first detached the Epigastrica which goes to the Musculi Abdominis Recti. Having quitted the Abdomen, it commences Arteria Cruralis, which runs down upon the Thigh, and is distributed by many Branches and Ramifications to all the lower Extremity.

40. I shall now go on to examine particularly all the capital or original Branches of the Aorta, from their Origin, to the Entry of them and of their Ramifications into all the parts of the Body, and all the different Viscera and Organs.

41. THE cardiac or coronary Arteries of the Heart, arise from the Aorta immediately on its leaving the Heart. They are two in number, and according to the natural Situation of the Heart, one is rather superiour than anterior, the other rather inferiour than posterior. *Arteriæ Cardiacæ sive Coronariæ Cordis.*

42. THEY go out near the two Sides of the pulmonary Artery, which having first surrounded, they afterward run upon the Basis of the Heart in form of a kind of Crown or Garland, from whence they are called Coronariæ; and then pursue the superficial Traces of the Union of the two Ventricles, from the Basis of the Heart to the Apex.

43. THEY send communicating Branches to each other, which are afterward lost in the Substance of the Heart, as shall be shown more particularly in describing that Organ.

44. WE sometimes meet with a third coronary Artery which arises from the Aorta more backward, and is spent on the posterior or lower side of the Heart.

45. THE carotid Arteries are commonly demonstrated after the Subclavian; but I choose to describe them first, that I may afterwards be able to pursue the Arteries of the Thorax arising partly from the Subclaviæ and partly from the Aorta Descendens, without interruption. *The Arteriæ Carotides in general.*

46. THESE Arteries are two in Number, one called the right Carotid, the other the left. They arise near each other, from the Curvature or Arch of the Aorta, the left immediatly; the right most commonly from the Trunk of the Subclavia on the same Side, as has been already observed.

47. THEY run upon each side of the Trachea Arteria, between it and the internal jugular Vein, as high as the Larynx, without any Ramification. During this Course, therefore, they may be named carotid Trunks or general, common and original Carotids. Each of these Trunks is afterwards ramified in the following manner.

48. THE Trunk having reached as high as the Larynx, is divided into two large Branches or particular Carotids, one named external, the other internal, because the first goes chiefly to the external parts of the Head, the second enters the Cranium and is distributed to the Brain.

49. THE external Carotid is anterior the internal, posterior; and the external is even situated more inward and nearer the Larynx than the other; but

but the common Names may still be retained, as being taken not from their Situation, but from their Distribution.

Arteria Carotis Externa.

50. THE external Carotid is the smallest, and yet appears by its Direction to be a Continuation of the common Trunk. It runs insensibly outward, between the external Angle of the lower Jaw, and the parotid Gland, which it supplies as it passes. Afterwards it ascends on the fore-side of the Ear, and ends in the Temples.

51. IN this Course it sends off several Branches, which may well enough be divided into antierior or internal, and posterior or external; and the principal Branches of each kind are these.

52. THE first antierior or internal Branch goes out from the very Origin of the Carotid on the inside; and having presently afterward taken a little turn, and sent off Branches to the jugular Glands near it, to the Fat and Skin; it runs transversely, and is distributed to the Glandulæ Thyroidææ, and to the Muscles and other parts of the Larynx; for which reason I name it Laryngææ or Gutturælis Superior. It likewise sends some Branches to the Pharynx and Muscles of the Os Hyoides.

53. THE second antierior Branch passes over the nearest Cornu of the Os Hyoides, to the Muscles of that Bone and of the Tongue; and to the Glandulæ Sublinguales; afterwards passing before the Cornu of the Os Hyoides, it loses itself in the Tongue, from whence it has been called Arteria Sublingualis; and it is the same Artery which others have named Ranina.

54. THE third Branch or Arteria Maxillaris Inferior goes to the maxillary Gland, to the styloide and mastoide Muscles, to the parotid and sublingual Glands, to the Muscles of the Pharynx, and to the small Flexors of the Head.

55. THE fourth Branch, which I name Arteria Maxillaris Externa, passes antieriorly on the masseter Muscle, and middle of the lower Jaw near the Chin, from whence it has a denomination in some Languages, which cannot be expressed in *English*. Afterwards it runs under the Musculus Triangularis Labiorum, which it supplies as well as the Buccinator and the Quadratus Menti.

56. IT sends off a particular Branch, very much contorted, which divides at the angular commissure of the Lips, and running in the same manner along the superior and inferior Portions of the Musculus Orbicularis, it communicates on both sides with its fellow, and thereby forms a kind of Arteria Coronaria Labiorum.

57. AFTERWARDS it ascends towards the Nares, and is distributed to the Muscles, Cartilages and other parts of the Nose, sending down some Twigs, which communicate with the coronary Artery of the Lips. Lastly, it reaches the great Angle of the Eye, and is ramified and lost on the Musculus Orbicularis Palpebrarum, Superciliaris and Frontalis. Through all this Course, it is named Arteria Angularis.

58. THE fifth Branch arises over-against the Condyle of the lower Jaw, and as it is very considerable, I call it Maxillaris Interna. It passes behind the

the Condyle, and having given off a Twig among the Musculi Pterygoidæi; it is divided into three principal Branches.

59. THE first Branch goes through the inferiour Orbitaly or Spheno-maxillary Fissure, to the Orbit, after having supplied the Musculi Peristaphylini, and the glandulous Membrane of the posteriour Nares, through the Foramen Spheno-Palatinum. I name this Branch Spheno-Maxillaris.

60. IT is distributed inferiourly and laterally to the Parts contained in the Orbit, and detaches a small subaltern Branch through the Extremity of the superiour Orbitaly or sphenoidal Fissure, which enters the Cranium, and is spent upon the Dura Mater, communicating there with the other Artery of the Dura Mater, which enters by the Foramen Spinale of the sphenoidal Bone.

61. IT sends off likewise another subaltern Branch, which passes through the posteriour Opening of the orbitaly Canal, and having furnished the maxillary Sinus and the Teeth, goes out by the inferiour orbitaly Hole, and on the Cheek communicates with the angular Artery.

62. THE second of the three Branches runs through the Canal of the lower Jaw, and being distributed to the Alveoli and Teeth, goes out at the Hole near the Chin, and loses it self in the neighbouring Muscles, communicating with the Rami of the Arteria Maxillaris externa.

63. THE third Branch of the Maxillaris interna runs up between the internal and external Carotids, passes through the Foramen Spinale of the sphenoidal Bone, and is distributed to the Dura Mater by several Ramifications which run forward, upward and backward; the uppermost communicating with those on the other side, above the longitudinal Sinus of the Dura Mater.

64. THIS Artery of the Dura Mater which may be termed Spheno-spinalis, to distinguish it from those that go to the same part by another Course, arises sometimes from the Trunk of the external Carotid, behind the Origin of the Laryngæa or Gutturalis superiour, and sometimes from the first Ramus of the Maxillaris interna, just before it enters the spheno-maxillary Fissure.

65. THE sixth anterior or internal Branch which is very small, is spent on the Musculus Masseter.

66. THE first external or posteriour Branch is named Arteria Occipitalis. It passes obliquely before the internal jugular Vein, and having given Twigs to the Musculus Stylo-Hyoidæus, Stylo-Glossus and Digastricus, it runs between the styloide and mastoide Apophyses, along the mastoide Groove, and goes to the Muscles and Integuments which cover the Os Occipitis, turning several times in an undulating Manner as it ascends backward.

67. IT communicates by a descending Branch with the vertebral and cervical Arteries, as has been already said; near the top of the Head, it communicates likewise with the posteriour Branches of the temporal Artery, and it sends a Branch to the Foramen Mastoidæum.

68. THE second external Branch spreads it self on the outward Ear, by a great many small Twigs on each side, several of which run inward, and furnish the Cartilages, Meatus Auditorius, Skin of the Tympanum and internal Ear.

69. THE Trunk of the external Carotid ascends afterward above the Zygoma, passing between the Angle of the lower Jaw and Parotid Gland, and forms the Temporal Artery, which divides into an antierour middle and posterour Branch.

70. THE antierour Branch of the temporal Artery goes to the Musculus Frontalis, communicates with the Arteria Angularis, and sometimes gives off a very small Artery, which pierces the internal Apophysis of the Os Malæ, all the way to the Orbit. The middle Branch goes partly to the Musculus Frontalis, partly to the Occipitalis. The posterour Branch goes to the Occiput, and communicates with the Arteria Occipitalis. All these Branches likewise furnish the Integuments.

Arteria Carotis Interna.

71. THE internal carotid Artery leaving the general Trunk, is at first a little incurvated, appearing as if either it were the only Branch of that Trunk, or a Branch of the Trunk of the external Carotid. Sometimes the Curvature is turned a little outward, and then more or less inward, passing behind the neighbouring external Carotid.

72. IT is situated a little more backward than the Carotis Externa, and generally runs up without any Ramification, as high as the lower Orifice of the great Canal of the Apophysis Petrosa of the Os Temporis. It enters this Orifice directly from below upward, and afterward makes an Angle according to the Direction of the Canal, the rest of which it passes horizontally, being covered by a Production of the Dura Mater.

73. AT the end of this Canal it is again incurvated from below upward, and enters the Cranium through a Notch of the sphenoidal Bone. Then it bends from behind, forward, and makes a third Angle on the side of the Sella Sphenoidalis; and again a fourth, under the clinoid Apophysis of that Sella.

74. AS it leaves the bony Canal to enter the Cranium, it sends off a Branch through the sphenoidal Fissure to the Orbit and Eye; and soon afterward, another, through the Foramen Opticum, by which it communicates with the external Carotid.

75. AFTERWARDS the internal Carotid runs under the Basis of the Brain to the side of the Infundibulum, where it is at a small distance from the internal Carotid of the other side, and there it commonly divides into two principal Branches, one antierour, and one posterour.

76. THE antierour Branch runs forward under the Brain, first separating from that on the other side, then coming nearer again, it unites with it by an Anastomosis or Communication in the Interstice between the olfactory Nerves. Afterwards having sent off some small Arteries, which accompany these Nerves, it leaves its fellow, and divides into two or three Branches.

77. THE first of these Branches goes to the antierour Lobe of the Brain; the second, which is sometimes double, is inverted on the Corpus Callosum, to which it gives some Ramifications, as also to the Falx of the Dura Mater, and middle Lobe of the Brain. The third, which in some Subjects is a distinct Branch, in others only a Division of the second, goes to the posterour Lobe

Lobe of the Brain. This might be look'd upon as a third principal Branch lying between the other two.

78. THE posteriour Branch communicates first of all, with the vertebral Artery of the same side, and then divides into several Rami which run between the superficial Circumvolutions of the Brain; and are ramified in many different Directions on and between these Circumvolutions, all the way to the bottom of the Sulci.

79. ALL these Ramifications are covered by the Pia Mater, in the Duplication of which, they are distributed, and form capillary reticular Textures in great numbers; and afterwards they are lost in the inner Substance of the Brain. The anterior and middle Branches produce the same kind of Ramifications, and the anterior in particular, sends a Twig to the Corpus Callosum.

80. THE subclavian Arteries are named from their Situation near the Claviculæ, in the transverse direction of which they run. They are two in number, one Right, the other Left; and they arise from the Arch of the Aorta, on each side of the left Carotid, which commonly lies in the middle between them; but when both Carotids go out separately, they both lie between the Subclaviæ. These Arteries terminate, or rather change their Name, above the middle of the two first Ribs, between the anterior Insertions of the Musculi Scaleni. *Arteria Subclavia.*

81. THE right Subclavian is larger at the beginning than the left, when it produces the right Carotid; its Origin is likewise more anterior and higher, because of the Obliquity of the Arch of the Aorta; for which reason also the left is shorter than the right, and runs more obliquely. Both of them are distributed much in the same manner; and therefore the Description of one may likewise be applied to the other.

82. THE right Subclavian, the longest of the two, gives off, first of all, small Arteries to the Mediastinum, Thymus, Pericardium, Aspera Arteria, &c. which are named Mediastinæ, Thymicæ, Pericardiæ, and Tracheales. These small Arteries sometimes go out from the Subclavian itself, either separately, or by small common Trunks; sometimes they are Branches of the Mammaria interna, especially the Mediastina.

83. AFTERWARD this right Subclavian, at about a Finger's breadth from its Origin, often produces the common Carotid of the same side; and at a small Finger's breadth from the Carotid, it gives off commonly three considerable Branches, viz. the Mammaria interna, Cervicalis, and Vertebralis, and sometimes an intercostal Artery which goes to the first Ribs, called Intercostalis superior.

84. THE Arteria Thymica communicates with the Mammaria interna, and sometimes arises from the anterior middle part of the common Trunk of the Subclavian and Carotid. The Thymus receives likewise some Rami from the Mammaria interna, and Intercostalis superior. The same Observation may be applied to the Mediastina and Pericardia. *Arteria Thymica.*

Arteria Pericardia.

85. THE Pericardia arises much in the same manner with the Thymica, and runs down upon the Pericardium all the way to the Diaphragm, to which it sends some small Ramifications.

Arteria Mediastina.

86. THE Mediastina arises sometimes immediately after the Thymica, and is distributed principally to the Mediastinum.

Arteria Trachealis.

87. THE Trachealis, which may likewise be named Gutturalis inferior, runs up from the Subclavia, in a winding Course, along the Aspera Arteria, to the Glandulæ Thyroidææ, and Larynx, detaching small Arteries to both sides, one of which runs to the upper part of the Scapula.

Arteria Mammaria Interna.

88. THE internal mammary Artery comes from the antierior and lower side of the Subclavia, near the middle of the Clavicula, and runs down for about one Finger's breadth, behind the Cartilages of the true Ribs, an Inch distant from the Sternum.

89. IN its passage it sends Rami to the Thymus, Mediastinum, Pericardium, Pleura, and intercostal Muscles. It likewise detaches other Branches, through these Muscles, and between the Cartilages of the Ribs, to the Pectoralis Major, and other neighbouring muscular Portions, to the Mammæ, Membrana Adiposa and Skin.

90. SEVERAL of these Rami communicate by Anastomoses, with the Mammaria externa, and other Arteries of the Thorax, especially in the Substance of the Pectoralis Major, and likewise with the Intercostals. Afterwards it goes out of the Thorax on one side of the Appendix Eniformis, and is lost in the Musculus Abdominis Rectus, a little below its upper part; communicating at this place, by several small Ramifications with the Arteria Epigastrica; and in its Course, it gives Branches to the Peritonæum, and to the antierior Parts of the oblique and transverse Muscles of the Abdomen.

Arteria Cervicalis.

91. THE cervical Artery arises from the upper side of the Subclavian, and is presently afterwards divided into two, which come out sometimes separately, sometimes by a small common Trunk. The largest of these two Arteries is antierior, the other posterior.

92. THE antierior Cervicalis, running behind the Carotid of the same side, is distributed to the Musculus Coraco-Hyoidæus, Mastoidæus, Cutaneus, Sterno-Hyoidæus, and Sterno-Thyroidæus, to the jugular Glands, the Aspera Arteria, the Muscles of the Pharynx, Bronchia, Œsophagus and to the antierior Muscles, which move the Neck and Head. This Artery has been observed to send out the Intercostalis Superior.

93. THE posterior Cervicalis arises sometimes a little after the Vertebralis, and sometimes from that Artery. It passes under the transverse Apophysis of the last Vertebra of the Neck; and sometimes through a particular Hole in that Apophysis; and from thence runs up backward in a winding Course, on the vertebral Muscles of the Neck, and then returns in the same manner.

94. IT communicates with a descending Branch of the occipital Artery, and with another of the vertebral Artery above the second Vertebra. It is distributed

distributed to the Musculi Scaleni, Angularis Scapulæ, and Trapezius, and to the jugular Glands and Integuments.

95. THE vertebral Artery goes out from the posteriour and upper side of the Subclavian, almost opposite to the Mammaria Interna and Cervicalis. It runs up through all the Holes in the transverse Apophyses of the Vertebrae of the Neck, and in its passage sends off little Twigs through the lateral Notches of these Vertebrae, to the Medulla Spinalis and its Coverings. It also gives Arteries to the vertebral Muscles, and to other Muscles near them.

96. As it passes through the transverse Hole of the second Vertebra, it is generally incurvated, to accommodate it self to the particular Obliquity of this Foramen, mention'd in the Description of the Sceleton N^o 479. And between this Hole and that in the first Vertebra, it takes another larger turn in a contrary direction to the former. Having passed the transverse Hole of the first Vertebra, it is considerably incurvated a third time, from before backwards, as it goes through the superiour and posteriour Notch in this Vertebra.

97. AT this third Curvature, it sends off a small Branch which is ramified on the outer and posteriour Parts of the Occiput, and communicates with the Cervical and Occipital Arteries. Having afterwards reached the great Foramen of the Os Occipitis, it enters the Cranium and pierces the Dura Mater; and on these accounts it may be named Arteria Occipitalis posterior, to distinguish it from the other which is lateral.

98. As soon as it enters the Cranium, it sends several small Ramifications to the back part of the Medulla Oblongata, and to the Corpora Olivaria and Pyramidalia, which are likewise spread on the back sides of the fourth Ventricle of the Brain, and form the Plexus Choroides of the Cerebellum.

99. AFTERWARDS it advances on the Apophysis Basilaris of the Os Occipitis, inclining by small degrees toward the vertebral Artery of the other side, all the way to the Extremity of that Apophysis, where they both join in one common Trunk, which may be named Arteria Basilaris.

100. THE Arteria Basilaris runs forward under the great transverse Protuberance of the Medulla oblongata, to which it gives Ramifications, as well as to the neighbouring Parts of the Medulla. Sometimes this Artery divides again near the Extremity of the Apophysis Basilaris into two lateral Branches, which communicate with the posteriour Branches of the two internal Carotides, and are lost in the posteriour Lobe of the Brain.

101. THE spinal Arteries are two in number, one anterior and one posterior; both produced by both Vertebrales, each of which, as soon as it enters the Cranium, sends out a small Branch, by the Union of which, the posteriour Spinalis is formed. Afterwards the Vertebrales advancing on the Apophysis Basilaris or Production of the Occipital Bone, detach backward two other small Branches, which likewise meet, and by their Union form the Spinalis Anterior. These spinal Arteries run down on the fore and back sides of the Medulla Spinalis, and by small transverse Ramifications, communicate with those which the Intercostal and Lumbar Arteries send to the same part.

Arteria Auditoria Interna.

102. THE internal auditory Artery goes off from each side of the Arteria Basilaris, to the Organ of Hearing, accompanying the auditory Nerve, having first furnished several small Twigs to the Membrana Arachnoides.

Arteria Meningæa posterior.

103. THE posterioir Meningæa arises from the same Trunk with the Auditoria Interna, and goes to the back part of the Dura Mater, on the Occipital and Temporal Bones, and likewise supplies the neighbouring Lobes of the Brain.

Arteria Intercoastalis superior.

104. WHEN the superioir intercoastal Artery does not go out from the Trunk of the Aorta Descendens, it commonly arises from the lower side of the Subclavian, and runs down on the inside of the two, three or four uppermost true Ribs, near their Heads, and sends off under each Rib, a Branch which runs along the lower Edge, and supplies the Intercoastal Muscles and neighbouring Parts of the Pleura.

105. THESE Branches or particular Intercoastal Arteries communicate with each other at different distances by small Rami, which run upward and downward from one to the other, on the Intercoastal Muscles.

106. THEY likewise give Branches to the Musculi Sterno-Hyoidæi, Subclavius, Vertebrales, and Bodies of the Vertebrae; and also to the Pectoralis Major and Minor, piercing the Intercoastal Muscles; and lastly, they send Branches through the Notches of the first four Vertebrae to the Medulla Spinalis and its Coverings.

107. SOMETIMES the superioir common Intercoastal Artery comes from the Cervicalis, and not immediately from the Subclavia. Sometimes it arises from the Aorta Descendens, either by small separate Arteries or by a common Trunk, which divides as it runs obliquely up upon the Ribs. Lastly, it sometimes arises from the nearest Bronchialis, or from several Bronchiales together.

Ductus Arteriosus in Ligamentum versus.

108. THE Ductus Arteriosus, which is found only in the Fœtus and in very young Children, arises from the Aorta Descendens, immediately below the left Subclavian Artery. In Adults, this Duct is shrunk up and closed, and appears only like a short Ligament adhering by one end to the Aorta, and by the other to the Pulmonary Artery; so that in reality it deserves no other Name than that of Ligamentum Arteriosum.

Arteria Bronchialis.

109. THE Bronchial Arteries go sometimes from the fore side of the superioir descending Aorta, sometimes from the first Intercoastal, and sometimes from the Arteria Oesophagæa. Sometimes they arise separately from each side, to go to each Lung, and sometimes by a small common Trunk, which afterwards separates towards the right and left hand, at the Bifurcation of the Aspera Arteria, and accompany the Ramifications of the Bronchia.

110. THE Bronchial Artery on the left side often comes from the Aorta, while the other arises from the superior Intercoastal on the same side, which Variety is owing to the Situation of the Aorta. Sometimes there is another Bronchial Artery which goes out from the Aorta posterioirly, near the superioir Intercoastal, above the Bronchialis anterior.

111. IN the Year 1719, I observed a very plain communication of the Branches of the left pulmonary Vein, with the Rami of an Arteria Œsophagæa, which came from the first left Intercoſtal, together with a Bronchial Artery of the ſame ſide.

112. THE Bronchialis gives a ſmall Branch to the neighbouring Auricle of the Heart, which communicates with the Arteria Coronaria.

113. IN the Year 1719 or 1720, I diſcovered a communication between the left Bronchial Artery and the Vena Azygos; and in the Month of *Auguſt* 1721, I ſaw a Branch of this Bronchial Artery joined by an Anastoſiſ to the Body of the Azygos.

114. THE Œſophagææ are generally two or three in number, ſometimes but one. They ariſe anteriorly from the Aorta Descendens, and are diſtributed to the Œſophagus, &c. Sometimes the uppermoſt Œſophagæa produces a Bronchial Artery. *Arteriæ Œſophagææ.*

115. THE inferior Intercoſtals are commonly ſeven or eight on each ſide, and ſometimes ten, when the ſuperior Intercoſtals ariſe likewiſe from the Aorta Descendens; in which Caſe theſe run obliquely upward, as has been already ſaid. *Arteriæ Intercoſtales Inferiores.*

116. THEY ariſe along the backſide of the deſcending Aorta in Pairs, all the way to the Diaphragm, and run tranſverſely toward each ſide, on the Bodies of the Vertebrae. Thoſe on the right ſide paſs behind the Vena Azygos; and afterwards they all run to the Intercoſtal Muſcles, along the lower Edge of the Ribs, all the way to the Sternum or near it.

117. THEY ſend Branches to the Pleura, to the vertebral Muſcles, to thoſe Muſcles which lie on the outſides of the Ribs, and to the upper Portions of the Muſcles of the Abdomen; and they communicate with the Arteriæ Epigaſtricae and Lumbares.

118. SOMETIMES inſtead of going out from the Aorta in Pairs, they ariſe by ſmall common Trunks, which afterwards divide, and ſend an Artery to each neighbouring Rib.

119. BEFORE they take their Courſe along the Ribs, each of them detaches one Branch between the tranſverſe Apophyſes on both ſides, to the vertebral Muſcles, and another which enters the great Canal of the Spina Doſſi. Each of theſe latter Branches divides at leaſt into two ſmall Arteries, one of which runs tranſverſely on the anterior ſide of the Canal, the other on the poſterior ſide. Both of them communicate with the like Arteries from the other ſide of the Spine, in ſuch a manner, as to form a kind of arterial Rings, which likewiſe communicate with each other by other ſmall Ramifications. The ſame is to be obſerved in the Arteriæ Lumbares.

120. AFTERWARDS each Intercoſtal Artery having reached the middle of the Rib or a little more, divides into two principal Branches, one internal, the other external. Soon after this Diviſion, the Arteries that run upon the false Ribs, ſeparate a little from them, being gradually bent downward one after another, and are ſpread upon the Abdominal Muſcles. They are likewiſe diſtributed to other neighbouring Muſcles, and particularly

to those of the Diaphragm, almost in the same manner with the Arteriæ Phrenicæ. They also communicate with the Lumbaræ, and sometimes with Branches of the Hypogastricæ.

*Arteria
Axillares.*

121. THE Subclavian Artery having left the Thorax immediately above the first Rib, in the Interstice left between the Portions of the Scalenus, there receives the name of Axillaris, because it passes under the Axilla.

122. IN this Course it gives off from its inside, a small Branch to the inside of the first Rib; and afterwards, four or five principal Branches, viz. The Thoracica Superior or Mammaria Externa, Thoracica Inferior, Muscularis or Scapularis Externa, Scapularis Interna, and Humeralis.

*Arteria Tho-
racica Supe-
rior.*

123. THE superiour Thoracica or external mammary Artery, runs down in a winding Course on the lateral parts of the Thorax, and crosses the Ribs. It gives Branches to the two pectoral Muscles, to the Mamma, Musculus Subclavius, Serratus Major, Latissimus Dorsi, and to the upper Portions of the Coraco-Brachialis and Biceps.

124. THESE Branches are sometimes separate for some space; and one of them in particular runs down between the Deltoides and Pectoralis Major, together with the Vena Cephalica to which it adheres very closely, the Extremity of it piercing the Coat of that Vein, as if there were an Anastomosis between them. Another sometimes runs between the Musculus Brachialis and Anconæus Internus, which communicates with a Branch of the Radial Artery.

*Arteria Tho-
racica Infe-
rior.*

125. THE inferior Thoracic Artery runs along the inferior Costa of the Scapula, to the Musculus Subscapularis, Teres Major and Minor, Infra-Spinatus, Latissimus Dorsi, Serratus Major, and the neighbouring Intercostal Muscles, communicating with the Arteriæ Scapulares.

*Arteriæ Sca-
pulares.*

126. THE external Scapular Artery passes through the Notch in the superior Costa of the Scapula, to the Musculus Supra-spinatus and Infra-spinatus, Teres Major and Minor, and to the Articulation of the Scapula, with the Os Humeri.

127. THE internal Scapularis arises from the Axillary Artery near the Axilla, and runs backward, to be distributed to the Subscapularis, giving Branches to the Serratus Major, to the Axillary Glands, and to the Teres Major, upon which it is ramified in different manners. It likewise sends Rami to the Infra-Spinatus and upper Portion of the Anconæi.

*Arteria
Humeralis.*

128. THE humeral Artery arises from the lower and fore-side of the Axillaris, and runs backward between the Head of the Os Humeri and Teres Major, surrounding the Articulation, till it reaches the posterious part of the Deltoides to which it is distributed.

129. DURING this Course, it gives several Branches to the superior Portions of the Anconæi, to the Capsular Ligament of the Joint of the Shoulder, and to the Os Humeri itself, through several Holes immediately below the great Tuberosity of the Head of that Bone. It likewise communicates with the Scapular Artery.

130. OPPOSITE to the Origin of this humeral Artery, the Axillaris sends off another small Branch, which runs in a contrary direction between

the Head of the Os Humeri and the common upper part of the Biceps and Coraco-Brachialis; and having given Branches to the Vagina and Channel of the Biceps, and to the Periosteum, afterwards joins the principal Humeralis.

131. THE Axillary Artery having given off these Branches, passes immediately behind the Tendon of the Pectoralis Major, where it changes its former Name for that of Arteria Brachialis. It runs down on the inside of the Arm over the Musculus Coraco-Brachialis, and Anconæus Internus, and along the inner Edge of the Biceps behind the Vena Basilica, giving small Branches on both sides to the neighbouring Muscles, to the Periosteum, and to the Bone. *Arteria Brachialis.*

132. BETWEEN the Axilla and middle of the Arm, it is covered only by the Skin and Fat; but afterwards it is hid under the Biceps, and runs obliquely forward as it descends; being at some distance from the internal Condyle, but it does not reach the middle of the Fold of the Arm.

133. BETWEEN the Axilla and this place, it sends off many Branches to the Infra-Spinatus, Teres Major and Minor, Subscapularis, Latissimus Dorsi, Serratus Major, and other neighbouring Muscles, to the common Integuments and even to the Nerves. Below the Fold of the Arm, it divides into two principal Branches, one called Arteria Cubitalis, the other Radialis.

134. FROM its upper and inner part it sends off a particular Branch, which runs obliquely downward and backward over the Anconæi, and then turns forward again near the external Condyle, where it communicates with a Branch of the Arteria Radialis.

135. IMMEDIATELY below the Insertion of the Teres Major, it gives off another Branch, which runs from within outwards, and from behind forward, round the Os Humeri; and descends obliquely forward between the Musculus Brachiiæus, and Anconæus Externus, to both which it is distributed in its passage. Having afterwards reached the external Condyle, it unites with the Branch last mentioned, and likewise communicates with a Branch of the Arteries of the Fore-Arm, so that there is here a triple Anastomosis.

136. ABOUT the breadth of a Finger below this second Branch, the Brachial Artery sends off a third, which runs down toward the internal Condyle, and communicates with other Branches of the Arteries of the Fore-Arm, as we shall see hereafter.

137. ABOUT the middle of the Arm, or a little lower, much about the place where the Brachial Artery begins to be covered by the Biceps; it sends off a Branch, which is distributed to the Periosteum, and penetrates the Bone, between the Musculus Brachiiæus and Anconæus Internus.

138. ABOUT an Inch lower, it gives off another Branch, which having furnished Ramifications to the Anconæus Internus, runs over the inner Condyle, and likewise communicates with Branches of the Arteries of the Fore-Arm.

139. HAVING got below the middle of the Arm, the Brachial Artery detaches another Branch which runs behind the inner Condyle in company with a considerable Nerve; and having passed over the Muscles inserted in this Condyle,

Condyle, it communicates with that Branch of the Cubital Artery, which encompasses the Fold of the Arm.

140. A little lower, it sometimes sends out another Branch which passes on the fore-side of the inner Condyle, and then communicates with a Branch which runs up from the Cubital Artery. These three communicating Branches are termed Collateral Arteries.

141. THE common Trunk of the Brachial Artery having reached the Fold of the Arm, runs together with a Vein and a Nerve immediately under the Aponeurosis of the Biceps, and passes under the Vena Mediana, detaching Branches on each side to the neighbouring Muscles.

142. ABOUT a large Finger's breadth beyond the Fold of the Arm, this Artery divides into two principal Branches, one inner or posteriour, named Cubitalis; the other outer or anteriour, named Radialis, as has been already said.

143. FROM this Bifurcation, the Brachial Artery sends Branches on each side, to the Supinator Longus, Pronator Teres, Fat and Skin. It sometimes tho' very rarely happens, that this Artery is divided from its Origin into two large Branches, which run down on the Arm, and afterwards on the Fore-Arm, where they have the Names of Cubitalis and Radialis.

Arteria Cubitalis.

144. THE Cubital Artery sinks in between the Ulna, and the upper Parts of the Pronator Teres, Perforatus, Ulnaris Gracilis, and Radialis Internus; then leaving the Bone, it runs down between the Perforatus and Ulnaris Internus, all the way to the Carpus and great transverse Ligament. In this Course it winds and turns several ways and sends out several Branches.

145. THE first is a small Artery which runs inward to the inner Condyle, and then turns upward like a kind of Recurrent, to communicate by several Branches with the Collateral Arteries of the Arm already mentioned, and particularly with the third. A little lower down, another small Branch goes off, which having run upward a little way, and almost surrounded the Articulation, communicates with the second collateral Artery of the Arm, between the Olecranon and inner Condyle.

146. AFTERWARDS the Cubital Artery having in its Course between the Heads of the Ulna and Radius, reached the Interosseous Ligament, sends off two principal Branches, one internal, the other external, which I call the Interosseous Arteries of the Fore-Arm.

147. THE external Artery pierces the Ligament about three Fingers breadth below the Articulation; and presently afterward, gives off a Branch, which runs up like a Recurrent toward the external Condyle of the Os Humeri under the Ulnaris externus, and Anconæus minimus, to which it is distributed, as also to the Supinator Brevis; and it communicates with the Collateral Arteries of the Arm on the same side.

148. AFTERWARD this external interosseous Artery runs down on the Outside of the Ligament, and is distributed to the Ulnaris externus, Extensor Digitorum communis, and to the Extensores Pollicis, Indicis and minimi Digiti; communicating with some Branches of the internal interosseous Artery.

149. **HAVING** reached the lower Extremity of the Ulna, it unites with a Branch of the internal interosseous Artery, which at this place runs from within outward; and is distributed together with it on the convex side of the Carpus and Back of the Hand; communicating with the Arteria Radialis and with a Branch of the Cubitalis which will be mentioned hereafter.

150. **BY** these Communications, this Artery forms a sort of irregular Arch, from whence Branches are detached to the external interosseous Muscles, and to the external lateral parts of the Fingers.

151. **THE** internal interosseous Artery runs down very close to the Ligament, till it reaches below the Pronator Teres, between which and the Pronator Quadratus, it perforates the Ligament, and goes to the convex side of the Carpus and Back of the Hand, where it communicates with the external interosseous Artery, with the Radialis and internal Branches of the Cubitalis.

152. **FROM** the Origin of the two Interosseæ, the cubital Artery runs down between the Perforatus, Perforans, and Ulnaris Internus, along the Ulna, sending Branches to the neighbouring parts. Below the internal Interossea, it sometimes sends off a Branch which runs down between the Flexor Pollicis, Radialis Internus and Perforatus, to which it is distributed all the way to the Carpus, where it runs under the internal annular Ligament and communicates on the Hand with Branches of the Arteria Radialis.

153. **AFTERWARD** the cubital Artery passes over the internal transverse Ligament of the Carpus, by the side of the Os Pisiforme, and having furnished the Skin, Palmaris Brevis and Metacarpus, it slips under the Aponeurosis Palmaris, giving off one Branch to the Hypothenar Minimi Digiti, and another which runs towards the Thumb between the Tendons of the Flexors of the Fingers, and the Bases of the metacarpal Bones.

154. **IT** likewise sends off a Branch, which running between the third and fourth Bones of the Metacarpus, reaches to the Back of the Hand, where it communicates with the external interosseous Artery. Afterwards having supplied the interosseous Muscles, it communicates with the Radialis; and they both form an arterial Arch in the hollow of the Hand in the following manner.

155. **THE** Cubitalis having got about two Fingers breadth beyond the internal annular Ligament of the Carpus, forms an Arch, the convex side of which is turned to the Fingers, and commonly sends off three or four Branches. The first goes to the inner and back part of the little Finger; and is sometimes a Continuation or Production of that Branch which goes to the Hypothenar.

156. **THE** other three Branches run in the Interstices of the four metacarpal Bones, near the Heads of which, each of them is divided into two Branches, which pass along the two internal lateral parts of each Finger, from the foreside of the little Finger to the posterior side of the Index inclusively; and at the ends of the Fingers, these digital Arteries communicate and unite with each other.

157. SOMETIMES the Arch of the cubital Artery terminates by a particular Branch in the middle Finger, and in that case it communicates with the radial Artery which makes up what the other wants.

158. This Arch sends likewise from its concave Side, toward the second Phalanx of the Thumb, a Branch for the lateral internal part thereof, and then ends near the Head of the first metacarpal Bone, by a Communication with the Radialis, having first given a Branch to the fore-side of the Index, and another to the side of the Thumb next the former. These communicate at the ends of the Fingers with the neighbouring Branches, as in the other Fingers.

159. THIS Arch sends likewise small Twigs to the interosseous Muscles, to the Lumbricales, Palmaris, and to other neighbouring Parts; and lastly, to the Integuments.

Arteria Radialis.

160. THE radial Artery begins by detaching a small Branch which runs upward like a Recurrent, toward the fold of the Arm, and turns backward round the external Condyle, communicating with the neighbouring Branches from the Trunk of the brachial Artery, especially with the first collateral Branch on that side.

161. IT runs down along the inside of the Radius, between the Supinator Longus, Pronator Teres and the Integuments, giving Branches to these Muscles, and likewise to the Perforatus, Perforans and Supinator Brevis. From thence it runs in a winding Course toward the Extremity of the Radius, supplying the Flexors of the Thumb and Pronator Quadratus.

162. HAVING reached the Extremity of the Radius, it runs nearer the Skin, especially toward the anterior Edge of the Bone, being the Artery which we there feel when we examine the Pulse.

163. AT the end of the Radius, it gives off a Branch to the Thenar; and after having communicated with the Arch of the cubital Artery in the Palm of the Hand, and sent off some cutaneous Branches at that place, it detaches one, along the whole internal lateral part of the Thumb.

164. AFTERWARDS it runs between the first Phalanx and Tendons of the Thumb, to the Interstice between the Basis of this first Phalanx and of the first metacarpal Bone, where it turns toward the hollow of the Hand.

165. AT this turning, it sends off a Branch to the external lateral part of the Thumb, which having reached the end thereof, communicates by a small Arch with the Branch which goes to the internal lateral Part.

166. IT likewise sends Branches outward, which run more or less transversely between the first two Bones of the Metacarpus and the two Tendons of the Radialis Externus; and it communicates with an opposite Branch of the Cubitalis, together with which it furnishes the external interosseous Muscles and Integuments of the Back of the Hand and convex Side of the Carpus.

167. Lastly, the radial Artery terminates, in its Passage over the semi-interosseous Muscle of the Index, near the Basis of the first metacarpal Bone, and as it runs under the Tendons of the Flexor Muscles of the Fingers, where it is joined to the Arch of the Cubitalis.

168. IT

168. IT sends off another Branch which runs along the fore part of the first Bone of the Metacarpus, to the convex Side of the Index, where it is lost in the Integuments.

169. IT gives likewise a Branch to the internal lateral part of the Index, which at the end of that Finger, joins an opposite Branch which comes from the Arch of the Cubitalis. It also sends off a small Branch cross the internal interosseous Muscles, where it forms a kind of small irregular Arch, which communicates with the great Arch by several small arterial Rami.

170. WHEN the Arch of the Cubitalis ends at the middle Finger, the Radialis runs along the inner or concave part of the first metacarpal Bone, at the Head of which it terminates by two Branches.

171. ONE of these Branches runs along the inner and anterior lateral part of the Index; the other passes between the Flexor Tendons of this Finger and the metacarpal Bone, and having communicated with the cubital Branch of the middle Finger, it advances on the posterior lateral part of the Index all the way to the end of that Finger, where it unites again with the first Branch.

172. The left Diaphragmatic Artery goes out commonly from the Aorta Descendens, as it passes between the Crura of the small Muscle of the Diaphragm. The right Diaphragmatic comes sometimes from the nearest Lumbar Artery, but most commonly from the Cæliaca. Sometimes both these Arteries arise by a small common Trunk immediately from the Aorta. They likewise have the Name of Arteriæ Phrenicæ.

*Arteria
Diaphrag-
matica.*

173. THEY appear almost always in several Ramifications on the concave or lower side of the Diaphragm, and seldom on the upper or convex side. They give small Branches to the Glandulæ Renales or Capsulæ Atrabiliaræ, which sometimes communicate with the other Arteries that go to the same Part.

174. THEY send likewise small Branches to the Fat which lies upon the Kidneys, called the Membrana Adiposa, from whence they have the Name of Arteriæ Adiposæ; and they sometimes come immediately from the Trunk of the Aorta on one side of the Mesenterica Superior.

175. BESIDES these capital Diaphragmatic Arteries, there are others of a subordinate Class, which come from the Intercostrales, Mammariæ Internæ, Mediastinæ, Pericardiæ and Cæliaca, as is observed in the Description of each of these Arteries.

176. THE Cæliac Artery arises anteriorly and a little to the left hand, from the Aorta Descendens, immediately after its passage through the small Muscle of the Diaphragm, nearly opposite to the Cartilage between the last Vertebra of the Back and first of the Loins. The Trunk of this Artery is very short; and near its Origin, it sends off from the right Side two small Diaphragmaticæ, tho' sometimes there is only one which goes to the right hand, and is afterwards distributed both ways; communicating with the other Arteries of the same name which come from the Intercostrales and Mammariæ. The left Branch sends Rami to the superior Orifice of the Stomach and to the Glandula Renalis on the same side; the right furnishes the Pylorus, and the Renal Gland on the right side.

*Arteria
Cæliaca.*

177. IMMEDIATELY after this, the Cæliaca gives off a considerable Branch, named Arteria Ventriculi Coronaria, and Gastrica, or Gastrica superior; and then it presently divides into two large Branches, one toward the right hand, named Arteria Hepatica; the other to the left, called Splenica, which is larger than the former.

178. SOMETIMES this Artery is divided into these three Branches at the same place, very near its Origin; the Trunk going out from the Aorta almost in a straight Line, and the Branches from the Trunk almost at Right Angles, like Radii from an Axis, whence this Trunk has been called Axis Arteriæ Cæliacæ.

*Arteria Ven-
triculi Coro-
naria.*

179. THE Coronary Artery of the Stomach goes first to the left side of that Organ, a little beyond the superiour Orifice; round which Orifice it throws Branches, and also to every part of the Stomach near it; and these Branches communicate with those which run along the bottom of the Stomach to the Pylorus.

180. AFTERWARDS it runs on the right side of the superiour Orifice, along the small Curvature of the Stomach, almost to the Pylorus, where it communicates with the Arteria Pylorica; and turning towards the small Lobe of the Liver, it gives off some Branches to it.

181. THEN it advances, under the Ductus Venosus, to the left Lobe of the Liver, in which it loses itself near the beginning of the just-mentioned Duct, having first given off some small Branches to the neighbouring Parts of the Diaphragm and Omentum.

*Arteria
Hepatica.*

182. As soon as the Hepatic Artery leaves the Cæliaca, it runs to the upper and inner part of the Pylorus, in company with the Vena Portæ, sending off two Branches, a small one called Arteria Pylorica, and a large one named Gastrica Dextra, or Gastrica Major.

183. THE Pylorica is ramified on the Pylorus, from whence it has its Name; and having distributed Branches to the neighbouring parts of the Stomach, which communicate with those of the right Gastrica, it terminates on the Pylorus, by an Anastomosis with the Coronary Artery of the Stomach.

184. THE right Gastric Artery having passed behind and beyond the Pylorus, sends out a considerable Branch named Arteria Duodenalis, or Intestinalis, which sometimes comes from the Trunk of the Hepatica, as we shall see hereafter. Afterwards this Gastric Artery runs along the right side of the great Curvature of the Stomach, to the neighbouring Parts of which, on both sides, it distributes Branches.

185. THESE Branches communicate with those of the Arteria Pylorica, and of the Coronaria Ventriculi, and with the right Gastro-Epiploicæ, which furnish the nearest Parts of the Omentum, and communicate with the Mesenterica Superior. After this, the right Gastric Artery ends in the left, which is a Branch of the Splenica.

186. THE Duodenal or Intestinal Artery runs along the Duodenum on the side next the Pancreas; to both which it furnishes Branches, and also to the

the neighbouring part of the Stomach. Sometimes this Artery goes out from the Mesenterica Superior, and sometimes it is double.

187. THE Hepatic Artery having sent out the Pylorica and right Gastrica, advances behind the Ductus Hepaticus, toward the Vesicula Fellea, to which it gives two principal Branches called Arteriæ Cysticæ; and another named Biliaria, which is lost in the great Lobe of the Liver.

188. AFTERWARDS, this Artery enters the Fissure of the Liver, and joins the Vena Portæ, with which it runs within a membranous Vagina called Capsula Glissoni, and accompanies it through the whole Substance of the Liver by numerous Ramifications, which may be termed Arteriæ Hepaticæ Propriæ.

189. BEFORE it enters the Liver, it gives small Branches to the external Membrane of this Viscus, and to the Capsula Glissoni. The Gastric and proper Hepatic Arteries come sometimes from the Mesenterica Superior, when the ordinary Ramifications are wanting.

190. IMMEDIATELY after the Origin of the Splenic Artery from the *Arteria Cæliaca*, it runs toward the left hand, under the Stomach and Pancreas, to the Spleen. It adheres closely to the posterior part of the lower side of the Pancreas, to which it gives several Branches named Arteriæ Pancreaticæ. *Splénica.*

191. NEAR the Extremity of the Pancreas, under the left Portion of the Stomach, the Splenic Artery gives off a principal Branch called Gastrica Sinistra or Minor, which runs from left to right along the left Portion of the great Curvature of the Stomach, giving Branches to both sides of this Portion, which communicate with those of the Coronaria Ventriculi.

192. THIS Gastric Artery sends likewise another Branch, at least, to the Extremity of the Pancreas, which communicates with the other Pancreatic Arteries. It also supplies the Omentum with Branches, termed Gastro-Epiploicæ Sinistræ; and then it communicates with the right Gastrica, and from this Union, the Gastro-Epiploicæ Mediæ are produced.

193. From this Detail we learn that the Arteria Coronaria Ventriculi Pylorica, Intestinalis, both Gastricæ, Gastro-Epiploicæ, and consequently the Hepatica, Splénica and Mesenterica, communicate all together.

194. AFTERWARDS, the Splenic Artery advances towards the Spleen, in a course more or less contorted; but before it arrives at that Viscus, it gives two or three Branches to the large Extremity of the Stomach, commonly called Vasa Brevia; and one to the Omentum, named Epiploica.

195. AT the Spleen, this Artery divides into four or five Branches, which enter that Viscus, after having given some small Twigs to the neighbouring Parts of the Stomach and Omentum.

196. THE superiour Mesenteric Artery arises anteriorly from the lower Portion of the descending Aorta, a very little way below the Cæliaca, going out a little towards the right hand, but bending immediately afterwards to the left. *Arteria Mesenterica Superior.*

197. NEAR its Origin, it gives off a small Branch, which dividing into two, goes to the lower side of the Head of the Pancreas, and neighbouring part

part of the Duodenum, communicating with the Intestinalis by small Arches, and Areolæ or Masles.

198. AFTERWARDS it passes over the Duodenum, between this Intestine and the Mesenteric Vein, between the two Laminæ of the Mesentery; and then bending in an oblique Direction from left to right, and from above downward, by very small degrees, it advances toward the extremity of the Ileum. By this Incurvation, it forms a kind of long Arch, from the convex side of which a great many Branches go out.

199. THESE Branches are sixteen or eighteen in number, or thereabouts, and almost all of them are bestowed on the small Intestines, from the lower third part of the Duodenum to the Cæcum and Colon. The first Branches are very short, and from thence they increase gradually in length all the way to the middle of the Arch; the rest diminishing again by small degrees.

200. As they approach the Intestines, all these Branches communicate first by reciprocal Arches; then by Areolæ and Masles of all kinds of figures, from which is detached an infinite number of small Ramifications, which surround the intestinal Canal, like an annular Piece of Net-work.

201. THESE Arches and Masles increase in number proportionably to the length of the Branches; and their Size diminishes gradually as they approach the Intestines.

202. THE first Branches from the convex side of the Mesenteric Arch, which are very short, supply the Pancreas and Mesocolon, and communicate with the Duodenal Artery. The last Branches go to the Appendicula Vermiformis, and send a Portion of an Arch to the beginning of the Colon.

203. THE considerable Branches from the concave side of the Mesenteric Arch, are seldom above two or three in number; but before they arise, a small Ramus goes out to the Duodenum, and gives some very small Arteries to the Pancreas.

204. THE first considerable Branch from the concave side of the Arch goes into the Mesocolon towards the right Portion of the Colon, being first divided into two Rami; the first of which runs along the whole superior part of the Colon, where it forms the famous Communication with the Mesenterica Inferior; and might be named Arteria Colica Superior. The other Ramus of this Branch runs down on the right Portion of the Colon.

205. THE second principal Branch having run for some space through the Mesentery, divides into three Rami; the first of which goes to the lower part of the right Portion of the Colon, where it communicates with the second Ramus of the first Branch; the second goes to the beginning of the Colon, where it communicates with the first, and to the Intestinum Cæcum.

206. THE third Ramus of this second Branch, having communicated with the second, gives small Twigs to the Cæcum, Appendicula Vermiformis, and Extremity of the Ileum. Afterwards it communicates with the Extremity of the Arch, or curve Trunk of the superior Mesenteric.

207. ALL these Communications are by Arches and Masses, as in those Branches that come from the convex side of the Arch; and it is to be observed in general, that all the Branches of the Mesenterica Superior are disposed according to the Folds of the Mesentery and Circumvolutions of the Intestines; giving off Branches, through their whole course, to the Laminæ of the Mesentery, its cellular Substance, and to the Mesenteric Glands.

208. THE lower Mesenteric Artery goes out anteriorly from the Aorta *Arteria Mesenterica Inferior.* Descendens Inferior, about a Finger's breadth or more above the Bifurcation, and below the spermatic Arteries; and having run about the length of an Inch, or something more, it is divided into three or four Branches, which gradually separate from each other.

209. THE first or superior Branch, about an Inch from its Origin, divides into two Rami; the first of which runs along the left Portion of the Colon, and forms the Communication of the two Mesenteric Arteries, already mentioned. It may be named Arteria Colica Sinistra. The second Ramus having communicated with the first, runs down upon the same Portion of the Colon.

210. THE middle Branch having run the same length with the first, divides into two Rami; one of which passes upward on the extremity of the Colon, communicating by Arches with the second Ramus of the superiour Branch; the other runs down on the extremity of the same Intestine.

211. WHEN there is another middle Branch, it goes to the first part of the double Curvature of the Colon, by a like Distribution and Communication from above downward.

212. THE lower Branch goes to the second Portion of the Colon, or to both, when the second middle Branch is wanting, and sends up a Ramus, which communicates with the foregoing.

213. IT sends another considerable Branch downward, called Arteria Hæmorrhoidalis Interna, which runs down behind the Intestinum Rectum, to which it is distributed by several Ramifications, and it communicates with the Arteriæ Hypogastricæ.

214. THE Renal Arteries, called commonly Emulgents, are ordinarily *Arteriæ Renales.* two in number, and go out laterally from the inferiour descending Aorta, immediately under the Mesenterica Superior, one to the right hand, the other to the left. The right is situated more backward, and is longer than the left, because of the Vena Cava, which lies on the right side between the Aorta and the Kidney.

215. THEY run commonly without division, and almost horizontally to the Kidneys, into the Depressions of which they enter by several Branches, which form Arches in the inner Substance of these Viscera.

216. FROM these Arches, numerous small Rami go out toward the Circumference or outer Surface of the Kidneys. Sometimes there is more than one Artery on each side; sometimes this Augmentation is only on one side, and these supernumerary Arteries come sometimes immediately from the Aorta, and enter at the upper or lower part of the Kidneys.

217. ORDINARILY, the right Renal Artery passes behind the Vena Cava and Renal Vein on the other side; and the left Artery, first behind and then before the Vein. Sometimes they send Branches to the Glandulæ Renales, Membrana Adiposa of the Kidneys, and even to the Diaphragm.

*Arteriæ
Capsulares.*

218. THE Arteries of the Renal Glands, which may be termed *Arteriæ Capsulares*, arise sometimes from the Aorta above the *Arteria Renalis*, and give out the *Arteriæ Adiposæ*, which go to the Fat of the Kidneys. Sometimes they come from the Trunk of the *Cæliaca*. The right Capsular Artery comes most commonly from the *Arteria Renalis* of the same side, near its Origin; the left, from the Aorta above the *Renalis*.

*Arteriæ
Spermaticæ.*

219. THE Spermatic Arteries are commonly two in number, sometimes more. They are very small, and go out anteriorly from the Aorta Descendens Inferior, near each other, about a Finger's breadth below the *Arteriæ Renales*, more or less, between the two *Mesentericæ*, or between the *Renales* and *Mesentericæ Inferiores*. Sometimes one is higher, or placed more laterally than the other.

220. THEY send off to the common Membrane of the Kidneys, small Branches named *Arteriæ Adiposæ*; and afterwards they run down upon the *Psoas Muscles*, on the fore-side the Ureters, between the two *Laminæ* of the *Peritonæum*.

221. THEY give several considerable Branches to the *Peritonæum*, chiefly to those Parts of it which are next the Mesentery, and they communicate both with the *Mesentericæ* and *Adiposæ*. They likewise send small Arteries to the Ureters.

222. AFTERWARDS, they pass in Men through the Tendinous Openings of the Abdominal Muscles in the Vagina of the *Peritonæum*, and are distributed to the Testicles and Epididymes, where they communicate with a Branch of the *Iliaca externa*.

223. IN Women they do not go out of the Abdomen, but are distributed to the Ovaria and Uterus, and communicate with Branches of the *Hypogastrica*, at the jagged Extremities of the *Tubæ Falloppianæ*.

*Arteriæ
Lumbares.*

224. THE Lumbar Arteries go out posteriorly from the inferior descending Aorta, in five or six Pairs, or more, much in the same manner with the *Intercostals*.

225. THEY may be divided into Superiour and Inferiour. The Superiour send small Branches to the neighbouring Parts of the Diaphragm and *Intercostal Muscles*, and supply the place of *Semi-intercostal Arteries*. Sometimes those Pairs go out by a small common Trunk, and not separately.

226. THEY are distributed on each side to the *Psoas Muscles*, to the *Quadrati Lumborum*, and to the oblique and transverse Muscles of the Abdomen; and by perforating the oblique Muscles, they become external *Hypogastric Arteries*. They go likewise to the *Vertebral Muscles*, and to the Bodies of the *Vertebræ*, and enter the Spinal Canal through the lateral Notches, to go to the Membranes, &c. forming Rings much in the same manner with the *Intercostals*; and they likewise give small Twigs to the Nerves.

227. THE Arteriæ Sacræ go out commonly from the back part of the inferior descending Aorta, at the Bifurcation. Sometimes they arise higher, from the Lumbares, and sometimes lower, from the Iliacæ. They are two, three or four in number, and sometimes but one. They are ramified on the Os Sacrum, and on the neighbouring Parts of the Peritonæum, Intestinum Rectum, Fat, &c. and enter the Canal of that Bone through the anterior Holes, being there distributed toward each side. They likewise send small Arteries to the large Fasciculi of Nerves, which go out through the Holes of the Os Sacrum, and they penetrate the inner Substance of that Bone.

228. THE inferior descending Aorta ends at the last Vertebra of the Loins, and sometimes higher, in two large lateral Branches, one on the right hand, the other on the left, called Arteriæ Iliacæ; each of which is a common Trunk to two other Arteries of the same Name. This Bifurcation lies on the anterior and left side of that of the Vena Cava.

229. THE primitive Iliac Arteries divaricate gradually as they descend, advancing obliquely toward the anterior and lower part of the Ossa Ilium, without any considerable Ramification for about the breadth of three Fingers, except a few very small Arteries that go to the Os Sacrum, some of which enter by the upper Holes, and are distributed like the Arteriæ Sacræ, while others emerge again through the posterior Holes, and go to the neighbouring Muscles, &c. They likewise give small Arteries to the Peritonæum, to the Coats of the Veins, and to the Fat and Ureters, behind which the Iliac Trunks pass.

230. THE right Iliac Trunk passes first, on the Foreside of the Origin of the left Iliac Vein, and runs down on the foreside of the right Vein, almost to the place where it goes out of the Abdomen, its Course being there directed more inwardly. The left Trunk goes down likewise before the left Vein, but lies a little toward the inside as it leaves the Abdomen.

231. ABOUT three Fingers breadth from their Origin, each Iliac Trunk is divided into two secondary Arteries, one external, the other internal. The external Artery has no particular Name; the internal is termed Hypogastrica, which often appears to be no more than a Branch of the other, in Adults; but in young Children, and especially in the Fœtus, the Hypogastric Artery looks like the Trunk, and the other like a Branch.

232. THE external Iliaca on each side runs down on the Iliac Muscle to the Ligamentum Falloppii, under which it goes out of the Abdomen. In this Course, it gives off only a few small Arteries, to the Peritonæum and other Parts near it, but as it passes out of the Abdomen under the Ligament, it detaches two considerable Branches, one internal, the other external.

233. THE internal Branch is named Arteria Epigastrica, and goes out anteriorly from the external Iliaca. From thence it runs obliquely upward on the Tendon of the transverse Muscle toward the posterior part of the Rectus, which it reaches about two or three Fingers breadth above the Os Pubis.

234. AFTERWARDS the Epigastric Artery runs up along the posterior or inner side of this Muscle, sending Ramifications to the Tendons of the neighbouring

bouring Muscles, &c. and then loses it self by a true Anastomosis of several Ramifications, with the Mammaria interna. It likewise communicates with the inferiour Intercostals which are spread on the Abdomen.

235. IT sometimes gives out two particular Branches, one of which accompany'd by a Nerve, goes through the Foramen Ovale of the Pelvis to the Triceps Muscles, &c. the other runs down to the Testicles along with the spermatic Artery, and there communicates with it.

236. THE external Branch of the outer Iliaca goes off laterally from the Outside of that Artery under the Ligamentum Falloppii, and from thence to the internal Labium of the Os Ilium, where it divides into two, and is ramified on the oblique and transverse Muscles of the Abdomen, communicating with the Arteria Lumbaris.

237. BESIDES these two Branches, the external Iliaca gives off a small Ramus internally, under the Ligament, which runs to the Vagina of the spermatic Rope; and sometimes another small Twig goes from the Outside, to the Os Ilium.

238. THE internal Iliaca or Hypogastrica, having run a little more than a Finger's breadth inward and backward, bends by small degrees obliquely forward, and toward the outside; and afterwards contracting in its Dimensions, it ends in the Umbilical Artery, which ought to be look'd upon as a true Continuation of the Trunk of the Hypogastrica.

239. THIS Arteria Umbilicalis ascends on the side of the Bladder, and having detached small Rami to that Viscus and to the neighbouring Parts of the Peritonæum, &c. it contracts, and in Adults is quite closed up, above the middle of the Bladder. It likewise gives Branches to the Uterus and to the neighbouring Parts in both Sexes. Afterwards it ascends in form of a Ligament to the Umbilicus, where it joins the Umbilical Artery on the other side; its Name being taken from its use in the Fœtus.

240. FROM the convex side of the Curvature of the Hypogastric Artery, four or five principal Branches commonly go out very near each other. Sometimes they all arise separately, sometimes by small common Trunks, and what is the first Branch in some Subjects, is only a Ramus of another principal Branch in others; so much does the Number, Disposition, Origin, and Distribution of these Branches vary in different Subjects. For this reason I think it proper to distinguish them by the following proper Names; Iliaca minor, Glutæa, Sciatica, Pudica communis sive Pudica Hypogastrica and Obturatorix.

241. THE Iliaca minor, the most posteriour of these Branches, and which is often no more than a Ramus of the Glutæa, passes between the last two Lumbar Nerves, and divides into two Rami, one of which enters the Canal of the Os Sacrum through the lowest large anterior Holes; the other passes behind the Musculus Psoas to which it gives Twigs, and behind the Crural Nerve, being afterwards distributed to the Iliac Muscle, and to the middle part of the inside of the Os Ilium, penetrating into the Substance of the Bone sometimes by one Hole, sometimes by more.

242. THE Arteria Glutæa is commonly very considerable, and sometimes the largest of all the Hypogastric Branches. Near its beginning it sometimes sends out the Iliaca Minor, and sometimes the small Ramus that goes from that Artery to the Os Sacrum and other parts fixed to that Bone. Afterwards this Artery goes out of the Pelvis in company with the Sciatic Nerve, thro' the upper part of the great Sinus of the Os Innominatum, below the Musculus Pyriformis, and is distributed in a radiated manner to the Glutæus Maximus and Medius.

243. IN its passage, it gives some Branches to the Os Sacrum, Os Coccygis, Musculus Pyriformis, the Muscles of the Anus, and to the neighbouring parts of the Intestinum Rectum, forming a particular Hemorrhoidalis Interna. It likewise sends Twigs to the Bladder and parts near it; and detaches a pretty long Branch which runs down with the Sciatic Nerve.

244. The Arteria Sciatica gives first of all, some Branches to the Musculus Pyriformis, the Quadrigeminij, the Os Sacrum, &c. and even to the inner side of the Os Ischium. It likewise detaches a Branch which runs under the Musculus Quadratus, to the Articulation of the Os Femoris.

245. It passes obliquely over the Sciatic Nerve, and as they both go through the great posterour Sinus of the Os Ilium, it detaches small Arteries which are distributed to the inner Substance of that Nerve. Afterwards it runs up in a radiated manner on the outside of the Os Ilium, and is distributed to the inner Substance of that Bone, and to the Musculi Glutæi, especially to the Medius and Minimus.

246. The Pudica Communis, called commonly Pudica Interna, arises sometimes by a Trunk common to it and to the Glutæa, and gives out two principal Branches; the first of which passes through the great Sinus of the Os Ilium in company with the Glutæa and Sciatica, and then divides into two Rami.

247. THE first Ramus goes behind the Spine of the Ischium, between the two Ligaments which lie between that Bone and the Os Sacrum; and runs on the inside of the Tuberculum Ischij, all the way to the Origin of the Corpus Cavernosum Penis. There it divides into several Arteries, one of which goes to the Sphincter Ani, under the Name of Hemorrhoidalis Externa.

248. THE rest are distributed to the neighbouring Integuments, to the Bulb of the Urethra, and to the Corpus Cavernosum Penis; but the last of these Arteries, or rather the Extremity of this first Ramus, runs from behind forward, over the Neck of the Os Femoris, and communicates with a Branch of the Arteria Cruralis.

249. THE second principal Ramus called commonly Arteria Pudica Externa, runs between the Bladder and Intestinum Rectum, and is distributed in Men to the Vesiculæ Seminales, Neck of the Bladder, Prostate Gland, and neighbouring parts of the Rectum.

250. AFTERWARDS it runs under the Os Pubis on the side of a considerable Vein, which lies directly under the Symphysis; and it runs along the Penis between this Vein and a Nerve, being distributed in its passage

to the Corpus Cavernosum, and communicating with the Pudica Minor, which comes from the Cruralis.

251. THIS second Branch of the Pudica Major goes off sometimes separately from the Hypogastrica, especially in Women, being distributed to the lateral Parts of the Uterus, where it communicates with the spermatic Artery, near the jagged Extremity of the Tuba Falloppiana; and to the neighbouring parts of the Vagina, &c.

252. THE Arteria Obturatrix perforates the Obturator Muscles from whence it has its Name, and goes out of the Pelvis at the upper part of the Ligament of the Foramen Ovale, having first sent a small Branch over the Symphysis of the Os Ilium and Os Pubis, to the Inguinal Glands and Integuments.

253. As it passes by the Muscles, it divides and is distributed to the Pectineus and Triceps. It likewise sends out another Branch, which communicates with that Branch of the Sciatica that goes to the Articulation of the Os Femoris; and gives small Arteries to the Holes in the Neck of that Bone.

254. AFTERWARDS the Hypogastric Artery ends in the Umbilicalis, as has been already said.

*Arteria
Crurales.*

255. THE Iliac Artery goes out of the Abdomen between the Ligamentum Falloppii and Tendon of the Psoas at the Union of the Os Ilium and Os Pubis, and there it takes the Name of Arteria Cruralis.

256. It sends off first of all, three small Branches; one of which called Pudica Externa, goes over the Crural Vein to the Skin and Ligament of the Penis and to the Inguinal Glands, communicating with the Pudica Interna. The second goes to the Musculus Pectineus; and the third to the upper part of the Sartorius. All these Branches furnish likewise the neighbouring anterior Integuments.

257. AFTERWARDS the Crural Artery runs down on the Head of the Os Femoris, and by taking a particular turn, gets on the inside of the Crural Vein, about three Fingers breadth from where it goes out of the Abdomen. From its Origin to this place, it is covered only by the Skin and Fat, and lies on the Pectineus and Triceps Primus.

258. IN changing its Situation it sends out three considerable Branches, one external, one middle, and one internal. They all go out more or less posteriorly, sometimes by a short common Trunk, sometimes by two, &c.

259. THE external Branch runs on the upper side of the Thigh to the Crureus, Vastus Externus, Rectus Anterior, Musculus Fasciæ Latæ and Glutæus Medius; sending up a Ramus to the Apex of the great Trochanter, which communicates with the first principal Ramus of the Pudica Major, and Sciatica, as has been already said.

260. THE middle Branch runs down on the inside of the Thigh between the Triceps Muscles, to which it gives several Rami, one whereof perforates the second Muscle, and is distributed to the Glutæus Maximus, Semi-Nervosus, Semi-Membranosus, Biceps, and to the neighbouring Integuments.

261. THE internal Branch runs backward on the *Quadrigemini* towards the great *Trochanter*; and having detached a *Ramus* which goes into the Joint of the *Os Femoris*, it runs downward and gives *Rami* to all the *Muscles* that lie on the backside of that Bone, one of which enters the Bone itself on one side of the *Linea Aspera*.

262. HAVING sent off all these three Branches, the *Arteria Cruralis* runs down between the *Sartorius*, *Vastus Internus* and *Triceps*, giving Branches to all the parts near it. It is covered by the *Sartorius* all the way to the lower part of the Thigh, where it is inflected backward over the *Triceps Tertius* a little above the internal Condyle of the *Os Femoris*. Afterwards continuing its Course through the hollow of the Ham, it is called *Arteria Poplitea*, being accompany'd by the Vein of the same name.

263. THE *Poplitea* while in the Ham, is covered only by the Integument, sending off Branches toward each side, which run up upon the Condyles, and communicate with the lower Ramifications of the *Arteria Cruralis*.

264. It sends *Rami* to the Joint of the Knee, one of which at least, passes between the Crucial Ligaments. As it runs down it sends Branches to the *Gastrocnemii* and *Popliteus*; and having reached the backside of the Head of the *Tibia*, it gives off two Branches, one to each side.

265. THE first or internal Branch surrounds the forepart of the Head of the *Tibia*, passing between the Bone and internal lateral Ligament; and besides several other Ramifications, sends up a small Branch which communicates with the Arteries that lie round the Condyles of the *Os Femoris*.

266. THE second or external Branch runs over the Head of the *Fibula*, and between the Head of the *Tibia* and external lateral Ligament of the Knee, surrounding the Articulation all the way to the Ligaments of the *Patella*, and communicating with the Branches which lie round the Condyles of the *Os Femoris*, together with a Branch of the first or internal *Ramus*.

267. IMMEDIATELY after the Origin of these two *Rami*, and before the *Poplitea* ends, it sends a small Artery down on the backside of the interosseous Ligament, very near the *Tibia*, into which it enters by a particular Hole a little above the middle portion of the Bone.

268. As the *Poplitea* ends, it divides into two principal Branches, one of which runs between the heads of the *Tibia* and *Fibula*, passing from behind forwards on the interosseous Ligament, where it takes the Name of *Arteria Tibialis Anterior*. The second Branch divides into two others, one internal and largest, called *Arteria Tibialis Posterior*, the other posteriour and smallest, named *Arteria Peronæa Posterior*.

269. THE *Tibialis Anterior* having passed between the heads of the *Tibia* and *Fibula*, sends small Branches upward and laterally. The superior Branches communicate with those *Rami* of the *Popliteus* which lie round the Articulation; and the lateral Branches go to the neighbouring parts. Afterwards this *Tibial Artery* runs down on the foreside of the interosseous Ligament, toward the outside of the *Tibia*, between the *Musculus Tibialis Anticus* and *Extensor Pollicis*.

270. HAVING run laterally on the Tibia for about two thirds of the length of that Bone, it passes on the fore side under the common Annular Ligament, and Extensor Pollicis, to the Articulation of the Foot; giving off several Rami both to the right and left hand, which communicate laterally with the Tibialis Posterior and Peronæa Posterior, so that these two Bones are in a manner surrounded by Arteries.

271. AT the Joint of the Foot, it sends out Branches which run between the Astragalus and Os Calcis, being distributed to the Articulation and to the Bones of the Tarsus. The Communications are here very numerous on all sides.

272. HAVING passed the Fold of the Foot, it sends off toward both sides, other Rami, which communicate with the Posterior Tibialis and Peronæa; all these Branches making a kind of Circles round the Tarsus.

273. AFTERWARDS the anterior Tibial Artery advances on the convex side of the Foot, as far as the Interstice between the first and second Metatarsal Bones; between the Heads of which, it sends a large Branch, which perforates the superior interosseous Muscles, and joining the Tibialis Posterior, forms an Arch on the side of the Foot.

274. IT likewise sends two or three considerable Branches over the other Metatarsal Bones, which go to the rest of the interosseous Muscles, Integuments, &c. and communicate with each other.

275. LASTLY, this Artery terminates by two principal Branches, one of which goes to the Thenar and Inside of the Great Toe; the other is spent upon the Outside of the Great Toe, and the Inside of the second Toe.

276. THE Tibialis Posterior, called likewise Suralis, runs down between the Solei, Tibialis Posticus, Flexor Digitorum communis, and Flexor Pollicis; giving Branches to these Muscles, to the Tibia, and to the Marrow of that Bone, through a particular Canal in its posterior and upper Part.

277. AFTERWARDS it runs behind the inner Ankle, communicating with the Tibialis Anterior, and surrounded by the neighbouring Veins; and passes to the Sole of the Foot between the concave side of the Os Calcis and Thenar Muscle, where it divides into two Branches, one large or external, the other small or internal.

278. THE great Branch, or Arteria Plantaris externa, passes on the concave side of the Os Calcis obliquely under the Sole of the Foot, to the Basis of the fifth Metatarsal Bone, and from thence runs in a kind of Arch toward the Great Toe, communicating there with the Tibialis Anterior, which perforates the interosseous Muscles in the manner already said.

279. THE convex side of this Arch supplies both sides of the last three Toes, and the outside of the second Toe, forming small communicating Arches at the end, and sometimes at the middle of each Toe, as in the Hand. The concave side of the Arch furnishes the neighbouring Parts.

280. THE small Branch, or Arteria Plantaris Interna, having reached beyond the middle of the Sole of the Foot, is divided into two; one of which goes to the great Toe, communicating with the Ramus of the Tibialis Anterior;

terior; the other is distributed to the first Phalanges of the other Toes, communicating with the Ramifications from the Arch already mentioned.

281. THE Arteria Peronæa runs down on the backside of the Fibula, between the Soleus and Flexor Pollicis, to which and to the neighbouring Parts it gives Rami in its passage.

282. HAVING reached to the lower third part of the Fibula, it sends off a considerable Branch, which runs in between the Tibia and that Bone, passing between their Extremities from behind forward, below the interosseous Ligament, and is distributed to the Integuments of the Tarsus.

283. LASTLY, the Peronæa continuing its course downward, on the back side of the Fibula, as far as the Os Calcis, forms an Arch with the Tibialis Posterior, between the Astragalus and the Tendo Achillis.

284. FROM thence it runs outward, and a little above the outer Ankle communicates with the Tibialis Anterior by an Arch, which sends several small Ramifications to the neighbouring Parts.

285. IN this Description of the Arteries, I have said nothing of the Cutaneous Anastomoses, which are exceedingly beautiful in the Fœtus; nor of the frequent and considerable Communications of small Arteries upon the Periosteum, which form a delicate kind of Net-work, or Rete Mirabile.



SECT.

S E C T. V.

*A Description of the Veins.**Introduction.*

1. **T**HE Blood distributed to all Parts of the Body by two kinds of Arteries, the Aorta and Arteria Pulmonaris, returns by three kinds of Veins, called by Anatomists Vena Cava, Vena Portæ, and Vena Pulmonaris.

2. THE Vena Cava carries back to the right Auricle of the Heart, the Blood convey'd by the Aorta to all the Parts of the Body, except what goes by the Arteriæ Coronariæ Cordis. It receives all this Blood from the Arterial Ramifications in part directly, and in part indirectly.

3. THE Vena Portæ receives the Blood carried to the floating Viscera of the Abdomen by the Arteria Cæliaca, and the two Mesentericæ, and conveys it to the Vena Hepatica, and from thence to the Vena Cava.

4. THE Vena Pulmonaris conveys to the Pulmonary Sinus, or left Auricle of the Heart, the Blood carried to the Lungs by the Arteria Pulmonaris.

5. To these three Veins two others might be added, viz. those which belong particularly to the Heart and to its Auricles, and the Sinuses of the Dura Mater.

6. IN describing the general Course of the Veins, we may either begin by their Extremities in all the parts of the Body, and end by the Trunks carried all the way to the Heart, according to the Course of the Blood; or we may begin by the great Trunks, and end by the Ramifications and capillary Extremities, according to their several Divisions and Subdivisions.

7. THIS last Method is most convenient, and makes it a very easy matter to pursue the first, whenever we think it proper to do it; and for these Reasons, I have chosen to follow it, in this Description.

General Division of the Vena Cava.

8. WE commonly talk of the Vena Cava in general, as if it were but one Vein at its Origin, or had but one common Trunk; whereas it goes out from the right Auricle of the Heart by two large separate Trunks, in a Direction almost perpendicularly opposite to each other, one running upward called Vena Cava Superior, the other downward called Vena Cava Inferior.

9. IT may however be said, that these two Veins have a sort of Continuity, or a small Portion of a common Trunk, fixed to the Edges of the right Auricle; as if three quarters of the Circumference of a large straight Tube were cut off, and the Edges of a small Bladder applied to the Edges of the Opening thus made in the Tube.

10. THE right Auricle may also be look'd upon as a Muscular Trunk common to these two large Veins, and may be called the Sinus of the Vena Cava; but in this respect, the name of Sinus Pulmonaris agrees still better to the left Auricle.

11. THE Vena Cava Superior is distributed chiefly to the Thorax, Head, and upper Extremities, and but very little to the Parts below the Diaphragm.

12. THE Vena Cava Inferior is distributed chiefly to the Abdomen and lower Extremities, and but very little to the Parts above the Diaphragm.

13. THE Ancients called the Superior Vena Cava, Ascendens, and the Inferior, Descendens, having regard only to the great Tubes, and to their Division into Trunks and Branches. Several Moderns have retained these Names, but in a contrary Signification, to accommodate them to the Motion of the Blood which descends by the Cava Superior, and ascends by the Cava Inferior.

14. BUT to shun the Mistakes that may happen in Reports made of Wounds or other Diseases, and of what is observed in Opening dead Bodies, and in other Cases of these kinds, it is best to retain the Distinction of Vena Cava Superior and Inferior.

15. THE Trunk of each of these two Veins sends off, much in the same manner with the Arteries, a certain Number of principal or capital Branches, which are afterward ramified in different manners. Each Trunk terminates afterwards by a Bifurcation or a Division into two subordinate Trunks, each of which gives off other principal Branches, ending in a great number of small Trunks, Rami and Ramifications.

16. THEY have likewise this common to them with the Arteries, that the greatest part of the capital Branches are in Pairs; as well as the subordinate Trunks. The Ramifications of each subaltern Trunk taken by itself, are in uneven Numbers, but they make even Numbers with those of the other like Trunk. The Vena Azygos and some other small Veins, of which hereafter, are Exceptions from this Rule.

17. BEFORE I go on to the particular Description of each of these Veins, many of which have proper Names; I shall give a general Idea of their Distribution, and an Enumeration of their principal Ramifications, in the same manner as I did in the Description of the Arteries, and for the same Reason. But I shall say nothing of the Venæ Coronariæ Cordis, because they are not immediately join'd to any other Vein, as we shall see in describing the Parts of the Thorax. I begin by the Vena Cava Superior.

18. THE Superior Vena Cava runs up from the right Auricle of the Heart, almost in a direct Course, for about two Fingers breadth, lying within the Pericardium, in the right side of the Trunk of the Aorta, but a little more anteriorly. *Vena Cava Superior.*

19. As it goes out of the Pericardium, it is inclined a little to the left Hand, and then runs up about an Inch, that is, as high as the Cartilage of the first true Rib, and a little higher than the Curvature of the Aorta. At this Place it terminates by a Bifurcation or Division into two large Branches or subordinate Trunks, one of which runs toward the left hand, the other toward the right.

20. THESE two Branches are named Subclaviæ, as lying behind, and in some measure, under the Claviculæ, both in the same manner. They

are of unequal lengths, because the Trunk of the Vena Cava does not lie in the middle of the Thorax, but toward the right Side, where the left Subclavian arises as well as the right, and is consequently longest.

21. THE Trunk of the Superior Cava from where it leaves the Pericardium to the Bifurcation, sends out anteriorly several small Branches, which sometimes arise separately and sometimes by small common Trunks. These Branches are the Vena Mediaſtina, Pericardia, Diaphragmatica Superior, Thymica, Mammaria Interna, and Trachealis, the last of which go out sometimes behind the Bifurcation.

22. ALL these small Branches from the Trunk of the Cava Superior are termed *Dextræ*; and their fellows on the other side called *Siniſtræ* do not arise from the Trunk, because of its lateral Situation, but from the left Subclavia.

23. POSTERIOURLY, a little above the Pericardium, the Trunk of the Superior Cava sends out a capital Branch, called Vena Azygos, or Vena ſine Pari, which runs down on the right Side of the Bodies of the Vertebrae Dorſi, almoſt to the Diaphragm; giving off the greateſt part of the Venae Intercoſtales and Lumbares Superiores.

24. THE two Subclaviae run laterally or toward each ſide, and terminate as they go out of the Thorax, between the firſt Rib and Clavicula, immediately before the anterior Inſertion of the Muſculus Scalenus.

25. THE right Subclavian, which is the ſhorteſt of the two, commonly ſends out four capital Branches; the Jugularis Externa, Jugularis Interna, Vertebralis and Axillaris, which laſt is rather a Continuation than a Branch of the Subclavia.

26. THE left Subclavian being longer than the right, for the reaſon already given, gives off firſt of all the ſmall Veins on the left ſide, anſwering thoſe on the right ſide that come from the Trunk of the Superior Cava, viz. the Mediaſtina, Pericardia, Diaphragmatica Superior, Thymica, Mammaria Interna and Trachealis.

27. NEXT to theſe ſmall Veins, called *Siniſtræ*, it detaches another ſmall Branch, called Intercoſtalis Superior *Siniſtra*, and then four large Branches like thoſe from the right Subclavian, viz. the Jugularis Externa, Jugularis Interna, Vertebralis and Axillaris, which are all termed *Siniſtræ*.

28. THE external jugular Veins are diſtributed chiefly to the outer parts of the Throat, Neck and Head; and ſend a ſmall Vein to the Arm, named Cephalica, which aſſiſts in forming a large one of the ſame Name.

29. THE internal jugular Veins go to the internal parts of the Neck and Head, communicating with the Sinuſes of the Dura Mater, and in ſeveral places, with the external jugular Veins.

30. THE vertebral Veins paſs through the Holes in the tranſverſe Apophyſes of the Vertebrae of the Neck, ſending Branches to the Neck and Occiput. They form the Sinuſ Venales of theſe Vertebrae, and communicate with the Sinuſes of the Dura Mater.

31. THE Axillary Veins are Continuations of the Subclaviae, from where theſe leave the Thorax, to the Axillae. They produce the Mammariae Internae,

ternæ, Thoracicæ, Scapulares or Humerales, and a Branch to each Arm, which, together with that from the external Jugularis, forms the Vena Cephalica.

32. AFTERWARDS the Axillary Vein terminates in the principal Vein of the Arm, called Basilica; which, together with the Cephalica, is distributed by numerous Ramifications to all the parts of the Arm, Fore-Arm and Hand.

33. THE Portion of the inferior Vena Cava contained in the Pericardium is very small, being scarcely the twelfth part of an Inch on the fore part, and not above a quarter of an Inch on the back part. From thence it immediately perforates the Diaphragm, to which it gives the Venæ Diaphragmaticæ Inferiores or Phrenicæ. *Vena Cava Inferior.*

34. IT passes next behind the Liver, through the great Sinus of that Viscus to which it furnishes several Branches, termed Venæ Hepaticæ.

35. IN this Course it inclines a little toward the Spina Dorsi and Aorta Inferior, the Trunk and Ramifications of which it afterwards accompanies in the Abdomen, all the way to the Os Sacrum; the Arteria Cæliaca and the two Mesentericæ only excepted.

36. THUS the inferior Cava sends out on each side, in the same manner with the Aorta, the Venæ Adiposæ, Renales, Spermaticæ, Lumbares, and Sacræ. Having reached to the Os Sacrum it loses the Name of Cava, and terminating by a Bifurcation, like that of the descending Aorta, it forms the two Venæ Iliacæ.

37. THESE Iliac Veins having given off the Hypogastricæ with all their Ramifications, to the Viscera of the Pelvis and to some other external and internal neighbouring Parts, go out of the Abdomen, under the Ligamentum Fallopii, and there take the Name of Venæ Crurales.

38. EACH Crural Vein sends off numerous Ramifications to all the lower Extremity; besides the Vena Saphena which goes out near the Origin of the Cruralis, and running along this whole Extremity, detaches many Ramifications, all the way to the Foot, as we shall see more particularly hereafter.

39. THE Vena Azygos or sine Pari is very considerable, and arises posteriorly from the Superior Cava a little above the Pericardium. *Vena Azygos, and Venæ Intercostales.*

40. IT is immediately afterwards bent backward over the Origin of the right Lung; forming an Arch which surrounds the great Pulmonary Vessels on that side, as the Arch of the Aorta does those of the left Side, with this difference only, that the Curvature of the Azygos is almost directly backward, whereas that of the Aorta is oblique.

41. FROM thence it runs down on the right side of the Vertebrae Dorsi on one side of the Aorta, and before the Intercostal Arteries; and getting behind the Diaphragm, it terminates by a very sensible Anastomosis, sometimes with the Vena Renalis, sometimes with a neighbouring Lumbar Vein, sometimes immediately with the Trunk of the Cava Inferior, and sometimes otherwise.

42. I have seen this Vein extremely large, resembling the Trunk of the inferior Cava, from the Diaphragm, to the Origin of the Renales; the

true Cava being through all this Space very narrow, or of the size of an ordinary Azygos.

43. THE Vena Azygos sends out first of all, two or three small Veins from the Top of the Arch, one of which goes to the Aspera Arteria; the others partly to the Aspera Arteria, and partly to the Bronchia, by the name of Venæ Bronchiales, accompanying the Ramifications of the Bronchial Artery.

44. AFTERWARDS the Azygos detaches from the Extremity of the Arch, a small Trunk common to two or three small Veins, called Intercostrales superiores Dextræ, which bring back the Blood from the first three Series of intercostal Muscles, and from the neighbouring Part of the Pleura.

45. THESE intercostal Veins send Branches through the intercostal Muscles to the Serratus superior Posticus, Serratus major, &c. and afterwards they run along the Interstices between the Ribs, communicating with the Venæ Mammariæ.

46. THEY likewise send small Branches backward to the Vertebral Muscles, and Canal of the Spine, where they communicate with the Venal Circles or Sinuses which bring back the Blood from the Medulla Spinalis.

47. As the Azygos runs down, it sends off the inferiour Intercostal Veins on the right side, one going to each Series of intercostal Muscles. These Veins run along the lower Edges of the Ribs, and perforate the Muscles by Branches, which go to the posteriour and external Part of the Thorax.

48. THEY communicate with the Venæ Thoracicæ, and most commonly with the Mammaria Interna; and lastly, more or less with each other, by perpendicular Branches, near the posteriour Extremities of the Ribs.

49. THE Azygos sends off likewise the left intercostal Veins, but seldom the whole number; for the superiour Veins come often from the left Subclavian, as we shall see in the History of that Vein. The inferiour intercostal Veins, to the number of six or seven, sometimes more, sometimes fewer, come often from the Trunk of the Azygos; and running between the Aorta and Vertebrae, to the Substance of which they give small capillary Twigs, they send off almost the same Ramifications with the Veins on the right side, and likewise some to the Oesophagus.

50. SOMETIMES these intercostal Veins come from a small common Trunk which goes out from that of the Azygos, and passing between the Aorta and Vertebrae is bent downward along the left side of the Vertebrae, in which Course, it detaches the Intercostals laterally. This small Trunk is in some Subjects bifurcated upward and downward, as it sends off the Intercostals; and in others there are two small common Trunks.

51. LASTLY, there is sometimes an intire Azygos on the left side, which proceeding from the Arch of the ordinary Azygos, is afterwards distributed in the same manner as the other on the right side; but this Disposition likewise varies very much.

52. THE Azygos having reached below the last Rib, sends off a large Branch, which bending outward, perforates the Muscles of the Abdomen, is ramified between their different Planes, and communicates with the like Ramifications of the last, or last two intercostal Veins.

53. SOMETIMES it sends off the Vena Diaphragmatica inferior, and likewise gives downward to the first, or first two transverse Apophyses of the Vertebrae Lumbares, a Branch which forms the first Venæ Lumbares Dextræ.

54. THESE Communications between the last Intercoastal, and first Lumbar Veins are very irregular, being sometimes by a Series of opposite Angles, sometimes by Areolæ, sometimes by a reticular Texture, &c. Sometimes the Extremity of the Vena Azygos communicates either mediately or immediately with the Vena Adiposa, and even with the Vena SpermatICA.

55. THE Pectorales internæ, are small Veins disposed in Pairs toward the right and left hand, behind the Sternum and parts near it, including the Diaphragmaticæ Superiores, or Pericardio-Diaphragmaticæ, Mediastinæ, Mammariæ internæ, Thymicæ, Pericardiæ, and Gutturales or Tracheales. *Venæ Pectorales Internæ.*

56. ALL these small Veins are divided into right and left; and these are both distributed much in the same manner; but they differ in their Origins, because of the Inequality in the Bifurcation of the Cava superior.

57. THE right Vena Mediastina goes out anteriorly from the Trunk of the superior Cava, a little above the Origin of the Azygos; the left comes from the Subclavia.

58. THE right superior Diaphragmatica or Pericardio-Diaphragmatica comes anteriorly from the Root of the Bifurcation near the Mediastina; and is distributed by several Branches to the upper, fore, and back Parts of the Pericardium, communicating with those of the left Diaphragmatica, and accompanying the Nerve of the same name. The left superior Diaphragmatica comes from the left Subclavian a little below the Origin of the Mammaria.

59. THE right internal Mammaria arises anteriorly from the Vena Cava, a little below the Angle of the Bifurcation. It runs along the nearest internal or posterior Edge of the Sternum, and on the cartilaginous Extremities of the right Ribs, together with the Artery of the same name. Having reached near the Diaphragm, it sends it a Branch which runs toward the tendinous Plane, and communicates with the common diaphragmatic Veins.

60. AFTERWARDS this mammary Vein gives small Branches to the Mediastinum, and others between the Ribs to the Integuments; of which those that pass between and under the Cartilages of the last true Ribs, run down on the inner or posterior side of the Musculi Recti Abdominis, being ramified among their fleshy Fibres, and communicating really with the Epigastric Veins by several small Twigs.

61. THE left internal Mammaria arises anteriorly from the left Subclavian, opposite to the Cartilage or anterior Extremity of the first true Rib.

62. THE right Vena Thymica, when it arises separately, goes out from the Bifurcation; and when it is wanting, the Thymus from whence it takes its name, is furnished by the Gutturalis or some other neighbouring Vein. This Vein often reaches no lower than the inferior Part of the Thymus; and the left Vein of the same name comes from the left Subclavian, almost opposite to the Sternum.

63. THE right Pericardia seems to go out rather from the Origin of the right Subclavian, than from the Trunk of the superior Cava; but in this there

there are many Varieties. It goes to the upper side of the Pericardium, and other neighbouring Parts. The left Pericardia comes sometimes from the left Subclavian, before the Mammaria, and sometimes from the Mammaria or Diaphragmatica superior on the same side.

64. THE right Gutturalis or Trachealis goes out from the upper part of the Bifurcation, above the Mammaria of the same side, sometimes more backward, and sometimes from the Subclavia. It is distributed to the Glandulæ Thyroidææ, Trachea Arteria, Musculi Sterno-Hyoidæi, Thymus and Glandulæ Bronchiales. It communicates by lateral Branches more or less contorted, with the internal jugular Vein, and sometimes by another Branch, with a small Vein, which the internal Jugular sends to the Glandula Thyroides. The left Gutturalis comes from the upper or posterior Part of the left Subclavian near its Origin.

65. THE smallest internal pectoral Veins do not always arise separately, but have sometimes a small common Trunk, especially on the right side; and of all these small Veins, the Mammaria interna is the most considerable.

Vena Sub-claviæ.

66. THE right subclavian Vein, as has been already said, is very short, and its Course very oblique, so that it appears to rise higher than the left Vein. It sends off first of all, four large Branches, already mentioned, viz. the Vertebralis, which is the first and most posteriour; the Jugularis interna, Jugularis externa and Axillaris.

67. THE left Subclavian seems to ascend but very little, after the Bifurcation, because it runs further and more transversely than the right; and in this Course it covers the Origin of three large Arteries, which come from the Curvature of the Aorta. It sends off four large Branches besides the small pectoral Veins, and receives the Ductus Thoracicus.

68. IT likewise gives off, before its principal Division, a small Trunk for the left superiour Intercostals, which are sometimes six in number, and communicate with the inferiour Intercostals, and with a Branch of the Vena Azygos. This small common intercostal Trunk furnishes likewise the left Bronchialis.

69. EACH Subclavian Vein near the middle of the Clavicula, sends off a Branch call'd Cephalica, which descends near the Surface of the Body, between the Deltoides and Pectoralis Major, and reaches the Arm in the manner which shall be related hereafter.

Vena Jugulares Externa.

70. Each external jugular Vein arises from the Subclavian on the same side, sometimes from the Axillaris, and sometimes from the Union of these two Veins. The right and left do not always arise in the same manner; for sometimes the right comes from the Subclavian, and the left from the internal Jugular on the same side. They run up between the Musculus Cutaneus and Sterno-Mastoidæus, being covered by the former, and crossing over the latter.

71. SOMETIMES they are double from their very Origins; and when they are single, each of them divides afterwards into two, one anteriour, and the other posteriour or rather superiour. The anteriour Vein goes to the Throat and Face, running up toward the Angle of the lower Jaw, and the posteriour goes to the Temples and Occiput.

72. THE antierour external jugular Vein is often a Branch of the Jugularis interna, and sometimes arises from the Communications of the two Jugulares in such a manner as that it cannot be said to belong more to the one than to the other. Sometimes, but very rarely, it comes from the Vena Axillaris. *Vena Jugularis Externa Anterior.*

73. IT runs up toward the lateral Part of the lower Jaw, between the Angle and the Chin, like a Vena Maxillaris, and sends several Branches forwards, backwards and inwards.

74. POSTERIOURLY it gives, (1) a large Branch on the side of the upper Part of the Larynx, which communicates with the Jugularis interna; and likewise with a large short Branch of the Jugularis externa posterior, of which below. (2) A small Branch which has the same Communication, but which is not always to be found. (3) Another small Branch a little below the lower Jaw, which communicates with the Jugularis externa posterior.

75. ANTERIOURLY it sends several Branches to the Muscles of the Larynx, Sterno-Hyoidæi, Thyro-Hyoidæi and to the Integuments; and below the Larynx it sends communicating Branches to the Jugularis externa Anterior of the other side.

76. A little higher, opposite to the Cartilago Thyroides, it gives off a transverse Branch, which runs on the antierour and lower Part of the Musculi Sterno-Mastoidæi, and communicates with the Jugularis of the other side, tho' not always by a Vein of the same kind.

77. THE superiour and inferiour transverse Branches communicate on each side by Branches more or less perpendicular, and send a small Branch to the Musculus Quadratus of the Chin, to the Musculus Cutaneus and Integuments.

78. IT sends another large Branch antierourly toward the Symphysis of the lower Jaw, which after having supplied the maxillary Glands, is distributed to the Digastric Muscle, to the Chin and under Lip.

79. INTERIOURLY at the same place it sends out a large Branch, which furnishes the Glandulæ Sublinguales, runs down toward the Cornua of the Os Hyoides, to communicate with some Branches of the Jugularis interna, and sends several Rami to the Tongue, called Venæ Raninæ. It gives off likewise a small Branch, which running upon the Musculus Labiorum Triangularis, to the Commissure of the Lips, is distributed to the neighbouring Parts.

80. THE same Branch which gives out the Venæ Raninæ, detaches another to the lateral Parts of the Septum Palati, which is distributed to the Amygdalæ, and to the Uvula, and sends Rami forward to the Membrane, which lines the Arch of the Palate. Another Branch goes out from it to the Pterygoidæus internus, Peristaphylini and Cephalo-Pharyngæi.

81. AFTERWARDS the Trunk of the antierour external jugular Vein runs up on the Musculus Triangularis, where it receives the Name of Vena Triangularis, in a winding Course from the Angle of the lower Jaw to the great or internal Angle of the Orbit, sending Branches on each side to the Muscles and Integuments.

82. THESE Branches communicate with each other, especially one which passes under the Zygoma, behind the Os Malæ, to the inferiour Orbital or Spheno-Maxillary Fissure, and another small Branch, which runs along the inferiour Portion of the Orbital Muscle, to the small or external Angle of the Eye, where it communicates with the Rami Temporales and Frontales.

83. IT is here to be observed that under the Angle of the lower Jaw, there is a great variety of Communications between the external and internal jugular Veins, and also a great Variety in the Distribution of these Veins.

84. ALMOST all the Ramifications, which at this place go from the external jugular Vein, to be distributed on the upper part of the Throat and on the Face in some Subjects, arise in other Subjects from the internal Jugular; and sometimes, one part of them comes from the external Jugular, the rest from the internal.

85. THE Trunk of the Vena Angularis having reached the Bones of the Nose, sends out a Branch through the lateral Cartilages of the Nose, which is distributed to the Nares; and another which runs down in a winding Course to the upper Lip.

86. AT the great or inner Angle of the Eye, the same Trunk sends off several other Branches; the first of which goes to the Root of the Nose, and communicating with its Fellow from the other side, gives several small Veins to the Holes of the Ossa Nasi.

87. THE second Branch runs up on the Forehead, by the name of Vena Frontalis, antiently Præparata; and is distributed to each side, communicating with its Fellow, when any such Vein is found.

88. THE third Branch enters the Orbit in a winding Course, on one side of the Cartilaginous Pulley, and communicates with the Sinuses of the Dura Mater, by the Orbital Sinus of the Eye.

89. THE fourth Branch goes along the Musculus superciliaris and the upper part of the Orbicularis, to the small or external Angle of the Eye, to communicate with the Vena Temporalis and with that Vein which runs along the lower part of the orbicular Muscle, with which it forms a kind of Circle.

Vena Jugularis externa posterior, sive superior.

90. THE posteriour or superiour external jugular Vein runs up toward the parotid Gland, and lower anterior part of the Eye, giving out several considerable Branches toward each side.

91. AT its Origin it sends out posteriourly, a principal Branch with its Ramifications, to the Muscles which cover the Scapula, and Joint of the Humerus, commonly called Vena Muscularis, and which might be named Super-Humeralis.

92. A little higher, it gives off the Vena Cervicalis which goes to the vertebral Muscles of the Neck. This Vein communicates with the Humeralis by several Areolæ, or venal Mashies, and they are both ramified in different manners.

93. THESE Ramifications and Communications are in part covered by the Musculus Trapezius, and communicate likewise with some Branches of the Vena Occipitalis, and with a Branch of the superior intercostal Vein, which perforates the first intercostal Muscle.

94. NEAR the cervical Vein, but a little more outward, it gives off sometimes the small Vena Cephalica, which runs down between the Pectoralis Major and Deltoides, as was said No 69. and unites with the Vena Cephalica of the Arm, which shall be described hereafter.

95. BACKWARD it detaches the Vena Occipitalis, which is distributed on the Occiput, and sometimes comes from the Vena Vertebralis or Axillaris, &c. It likewise sends out a small Vein, which enters the Cranium by the posterior Mastoide Hole, and terminates in one of the lateral Sinuses of the Dura Mater. This Branch comes sometimes from another Vein.

96. HAVING reached as far as the Parotid Gland, it forms Communications with the anterior external Jugular, under the Angle of the lower Jaw; and then passes through the Parotid Gland, between that Angle and the Condyle, giving off a large Branch which communicates with another Branch common to the internal and anterior external Jugulars.

97. SOMETIMES there are several Branches, which having run a very little way, unite together and represent the short large Branch, forming Aræolæ or Meshes through which the Nerves pass.

98. AFTERWARDS it passes before the Ear, taking the name of Vena Temporalis, which is distributed to the Temples and lateral Parts of the Head, towards the Occiput and Fore-head. Sometimes the Temporal Vein has two Origins, whereof one is from the Jugularis interna.

99. THE Temporal Vein of one side communicates above, with its fellow on the other side; before, with the Vena Frontalis, and behind, with the Vena Occipitalis. Opposite to the Ear, it gives out a large Branch, one Ramus of which runs under the lower Edge of the Zygoma, and then returning, communicates with another Ramus from the same Jugularis, a little below the Condyle of the lower Jaw, forming a kind of Island irregularly round.

100. BEHIND this Condyle, it gives Branches to the Temporal Muscle, to the neighbouring parts of the upper Jaw, and to the inside of the lower Jaw, almost in the same manner as is done by the Arteries.

101. ONLY one of these Branches runs from without inward, between the Condylode and Coronode Apophyses, to be distributed to the Musculus Temporalis and Pterygoidæi; sending off a Ramus to the Masseter, in its Passage.

102. THE internal jugular Vein, is the largest of all those that go to the Head; tho' not so large as it seems to be, when injected.

103. IT runs up behind the Sterno-Mastoidæus and Omo-Hyoidæus which it crosses; along the sides of the Vertebrae of the Neck, by the edge of the Longus Colli, to the Fossula in the Foramen Lacerum of the Basis Cranii.

104. THE first Branches which it sends off are small and go to the Thyroide Glands. About two Fingers breadth higher up, it detaches a middle-sized Branch which runs laterally toward the Larynx, and may be named Vena Gutturalis.

105. THIS Guttural Vein divides chiefly into three Branches; the lowest of which goes to the Thyroide Gland and neighbouring Muscles; the middle

Vena Jugularis Interna.

Branch to the Larynx, Musculi Thyroidæi, &c. and the third runs upward to the great Communication between the two Jugulares already mentioned. In this, however, there is some variety, and I have seen the left Guttural Vein go out from the Axillaris.

106. ABOUT the same distance upward, almost opposite to the Os Hyoides, the internal Jugular gives another Branch, which sends Rami to the Muscles belonging to that Bone, and others which communicate with the foregoing Branch. This other Branch runs upward toward the parotid Gland and Angle of the lower Jaw, where it sends communicating Branches forward and backward to the two external Jugulares.

107. IT is at this place likewise that the internal Jugular sometimes produces the Vena Maxillaris Interna and all its Ramifications, as has been already said in the Description of the Jugularis Anterior Externa.

108. THE internal Jugular sends another Branch backward, which is distributed to the Occiput, where it communicates with a Branch of the Vertebralis; and through the posterioir Mastoide Hole, with the lateral Sinus of the Dura Mater. This Communication is sometimes by an Anastomosis with a Branch of the external Jugular, or of the Cervicalis which goes thither.

109. AFTERWARDS it reaches the Foramen Lacerum of the Basis Cranii, bending a little, and sending off small Twigs to the Pharynx and neighbouring Muscles.

Vena Vertebralis.

110. THE Vertebral Vein arises posteriorly from the Subclavia or Axillaris, sometimes by two Stems, sometimes by one, which soon afterwards divides into two.

111. THE first and principal Stem gives out a Branch called Vena Cervicalis, which is distributed to the neighbouring Muscles, and afterwards runs up through the Holes of the transverse Apophyses of the Vertebrae Colli. This cervical Branch comes sometimes from the Axillaris.

112. THE other Stem of the vertebral Vein runs up on the side of the Vertebrae, and having reached the fourth, or sometimes higher, it runs in between the transverse Apophyses of that Vertebra and of the fifth, to join the first or principal Stem.

113. THUS the vertebral Vein accompanies the Artery of the same name, sometimes in one Trunk, sometimes in several Stems, through all the Holes of the transverse Apophyses of the Vertebrae Colli, all the way to the great Foramen Occipitale, communicating with the occipital Veins and small occipital Sinuses of the Dura Mater.

114. IN its passage it gives off one Branch which enters by the posterior Condylode Hole of the Os Occipitis, and communicates with the lateral Sinus of the Dura Mater; but it is not always to be met with.

115. As these Veins run through the Holes in the transverse Apophyses, they send Branches forward to the anterior Muscles of the Neck, and to the small interior Muscles of the Head.

116. OTHER Branches go likewise outward and backward to the Musculi Transversales and Vertebrales Colli; and inward to the great Canal of the

the spinal Marrow, where they form Sinuses, which communicate with those on the other side.

117. THESE vertebral Sinuses are pretty numerous, and placed one above another all the way to the Occiput; the lower communicate with the upper; and at the great Foramen of the Os Occipitis there is a Communication between them and the occipital Sinuses of the Dura Mater.

118. THE subclavian Vein having sent off the Branches already described, goes out of the Thorax, and passes before the anterior Portion of the Musculus Scalenus, and between the first Rib and the Clavicle, to the Axilla. Through this Course it takes the name of Vena Axillaris, and gives off several Branches, the chief of which are the Venæ Musculares, Thoracicæ and Vena Cephalica, which is sometimes double. *Vena Axillaris.*

119. THE first Veins which it sends off are the Musculares, distributed to the middle Portion of the Musculus Trapezius, to the Angularis, Infra-Spinatus and Subscapularis; and as some of these Branches go to the Shoulder exteriorly, others interiorly; the Venæ Scapulares are distinguished into external and internal.

120. A little before the Axillaris reaches the Axilla, it sends out the Venæ Thoracicæ, one of which is superior, called also, Mammaria Externa, and the other inferior. It likewise sends Rami to the Musculus Subscapularis, Teres Major, Teres Minor, Supra-Spinatus, Latissimus Dorsi, Serratus Major, Pectoralis Minor, Pectoralis Major, and to the Glands of the Axilla; and sometimes gives a communicating Branch to the Vena Basilica.

121. THE Axillaris having reached the side of the Head of the Os Humeri, produces a very considerable Branch named Vena Cephalica, and afterwards runs along the Arm by the name of Vena Basilica; which however appears sometimes to be rather a Branch, than a Continuation of the Trunk of the Axillaris; in which case the Cephalica and Basilica might be looked upon as two principal Branches of the Axillary Vein.

122. THE Cephalic Vein which is a Branch of the Axillaris, at a small distance from its Origin, joins the small Cephalica which runs down from the Subclavia or Jugularis externa; having till then run near the Surface of the Body between the Deltoides and Pectoralis major, and sometimes these two Veins communicate before their Union. *Vena Cephalica.*

123. THE great Cephalica runs down between the Tendons of the last mentioned Muscles, and along the outer Edge of the external Portion of the Biceps; communicating several times with the Vena Basilica, and sending small Rami on each side, to the neighbouring Muscles, Fat and Skin. Some Branches go out from its upper part, which, lower down unite again with the Trunk.

124. A little below the external Condyle of the Os Humeri, it detaches a Branch backward, which runs up between the Musculus Brachialis and the upper Portion of the Supinator Longus, and afterwards bends back between the Os Humeri and Anconæus Externus, where it communicates with some Branches of the Basilica.

125. **HAVING** reached very near the Fold of the Arm, it is divided into two principal Branches, one long, the other short. The long Branch is named *Radialis Externa*, and the short one may be called *Mediana Cephalica*, to distinguish it from another *Mediana*, which is a short Branch of the *Basilica*; and therefore ought to be called *Vena Mediana Basilica*.

126. **THE** external radial Vein runs along the Radius between the Muscles and Integuments, giving off Branches toward both sides, which communicate with other Branches of the same Vein, and with some from the *Basilica*, forming *Areolæ* much in the same manner as the *Saphena* does in the lower Extremity.

127. **THE** *Mediana Cephalica* runs down obliquely toward the middle of the Fold of the Arm, under the Integuments, and over the Tendon of the Biceps, where it joins a short Branch of the same kind from the *Basilica*, which I have already named *Mediana Basilica*. These two *Medianæ* unite in an Angle, the Apex of which is turned downward.

128. **FROM** this angular Union, or *Anastomosis*, a considerable Branch goes out, which runs down on the Fore-Arm, uniting on one side with the *Vena Cephalica*, and communicating on the other with the *Basilica*, by several irregular *Areolæ*. The Name of *Mediana* is given to this large Branch, as well as to the two short ones, by the Union of which it is formed; but that they may not be confounded, this large Branch may be termed *Mediana Major* or *Media*, the Names already given to the other two, being retained.

129. **FROM** this Union of the two lateral *Medianæ*, and sometimes from the Origin of the *Mediana Media*, which is the true *Mediana* of *Riolan*, a Branch goes out which runs down on the inside of the Fore-Arm, opposite to the interosseous Ligament, and is called *Vena Cubiti Profunda*. It goes to the neighbouring Muscles, and communicates with the other Veins of the Fore-Arm. The *Mediana Cephalica* sometimes sends down a long Branch, called *Radialis Interna*, which lies almost parallel to the *Radialis Externa* already mentioned.

130. **AFTERWARDS**, the *Cephalica* having reached the Extremity of the Radius, is distributed by numerous *Areolæ*, almost in the same course with the radial Artery.

131. A particular Branch goes out from it, which runs more or less superficially between the Thumb and Metacarpus, by the name of *Cephalica Pollicis*. The *Areolæ* furnish the interosseous Muscles and Integuments, and communicate with a small Ramus from the *Basilica*, called by the Ancients *Salvatella*.

Vena Basilica.

132. **THE** Ancients termed the *Basilic Vein* of the right Arm, the Vein of the Liver, or *Vena Hepatica Brachii*; and that of the left Arm, the Vein of the Spleen, or *Vena Splenica Brachii*. It has sometimes a double Origin, by a Branch of Communication with the Trunk of the *Axillaris*.

133. **IT** sends off first of all, under the Head of the *Os Humeri*, a pretty large Branch, which passes almost transversely round the Neck of that Bone, from within, backward, and from behind, outward, running up on the Scapula, where it is ramified on the *Deltoides*, and communicates with the *Venæ Scapulares*.

Scapulares externæ. This Branch may be named *Vena Sub-humeralis* or *Articularis*, as the Artery which lies in the same place; they both having much the same Course.

134. THIS articular Vein sends down two principal Branches, one of which runs along the inside of the Bone, to which, and to the Periosteum, it gives small Veins. The other turns forward, toward the middle of the Arm between the Bone and the Biceps, and communicates with the *Cephalica*.

135. BELOW the Neck of the *Os Humeri*, near the Hollow of the *Axilla*, and behind the Tendon of the *Pectoralis Major*, the *Basilica* sends out a considerable Branch, which runs down on the side of the *Brachial Artery*, and furnishes the neighbouring Muscles on both sides. This Vein is named *Profunda Brachii*, or *Profunda superior*.

136. IMMEDIATELY afterwards, the *Basilica* detaches two or three small Veins, which run down very closely joined to the *Brachial Artery*, surrounding it at different distances by small Twigs, which communicate with each other. These Veins might be named *Venæ Satellites Arteriæ Brachialis*.

137. THESE small Veins which often arise from the *Profunda superior*, communicate with the *Basilica* and *Cephalica*; and having reached the Fold of the Arm, they divide like the Artery, and the same Divisions are continued along the whole Fore-Arm, through all which Space they accompany and surround the arterial Branches, in the manner already said.

138. AFTERWARDS the *Basilica* continues its Course along the inside of the *Os Humeri*, between the Muscles and Integuments, forming many Communications with the *Vena Profunda*, *Satellites* and *Cephalica*, and supplying the Muscles and Integuments.

139. HAVING reached the inner Condyle, and having sent off obliquely in the Fold of the Arm, the *Mediana Basilica*, it runs along the *Ulna*, between the Integuments and Muscles, a little toward the outside, by the name of *Cubitalis externa*, still communicating with the *Profunda*, *Satellites* and *Cephalica*.

140. HAVING detached the *Mediana Basilica*, it sends out another Branch, which runs down along the inside of the Fore-Arm near the *Ulna*, and communicates with the *Mediana major*, &c. This Branch may be named *Cubitalis interna*.

141. THE *Basilica* having at length reached the Extremity of the *Ulna*, sends several Branches to the convex side of the *Carpus*; one of which named *Salvatella*, goes to that side of the Little Finger next the Ring-Finger, having first communicated with the *Cephalica*, by means of the *Venal Areolæ* conspicuous on the back of the Hand. In the other Fingers this Vein follows nearly the same Course with the Artery.

142. IN general, the external or superficial Veins of the Fore-Arm are larger than the internal; but they are accompanied only by small Arteries; whereas the deep Veins accompany large Arteries.

143. THE inferiour *Vena Cava* having run down about a quarter of an *Vena Cava* inch from the right Auricle of the Heart, within the *Pericardium*, as has *Inferior* been

been already said, pierces that Membrane, and the tendinous Portion of the Diaphragm which adhere very closely to each other.

144. AT this place it gives off the *Venæ Diaphragmaticæ* or *Phrenicæ*, which are distributed to the Diaphragm, and appear chiefly on its lower side, one towards the right hand, and one toward the left. The right Vein is more backward and lower than the left. The left is distributed partly to the Pericardium, and partly to the Diaphragm; and sometimes they send *Rami* to the *Capsulæ Renales*, much in the same manner as the *Arteriæ Phrenicæ*.

145. THE inferiour Cava having perforated the Diaphragm, passes through the posteriour part of the great Fissure of the Liver, penetrating a little into the Substance of that Viscus, between the great Lobe and the Lobulus *Spigellii*, being however covered but very little on the back side by the Substance of the Liver, till it reaches the Lobulus.

146. IN its passage, it sends off commonly three large Branches, called *Venæ Hepaticæ*, which are ramified in the Liver. Sometimes there are only two, and sometimes four.

147. BESIDES these large Branches, it sends out some other small ones, either before or immediately after it goes out of the Liver; which, according to some Anatomists, answer to the Branches of the Hepatic Artery, as the large Branches do to those of the *Vena Portæ*.

148. IN the Fœtus, as the *Vena Cava* passes by the Liver, it gives off the *Ductus Venosus*, which communicates with the Sinus of the *Vena Portæ*, and in Adults is changed to a flat Ligament.

149. AFTER its passage through the Liver, the *Vena Cava* turns from before backward, and from right to left, toward the *Spina Dorsi*, placing it self on the right side of the Aorta, which it accompanies from thence downward.

150. HAVING got as low as the *Arteriæ Renales*, it gives off the Veins of the same name, termed formerly *Venæ Emulgentes*, and which are the largest of all the Veins that go from the Cava inferior, from the Liver to the Bifurcation.

151. THE right Renal Vein is the shortest, and runs down a little obliquely because of the Situation of the Kidney. The left Vein, which is the longest, crosses on the foreside of the Trunk of the Aorta, immediately above the superiour Mesenteric Artery; and both Veins accompany the Renal Arteries.

152. THEY send up the *Venæ Capsulares*, which go to the *Glandulæ Renales*, and downward, the *Venæ Adiposæ*, which go to the fatty covering of the Kidneys; and ordinarily the left Renal Vein furnishes the left Spermatic Vein. Afterward they run to the Sinus or Cavity of the Kidneys, in the Substance of which they are distributed by numerous Ramifications.

153. A little below the Renal Veins, the Trunk of the Cava sends out anteriorly toward the right side, the right *Vena Spermatica*. The left spermatic Vein comes commonly, tho' not always, from the left Renalis, as has been already observed. Both Veins accompany the spermatic Arteries, to the Parts to be mentioned hereafter.

154. IN their passage, they send several small Branches on each side, to the Peritonæum and Mesentery, where they seem to be joined by Anastomoses with the Venæ Mesaraicæ, and consequently with the Vena Portæ.

155. THEY sometimes send a considerable Branch over the Iliac Muscle, which afterwards dividing into two, one Ramus runs up to the Membrana Adiposa of the Kidneys, the other runs down on the last-mentioned Muscle.

156. ABOUT the same height with the spermatic Vein, the inferiour Cava sends off posteriorly in some Subjects, a Branch which runs upward, and communicates with the Vena Azygos. Sometimes this Branch goes out from one or other of the Renales, and appears to be a true Continuation of the Extremity of the Azygos.

157. THE Cava sends likewise off posteriorly the Venæ Lumbares, which commonly arise in Pairs in the same manner as the Arteries of the same name go out from the Aorta. These may be divided into superiour and inferiour Veins.

158. THEIR Origins vary in different manners. Sometimes the Cava gives off a Branch to each side below the first Vertebra of the Loins, which, like a common Trunk, furnishes the Lumbar Veins. This Branch communicates with the Azygos.

159. SOMETIMES a considerable Branch goes out from the lower Extremity of the Cava, near the Bifurcation, chiefly on the right side; which afterwards running up between the Bodies and transverse Apophyses of the Vertebrae, detaches the Venæ Lumbares, and communicates with the Azygos.

160. SOMETIMES a like Branch comes from the beginning of the left Vena Iliaca, and running up on that side in the same manner, produces the Lumbares. This Branch likewise communicates with the Azygos, and with the superiour or descending Ramus Lumbaris.

161. THE Venæ Lumbares on one side, communicate by transverse Branches with those of the other side, and likewise with each other by Branches more or less longitudinal. The first and second often go from the Azygos, and thereby they communicate with the intercostal Veins.

162. THE Lumbar Veins send small Capillaries, in their passage, to the Substance of the Bodies of the Vertebrae; and they are distributed to the Muscles of the Abdomen, Quadratus Lumborum, Psoas, Iliacus, &c. They send Branches backward to the neighbouring vertebral Muscles, and to the Canal of the Spine, and communicate with the venal Sinuses in the same manner as the Intercostals.

163. THE inferiour Cava having reached as low as the last Vertebra of the Loins, and near the Bifurcation of the Aorta, runs in behind the right Iliac Artery, and there is divided into two Subaltern Trunks, called the right and left Iliac Veins.

164. THE Extremity of the Trunk of the Vena Cava passes in some Subjects behind the Origin of the right Iliac Artery; in others, it is the left Iliac Vein which passes there, and consequently crosses the right Iliac Artery.

Afterward

Afterward the left Iliac Vein accompanies the inside of the left Artery, till it goes out of the Abdomen. Therefore the Iliac Veins lie on the insides of the Arteries at this place.

165. FROM this Bifurcation of the Vena Cava, and often from the Origin of the left Iliaca, the Vena Sacra goes out, and accompanies the Artery of the same name in its distribution to the Os Sacrum, to the Nerves which lie there, and to the Membranes which cover both sides of that Bone.

ve Iliacæ.

166. EACH original Iliac Vein is divided on the side of the Os Sacrum, much after the same manner as the Arteries, into two large Trunks, or secondary Iliac Veins. This second Bifurcation is about a Finger's breadth below that of the Iliac Arteries.

167. ONE of these Trunks is named Vena Iliaca Externa, or Anterior; the other Interna, or Posterior. The external Vein is likewise named simply Iliaca, and the Internal, Hypogastrica. The external Vein seems to be the true Continuation of the Trunk, and the Hypogastrica only a Branch. I here speak of adult Bodies, because in the Fœtus there is a considerable Variation.

168. THESE Veins follow nearly the Course and Distribution of the Iliac Arteries, except that the Hypogastric Vein does not send off the Vena Umbilicalis. The external Iliac Veins lie more or less on the inside of the Arteries, in the manner already said; but the Hypogastric Veins, in the bottom of the Pelvis, lie almost behind the Arteries on the same side.

169. FROM the common Trunk of the Iliac Veins, and sometimes from the Origin of the Iliaca Externa, a particular Branch goes out, which is distributed to the Musculus Psoas, Iliacus, and Quadratus Lumborum; and afterwards sends a Ramus on the fore-side of the last transverse Apophysis of the Loins, to communicate with the last Lumbar Vein.

170. THE external Iliac, a little before it leaves the Abdomen, near the Ligamentum Falloppii, lying on the Psoas and Iliac Muscles, gives off almost the same Branches with the Artery of the same name, and follows the same Course. The chief Branches are these.

171. A little before it goes out of the Abdomen, it sends off from the outside, a small Branch, which runs up along the Crista of the Os Ilium, and gives Branches on each side, to the lateral and posterour lower Portions of the Musculi Abdominis, to the Musculus Iliacus, &c.

172. FROM the inside, before it leaves the Abdomen, it sends off the Vena Epigastrica; which having furnished some small Rami to the neighbouring conglobated Glands, runs up along the inside of the Musculi Recti, on which it is ramified both ways; as also on the broad Muscles of the Abdomen, by other small Branches, which penetrate from within outwards.

173. AFTERWARDS, the Vena Epigastrica runs upward, and joins the Ramifications of the Mammaria, by an equal Number, accompanying the Epigastric Artery. From the inside of the Epigastric Vein, a Branch is sometimes detached to the Musculus Obturator Internus, where it joins another Ramus named Vena Obturatix.

174. BEFORE the Iliac Vein gets from under the Ligamentum Falloppii, it sends several small Rami to the neighbouring Lymphatic Glands; and immediately afterwards, losing the name of Iliaca, it takes that of Cruralis.

175. THE Hypogastric or internal Iliac Vein, runs behind the Artery of *Vena Hypo-* the same name, making the same kind of Arch, from which the following *gastrica.* Branches go out.

176. FROM the posteriour or convex part of the Arch, it gives a Branch to the superiour lateral part of the Os Sacrum, which is distributed to the Musculus Sacer or Transverso-Spinalis Lumborum, and other Muscles thereabouts, and to the Cavity of the Bone, which it enters through the first great Hole.

177. A little lower, on the same side, it sends out another, which is distributed much in the same manner with the former, and enters the second Hole.

178. FROM the external lateral part of the same Arch, a little anteriorly, it sends out a large Branch, which runs behind the great Sciatic Sinus, and is distributed to the Musculi Glutæi, Pyriformis and Gemelli.

179. LOWER down, the same lateral part of the Hypogastric Vein gives out another large Branch; which having run a little way, detaches several Rami, and afterward reaching the Foramen Ovale of the Os Innominatum, perforates the Obturator Muscles, communicates with the Vena Cruralis, and is distributed to the Musculus Pectineus, Triceps, and neighbouring Parts. This Vein is termed Obturatrix, from its passing thro' the Muscles of that name.

180. AMONG the Branches sent off by the Vena Obturatrix, before it perforates the Muscles, one is situated exteriorly, which runs toward the Sciatic Sinus, to the Musculus Iliacus, the superiour part of the Obturator Internus, and to the Os Ilium, near its Symphysis with the Os Ischium.

181. INTERIOURLY, the same Obturator Vein sends off another Branch, which is distributed to the Ureters, Bladder, and internal parts of Generation in both Sexes. It communicates with the Spermatic Veins, and is more considerable in Women than in Men.

182. LASTLY, the Hypogastric Vein runs backward, and goes out of the Pelvis, above the Ligament which lies between the inferiour lateral part of the Os Sacrum and Spine of the Ischium; and as it goes out, it is ramified chiefly upward and downward.

183. IT sends a large Branch upward to the lower part of the Os Sacrum, and two or more downward; which running behind the same Ligament, are distributed to the Buttocks, Anus, neighbouring Portion of the Musculus Pectineus, and to the external Parts of Generation, nearly in the same manner with the Artery which accompanies them.

184. THE Veins that go to the Anus, are termed Hæmorrhoidales Externæ, and they that go to the Parts of Generation, Pudicæ Internæ. The external Hæmorrhoidales communicate with the internal Veins of the same Name, which come from the small Vena Mesaraica, one of the Branches of the Vena Portæ, as we shall see hereafter.

*Vena Cru-
ralis.*

185. THE Crural Vein goes out under the Ligamentum Falloppii, on the inside of the Crural Artery, and immediately gives small Branches to the Inguinal Glands, the Musculus Pectineus, and Parts of Generation. These last are termed Pudicæ Externæ, and evidently communicate with the internal Veins of the same name.

186. ABOUT an Inch below where it leaves the Abdomen, the Crural Vein produces a large Branch, which runs down anteriorly between the Integuments and the Sartorius, following the Direction of that Muscle almost all the way to the inside of the Thigh.

187. THIS Branch having afterwards got beyond the Condyles of the Os Femoris, runs down between the Integuments and inner Angle of the Tibia, to the fore part of the inner Ankle, and is distributed to the Foot. All this large Branch is named Vena Saphena, or Saphena Major.

188. AFTER the Origin of the Saphena, as the Trunk of the Crural Vein runs down, it sinks in between the Muscles, and is distributed to all the inner or deep parts of the lower Extremity, accompanying the Crural Artery to the very Extremity of the Foot, being all along more considerable than the Artery, both for Capacity and Ramifications, a thing very common in the Veins.

189. As the Saphena is a Vein of very large extent, I shall here describe it all together, and afterwards return to the Vena Cruralis.

*Vena Sa-
phena.*

190. THE Vena Saphena, in its passage from the Inguen to the Foot, is covered only by the Skin and Fat. Immediately after its rise, it gives small Veins to the inferior Inguinal Glands; and then it gives out others more anteriorly, which running under the Integuments, communicate with each other by numerous Areolæ, or Masles. Sometimes these Communications come all from the Rami of one Branch.

191. THE Saphena having run down on the Thigh, as low as the middle of the Sartorius, sends off to the same side several Branches, which communicate with each other, and with the superior Branches already mentioned; and as they run down, they communicate again with the Trunk of the Saphena.

192. THESE two sorts of Communications furnish a third collateral kind, from which likewise particular Branches are detached, which communicate with each other at different distances all the way to the Knee.

193. BETWEEN these upper and lower Branches, the Saphena sends backward a particular Branch; which, after being distributed to the Integuments which cover the Gracilis Internus and Triceps, turns backward; and a little below the Ham, runs in among the Muscles situated there, and communicates with another Branch, which may be termed Saphena Minor.

194. AFTERWARDS the Trunk of the great Saphena runs down on the inside of the Tibia, lying always near the Skin; and at the upper part of that Bone, it sends Branches forward, outward and backward.

195. THE anterior Branches go to the Integuments on the upper part of the Leg; the posterior, to those which cover the Gastrocnemii, and communicate with the little Saphena; and the external Branches are likewise distributed

distributed to the Fat and Integuments, and having reached as low as the middle of the Tibia, it sends a communicating Branch to the Trunk of the great Saphena.

196. FROM this Communication, a Branch goes out anteriorly, which runs along the Integuments of the Tibia all the way to the outer Ankle, having in its passage communicated again with the great Saphena.

197. As the Saphena runs down on the inside of the Tibia, it sends out a Branch near the middle of that Bone, which runs up behind the Tendons of the Sartorius, Gracilis Internus, and Semi-Nervosus, then between the Tibia and upper end of the Soleus, and is joined by an Anastomosis with the Crural Vein.

198. IT likewise detaches to the fore part of the Tibia some Branches irregularly transverse; which having been distributed to the Periosteum and Bone, communicate with other Branches already mentioned.

199. AT the lower part of the Tibia, the Saphena produces a considerable Branch, which runs obliquely forward over the Joint of the Tarsus toward the outer Ankle, sending off several Rami which communicate with each other, and with the Trunk of the Saphena.

200. LASTLY, the Extremity of this Trunk passes on the foreside of the inner Ankle, and runs irregularly under the Skin, along the Interstice between the first two Metatarsal Bones toward the Great Toe, where this Vein terminates.

201. HAVING got below the inner Ankle, it sends a Branch outward and forward, which runs under, and in some measure accompanies the anterior Tibial Artery. Interiorly it sends another Branch, almost from the same place, which passes under the Foot, communicating with the external Tibial Vein by irregular Arches, from which Veins are sent to the Toes.

202. LASTLY, before the Saphena terminates at the Great Toe, it detaches a kind of transverse Arch over the Metatarsus, which communicates by several Branches with that Arch which lies on the Joint of the Tarsus, and sends others to the Toes. This Arch gives off likewise another Branch, which runs up behind the outer Ankle, and communicates with the Vena Tibialis Externa.

203. THE Crural Vein having sent off the Saphena, and the small Branches for the Pectineus, &c. as has been said, runs down on the Thigh behind the Crural Artery. Opposite to the little Trochanter, it produces two large short Branches, or one which afterwards divides into two, whereof one is anterior, the other posterior.

*Continuation
of the Vena
Cruralis.*

204. THE anterior Branch runs more or less transversely forward, to be distributed to the Vastus Internus, lower part of the Pectineus, and of the second Triceps, and to the other two Muscles of the same name, running in between them as it goes from one to the other.

205. THE posterior Branch runs more or less transversely backward, and furnishes the Glutæi, Vastus Externus, and beginning of the Biceps.

206. A little below these two Branches, about the upper Extremity of the Vastus internus, the Crural Vein produces a Branch which runs down on the side of the Trunk, covering the Crural Artery, almost as low as the Ham, where it is again united to the Trunk by an Anastomosis, and sometimes it is continued separate a little way down on the Leg. It has the name of Vena Sciatica from the Sciatic Nerve which it accompanies.

207. ON the outside of this Anastomosis, the Crural Vein gives off a Branch which runs backward between the Biceps and neighbouring Muscles, and so downward on the backside of the Leg a little exteriorly, and very near the Skin, all the way to the outer Ankle. This Vein is termed Saphena minor or externa.

*Saphena
Minor.*

208. THE little Saphena having got near the Integuments in its Course downward, gives out a Branch which runs backward, and communicates with the great Saphena about the middle of the backside of the Thigh, as has been already observed.

209. IMMEDIATELY above and below the Ham, this Vein sends out other Branches, which likewise communicate with the Saphena Major, and and having run down about one third part of the backside of the Tibia, it sends off another Branch which is afterwards reunited to the Trunk.

210. ABOUT the Beginning of the Tendo Achillis, the little Saphena runs outward in the Integuments, toward the outer Ankles, where it terminates in cutaneous Ramifications sent to every side.

*Vena Pop-
litea.*

211. THE crural Vein having detached the little Saphena, runs down between the Biceps and the other Flexors of the Leg, closely accompanied by the crural Artery, between which and the inner Condyle of the Os Femoris, it is situated.

212. A little above the Ham, it takes the name of Vena Poplitea, and as it runs down betwixt the two Condyles, it gives Branches to the Flexor Muscles above mention'd, to the lower and posterioir Parts of both Vasti, and to the Fat which lies above the Interstice of the two Condyles.

213. IT likewise gives off several other Branches, one of which runs up laterally between the outer Condyle and the Biceps, and then turning forward, is ramified in the same manner with the Artery. Another Branch goes backward, sending Ramifications to the beginning of the Gastrocnemii, after which it runs down on the backside of these Muscles, to the Tendo Achillis.

214. NEAR the internal Condyle, the Poplitea sends some lateral Branches to the Extremities of the neighbouring Muscles, especially those of the Semi-Nervosus, Semi-Membranosus, &c. Lastly, it sends a Branch toward the external Condyle, which having run for a small space on the Peronæus Longus, goes back again into the Trunk.

215. THE Vena Poplitea runs down immediately behind the Muscle of the same Name, at the lower part of which it sends off several Ramifications to each side, which divide and unite again in different Ways and Degrees; and afterwards it loses its Name, being divided into three considerable Branches, called Tibialis anterior, Tibialis posterior, and Peronæa; of which

which the Tibialis posterior is most frequently a Continuation of the Trunk, and the other two like Branches.

216. THE Anterior Tibial Vein having distributed some small Branches from its very Beginning, to the Muscles behind the Heads of the two Bones of the Leg, perforates the interosseous Ligament from behind, forward, and runs between the superior Portions of the Musculus Tibialis Anticus, and Extensor Digitorum communis. *Vena Tibialis Anterior.*

217. As soon as it pierces the interosseous Ligament, it distributes small superficial Branches to the Head of the Tibia and Fibula, which run to the Joint of the Knee, and communicate with the lateral Branches of the Vena Poplitea, already mentioned.

218. AFTERWARDS it divides into two or three Branches, which run down together on the Foreside of the interosseous Ligament in Company with the anterior Tibial Artery, which they surround at different distances, by small communicating Circles.

219. THESE Branches having reached the lower Extremity of the Leg, unite in one, which afterwards divides into several, the Ramifications of which are distributed to the Foot.

220. A particular Branch goes out from the reunited Portion, which at the lower part of the Leg, perforates the interosseous Ligament from before backward, and communicates with the Vena Tibialis posterior.

221. THE posterior Tibial Vein gives off from its Beginning, a Branch toward the inside, which is distributed to the Gastrocnemii and Soleus. This Vein is named Suralis. *Vena Tibialis Posterior.*

222. AFTERWARD the posterior Tibialis runs down between the Soleus and Tibialis Posticus, giving Branches to each of them. It is divided in the same manner as the Tibialis anterior, into two or three Branches, which as they run, surround the corresponding Artery, by small communicating Circles formed at different distances.

223. IT continues this Course in company with the Artery as low as the outer Ankle, furnishing the Musculus Tibialis Posticus, and the long Flexors of the Toes. At the lower part of the Leg, it communicates with a transverse Branch of the Saphena, and with the anterior Tibial Vein, in the manner already said.

224. LASTLY, it passes on the inside of the Os Calcis, under the Sole of the Foot, where it forms the Venæ Plantares, by dividing into several transverse Arches, which communicate with each other, and with the Saphena, and send Ramifications to the Toes, nearly in the same manner as the Arteria Plantaris.

225. THE Vena Peronæa is likewise double, and sometimes triple. It runs down on the inside of the Fibula, almost in the same Direction with the Arteria Peronæa, which it likewise surrounds at different distances, by communicating Branches; after the manner of the Tibialis posterior. *Vena Peronæa.*

226. IT runs down as low as the outer Ankle, communicating several times with the Tibialis posterior, and sending Ramifications to the neighbouring Portions of the Musculi Peronæi, and long Flexors of the Toes.

227. THE last of these Communications makes the Venæ Plantares in some Subjects, to appear rather to come from this Vein, than from the Tibialis Posterior, from which they commonly arise, as we have already observed.

Vena Portæ. 228. THE Vena Portæ is a large Vein, the Trunk which is situated chiefly between the Eminences on the lower or concave side of the Liver, called Portæ by Anatomists; and from thence this Vein has got the general Name of Vena Portæ, or Vena Portarum.

229. IT may be considered as made up of two large Veins, joined almost endwise by their Trunks, from each of which, the Branches and Ramifications go out in contrary or opposite Directions. One of these Trunks adheres to the Liver, and is ramified in that Viscus, its Branches accompanying the whole Distribution of the Hepatic Artery.

230. THE other Trunk is without the Liver, and sends its Branches to the Viscera supplied by the rest of the Arteria Cæliaca, and by the two Mesentericæ, that is, to the Stomach, Intestines, Pancreas, Spleen, Mesentery and Omentum.

231. THE first Portion of this Vein, may be termed Vena Portæ Hepatica, Superior or Minor, the Trunk of which is commonly known by the name of Sinus Venæ Portarum. The other Portion may be called Vena Portæ Ventralis, Inferior or Major; and this is what I am now to describe, referring the Distribution of the other to the History of the Liver.

232. THE large Trunk of the Vena Portæ Inferior or Ventralis, is situated under the lower or concave side of the Liver, and joined by an Anastomosis to the Sinus of the Vena Portæ Hepatica, between the middle and right Extremity of that Sinus, and consequently at a good distance from the left Extremity. From thence it runs down a little obliquely from right to left, behind or under the Trunk of the Arteria Hepatica, bending behind the Beginning of the Duodenum, and under the Head of the Pancreas; its length being about five Fingers breadth.

233. HAVING reached to the Head of the Pancreas, this Trunk loses the general name of Vena Portæ, and terminates in three large principal Branches, which are distributed by numerous Ramifications, to the Viscera already named. The first Branch is termed Vena Mesaraica, or Mesaraica Major; the second, Splenica; and the third, Hæmorrhoidalis Interna, or Mesaraica Minor.

234. THE Vena Mesaraica Major appears to be a Continuation of the Trunk of the Vena Portæ Inferior. The Splenica is a capital Branch of that Trunk; and the Hæmorrhoidalis Interna has sometimes a common Origin with the Splenica, and sometimes is no more than a Branch of that Vein. In some Subjects the Mesaraica Major and Splenica appear to arise by an equal Bifurcation of the Trunk of the inferior Vena Portæ, and in others, the Hæmorrhoidalis arises from the very Angle of that Bifurcation.

235. THE inferior Vena Portæ, before the Formation of these three Branches, sends off from the Trunk several small Rami, which are commonly the Venæ Cysticæ, Hepatica Minor, Pylorica, Duodenalis, and sometimes the Gastrica Recta, and Coronaria Ventriculi,

236. ALL these small Veins sometimes arise separately ; and in other Subjects, some of them go out by small common Trunks. It sometimes happens that several of them do not come immediately from the Trunk of the Vena Portæ, but from one of its great Branches.

237. THE Cystic Veins run along the Vesicula Fellis from its Neck to the Bottom ; and as they are often no more than two in number, they are called Cysticæ Gemellæ, a Name given likewise to the Arteries which accompany them. They go out from the right side of the great Trunk near its beginning, sometimes separately, sometimes by a small and very short common Trunk.

238. THE small Hepatic Vein is commonly a Branch of one of the Cysticæ, or of their common Trunk.

239. THE Vena Pylorica arises from the great Trunk, almost opposite to the Origin of the Cysticæ ; and sometimes is only a Branch of the right Gastrica. It passes over the Pylorus to the short Arch of the Stomach, where it is join'd by Anastomosis with the Coronaria Ventriculi.

240. THE Duodenal Vein, commonly called Vena Intestinalis, goes out from the great Trunk near the Cysticæ, and sometimes from the small common Trunk of these Veins. It is distributed chiefly to the Intestinum Duodenum, and sends likewise some Rami to the Pancreas. There is another Vein called also Duodenalis, which is a Branch of the Gastrica of the same side.

241. THE Vena Gastrica, or Gastro-Epiploica Dextra, and the Coronaria Ventriculi, come more seldom from the Trunk of the Vena Portæ, than from its great Branches, with which I therefore chuse to describe them.

242. THE inferiour Vena Portæ, having given off the Splenica, changes its Name to that of Mesaraica, or Mesaraica Major, which often appears to be rather a Continuation of the Trunk, than one of the great Branches, as has been already observed. *Vena Mesaraica Major.*

243. IT bends toward the superiour Mesenteric Artery, sending off two Veins, and afterwards running up over that Artery, it accompanies it in those Portions of the Mesentery and Mesocolon which belong to the small Intestines, the Cæcum, and right Portion of the Colon. As it runs down, it forms an oblique Arch almost like that of the Artery, which is likewise ramified on both the convex and concave sides, but not so regularly.

244. THE first particular Branch from this Trunk is called by *Riolan* Vena Colica. It goes out from the anterior part of the Trunk, before it joins the Artery, and runs directly to the middle of the Colon, where it divides to the right and left, and forms Arches. On the left hand it communicates with the superiour or ascending Branch of the Hæmorrhoidalis ; and on the right, with the second Branch of the Mesaraica.

245. THIS second Branch is a little under the first, or Colica anterior, and something more toward the right hand. It may be named Gastro-Colica, and is soon divided into two Branches, one superiour, the other inferiour.

246. THE superiour Branch of the Vena Gastro-Colica, sends small Veins to the Head of the Pancreas, and forms the Vena Gastrica, or Gastro-Epiploica Dextra, which goes from the Pylorus to the great Curvature of the Stomach, and communicates with the Gastrica Sinistra. In its passage it supplies the Stomach and Omentum, and communicates with the Pylorica, Coronaria Ventriculi, &c. as has been already said; and sometimes it forms the Pylorica.

247. THE inferiour Branch of the Vena Gastro-Colica, which may be called Colica Dextra, goes to the right Portion of the Colon; and from thence to the upper part of that Intestine, where it is divided archwise, and communicates with the right Branch of the Colica Anterior, and with a Branch of the Vena Cæcalis, as we shall see hereafter.

248. THE Trunk of the great Mesaraic Vein sends out sometimes, opposite to the Gastrica, a particular Branch to the Omentum, called Epiploica Dextra. But almost immediately before it ascends over the Mesenteric Artery, it produces two large Branches very near each other, which pass behind and under the Artery, being distributed to the Jejunum and part of the Ileum by numerous Ramifications, which form Arches and Areolæ like those of the Artery.

249. AFTERWARDS the Trunk of the Mesaraica passes over the superiour Mesenteric Artery, to which it adheres very closely, and from the convex side of its Arch sends out several Branches almost in the same manner with the Artery; but with this difference, that oftentimes the Branches do not arise immediately from the Vein in so great numbers: and each of them sends out many more Ramifications.

250. From the concave side of the Mesaraic Vein, a little below the Origin of the second Branch from the convex side, arises a Branch called by *Riolan* Vena Cæcalis, which runs to the beginning of the Colon, crossing one of the Branches of the superiour Mesenteric Artery.

251. THIS Cæcal Vein divides by two Arches, the uppermost of which communicates with the lower Branch of the Vena Gastro-Colica; the other, after having sent Ramifications to the Intestinum Cæcum, and Appendicula Vermiformis, communicates below, with the Extremity of the great Mesaraic Vein.

Vena Splenica.

252. THE Splenic Vein is one of the three great Branches of the Vena Portæ, and may be said in some measure to be a subordinate Trunk of that Vein. It runs transversely from the right to the left, first under the Duodenum, and then along the lower side of the Pancreas, near the posteriour Edge.

253. IN this course it gives off several Veins, viz. the Vena Coronaria Ventriculi, Pancreaticæ, Gastrica, or Gastro-Epiploica Sinistra, and Epiploica Sinistra. It likewise often gives Origin to the Hæmorrhoidalis Interna, the third capital Branch of the Vena Portæ.

254. IT terminates afterwards by a winding Course, being divided into several Branches that go to the Spleen; one of which produces the small Veins called by the Ancients Vasa Brevia.

255. THE Coronaria Ventriculi, so called because it surrounds more or less the upper Orifice of the Stomach, runs along the small Arch of that Viscus toward the Pylorus, where it joins and becomes continuous with the Vena Pylorica. In its passage, it gives several Rami to the sides of the Stomach, which there form numerous Areolæ, and communicate with the Veins of the great Arch.

256. It arises pretty often from the beginning of the Splenica, and sometimes from the left side of the Extremity of the great Trunk of the Vena Portæ, behind the Hepatic Artery; and in that case, it is the most considerable of all the small Veins that go out from the great Trunk.

257. THE Venæ Pancreaticæ are several small Branches sent by the Splenica to the Pancreas, along its lower side. There are other small Pancreatic Veins which do not arise from the Splenica, as has been said in the Description of the Gastro-Colica, one of the Branches of the great Mesaraic Trunk.

258. THE left Gastric or Gastro-Epiploic Vein, goes out from the Splenica at the left Extremity of the Pancreas; from whence it runs to the great Extremity of the Stomach, and along the great Arch, till it meets the Gastrica Dextra, which is continuous with the Sinistra.

259. In its passage, it gives several Branches to both sides of the Stomach, which are distributed by numerous Ramifications, form many Areolæ, and communicate with the Branches of the Coronaria Ventriculi.

260. AT a small distance from its Origin, this Gastric Vein sends out a Branch, which is distributed to the Omentum; and on this account it has been called Gastro-Epiploica. This Branch seems to communicate with the Hæmorrhoidalis Interna.

261. THE Vena-Epiploica Sinistra arises at the small Extremity of the Pancreas, and is ramified on the Omentum all the way to the Colon, where it communicates with the Hæmorrhoidalis Interna. When this Vein is wanting, the Branch of the left Gastrica already mentioned, supplies its place. It sometimes comes from the most Anterior Branch, which the Splenica sends to the Spleen.

262. LASTLY, the Vena Splenica reaches the Fissure of the Spleen, which it enters through its whole length by several Branches, almost in the same manner as the Splenic Artery. It is from the most posterious of these Branches that the Veins are sent off to the great Extremity of the Stomach, formerly known by the name of Vasa Brevia, which communicate with the Coronaria Ventriculi and Gastrica Sinistra.

263. THE internal Hemorrhoidal Vein is one of the three great Branches of the Vena Portæ, coming ordinarily from the beginning of the Vena Splenica, and sometimes from the Extremity or Angle of the Bifurcation of the great Trunk of the Vena Portæ.

Vena Hæmorrhoidalis Interna, five Mesaraica Minor.

264. AT a small distance from its beginning, it gives to the Duodenum a second Vena Duodenalis, which is sometimes more considerable than the first, or that which comes from the great Trunk of the Vena Portæ.

265. AFTERWARDS it is divided into two Branches, one superiour or ascending, the other inferiour or descending. The first runs to the upper part

of the Arch of the Colon, where, after many Ramifications, it communicates with a Branch of the great Mesaraica, with the Ramifications of the Gastro-Epiploica Sinistra, and with those of the neighbouring Epiploica.

266. THE inferiour Branch runs down on the left Portion of the Colon, on the lower Incurvations of that Intestine, and on the Rectum all the way to the Anus. In this course, it supplies the Mesocolon, and forms Arches, which send out numerous small Ramifications which surround these Intestines. It seems likewise to communicate by some capillary Twigs with the left Spermatick Vein.

267. THIS Vein has been named Hæmorrhoidalis from the Tumours often found at its Extremity next the Anus, which are called Hæmorrhoides. The word Interna is added to distinguish this Vein from the Hæmorrhoidalis Externa, which comes from the Vena Hypogastrica, and with which this Vein communicates by capillary Ramifications. The name of Mesaraica Minor agrees to it very well, because of its Situation, with respect to the inferiour Mesenteric Artery, which is also less than the superiour.



S E C T. VI.

A Description of the Nerves.

1. **A**LL the Nerves of the Human Body come originally from the *Introduction.* Cerebrum or Cerebellum, by means of the Medulla Oblongata, or Medulla Spinalis. They go out in Bundles regularly disposed in Pairs, like so many distinct Trunks, which are afterwards divided into Branches, Rami, Ramifications and Filaments.

2. THE Nerves of the Medulla Oblongata go out, for the most part, through the Basis of the Cranium, at Holes situated according to their Disposition. Those of the Medulla Spinalis pass through the lateral Foramina of all the Vertebrae, and through the great Anterior Foramina of the Os Sacrum.

3. WE commonly reckon ten Pairs of these Fasciculi or Nervous Trunks to the Medulla Oblongata, nine of which go out separately through particular Holes of the Basis Cranii; and the tenth, which arises from the Extremity of that Medulla, passes through the great Occipital Foramen.

4. THE Trunks from the Spinal Marrow are twenty-four Pairs, and may in general be termed Nervi Vertebrales, or Intervertebrales. Seven of them are called Cervical Nerves; twelve, Dorsal or Costal, being true Intercoastal Nerves; and five, Lumbar; to which must be added, five or six Pairs that pass out through the Os Sacrum.

5. BEFORE I enter upon the particular Distribution of all these Nerves, and the Course of their Branches, Ramifications and Filaments, I think it proper to give a general Idea of them in the following Table.

6. THE Nerves of the Medulla Oblongata are these:

*Nerves of
the Medulla
Oblongata.*

First Pair; Nervi Olfactorii.

Second Pair; Nervi Optici.

Third Pair; Nervi Motores Oculorum, Oculares Communes, Musculares Communes, Oculo-Musculares Communes.

Fourth Pair; Nervi Trochleares, Musculares Obliqui Superiores, vulgo Pathetici.

Fifth Pair; Nervi Innominati, Trigemini. The subordinate Trunks of this Pair are three on each side, viz. The Nervus Orbitarius, Maxillaris Superior, and Maxillaris Inferior.

Sixth Pair; Nervi Motores Externi, Oculares Externi, Musculares Externi, Oculo-Musculares Externi.

Seventh Pair; Nervi Auditorii, which are two on each side, one called Portio Mollis Nervi Auditorii; the other, Portio Dura, to which I give the name of Nervus Sympatheticus Minor.

Eighth Pair; Par Vagum Minus, which I call Nervi Sympathetici Medii.

Ninth Pair; *Nervi Hypoglossi*, vulgò *Gustatorii vel Linguales*.
Tenth Pair; *Nervi Sub-Occipitales*.

*Nerves of
the Medulla
Spinalis,*

7. THE Nerves of the Medulla Spinalis are these:

One Pair called *Nervi Accessorii* of the eighth Pair from the Medulla Oblongata.

One Pair commonly called *Nervi Intercostrales*, which I name *Nervi Sympathetici Majores*.

Seven Pairs of *Nervi Cervicales*, or *Intervertebrales Colli*.

Twelve Pairs of *Nervi Dor sales*, *Costales*, *Intercostrales Veri*, or *Intervertebrales Dor si*.

Five Pairs of *Nervi Lumbares*, or *Intervertebrales Lumborum*.

Five or six Pairs of *Nervi Sacri*.

Two *Nervi Diaphragmatici*, each formed by a Trunk of the second, third, and fourth Pair of Cervical Nerves.

Nervi Brachiales of each side, formed by the fifth, sixth, and seventh Pairs of Cervical Nerves, and by the first Pair of the Dor sales.

From these Nerves, six Branches arise on each side, viz.

Nervus Musculo-Cutaneus.

Nervus Medianus.

Nervus Cubitalis.

Nervus Cutaneus Internus.

Nervus Radialis.

Nervus Axillaris, five *Articularis*.

Nervi Crurales of each side, formed by the first, second, and third Pairs of the *Nervi Lumbares*; and partly by the fourth and fifth.

Each of these Nerves is divided into three Portions, which are

Nervus Femoris Cruralis, five *Cruralis Superior*.

Nervus Tibiæ Cruralis, five *Cruralis Tibialis*.

Nervus Cruralis Pedis, five *Cruralis Pedialis*.

Nervi Sciatici, each formed by the Trunks of the last two Pairs of the *Nervi Lumbares*, and by the three or four following Pairs of the *Nervi Sacri*.

The principal Division of each of these Nerves produces the following:

Nervus Sciatico-Cruralis.

Nervus Sciatico-Popliteus.

Nervus Sciatico-Tibialis.

Nervus Sciatico-Peronæus.

Nervus Plantaris Internus.

Nervus Plantaris Externus.

8. I refer the Subdivisions of the *Nervi Innominati*, or of the fifth Pair, and those of the three *Nervi Sympathetici*, to the particular Description, in which I shall trace the Branches, Ramifications, and even the most remarkable Filaments, all the way to where they enter the Muscles, Viscera, Organs, &c. and I shall pursue their Course still further in the particular History of each of these Parts.

9. THE first Pair of Nerves of the *Medulla Oblongata*, or *Nervi Olfactorii*, formerly named *Processus Mammillares*, arise by medullary Fibres, anteriorly and exteriorly from the Eminences of the *Cerebrum*, called *Corpora striata*, between the anterior and middle Lobes. *Nervi Olfactorii.*

10. THEY run forward, toward the *Os Ethmoides*, on each side the *Crista Galli*, in form of medullary Ropes, having a very slender Consistence; and in this Course they receive some medullary Fibres from the anterior Lobes of the *Cerebrum*.

11. THEY are at first very thin, but as they advance, they grow gradually larger and softer, and having reached the sides of the *Crista* without any Communication betwixt them, they send off a great number of Filaments, which run through the Holes of the *Lamina Cribrosa*.

12. IN their passage through these Foramina, they are accompanied and invested by the same number of small Productions from the two *Laminae* of the *Dura Mater*, as by particular *Vaginae*; and they are afterwards distributed by an infinity of small Filaments to the Membrane, which lines all the internal Parts of the Nose.

13. EACH olfactory Nerve communicates by particular Filaments with some Branches of the *Nervi Ophthalmici* and *Maxillaris Superior*.

14. THE Optic Nerves arise from the Eminences of the *Cerebrum*, called *Thalami Nervorum Opticorum*; and being first of all incurvated outward, they afterwards approach each other, as they run over the *Sella Sphenoidalis* of the *Basis Cranii*, at which place they unite a little, and afterwards separate again in their passage to the *Foramina Optica*, to the Orbits, and Globe of the Eyes. *Nervi Optici.*

15. THIS Union of the Optic Nerves is on the anterior part of the *Glandula Pituitaria*, and is of a very singular kind, as we shall see in the particular Description of the Head.

16. THE third Pair of Nerves, commonly called *Motores Oculorum*, arise immediately before the Border of the anterior Edge of the great transverse Protuberance, ordinarily termed the *Processus Annularis* of the *Medulla Oblongata*. *Nervi Motores Oculorum Communes.*

17. EACH Nerve perforates the *Dura Mater*, behind the lateral Parts of the posterior Apophysis of the *Sella Sphenoidalis*; and afterwards runs along the upper part of the *Sinus Cavernosus* of the *Dura Mater*, on one side the Curvature of the Carotid Artery, to the superior Orbital, or Sphenoidal Fissure.

18. FROM thence it passes into the Orbit, and divides into four Branches, one superior, one internal, and two inferior, one of which is long, the other short.

19. THE superiour Branch goes off as soon as the Trunk enters the Sphenoidal Fissure, and runs directly to the lower side of the Musculus Rectus superior of the Globe of the Eye.

20. HAVING reached the middle of that Muscle, or thereabouts, it sends up a Ramus to the Levator Palpebræ superioris; and when this Ramus goes off nearer the Sphenoidal Fissure, it may be looked upon as the second superiour principal Branch of the Motor Oculi.

21. THE other three Branches go off at some distance from the superiour Branch. The internal Branch is distributed to the Musculus Rectus internus of the Eye; the short inferiour Branch, to the Rectus inferior; and the long inferiour Branch, to the Obliquus inferior, into the Substance of which it penetrates, after having run along the Rectus inferior.

22. BESIDES these four or five Branches, there is a small short Branch, which arises most commonly from that which goes to the Musculus Obliquus inferior; and it forms a small lenticular Ganglion, that detaches several very fine Filaments round the Optic Nerve.

23. THE Filaments of the Ganglion perforate the Tunica Sclerotica of the Eye, and then run between this Coat and the Choroides, all the way to the Iris, where they are distributed by very fine Ramifications.

24. THE small lenticular Ganglion produces likewise other nervous Filaments, which communicate with the Ramus Internus or Nasalis of the orbitary Nerve.

Nervi Trochleares.

25. THE fourth Pair of Nerves of the Medulla Oblongata, or Nervi Trochleares, are long and small, arising behind the Eminences called Nates, from the lateral part of the medullary Expansion, which lies above the passage between the third and fourth Ventricles of the Brain.

26. FROM thence they go on each side to the Edge of the Fold formed by the Dura Mater, on the Extremity of the Apophysis Petrosa, behind the Sella Sphenoidalis, that is, by the anterior Portions of the Septum Transversum.

27. THERE, each Nerve perforates the Edge of the Fold, above the Passage of the Nerve of the third Pair, and more backward and outward. Afterwards, it runs in the Duplicature of that Fold, on one side of the Nerve of the third Pair, along the upper part of the Sinus Cavernosus, and passes into the Orbit through the Sphenoidal Fissure, and into the Musculus Trochlearis. Its Course is oblique over the other Nerves and neighbouring Muscles, and it sends off small Filaments on each side; appearing to communicate with the first Branch of the fifth Pair or Nervus Ophthalmicus.

Nervi Trigemini.

28. THE fifth Pair of Nerves is very large, and they arise anteriorly from the lateral Parts of the transverse Protuberance of the Medulla Oblongata, by a great number of Filaments closely united together, which afterwards form two large flat Trunks, one on each side. Each Trunk runs toward the Apex of the neighbouring Os Petrosus, where it perforates the Dura Mater, a little below the Edge of the Extremity or anterior Portion of the Septum Transversum of the Brain.

29. HAVING detached some Filaments to the Apex of the Apophysis Petrosa, or to a kind of Sefamoide Bone, which is often found near this Apex, it enters the Sinus Cavernosus; and having sent some other Filaments to the Dura Mater, it expands in the Sinus, and forms a kind of Plexus, or flat irregular Ganglion.

30. AFTERWARDS, the Trunk is divided into three large Branches more or less flatted, which run through the Cavernous Sinus, being closely connected to the spongy Filaments thereof, and bathed in the venal Blood, which it contains. These three Branches are disposed laterally on one Vertical Plane, and separate after the manner of a Goose's Foot.

31. THE first Branch commonly called Nervus Ophthalmicus Willisii, is the smallest and longest of the three, and enters the Orbit through the Sphenoidal Fissure; for which reason I name it Nervus Orbitarius.

32. THE second or middle Branch, called also Nervus Maxillaris superior, passes through the superior maxillary Foramen of the Os Sphenoides.

33. THE third or inferiour Branch, called likewise Nervus Maxillaris inferior, goes down through the Foramen Ovale or Maxillare inferius of the sphenoidal Bone. The two maxillary Nerves are united at their Origin, for which reason, some Anatomists have divided the large Trunk into two principal Branches; and the second of these Branches, into two others.

34. THE Orbital or Ophthalmic Nerve, which is the first Branch of the fifth Pair, as soon as it enters the Orbit, through the sphenoidal Fissure, is divided into three Rami, one superiour or frontal, one internal or nasal, and one external or lacrymal; and before its Entry, it sometimes gives and sometimes receives communicating Branches. It communicates by a Filament or two with the Nerve of the sixth Pair, and with the Nerve commonly called Intercoastalis. *Nervus Orbitarius vulgò Ophthalmicus.*

35. THE Ramus Superior or Frontalis, which might likewise be termed Nervus Superciliaris, is the most considerable of the three, and runs along the superiour Part of the Orbit close to the Membrane which lines it, sending Filaments to the Fat which surrounds the Globe of the Eye, to the neighbouring Membranes, and to the Musculus Levator Palpebræ.

36. AFTERWARDS it passes through the Foramen Superciliare, and being divided toward each side, it is spent on the neighbouring Portions of the Musculus Frontalis, Orbicularis and Integuments; communicating with a neighbouring Ramus of the Portio Dura of the Auditory Nerve.

37. The Ramus Internus or Nasalis of the Orbital Nerve, runs toward the Nose; and near its Origin sends off a Filament, which communicates with the small lenticular Ganglion already mentioned.

38. THIS Filament comes sometimes from the Trunk of the orbital Nerve before the Division, and adheres to the internal Ramus all the way to where the Motor Communis is divided.

39. THIS Nasal Ramus runs first of all, obliquely over the Optic Nerve, and under the two Musculi Levatores, giving off some Filaments to the nearest Parts of these Muscles. Afterwards it runs between the Musculus Rectus internus and obliquus major, along the inside of the Orbit; and in

in its passage sends a small Filament through the internal orbitary Hole, of which hereafter.

40. FROM thence it passes over the Musculus Rectus internus, to the great or internal Angle of the Eye, where it is distributed to the neighbouring Parts, that is, to the Caruncula and Sacculus Lacrymalis, to the nearest Portions of the Musculus Orbicularis, Superciliaris, Pyramidalis Nasi, and to the Integuments.

41. THE small lateral Filament which it sends through the orbitary Hole, returns into the Cranium, running up from before, backward, on one side of the Os Cribrosum, and having reached the Fore-part of the Duplicature of the Dura Mater, it joins the Filaments of the Olfactory Nerve, on the Lamina Cribrosa, together with which it passes through the antierior Holes of that Lamina, and is distributed to the Nose.

42. THE Ramus Externus or Lacrymalis goes chiefly to the Glandula Lacrymalis, upon which it is distributed, and from whence it has its Name. It seems sometimes to be a Branch from the Ramus Frontalis, and it often arises from the Orbitary Nerve more posteriorly than the other Branches. It adheres closely to the Dura Mater, and runs obliquely along the inside of the Orbit, on the Musculus Rectus Externus, to the Glandula Lacrymalis.

43. BEFORE it reaches the Gland, it sends a small Branch to the external lateral Part of the Orbit, which is sometimes lost in the Diploë of the Cranium, and sometimes perforates the neighbouring Part, either of the Os Frontis, or Os Malæ, &c. sending Filaments to the nearest Portions of the Musculus Temporalis, Orbicularis Palpebrarum, Masseter, &c. and of the Integuments; and it likewise gives Filaments to the Fat and Membrana Conjunctiva of the Eye.

*Nervus
Maxillaris
Superior.*

44. THE superiour maxillary Nerve, the second Branch of the fifth Pair, goes out of the Cranium between the Foramen Ovale and Fissure of the Os Sphenoidale, passing through the Foramen Rotundum or Maxillare Superius of the same Bone.

45. IMMEDIATELY after its passage, it sends a Filament to the outside of the Orbit, which having perforated the Os Malæ, is distributed to the Parts which cover that Bone, communicates with a neighbouring Branch of the Portio Dura of the Auditory Nerve; and sends small Filaments to the Fat in the lower Part of the Orbit.

46. SOON afterwards, it is divided into three Rami, the first of which I name Suborbitarius, the second, Palatinus, and the third, Spheno-Palatinus, which last is sometimes only a Branch of the first; but still the common Division may be retained.

47. THE Sub-Orbitary Ramus, is the most considerable of the three. It runs in the Canal of the inferiour Portion of the Orbit, and goes out by the exterior orbitary Hole, which is sometimes double.

48. IN this passage it sends downward through the Holes of the Canal, small Filaments which enter the Sinus Maxillaris, and are distributed to the Membrana Pituitaria in that Sinus, to the Substance of the Bone, to the Alveoli,

Alveoli, to the anterior Dentes Molares, and to the Dentes Canini and Incisores.

49. As it enters the Canal, it sometimes gives off a Filament to the posterior Molares; and among all these Filaments there is at least one, which runs along the upper side of the Arch of the Palate, to the Union of the *Ossa Maxillaria*.

50. THIS Ramus having passed out of the bony Canal, through the Foramen Sub-Orbitarium Anterius, is distributed to the *Musculus Orbicularis Palpebrarum*, to the neighbouring Muscles of the Nose and Lips, and to the Integuments; communicating with a Ramus of the Portio Dura of the Auditory Nerve.

51. THE Ramus Palatinus of the superiour maxillary Nerve runs down before the Pterygoide Apophyses of the *Os Sphenoides*, in the Canal formed by the *Os Maxillare* and *Os Palati*; and having passed out of that Canal, through the Foramen Palatinum posterius, it is distributed by several Filaments to the Glandular Coat of the Palate, to the Septum Palati and Muscles belonging to that Part. Some of these Filaments go as far as the Foramen Palatinum Anterius or Incisorium.

52. As it runs down in the Canal, it is at first a little bent, and then sends Filaments to the *Musculus Pterygoidæus Externus*, to the Peri-Staphylini, and to the Arch of the Pharynx. It likewise sends other Filaments through the small Holes in the posterious Part or Tubercle of the *Os Maxillare*, to the Sinus Maxillaris and posterior Dentes Molares.

53. THE Ramus Spheno-Palatinus passes through the bony Hole of the same Name, and is distributed to the *Musculus Pterygoidæus Internus*, to the posterious Parts of the Nares, to the neighbouring Sinus Sphenoidalis, and to the Tuba Eustachiana.

54. It likewise sends a Filament through the Foramen Pterygoide, which perforates the Root of the Apophysis Pterygoide from behind forward, and joins the Nervus Maxillaris inferior.

55. THE inferiour maxillary Nerve, the third Branch of the fifth Pair, is *Nervus Maxillaris Inferior* larger at its Origin, than the other two. It goes out of the Cranium by the Foramen Ovale of the Sphenoidal Bone, and runs between the two Musculi Pterygoidæi, below the great Sinus of the lower Jaw, where it enters the bony Canal of that Jaw.

56. As soon as it leaves the Cranium, it sends off four principal Branches, and before it enters the Canal of the lower Jaw, it gives off another to the Tongue. The four first Branches arise very near each other, so that the Size of this Nerve decreases very much between the Musculi Pterygoidæi.

57. THE first Branch of this Trunk runs up to the Temporal Muscle, on the inside of which it is distributed, and also between its Fibres.

58. THE second Branch runs behind the Condyle of the lower Jaw, where it divides into two Filaments, which run from within, outward, and communicate with the neighbouring Ramus of the Portio Dura of the Auditory Nerve, behind the outside of the Condyle.

59. AT the Origin of these two Filaments, it sends off a small Ramus, which runs up before the external Ear toward the Temples, giving Filaments to the Concha of the Ear in its passage.

60. THE Ramus of this Trunk passes between the two Apophyses of the lower Jaw, perforates the lower part of the Temporal Muscle, and gives it several Filaments.

61. AFTERWARDS it bends downward upon the Musculus Masseter, to which it is chiefly distributed, giving Filaments to the neighbouring Integuments, and communicating with the Portio Dura of the Auditory Nerve, on the side of the Os Malæ. It terminates by Filaments which go to the Musculus Buccinator, to the Muscles of the Under Lip, and to the Integuments of these Parts.

62. THE fourth Branch of the Trunk of the inferiour maxillary Nerve, is oftentimes no more than a Ramus of the third Branch, which goes off near its Origin. It passes over the Musculus Pterygoidæus Externus, to which it gives Filaments, and is distributed to the Pterygoidæus Internus, and to the nearest Portion of the Temporalis.

63. IT is likewise distributed to the Musculus Buccinator, to the Glands of the Mouth and Muscles of the Lips. Sometimes it sends off a Filament, which runs up upon the Concha of the external Ear.

64. BESIDES these four Branches, several small Filaments go off on each side, one of which runs to the Foramen Pterygoidæum, where it joins a Filament of the Nervus Maxillaris Superior, and then continues its Course to the Membrane which covers the Vomer and neighbouring Parts of the internal Nares.

65. THE Ramus that goes to the Tongue, which may be termed Nervus Lingualis or Hypoglossus Minor, to distinguish it from the Hypoglossus Major, which belongs to the ninth Pair, is detached from the Maxillaris Inferior, as it passes between the Musculi Pterygoidæi, and sometimes a little sooner.

66. IT is a very considerable Branch, and sometimes nearly as large as the Trunk which it accompanies between the two Muscles already mentioned, and leaving it a little above the Canal of the lower Jaw, it runs over the Pterygoidæus Internus, and gives it some Filaments.

67. THIS Ramus Lingualis, a little after its Origin, communicates with the Trunk by a short collateral Branch which is sometimes Plexiform. At this place it sustains a particular Filament, which according to the common Opinion arises from it, and goes to the internal Ear.

68. THIS particular Filament of the Nervus Lingualis is supposed by Anatomists, to be a Recurrent which runs up backward through the Tympanum, and joins the Portio Dura of the Auditory Nerve. But as the Angle, which it makes with the small Nervus Lingualis, is very acute, and turned forward, there is more reason to think that it comes from the internal Ear to that Nerve, as we shall see more at length in the Description of that Organ.

69. AFTERWARDS this Lingual Ramus passes under the lateral part of the Tongue, and over the Glandula Sublingualis, giving Filaments to the neighbouring

neighbouring Portions of the Muscles of the Tongue, and to those of the Os Hyoides and Pharynx.

70. HAVING communicated by several Filaments, with the Extremities of the Nerve of the ninth Pair, or Lingualis Major, it enters the Substance of the Tongue, and terminates near its Apex or Point.

71. LASTLY, the inferiour maxillary Nerve, before it enters the Canal of the lower Jaw, sends Filaments to the neighbouring Portions of the Musculus Pterygoidæus Internus, Digastricus, &c. It likewise detaches a Filament or two along the Periosteum, to be distributed to the Musculus Mylo-Hyoidæus, and Glandula Sublingualis. The Marks of these Filaments often appear upon the Bone, all the way from their Origin, and sometimes they pass through a small intire bony Canal, lying on the Surface of the inside of the Bone.

72. AFTER the inferiour maxillary Nerve enters the Canal of the lower Jaw, it runs under the Alveoli, and distributes Filaments to each Tooth, all the way to the Hole near the Chin, where it sends another Ramus forward, into the Diploë, which is distributed to the other Teeth, that lie between that Hole and the Symphysis of the Chin.

73. THE Motores Externi, which make up the sixth Pair of Nerves from the Head, are smaller, but yet a little larger than those of the fourth Pair. They arise from the Union of the Medulla Oblongata, between the great transverse Protuberance, and the Corpora Olivaria; from whence they advance to the Dura Mater, and enter it on the Extremity of the Production of the Os Occipitis behind, and a little on one side of the Symphysis of that Bone with the Os Sphenoides. *Nervi Motores Externi.*

74. EACH of these Nerves runs afterwards in the Cavernous Duplication of the Dura Mater, on one side of the Bottom of the Sella Sphenoidalis, and of the Carotid Artery, to which it adheres very closely, and it there communicates with a Branch of the fifth Pair, by one or two short Filaments, as has been already said in the Description of the Orbital Nerve.

75. IMMEDIATELY after, and behind this Communication, the Motor externus sends down a Filament, which at first appears to run from before, backward, like a Recurrent, and presently enters the large Bony Canal of the Apophysis Petrosa, on one side of the internal Carotid Artery.

76. THIS Nervous Filament, which is sometimes double, is commonly taken for the Root or Origin of the celebrated Intercostal Nerve, which I term Sympatheticus Major; but as it makes an acute Angle in an opposite Direction, with the Nerve of the sixth Pair, it seems rather to run up with the Carotid Artery, and to join that Nerve, than to arise from it. The Progress of this Nerve shall be continued in the Description of the great Sympatheticus.

77. THE Nerve of the sixth Pair, which I have sometimes seen double or split in two Parts, before it enters the Dura Mater, passes afterwards thro' the Sphenoidal or Superiour Orbital Fissure, to the Musculus Rectus Externus of the Globe of the Eye.

Nervi Auditorii.

78. THE Nerves of the seventh Pair, termed Auditorii, arise from the lateral and posteriour part of the great transverse Protuberance of the Medulla Oblongata. Each of these Nerves is double, or consists of two Ropes, which accompany each other very closely to the Foramen Auditorium Internum of the Apophysis Petrosa.

79. ONE of these Ropes is small, solid and anteriour, being called the Portio Dura; the other less solid and posteriour, called Portio Mollis.

80. THE Portio Mollis terminates in the great Fossula of the Foramen Auditorium Internum, and is distributed to the Organ of Hearing through several other small Holes. This Portion alone deserves the name of the Auditory Nerve; but the particular Description thereof must be referred to that of the Ear.

81. THE Portio Dura passes through the small Fossula of the internal auditory Hole, into the winding Duct of the Apophysis Petrosa, and goes out by the Foramen Stylo-Mastoidæum, to the Face and other neighbouring Parts. As it passes through the winding Duct or Aqueduct of Falloppius, it touches the Dura Mater at the small opening on the upper side of the Apophysis Petrosa, where it joins some Filaments from the fifth Pair.

82. It likewise gives off a Filament to the Muscle of the Stapes; and as it goes out, it gives or receives another Filament which passes by the Tympanum, and joins the Ramus Lingualis of the inferiour Maxillary Nerve, as we shall see more particularly in the History of the Ear.

83. I choose to call this Portion of the Auditory Nerve, Nervus Sympatheticus Minor; to the Description of which I now proceed.

Nervi Sympathetici Minores.

84. THE Trunk of each Nerve of the Portio Dura, or of the Sympathetici Minores, having passed through the Ductus Petrosus Falloppii, and having communicated with the Dura Mater, &c. as has been already said, sends off, at about the sixth part of an Inch from where it goes out at the Stylo-Mastoide Hole, two Branches, one upward, the other downward.

85. THE superiour Ramus runs up chiefly to the posteriour parts of the external Ear, to which it is distributed; communicating, as it passes behind the Ear, with a Ramus of the second Pair of the Cervical Nerves; and forward, with a Branch of the Maxillaris Inferior.

86. THE inferiour Ramus is spent on the three Musculi Styloidæi, Digastricus, and on the superiour Extremity of the Sterno-Mastoidæus, reaching in some Subjects as far as the middle of that Muscle. In place of these two single Rami, small Ramifications go out sometimes from the Trunk.

87. AFTERWARDS the Trunk of the Portio Dura advances forward, through the Parotid Gland, to which it gives several Filaments; some of these Filaments running from without inwards, and surrounding that Branch of the external Carotid Artery, which runs behind the Ear. Sometimes, tho' very seldom, the Trunk itself is split to give passage to the Artery.

88. THIS Trunk having passed through the Parotid Gland, behind the Angle of the lower Jaw, is divided into two large Branches, one superiour, the other inferiour.

89. THE superiour Branch of the Portio Dura is the most considerable of the two ; and having run upwards for about the third part of an Inch, it divides into seven or eight Rami.

90. THESE Rami are spread superficially, and in an irregular radiated manner, on all the lateral parts of the Face, from the Hair as low as the Under Lip, between the Ear and Nose ; distributing a prodigious number of Cutaneous Nerves.

91. IN some Subjects these Rami, at their first separation, form a kind of Plexus which resembles a Goose's Foot.

92. THE first, second, and third Rami are distributed to the anterior part of the Ear, on the lateral parts of the Head, the temporal and frontal Muscles, and the neighbouring parts.

93. ONE of these Rami, and sometimes the large superiour Branch, detaches inward behind the Condyle of the lower Jaw, and before the temporal Vein, two or three Filaments which communicate with the inferiour Maxillary Nerve.

94. THE fourth Ramus goes to the Foramen Superciliare, or Supra-Orbitarium, giving in its passage, several Filaments to the external lateral and superiour parts of the Musculus Orbicularis Palpebrarum ; and afterwards communicating with the Orbital Nerve, which goes out by the same Foramen.

95. THE fifth Ramus is distributed by small Filaments on the lateral part of the Cheek, and is partly lost in some small Holes at the Basis or Root of the Zygoma ; giving likewise some Filaments to the external lower part of the Musculus Orbicularis Palpebrarum.

96. THE sixth and seventh Rami, and likewise the eighth when it is found, are spread on the whole Cheek as far as the Nose.

97. ONE of these latter Rami passes under or behind the Musculus Zygomaticus, to which it gives Filaments ; and then perforating and giving Filaments to the middle lower part of the Musculus Orbicularis Palpebrarum, it goes to the inferiour Orbital Hole in the Os Maxillare, and communicates with the Nervus Maxillaris Superior.

98. THE last Ramus communicates by some Filaments, with a neighbouring Ramus of the large inferiour Branch of the Portio Dura.

99. THIS large inferiour Branch, which is something less than the superiour, run under the Angle of the lower Jaw, and is distributed by several Rami to all the inferiour lateral parts of the Face, and to the neighbouring parts of the Throat, where it chiefly terminates by a vast number of Cutaneous Filaments.

100. THE upper Rami of the large inferiour Branch run up on the Musculus Masseter, to the lower part of the Zygomaticus, Buccinator, and other Muscles of the Lips.

101. ONE of these superiour Rami communicates with one of the inferiour Rami of the upper Branch, as has been already said ; and by the Intervention thereof, it communicates likewise in some measure with the Sub-Orbital Ramus of the Nervus Maxillaris Superior, or that which goes out by the Foramen Sub-Orbitarium.

102. THE most considerable of all these Rami, runs forward along the Basis of the lower Jaw, sending Filaments to the Musculus Cutaneus, and to the Muscles of the Under Lip, which it perforates near the Chin, and there communicates with the Nervus Maxillaris Inferior.

103. THE inferiour Rami run under the lower Jaw, giving Filaments to the Glandula Sub-Maxillaris, and is distributed to the Throat on the Musculus Cutaneus, intersecting the external Jugular Vein. One or more of these Rami are observed to run down to the middle of the Musculus Sterno-Mastoidæus, where it communicates with a Ramus of the second Vertebral Pair.

Nervi Sympathetici Medii.

104. THE Nerves of the eighth Pair, called by the Ancients Par Vagum, and which I have named Nervi Sympathetici Medii, arise from the posterior part of the Medulla Oblongata, from the great transverse Protuberance, and from the anterior part of the Corpora Olivaria, by several separate Filaments which are afterwards collected in a Fasciculus, that runs toward the anterior part of the Foramen Lacerum of the Basis Cranii, where it perforates the Dura Mater immediately before the Extremity of the great lateral Sinus.

105. THE passage of this Nerve is divided from that of the Sinus, by a small Membranous Septum of the Dura Mater, and by the little bony Prominences of the Foramen Lacerum, mentioned in the Description of the Sceleton.

106. THIS great Fasciculus does not penetrate the Dura Mater through a single Opening, and as one Rope; for several of the anterior Filaments form a particular Portion, divided from the main Body by a very thin membranous Septum.

107. THE Filaments which compose the large Portion, when carefully examined, seem to perforate the Dura Mater separately, by small Holes or Pores, which lie very near each other.

108. THO' these two Portions go out separately, they are look'd upon as a common Trunk; and the small Portion is look'd upon as a Branch of the great one, which lies behind the other, and is esteemed the true Trunk of this eighth Nerve.

109. As this Trunk goes out, it receives backward a small nervous Rope, which runs up laterally from the Spinal Canal, and passing through the great Occipital Hole on the Dura Mater, joins this Trunk. This small Rope is termed Nervus Accessorius Octavi Paris, or Nervus Spinalis.

110. As the two Portions pass through the Dura Mater and Foramen Lacerum, they are closely united together, and communicate by Filaments which increase the Size of the small Portion. The large Portion communicates likewise with the Nervus Accessorius, to which it is strongly connected during this passage.

111. THE small or anterior Portion having passed out of the Cranium, separates from the large one as a Branch from a Trunk; and from thence it has been called the first Branch of the eighth Pair.

112. IT is bent in form of an Arch, and passing interiorly on the side of the Digastric Muscle, it supplies the Musculi Genio-Hyoidæi, those near the Basis of the Tongue, and those of the Pharynx.

113. ABOUT two Fingers breadth from where it leaves the Cranium, this Portion sends backward, one Ramus which is bent in the same Direction like an inverted Arch; and detaches from its convex side, at least three Filaments. The first, which is sometimes double, communicates with the Trunk of this eighth Pair, on one side of the Ganglion of the Intercostal or great Sympathetic Nerve. The second joins the Nervus Accessorius, and the third goes to the Pharynx.

114. AFTERWARDS this small Portion goes to the Tongue, as has been said, where it communicates with the Extremities of the small Nervus Hypoglossus, or Ramus Lingualis of the inferior Maxillary Nerve, and with those of the great Hypoglossus or Nerve of the ninth Pair.

115. THE large Portion of the eighth Pair, or middle Sympathetic Nerve, adhering by one side to the first Ganglion of the Sympatheticus Maximus, and by the other, to the Hypoglossus Major, to both which it gives communicating Filaments, sends off a little below the small Portion, another smaller Branch, which goes by several Filaments to the Pharynx.

116. A little below, or on one side of the Union of the eighth Pair with the ninth, this Portion or Trunk forms a Ganglion, and gives off a third Branch, which runs before the internal Carotid Artery, to the Larynx, Musculi Laryngis, Glandula Thyroides, and Muscles of the Os Hyoides.

117. THIS third Branch passes between the Cornu of the Os Hyoides and the Ala of the Cartilago Thyroides, and running in between that Cartilage and the Cartilago Cricoides, it communicates with the Extremities of the Nervus Recurrens, of which hereafter.

118. AFTERWARDS, the large Trunk runs down on the fore side of the first Ganglion of the Nervus Sympatheticus Maximus, along the anterior Vertebral Muscles of the Neck, by the side of the Carotid Artery, and behind the internal Jugular Vein; being accompanied by the Intercostal Nerve as far as the last Vertebra of the Neck.

119. THROUGH all this Course, this Trunk is invested by a kind of Cellular, Filamentous, or Membranous Vagina, common to it with the internal Carotid Artery, the internal Jugular Vein, and the great Sympathetic Nerve. In its passage it gives small Rami to the neighbouring Parts, to the Pharynx, Œsophagus, and to the Carotid Artery and Jugular Vein. One of these small Rami, in its course downward, joins a small Ramus of the second Cervical Pair, and is distributed to the Glandula Thyroides.

120. THE Trunk having reached as low as the Larynx and Glandula Thyroides, sends out a Ramus, which, running down on the fore-side of the internal Carotid Artery, joins a Filament from the second Ganglion of the Intercostal Nerve, with which it runs to the Plexus Pulmonaris.

121. AFTERWARDS, both Trunks of the Nerves of the eighth Pair enter the Thorax, before the Origin of the Subclavian Arteries, which they cross, and run behind the Lungs, to the Œsophagus. At this place there is some difference

difference in the distribution of the two Trunks, which in every other respect is pretty much the same.

122. As the right Trunk passes before the subclavian Artery, it sends off a considerable Branch which bends backward under the Artery, and runs up on one side of the Aspera Arteria; to which, and to the Oesophagus, it sends Filaments as high as the Larynx. This Branch is called Nervus Recurrens.

123. THIS Recurrent Nerve having reached the Larynx, sends Rami to the Muscles thereof, to the Pharynx and Glandula Thyroides. Then it runs in behind the Cornua of the Cartilago Thyroides, where it joins the Extremity of the third Branch of the Trunk of this eighth Pair, communicating with it in the manner already said.

124. THE right Trunk having given off the Recurrent of the same side, runs down on one side of the Aspera Arteria, and behind the Origin of the right Lung, where it adheres to the Oesophagus; and in this course it sends out several Branches.

125. THE uppermost Branches run on the fore-side of the lower Extremity of the Aspera Arteria and Bronchia, and are all united to Filaments of the great Sympathetic Nerve, before the Bifurcation of the Trachea, and likewise to the Ramifications of the same Nerve from the other side. The other Branches which the Trunk sends off, as it runs down behind the Bronchia and Lungs, unite with Filaments of the great Sympathetic Nerve.

126. THE left Trunk of the eighth Pair is ramified in the Thorax, much in the same manner with that of the right side, with this difference only, that the left Recurrent Nerve goes out lower than the right; for it passes below the great Curvature of the Aorta, and behind the Ductus or Ligamentum Arteriosum, and afterwards runs up on one side of the Trachea Arteria, to the Larynx much in the same manner with the other.

127. THIS difference in the going off of the two Recurrents, is the reason why the left Trunk does not run down so straight as the right; and the left Recurrent gives off some of the Branches, which answer to those which come from the Trunk itself on the right side.

128. IMMEDIATELY after the Origin of the left Recurrent, the left Trunk sends down a Branch which goes partly to the Plexus Pulmonaris, and partly to the Oesophagus and Aorta.

129. THESE reciprocal Ramifications of both Trunks of the eighth Pair, and their mutual Communications with the Filaments of the Intercostal or great Sympathetic Nerve, of which presently, form particular Intertextures called Plexus; the most considerable of which are those called Plexus Cardiacus, and Plexus Pulmonaris.

130. THE Plexus Cardiacus is formed above the Lung, on the fore side of the Bronchia, and produces a great number of Filaments; some of which go to the Pericardium, and the rest go through it, round the great Vessels, to be distributed to the Heart.

131. THE Plexus Pulmonaris is composed of the following Ramifications which the two Trunks send off, as they run down behind the Lungs. Some of

of the Filaments detached from thence, run above the Bronchia at their Origin; but the greatest part run below, being distributed along with them thro' the whole Lungs.

132. BESIDES these Plexus, the two Trunks give off Rami to the Parts near which they pass; such as the posterious part of the Mediastinum, Œsophagus, and Aorta; and by all these Ramifications the Trunks are gradually diminished.

133. AFTER having sent off the two Plexus, these Trunks change in a very remarkable manner. The Trunk on the right side runs insensibly backward, as it descends, and to that on the left side, forward in the same manner.

134. IN their passage, they send several Filaments forward and backward to the Œsophagus, which unite at different distances, both with the Filaments from the same Trunk, and with the like Filaments from the Trunk on the other side; and the posterious Filaments from the left Trunk, are in some Subjects more considerable than the antierious ones from the right Trunk.

135. THESE repeated Divisions and Reunions which represent a kind of Plexus, cause the original Trunks to degenerate in some measure, into two particular Ropes, one antierious, the other posterious, which are called Nervi Stomachici.

136. THE posterious Stomachic Nerve arises principally from the right Trunk, and the antierious, from the left Trunk; and accordingly the posterious Rope is oftentimes much stronger than the antierious, because of the difference between the Filaments, of which each of them is made up.

137. THESE two Stomachic Ropes pass along with the Extremity of the Œsophagus, through the Opening in the small Muscle of the Diaphragm, and are distributed on the Stomach. The antierious Rope is spread on the upper, or as it is commonly called, the fore-side, and the posterious, on the lower or backside.

138. THE Ramifications of both Ropes communicate with each other, and form particular Intertextures chiefly near the upper Orifice of the Stomach, and along the small Curvature, all the way to the Pylorus; by all which a kind of Plexus is formed, called Coronarius Stomachicus.

139. THIS Coronary Plexus thus formed, sends off near its Origin two small Ropes; one of which seems to come chiefly from the great antierious Stomachic Rope, the other from the posterious Rope. These two small Ropes unite near the Trunk of the Hepatic Artery, which having accompanied for a little way, they are divided into two very short Branches.

140. THESE two Branches run presently afterwards to the right and left hands, immediately above the transverse Rope, which forms the Communication between the semi-lunar Ganglions of the two great Sympathetic Nerves; and they terminate by uniting with this Rope in a triangular Form.

141. IN this manner end the Nerves of the eighth Pair, or the Sympatheticus Medius of each side, by contributing together with the Sympatheticus Maximus, to the Formation of several Plexus in the Abdomen, which

are ascribed principally to the last named Nerve. Among these, are the Plexus Hepaticus, Splenicus, Mesenterici, and even the Renales.

142. WE see likewise that these two great Pairs of Nerves have a perpetual Correspondence through all the Viscera of the Abdomen, as well as in the Thorax, as we shall show more particularly hereafter.

Nervi Accessorii Octavi Paris.

143. THE Nervi Accessorii of the eighth Pair arise by several Filaments from both sides of the Medulla Spinalis of the Neck, sometimes higher, and sometimes lower. Each of them runs up between the two nervous Planes which come out from the spinal Marrow, to form the Vertebral Nerves, and they gradually increase in their course upwards by means of several Filaments which they receive from the posterioir nervous Planes.

144. HAVING reached above the first Vertebra, each Nerve is fixed to the backside of the Ganglion of the Nervus Sub-Occipitalis, or that of the tenth Pair; and having at the upper part of this Adhesion, received two Filaments from the posterioir Portion of the Medulla, they part from the Ganglion, and continue their course upward. I have sometimes found these two Filaments without any Communication with the Ganglion, or with the anterior Plane; so that they seem rather to belong to the Nervus Accessorius, than to the Sub-Occipitalis.

145. THEY enter the Cranium by the great Occipital Foramen; and having communicated with the Origin of the Sub-Occipitalis, or Nerves of the tenth Pair, and with the great Hypoglossi or ninth Pair, they return out of the Cranium with the Nerves of the eighth Pair, or Sympathetici Medii, with which they communicate in their common passage through the Cranium.

146. As soon as they get without the Cranium, each of them gives off a considerable Branch, which divides into two. One is very short, and immediately joins the Trunk of the eighth Pair; the other, which is longer, joins the small Portion or first Branch, which goes to the Tongue. They likewise communicate with the great Hypoglossus and Sympatheticus on each side.

147. AFTERWARDS the Nervus Accessorius runs backward, and perforating the Musculus Sterno-Mastoidæus, runs to the Trapezius, on which it is distributed, and terminates after having supplied the Rhomboides. In this course, it communicates with the first three Pairs of the Cervical Nerves, and gives Rami to the Glands of the Neck, to the Musculus Angularis of the Scapula, the Complexus, Occipitalis, and to the Integuments.

Nervi Hypoglossi Externi, sive Majores.

148. THE ninth Pair of Nerves, as they are commonly called, or the Par Linguale, arises on each side, between the Corpora Pyramidalia and Olivaria, by several small Filaments which uniting together, form ordinarily two small Ropes on each side. These two Ropes perforate the Dura Mater, by two small separate Holes, and afterwards soon unite in one Trunk on each side, which goes out of the Cranium, by the anterior Condylloid Hole of the Os Occipitis.

149. As soon as they leave the Cranium, each Trunk adheres very closely to the outside of the Trunk of the eighth Pair, and to that of the tenth. From thence each Nerve passes on the fore-side of the large Ganglion of the Sympatheticus Maximus, and runs between the internal Jugular Vein, and the neighbouring Carotid Artery, and then to the Tongue on one side of the Digastric Muscle.

150. IN its passage between the Jugular and Carotid, it sends down a Branch to the Jugular Glands, Musculus Cutaneus, &c. and behind the first Ganglion of the Intercostalis, it detaches another, which runs down till it joins the Nerve of the eighth Pair, or Sympatheticus Medius. A little afterwards, it gives off a third to the Musculus Omo-Hyoidæus, Sterno-Hyoidæus, and to the small Muscles of the Larynx.

151. AFTERWARDS this Trunk of the ninth Pair bends near the Angle of the lower Jaw, and runs forward between the Musculus Cerato-Basio-Glossus and Mylo-Hyoidæus, under the Genio-Glossus; to all which Muscles it gives Filaments, and it is afterwards lost in the Tongue, communicating with the Filament of the Ramus Lingualis of the inferior maxillary Nerve, and with the Ramus of the same name, belonging to the eighth Pair.

152. BEFORE it bends near the Angle of the lower Jaw, a little below the Apophysis Styloides of the Os Temporis, it communicates with the first Cervical Pair, and then sends a small Ramus to the Larynx, and another more considerable one, which runs down behind the Musculus Sterno-Mastoidæus, on the anterior Muscles of the Neck, and communicates with the first and second Vertebral Pairs.

153. THIS last Ramus communicates likewise with the Portio Dura of the Auditory Nerve, and with the following Vertebral Pairs; after which, it terminates chiefly in the Musculus Sterno-Hyoidæus, and Sterno-Thyroidæus.

154. THE Sub-Occipital Nerves, or those of the tenth Pair, arise a little lower, and more laterally than the former, at the Extremity of the Medulla Oblongata, opposite to the posterior Part of the Condylode Apophyses of the Os Occipitis. *Nervi Sub-Occipitales.*

155. THEY come on each side from the anterior Part of the Medulla, by a single Plane of small Filaments, and communicate by some collateral Filaments, with the first Cervical Pair, before they pierce the Dura Mater.

156. THEY pierce the Dura Mater directly outward, opposite to their Origin, at the same place where the Vertebral Arteries perforate it inwards; both going in a manner, through the same Holes, and the Nerves lying below the Arteries.

157. AFTERWARDS they run down in the Duplication of the Dura Mater, and emerge again under the Edge of the great Occipital Foramen, crossing the Elongation or Occipital Funnel of that Membrane.

158. HAVING passed out of the Cranium, each of them runs to the posterior Notch of the superior oblique Apophysis of the first Vertebra of the Neck,

Neck, in which it runs from behind forwards, in company with the vertebral Artery, which lies above it in the same Notch.

159. WHERE it leaves this Notch, it forms a Ganglion, and gives Filaments to the Musculi Recti and Obliqui of the Head, besides one which runs down in the transverse Foramina of the Vertebrae of the Neck, along the Blood-Vessels which lie there.

160. HAVING formed this Ganglion, and sent off these Filaments, it turns forward and downward over the transverse Apophysis of the first Vertebra, forming a sort of Arch with an ascending Ramus of the first Cervical Pair.

161. THIS Arch surrounds the Fore-part of the transverse Apophysis, and has several Communications with the first Ganglion of the great Sympathetic Nerve, and by its convex side, adheres very closely to those of the eighth and ninth Pairs.

162. THE superiour Part of this Arch or Ganglion sends up a considerable Nerve, which is increased by the Addition of a short Ramus belonging to the first Cervical Pair, and running upward and backward on the convex side of the Os Occipitis, is distributed to the superiour and lateral Parts of the Head, by several Ramifications. This Branch is termed Nervus Occipitalis.

163. THESE Sub-Occipital Nerves have this in common with the other Nerves of the Medulla Oblongata, that each arises only by one anterior Fasciculus of Filaments, without any posterior Fasciculus, as in the vertebral Nerves. We sometimes observe indeed, a small posterior single Filament on each side, but this seems rather to belong to the Nervus Accessorius of the eighth Pair, than to the Tenth.

164. THE particular Description of the Course, Division, and great Extent of the Nervi Sympathetici Maximi, commonly called Intercostrales, will come in most properly after that of all the vertebral Nerves, with which they almost universally communicate.

*The Verte-
bral Nerves
in general.*

165. THE vertebral Nerves are all those which arise from the Medulla Spinalis, and go out from the great Canal of the Spine, through the lateral Foramina formed by the corresponding Notches in the Vertebrae.

166. THE Original Trunk of each vertebral Nerve arises commonly by two flat Fasciculi of medullary or nervous Filaments; one anterior, the other posterior. These two Fasciculi on each side run towards each other, and perforate laterally the Production of the Dura Mater; after which, they presently unite in a kind of Ganglion, from which the Trunk is produced.

167. I reckon the vertebral Nerves by Pairs, in the common manner, beginning by those which pass between the first and second Vertebra. This Enumeration agrees with that of the Vertebrae themselves; there being seven Pairs of vertebral Nerves belonging to the Neck, termed Cervicales; twelve to the Back, called Dorsales; five to the Loins, named Lumbares; and five or six to the Os Sacrum, called Sacri.

168. THIS Distribution is fixed chiefly by the Dorsal Nerves, called Costales; for there is exactly the same number of these Nerves as of Ribs, and the

the first Pair of Costal Nerves passes between the first and second Vertebrae of the Back.

169. THIS is not the proper place to take notice, that the spinal Marrow from which all these Nerves arise, does not go down so low as the bony Canal of the Spine, &c. These Observations must be referred to the Description of the Brain, of which this Medulla is the true Continuation.

170. THE first Pair of Cervical Nerves passes between the first and second Vertebra of the Neck; lying more backward than the subsequent Pairs, and having larger Ganglions. *First Pair of Cervical Nerves.*

171. THE Trunk of each of these Nerves, sends out anteriorly a small Ramus, which runs up on the foreside of the transverse Apophysis of the first Vertebra, and forms a communicating Arch with the small descending Ramus of the Nervus Sub-Occipitalis of the same side, already mentioned; and consequently communicates likewise with the great Sympathetic Nerve.

172. POSTERIOURLY it sends out a considerable Branch, which is soon increased by a communicating Branch from the second Cervical Pair. This Branch communicates also with the Sub-Occipitalis, and afterwards passes between the Musculus Complexus and Rectus Minor Posticus of the Head; and bending backward, is distributed to the other small posterior Muscles of the Head, and to the Splenius, Complexus, and Trapezius. It passes next, over these Muscles to the Occiput, where it is ramified, backward, upward, and forward, to the Musculus Occipitalis, and Temporalis of the same side.

173. IT likewise gives off a Filament, which dividing into two, sends up one Portion to the Musculus Sterno-Mastoidæus, round the Nervus Accessorius Octavi Paris, or Sympatheticus Medius, and running afterwards behind that Muscle, it is distributed to the Splenius.

174. THE other Portion of this Filament runs downward, and bending in a particular manner, communicates with the second Cervical Pair, and with the Sympatheticus Major. It likewise sends smaller Filaments to the anterior Muscles of the Head and Neck, and to the Sterno-Mastoidæus, and Splenius.

175. ONE of these small Filaments communicates with the great Nervus Lingualis, or ninth Pair from the Brain, and goes to the Musculus Sterno-Hyoidæus, Thyro-Hyoidæus, and Thyroide Glands.

176. THE second Cervical Pair passes between the second and third Vertebra of the Neck; and as it goes out, communicates forward with the great Ganglion of the Sympatheticus Maximus, upwards, with the first Cervical Pair, and downward, with the third. *Second Pair of Cervical Nerves.*

177. AFTERWARDS the Trunk on each side is divided into several Branches; but from the place of its Union with the first Pair, it sends off first of all, one Filament, and then another from where it joins the third Pair.

178. LOWER down, these two Filaments unite into one, which runs down along the internal Jugular Vein, and then forming a considerable Arch, runs up along the Carotid Artery, as high as the Parotid Gland, where it joins and communicates with the Trunk of the ninth Pair of the Medulla Ob-longata.

longata. A Filament is detached from the Curvature or Arch, which is spent on the Musculus Coraco-Hyoidæus, Sterno-Hyoidæus, and Sterno-Thyroidæus.

179. OPPOSITE to the Sterno-Mastoidæus, the Trunk sends off a Branch, which behind that Muscle, communicates with the Nervus Accessorius of the eighth Pair, after the manner of a Plexus.

180. THIS Branch runs afterward behind the Musculus Splenius, perforates the upper Portion of the Trapezius, between the great Occipital Nerve and the Ear, and ascends to the lateral Part of the Occiput, where it communicates with its fellow from the other side. It is distributed on each side, to the Muscles just mentioned, and to the Angularis Scapulæ.

181. THE Trunk of this second Cervical Pair sends down other Branches to the middle part of the Musculus Trapezius, Sterno-Mastoidæus, and neighbouring vertebral Muscles; and sometimes we observe a Communication backward, between this Trunk and the third Cervical Pair.

182. HAVING given off these Branches, this Trunk advances toward the posterior Edge of the middle Portion of the Sterno-Mastoidæus, upon which it bends from behind forward, sending out several Branches. The first Branch runs downward and backward, and is distributed by several Rami to the Musculus Scalenus, Transversalis Colli, &c.

183. THE second Branch communicates with the third Cervical Pair, at the place where this Pair produces the Diaphragmatic Nerve, to the Formation of which it contributes. The third Branch is only a Filament which running upward, communicates with one or two Filaments of the inferior Branch of the Portio Dura Nervi Auditorii.

184. THE Extremity of this Curvature on the foreside of the Sterno-Mastoidæus, is divided into two Branches, one of which runs upward, the other downward. The superior Branch ascends on this Muscle, to the lower part of the Ear, sending one Ramus behind the Ear, and another to the Parotid Gland, where it joins the Trunk of the Portio Dura of the Auditory Nerve, and runs up on the foreside of the Ear.

185. THE inferior Branch runs from behind forward, to be ramified on the Musculus Cutaneus, and distributed to the Integuments of the Throat, in which it is lost near the Larynx, having first given Rami to the Musculi Sterno-Hyoidæi. It likewise communicates with a descending Branch of the Portio Dura, and with another of the ninth Pair from the Brain.

186. NEAR its Origin, this inferior Branch sends down a Ramus on the backside of the Sterno-Mastoidæus, gives other Rami to the Jugular Glands, to the Fat and Integuments of the lateral and lower part of the Neck, and passes before the middle Portion of the Clavicula, below which it is lost in the lateral Integuments of the Thorax.

*Third Pair
of Cervical
Nerves.*

187. THE third Cervical Pair passes between the third and fourth Vertebrae of the Neck, and communicates upward with the second Pair, downward with the fourth, and forward with the great Sympathetic Nerve, and with a Filament from the ninth Pair of the Medulla Oblongata. It communicates

municates likewise with the Nervus Accessorius of the Sympatheticus Medius, by a Filament which goes to the Musculus Trapezius.

188. EACH Trunk of this third Pair, sends several Branches to the anterior, posterior, and lateral Parts of the Neck, that is, to the Muscles, Glands, Membranes, Fat and Skin, all the way to the neighbouring upper Parts of the Thorax and Shoulder.

189. AMONG the posterior Branches, there is one which goes to the Musculus Supra-Spinatus, and passing over the Notch in the superior Costa of the Scapula, gives Filaments to the Extremity of the Omo-Hyoidæus; and there is another small one, which in its passage to the Musculus Trapezius, communicates with a Filament of the Nervus Accessorius of the eighth Pair.

190. OF the middle Branches, some go to the Jugular Glands, to the Musculi Subclavii, to the neighbouring Portions of the Pectoralis, Deltoides, and Trapezius, and to the Integuments which lie thereabouts.

191. AMONG the anterior Branches, there is one, which being strengthened by a Ramus from the second Cervical Pair, unites lower down with another Ramus of the fourth Pair, and thus forms the Nervus Diaphragmaticus.

192. THIS Diaphragmatic Nerve runs on the foreside of the Musculus Scalenus, and enters the Thorax behind the anterior Extremity of the Clavicula, receiving immediately afterwards, a Filament from the first Dorsal Pair, and communicating with the great Sympatheticus. It runs down obliquely forward, before the Subclavian Artery, and on one side of the Nervus Sympatheticus Medius, near the Origin of the Recurrent.

193. IN the Thorax, this Diaphragmatic Nerve runs down immediately before the Origin or Root of the Lung, along one side of the Pericardium, to which it adheres very closely, and then running a little backward, it soon enters the Diaphragm.

194. IT is distributed by numerous Ramifications on the great Muscle of that Organ, sending likewise some Filaments to the lower Portion, by which it communicates with the great Sympathetic Nerve, and with the neighbouring Plexus of the Abdomen.

195. THE right Diaphragmatic Nerve runs along the Vena Cava superior, and on that account appears to be situated more anteriorly than the left.

196. THIS left Diaphragmatic Nerve lies first of all a little backward, toward the Trunk of the Aorta, and afterwards runs in a longer Course than the right, being bent, in order to pass by that Portion of the Pericardium, which answers to the Apex of the Heart; for which reason it is longer than the right. From thence it is bent backward, and distributed to the Diaphragm in the same manner with the other.

197. THE last four Cervical Pairs pass between the Portions of the Musculus Scalenus, being in general larger than the three former. They are united by their Trunks, and together with the communicating Branch of the third Pair, and Trunk of the first Dorsal Pair, they form a very large Plexus, which is in a manner inclosed in a membranous Vagina, and produces
The last four Pairs of Cervical Nerves in general.
 six.

The Brachial Nerves in general.

six considerable Ropes, like so many particular Trunks, which are distributed to the upper Extremity, and go by the general name of *Nervi Brachiales*.

198. THE Brachial Nerves consist of six Ropes on each side, as has been said; and in the Year 1697, M. *Duverney* gave to five of them, the following names: *Nervus-Musculo-Cutaneus* five *Cutaneus Externus*, *Medianus*, *Cubitalis*, *Cutaneus Internus*, and *Radialis*, taking for a Branch of the *Radialis* that Nerve which I look upon as the sixth principal Rope, and which I name *Axillaris*, or *Articularis*.

199. THESE six Ropes do not arise separately; and their Origin is so complicated, that it is not an easy matter to determine it: but in general, it seems that each of the five vertebral Pairs, which form the great Plexus, contributes to the Formation of each Brachial Rope.

200. FOUR of these Nerves arise anteriorly from the great Plexus, *viz.* the *Musculo-Cutaneus*, *Medianus*, *Cubitalis*, and *Cutaneus Internus*; and the other two, the *Radialis* and *Axillaris*, arise posteriorly.

201. THE five vertebral Pairs form the large Plexus in the following manner.

202. THE fourth and fifth Cervical Pairs, about an Inch or more after they go out, unite into one common Trunk. The seventh Cervical and first Dorsal Pair unite likewise into one Trunk, very near their Origin. The sixth Cervical Pair runs singly for a considerable space, between the two other Trunks, and afterwards is increased by a communicating Portion which it receives from each of them.

203. THESE five large vertebral Nerves on each side, thus mingled, interwoven and complicated together, divide again, and are disposed in a quite different manner from what is ordinary, forming the six Brachial Ropes. There is, however, some Variety in this Plexiform Union and Mixture.

204. THE manner in which the six Brachial Nerves arise from the great Plexus, is commonly as follows.

205. THE *Nervus Musculo-Cutaneus* is formed by the Union of the fourth and fifth Cervical Pairs, and by their collateral Communication with the third and sixth Pairs.

206. THE *Medianus* comes on one side, from the Union of the sixth Cervical Pair, with the fourth and fifth; and on the other, from the Union of the seventh Pair, with the first Dorsalis. These two Unions form an acute Angle, the Apex of which produces the Median Nerve.

207. THE *Cubitalis* goes out from the Union of the seventh Cervical, with the first Dorsal Pair, a little nearer the lower side of the Angle of the *Medianus*.

208. THE *Cutaneus Internus* arises much in the same manner.

209. THE *Radialis* is the largest of the six, and goes out from the Apex of another nervous Angle, the upper side of which is formed by the Union of the Trunks of the fourth, fifth and sixth Pairs; and the lower side by the Union of the seventh Cervical and first Dorsalis.

210. THE *Axillaris* goes out close to the *Radialis*, chiefly from the upper side of the Nervous Angle, and it communicates with all the rest.

211. BESIDES the great Brachial Nerves, several small Branches go out from each of the last four Pairs; and it will be proper to describe all these Branches, together with the Trunks they belong to, before we go on to the Distribution of the Brachial Nerves.

212. THE fourth Cervical Pair passes between the fourth and fifth Vertebræ of the Neck, and communicates above with the third Pair, below, with the fifth, and forward with the great Sympathetic. *Fourth Pair of Cervical Nerves.*

213. IT sends several Rami to the Musculus Scalenus, Angularis Scapulæ, Rhomboides, Trapezius, and Pectoralis Major; and likewise gives off a Filament, which contributes to the Formation of the Nervus Diaphragmaticus. Afterwards it advances a Finger's breadth without any Ramification, and joins the Trunk of the fifth Cervical Pair.

214. AT the place of this Union or a little before, it gives out a pretty considerable Branch, which having sent a Filament to the Musculus Subscapularis, passes through the small Notch in the superior Costa of the Scapula, and gives other Filaments to the Supra-Spinatus. This Ramus runs afterwards under the last named Muscle, and under the Acromium, to the Infra-spinatus, and Teres Minor.

215. THE fifth Cervical Pair passes between the fifth and sixth Vertebræ of the Neck, communicating with the fourth and sixth Pairs, and with the great Sympatheticus. *Fifth Pair of Cervical Nerves.*

216. AFTERWARDS each Trunk sends forward a Ramus, which uniting with a like Ramus from the sixth Pair, is distributed to the Musculus Scalenus, to the Surface of the Pectoralis Major, and to the neighbouring Integuments. This Trunk sends off likewise near its Origin another Ramus, which runs down behind the Origin of the sixth Pair, from which it receives a small communicating Filament.

217. BEING thus strengthened, it runs down on the outside of the Thorax, and is distributed to the Muscles situated there; passing first under the two Pectorales, and then between the Serratus Major and Subscapularis.

218. AFTERWARDS continuing its Course downward, it reaches the anterior, middle and almost the lower part of the Latissimus Dorsi at the third false Rib, and terminates in this Muscle, and in the Integuments.

219. THE sixth and seventh Cervical Pairs having passed in the common manner, under the sixth and seventh Vertebræ of the Neck, and having communicated with the other Nerves near them, send several Filaments to the neighbouring Parts. *The last two Pairs of Cervical Nerves.*

220. THE Branch of the sixth Pair, which unites anteriorly with a like Branch of the fifth Pair, to be distributed on the Thorax, as has been said, sends down a Filament, which together with another common to the seventh Cervical, and first Dorsal Pair, forms a kind of Arch, under which the Axillary Artery passes.

221. ALL these Nerves give Filaments to the neighbouring Integuments; and some go likewise to the Axillary Glands.

222. THE Musculo-Cutaneous Nerve, which naturally lies on one side of the Cutaneus Internus, arises from the Union of the fourth and fifth *Nervus Musculo-Cutaneus.*

Cervical Pairs, and partakes of their lateral Communication with the third and sixth Pairs.

223. HAVING reached the upper Extremity of the Musculus Coraco-Brachialis, it perforates it obliquely from above downward, and gives it several Filaments. Afterwards it runs down on the Arm behind, and under the Biceps, to both Portions of which it gives Rami.

224. HAVING got from behind the Biceps, it runs from within outward, between the lower Extremity of that Muscle and of the Brachialis, which it likewise supplies. In the Fold of the Arm, it reaches the Skin immediately behind the Vena Mediana, and there it becomes a true Nervus Cutaneus. From thence it runs along, between the Supinator Longus and the Integuments, on the inside of the Cephalic Vein, all the way to the Thumb.

225. IT is distributed to the Integuments on the fore-side of the Carpus to those of the Thumb and of the convex part of the Hand. Before it reaches the Wrist, it passes over the Cephalic Vein, and communicates at the Thumb with a Branch of the Radial Nerve.

*Nervus
Medianus.*

226. THE Nervus Medianus lies between the Musculo-Cutaneus and Cubitalis. It arises from the Union of three Branches, one belonging to the sixth cervical Pair, one to the seventh, and one to the first Dorsalis. In some Subjects it is formed by the Union of two principal Branches, one of which comes from the Union of the first Dorsalis with the last Cervicalis the other from the Union of the fourth, fifth, and sixth Cervicales.

227. IT runs down on the Arm, along with the Brachial Artery, under the inner Edge of the Biceps, having first pass'd behind the inferior Insertion of the Coraco-Brachialis, and reaches the Fold of the Arm between the lower Extremity of the Musculus Brachialis and Pronator Teres; giving Filaments in its passage to all these Muscles on both sides.

228. IT passes behind the Ramus Medianus of the Basilic Vein, as it approaches the inner Condyle; and then runs backward cross the Pronator Teres, and downward between the Perforatus and Perforans to which it gives Rami.

229. BELOW the Pronator Teres, it sends off a particular Ramus, which runs along the Interosseous Ligament, behind the Pronator Quadratus, all the way to the Wrist, giving Filaments to that Muscle.

230. AFTERWARDS, having detached some Cutaneous Ramifications, the Trunk passes under the internal transverse Ligament of the Carpus, to the Palm of the Hand, where it sends off numerous Rami to the Musculus Thenar and Anti-thenar, two to the lateral concave parts of the Thumb, two to those of the Index, two to those of the middle Finger, and one to the nearest side of the Ring Finger, after having communicated with a Ramus of the Cubital Nerve. These Rami go all the way to the ends of the Fingers, supplying the Integuments, Ligaments, and Tendons.

*Nervus
Cubitalis.*

231. THE Cubital Nerve arises from the Union of the seventh Cervical, with the first Dorsal Pair; and communicates with the lower Root of the Median Vein.

232. It runs down on the inside of the Arm, along the *Musculus Anconæus Maximus*, between the Brachial Artery and the Basilic Vein; sending off only small Filaments to the neighbouring Muscles and Integuments.

233. It runs in between the inner Condyle of the *Os Humeri* and the Olecranon, where it is covered only by a kind of Ligament, and by the common Integuments; and this is what makes strokes upon the Elbow so painful, even all the way to the little Finger where this Nerve ends.

234. AFTERWARDS it runs down on the *Musculus Ulnaris Internus*, giving Filaments to the neighbouring Muscles, to the *Pronator Quadratus* and Integuments; and at the lower Extremity of the Ulna, it is divided into two Branches, one large, the other small.

235. THE large Branch, which may be reckoned the Continuation of the Trunk, passes on one side of the *Os Pisiforme*, under the great transverse Ligament of the Carpus, to that part of the Palm of the Hand which answers to the last two Fingers, where it gives some Filaments to the Integuments and Ligaments of the Carpus.

236. AFTERWARDS it divides into three particular Branches, one of which forms a kind of Arch, being distributed to the neighbouring small Muscles of the Thumb and to the *Interossei*; the second is bifurcated, and goes to the corresponding lateral concave parts of the Ring and little Fingers; and the third goes to the opposite lateral part of the little Finger, and to the neighbouring Muscles.

237. THE small Branch is turned outward, behind the Tendon of the *Ulnaris Externus*, and goes to that part of the Back of the Hand which answers to the last two Fingers. It is distributed to the lateral convex parts of these two Fingers, much in the same manner as the other Branch, to the lateral concave Parts. It likewise Supplies the *Musculus Hypothenar*, *Metacarpus*, and the Integuments, and communicates with a Ramus of the *Nervus Medianus*.

238. THE internal Cutaneous Nerve is very small, and arises from the Union of the seventh Cervical and first Dorsal Pairs, but chiefly from the latter. It runs over the other Brachial Nerves, and passes down on the inside of the Arm, between the Muscles and Integuments. *Nervus Cutaneus Internus.*

239. It divides first of all into two Branches, which accompany each other very closely, as far as the inner Condyle, on one side of the *Vena Basilica*, being covered by the Ramus Medianus of that Vein.

240. ONE of these Branches runs down under the Integuments, which cover the *Musculus Radialis Internus* and *Ulnaris Gracilis*, and is afterwards ramified on the Skin which covers the Wrist and beginning of the Palm of the Hand.

241. THE other Branch runs a little more backward along the Integuments which cover the *Musculus Ulnaris Internus* and Ulna, upon which it is ramified all the way to the little Finger.

242. THE Radial Nerve, so called, because it accompanies the *Radius* and the Radial Artery, arises from the Union of three compound Branches, *Nervus Radialis.*

one of which comes from the united Trunks of the fourth and fifth Cervical Pairs; the second from the single Trunk of the sixth Pair, and the third from the united Trunks of the seventh Cervical and first Dorsal Pairs.

243. THE Trunk of this Nerve lies deeper than the rest; and it runs first of all, from before backward, bending round the Os Humeri, between the Musculi Anconæi and that Bone.

244. THIS Curvature is oblique and contorted, answering to the Impression observable on the Bone; and above it, the Radial Nerve gives Branches to the three Anconæi, especially to the Longus and Externus. Afterwards it turns from behind forward, between the Anconæus Externus and Brachialis.

245. IT sends off from the Curvature or Arch, some Cutaneous Rami, the most considerable of which goes to the external Condyle of the Os Humeri, and is distributed to all the Integuments which cover the Radius on the fore and outer Sides, and to those which cover the exterior parts of the Carpus and Back of the Hand, all the way to the Thumb.

246. AT the Fold of the Arm, the Radial Nerve turns outward, and runs down between the lower Extremity of the Musculus Brachialis and upper Extremity of the Supinator Longus, giving Rami to these and to the neighbouring Muscles.

247. HAVING reached the Extremity of the Radius, it divides into two, or rather sends off a large Branch, which passes between the Radius and Supinator Longus, below the middle of the Bone, where it runs in between the Supinator Longus and Radialis.

248. THIS Branch accompanies the external Radial Artery near the Integuments, and having got to the lower part of the Radius, it is distributed in three Rami, to the convex lateral parts of three Fingers and an half.

249. ONE Ramus goes to the internal lateral part of the Thumb, and to the Integuments. The second is divided into two for the external lateral part of the Thumb and anterior lateral part of the Index; giving Filaments in its passage to the Integuments of the metacarpal Bones. The third Ramus is divided into several lesser Ramifications which go to the posterior lateral parts of the Index, to both sides of the middle Finger, and to the anterior lateral part of the Ring Finger.

250. THROUGH all this Course, this Branch supplies the Integuments and Interosseous Muscles.

251. THE Trunk or largest Branch of the Radial Nerve, passes between the upper Extremity of the Radius and Musculus Supinator Brevis; and in its passage, supplies this Muscle, the Anconæus Minimus, Supinator Longus, and Radialis Externus.

252. AFTERWARDS it is lost in the Extensor Digitorum Communis, and in the Muscles of the Carpus and Thumb, having first communicated with a Ramus of the Musculo-Cutaneous Nerve.

Nervus Axillaris.

253. THE Axillary or Articular Nerve arises from the last two Cervical Pairs, and sometimes seems to be no more than a large Branch of the Nervus Radialis. It runs in the Hollow of the Axilla, behind the Head of

of the Os Humeri, between the Musculus Teres Major and Minor; and bends or turns from within outward and backward, round the Neck of that Bone, running between the Articulation and the upper Extremity of the Anconæus Longus, to the Deltoides.

254. IT is divided into several Rami, which go chiefly to the upper and lower parts of the Deltoides, upon which they are ramified, supplying in their passage, the Sub-scapularis, the upper Extremity of the Anconæus Longus, Teres Major and Minor and Supra-spinatus. It likewise gives some Nerves to the Latissimus Dorsi, and Anconæus Externus.

255. THE Dorsal or Costal Nerves consist of twelve Pairs, as has been already said, and they deserve more justly to be called Intercostrales, than the great Sympathetic Nerve to which that name has been commonly given. *Nervi Dorsales five Costales.*

256. THEY have this in common with each other, that as soon as they leave the Vertebrae of the Back, before they begin to accompany the Ribs, they send out two Filaments anteriorly which communicate with the great Sympathetic Nerve and several Filaments backward, to the Vertebral and other Muscles.

257. EACH of these twelve Pairs is numbered from the Vertebra, under which it goes out; thus the first Pair is that which passes under the first Vertebra of the Back, and so of the rest.

258. THE first Pair enters the Composition of the Nervi Brachiales, as has been said, and together with the second Pair, it sends off the Rami Thoracici.

259. THE seven superiour Pairs run along the under sides of the true Ribs, all the way to the Sternum; being distributed to the Intercostrale Muscles, which they perforate likewise from within outward, to go to the Serratus Major, Pectorales and external Integuments.

260. THE seventh Pair having reached the Cartilaginous Portion of the seventh true Rib, runs down to the broad Muscles of the Abdomen, to which it is distributed.

261. THE lowest five Pairs leave the Extremities of the false Ribs, and go to the Muscles of the Abdomen.

262. THE eleventh Pair gives likewise some Filaments to the Diaphragm, and then runs in between the Musculi Transversales and Peritonæum.

263. THE twelfth is distributed to the Transversales and Obliqui Interni.

264. ALL these Nerves send numerous Ramifications through the Muscles, to the Integuments; which form the Cutaneous Nerves of the Thorax, of the upper two Regions of the Abdomen, and of the Superior Portion of the Loins.

265. ALL the five Pairs of Lumbar Nerves send Filaments backward to the vertebral Muscles, communicate with each other, and with the great Sympatheticus on each side, and are covered by the Psoas Muscle. *Nervi Lumbares.*

266. THE Branches which communicate with the great Sympathetic Nerve are long, because they advance forward a considerable way on the Bodies of the Vertebrae Lumbares.

*First Pair of
Lumbar
Nerves.*

267. THE Lumbar Nerves are denominated from the Vertebrae, under which they pass.

268. THE first Pair passes between the first and second Vertebrae of the Loins, and each receives a communicating Branch from the last Dorsal Pair, and gives out another to the second Lumbar Pair, or to a Branch thereof.

269. EACH Trunk communicates with the great Sympatheticus, by a pretty long Ramus; and afterwards gives out three Branches, one posterior, and two anterior, whereof one is external and large, the other internal and small.

270. THE posterior Branch perforates the Musculus Quadratus Lumborum, runs in between the back parts of the oblique Muscles of the Abdomen, pierces the Obliquus Externus, and is distributed to the Skin all the way to the Clunes. This Branch supplies also the vertebral Muscles, and Sacro-Lumbaris.

271. THE external anterior Branch perforates the upper Extremity of the Musculus Psoas, obliquely outward, passes over the Quadratus Lumborum, and runs along the Crista of the Os Ilium, to the anterior Spine of that Bone.

272. IT gives Filaments to the Abdominal Muscles, and supplies the Fascia Lata, neighbouring Integuments, and those of the anterior part of the outside of the Thigh, and the Inguinal Glands.

273. THE internal anterior Branch perforates the Psoas almost at the same place with the former, but a little more forward; and then passes over the Musculus Iliacus, to the beginning of the Ligamentum Falloppii, where it unites with the other anterior Branch, and by this Union forms a Nerve, which runs along that Ligament, and along the inside of the Aponeurosis of the Obliquus Externus, all the way to the Opening, commonly called the Ring of that Muscle.

274. THIS Nerve goes out by that Opening, and afterwards divides into several Cutaneous Filaments, which go to the Pubis and Integuments of the Parts of Generation in both Sexes, &c. It likewise supplies the spermatic Ropes, and those vascular Ropes falsely called the round Ligaments.

275. BESIDES these Branches, the Trunk of this first Pair, near its Union with the second, sends out two small Rami, closely united together, which run down behind the Psoas Muscle, over one tendinous Insertion of the small Muscle of the Diaphragm, in the third Vertebra of the Loins, and communicate with the great Sympathetic Nerve.

276. THESE two Rami accompany each other in this manner, all the way to the Ligamentum Falloppii; from whence one goes to the Testicles, in company with the spermatic Vessels; the other passes under the Ligament to the Skin and Glands of the Inguen.

277. AT the place of this Division, the Trunk sends a Branch directly downward, which joins the second Lumbar Pair, or rather a Branch thereof; and afterwards contributes to the Formation of the large Rope, termed Nervus Cruralis.

278. THE Trunks of the second Pair of Lumbar Nerves, go out between the second and third Vertebrae of the Loins; and having communicated with the first Pair, and with the great Sympathetic Nerve, each Trunk gives off several small Filaments to the neighbouring parts of the Musculus Psoas, and a large Ramus backward, to the Quadratus-Lumborum, Sacro-Lumbaris, Longissimus Dorsi, and neighbouring vertebral Muscles, the Quadratus having first been perforated by it. *Second Pair of Lumbar Nerves.*

279. AFTERWARDS the Trunk sends out a small Branch, which near its Origin joins a descending Ramus of the first Pair already mentioned. Being thus strengthened, it perforates the Head of the Psoas, runs along that whole Muscle, to the Fissure of the Obliquus Externus, and is distributed to the Inguinal Glands, to the Fat and Scrotum in Males, and in Females, to the Labia.

280. THE same Trunk sends out two other Branches, which accompany each other, and likewise a small Ramus between the Origins of these two, which goes to the upper part of the Psoas. These two Branches perforate the Psoas in different Places; and afterwards, continuing still near each other, they pass under the upper part of the Ligamentum Falloppii, and so go out of the Abdomen.

281. As they go out, they unite and form one Nerve, which is distributed by several Rami to the Inguinal Glands, the Aponeurosis Cruralis, and Integuments of the Fore-part of the Thigh, all the way to the Knee.

282. SOME of these Rami unite with those of the Nervus Cruralis; some are distributed to the Integuments on the inside of the Thigh; and one accompanies the Crural Artery, over one Branch of which, it runs in form of an Arch.

283. THIS Trunk sends out oftentimes another Ramus, which unites with one from the third, and one from the fourth Pairs, into a particular Rope, which passing to the Obturator Muscles, is named Nervus Obturator.

284. AFTERWARDS this Trunk runs downward, and having given a Ramus to the middle Portion of the Psoas Muscle, joins the Trunk of the third Pair, and contributes to the Formation of the Crural Nerve.

285. THE Trunks of the third Pair of Lumbar Nerves go out between the third and fourth Vertebrae of the Loins. Each Trunk communicates above with the second Pair, before, with the great Sympathetic Nerve, and below, joins the Trunk of the fourth Pair. It sends a considerable Ramus backward, between the transverse Apophyses which goes to the vertebral and other neighbouring Muscles. *Third Pair of Lumbar Nerves.*

286. BEFORE it unites with the fourth Pair, it sends a considerable Branch downward, and having received a communicating Branch from the second Pair, unites with one from the fourth Pair, and forms the Obturator Nerve.

287. It detaches likewise another large Branch which runs down between the Musculus Iliacus, and Psoas, and joins the Crural Rope on the outside of the lower part of the Muscle, last named. It may be reckoned a sort of Nervus Accessorius to the Cruralis.

288. As the Trunk runs along the Psoas, it gives off Filaments both to that, and to the Iliac Muscle; and sends down a Ramus, which passes under the Ligamentum Falloppii, to the Musculus Pectineus; and lastly, having joined a Branch of the second Pair, it unites with the fourth Pair, to form the Nervus Cruralis.

*Fourth Pair
of Lumbar
Nerves.*

289. THE Trunks of the fourth Pair of Lumbar Nerves go out between the fourth and fifth Vertebrae of the Loins; and each communicates above, with the third Pair, and before, with the great Sympathetic Nerve, oftentimes by two Filaments.

290. EACH Trunk sends Rami backward, to the vertebral and neighbouring Muscles; and afterwards compleats the Formation of the Nervus Cruralis, together with the other Portions of the Lumbar Nerves, already mentioned.

291. FROM the same place, it sends off a considerable Branch, which joining a Branch from the third Pair, and one from the second, forms the Nervus Obturator.

292. LASTLY, the remaining Part of the Trunk joins the fifth Pair of Lumbar Nerves.

*Nervus Ob-
turator.*

293. THE Obturator Nerve, formed in the manner already described, runs along the inner lateral Part of the Psoas Muscle, to the Pelvis, and goes out of the Abdomen, at the upper Part of the Obturator Muscles, and Foramen Ovale of the Os Innominatum.

294. As it goes out, it supplies the Musculi Obturatores and Pectineus; and is afterwards distributed by three principal Branches to all the Portions of the Triceps; and sends other Rami between these Portions, to the Gracilis Internus.

*Fifth Pair of
Lumbar
Nerves.*

295. THE fifth Pair of Lumbar Nerves passes between the last Vertebra of the Loins and Os Sacrum; each Trunk communicating above, with the fourth Pair, and before, with the great Sympathetic Nerve. It sends Rami backward to the vertebral and neighbouring Muscles, and even to the Glutæi; and as it bends forward, it sends a small Ramus to the Crural Nerve.

296. AFTERWARDS the Trunk runs down on the Symphysis of the Os Sacrum with the Os Ilium, enters the Pelvis, and having received a communicating Branch from the fourth Lumbar Pair, joins the Nervi Sacri, with which it forms a Plexus, that produces the Nervus Sciaticus, the largest Nerve of the Human Body, which is distributed to the lower Extremity.

Nervi Sacri.

297. THE Nervi Sacri are those that come from the Os Sacrum, the chief of which pass through the antierior Holes of that Bone, the rest through the lateral Notches at the Extremity of that Bone, and in the Os Coccygis.

298. THESE Nerves are reckoned likewise by Pairs, of which there are commonly six; four passing through the great antierior Holes, and two below them. This Number is increased, when there are five Pairs of great Holes; and some Filaments pass likewise through the posterior Holes.

299. THE first Pair is very large ; all the rest diminish gradually, and the last is very small.

300. THOSE which pass through the great Holes, unite together as soon as they enter the Pelvis, and together with the fifth Lumbar Pair, form the great Plexus for the Sciatic Nerve, already mentioned. They likewise send Rami backward through the Membranes of the posterioir Holes, to the neighbouring Integuments.

301. THE Trunks thus united and interwoven with each other, give off other small Branches, besides the great Sciatic Trunk ; and it will be proper to describe the most considerable of these Branches, together with the inferior Nervi Sacri, before we enter upon the Detail of the Ramifications of the great Sciaticus.

302. THIS Disposition resembles very much that of the last four Cervical Pairs and first Dorsalis, which are not only interwoven together, to form the Brachial Nerves ; but likewise send off many Branches from their Origin.

303. FROM this Intertexture of the Nervi Sacri, especially from the second Pair, a Branch goes out to the Vesiculæ Seminales, Prostate Gland, Uterus, Tubæ Falloppianæ, &c. Another Branch goes chiefly from the fourth Pair, partly to the places just named, and partly to the Bladder and Intestinum Rectum.

304. THE same Intertexture, and chiefly the third Pair united in some Subjects with the second, and in others with the fourth, and sometimes with both, produces a Branch which goes out of the Pelvis over the Ligamentum Fallopii, passes on the inside of the Tuberosity, and inner Part of the Os Ischium, and is distributed to the Corpus Cavernosum, to the Muscles thereof in both Sexes, to the neighbouring Parts of Generation, and to the Sphincters of the Anus.

305. THE last two Pairs of Nervi Sacri are very small. That which goes out immediately below the great Foramina, runs from behind forward, on each side, between the Extremity of the Os Sacrum, and Ligament of the Os Coccygis ; being distributed chiefly to the Muscles of the Anus, and neighbouring Integuments.

306. THE next or last Pair of Nervi Sacri runs down almost directly from the Extremity of the Canal of the Os Sacrum, and is likewise distributed to the Anus, Integuments, &c.

307. FROM the Extremity of the Plexus of all the Nervi Sacri, immediately before the Formation of the great Sciatic Rope, a Branch goes out to the Glutæus Medius and Minimus. Another goes out posterioirly, which is distributed partly to the Muscles of the Corpus Cavernosum, &c. and partly to the Glutæus Maximus, and neighbouring Integuments, by several Filaments, which reach as far as the Ham.

308. THE Crural Nerve, formed by the complicated Union of the Trunks *Nervus Cruralis* of the first, second, and third Pairs of Lumbar Nerves, and of a Portion of the fourth, sometimes increased by a Branch of the fifth Pair, as has been already observed, passes under the Ligamentum Fallopii, and goes out of the

Abdomen, on the outside of the Crural Artery, which lies between this Nerve, and the Crural Vein.

309. As it goes out, it is divided into several Branches, some of which are detached from its Union with the Ramus Accessorius of the third Pair, but the greatest Number goes out from the Trunk it self.

310. THE Branches which go from its Union with the Nervus Accessorius, run down on the foreside of the Thigh; and having reached the middle of the Musculus Sartorius, they follow its Course, and are spent on the Integuments of the fore and inner Parts of the Knee.

311. THE most antierour Branch passes on the Fascia Lata, or Aponeurosis Cruralis, forming Cutaneous Nerves all the way to the Knee.

312. THE internal Branch runs along the Tendon of the Sartorius, in the same manner, all the way to its Insertion in the Tibia, where they are spent on the Integuments; and some of them go to the inner Ankle, and convex part of the Foot.

313. AFTERWARDS the Crural Rope divides into a great number of Rami, which in their Course downward, are distributed to the antierour Muscles, viz. to the Rectus, Vasti, and Cruralis; giving Rami in their passage, to the Triceps, Sartorius, Gracilis Internus, and Semi-Tendinosus.

314. IT likewise gives off a Branch, which runs down interiorly between the Sartorius and Triceps, in the same Course with the Crural Vessels, as far as the middle of the Thigh.

315. AFTERWARDS it runs near the Integuments, behind the Sartorius, to which it gives several Filaments; and continues this Course all the way to the Insertion of that Muscle.

316. HAVING reached the Tibia, it lies near the Vena Saphena, and follows the same Course with it, as far as the inner Ankle, where it detaches a great number of Cutaneous Filaments.

317. LASTLY, it ends by Ramifications, on the inner and upper Part of of the Foot; where one of the most antierour Ramifications adheres very closely to the Saphena.

*Nervus
Sciaticus.*

318. THE great Sciatic Nerve being formed, as has been already said; or as it sometimes happens, from the last two Pairs of the Lumbares, and first three Pairs of the Sacri, runs obliquely backward, under the great Sinus of the Os Ilium, and under the Musculus Pyriformis.

319. IT goes this way, out of the Pelvis, passing between the Pyriformis, and superior Gemellus; and then running on the foreside of the first of these Muscles, and presently afterwards behind the two Gemelli and Quadratus Femoris, it gives Filaments to each of them.

320. IT runs down in the next place, between the Tuberculum Ischii, and the great Trochanter, along the inner and posterour Part of the Thigh, between the Musculus Biceps and Semi-Nervosus, as far as the hollow of the Poples, a little nearer to the internal Condyle than to the external, giving Rami in its passage to all these Muscles, and to the Triceps, and diminishing gradually in Size as it descends.

321. As it goes out of the Pelvis, it gives out a Branch, which passes between the Portions of the Ligamentum Sciaticum, to the Anus, Perinæum, Parts of Generation, &c. and this Branch joins a Ramus from the third Pair of the Nervi Sacri, which goes to the same Parts, as has been observed.

322. As it passes between the Tuberosity of the Ischium and the great Trochanter, it produces two Rami, one of which is spent on the Glutæus Maximus, the other divides into two, for the other two Glutæi.

323. BELOW the great Trochanter, where it may be termed Nervus Sciatico-Cruralis, it sends back a Ramus, which runs down with the Sciatic Vein, and is distributed to the Integuments as low as the middle of the Calf of the Leg; and sometimes lower toward the outer Ankle.

324. THE Sciatic Nerve having reached the Ham, is commonly called Nervus Popliteus, and begins to be divided into two Branches, which run at first very close to each other between the Extremities of the Biceps and Semi-Nervosus; and afterwards separate gradually, passing behind the Condyles of the Os Femoris, between the superiour Extremities of the Gastrocnemii.

325. THE innermost of these two Branches is very large, the outermost not so large. They are distributed to the whole Leg, and through this Course, they may be termed Nervi Sciatico-Tibiales.

326. THE large Branch of the Sciatico-Cruralis or Cruralis Internus, which may likewise be termed Popliteus Internus, runs down behind the Musculus Popliteus, on one side of the Tibialis Gracilis, commonly called Plantaris, and between the two Gastrocnemii.

327. AFTERWARDS it pierces the upper Extremity of the Soleus, and runs down between this Muscle and the great Flexors of the Toes, to the lower Extremity of the Tibia, near the inner Ankle.

328. IN its passage, it sends small Rami to the Joint of the Knee, to the Gastrocnemius Internus, to the other Muscles last mentioned, and to the Integuments, all the way down.

329. BESIDES these small Rami, it sends off another more considerable Branch towards its upper part, from which, one Filament goes to the Tibialis Posticus, another perforates the Interosseous Ligament, and is distributed to the upper part of the Tibialis Anticus.

330. SOON after this, it detaches externally a long Ramus, which runs down on the backside of the Leg, between the Integuments and external Gastrocnemius, on one side of the Vena Sciatica or Saphena Externa.

331. THIS long Ramus joins a Branch of the Sciaticus Externus Minor, sends off Filaments toward each side, through its whole Course, and having supplied the TendoAchillis, passes behind and under the outer Ankle.

332. THIS Ramus passes afterwards on the outside of the Foot, where it is distributed to the Integuments, and neighbouring Muscles, and terminates on both sides of the little Toe, and on the outside of the Toe next to that.

333. THE large Sciatic Branch or Sciatico-Tibialis, having given off these different Ramifications, passes behind the inner Ankle, through a particular annular Ligament, and runs downward to the great lateral Sinus of the Os

Calcis, passing first between that Bone and the Musculus Thenar, and then between it and the posterioir Insertion of the Flexor Digitorum Brevis.

334. AT this place, having first sent small Filaments to the neighbouring parts, it divides into two Rami, named Nervi Plantares, one internal and large, the other external.

335. THE Nervus Plantaris Internus is distributed to the Foot, much in the same manner as the Radial Nerve to the Hand. It runs first along the inside of the Sole of the Foot, and sends Filaments to the Thenar, Flexor Digitorum Brevis, and to the Musculus Lumbricalium Accessorius.

336. AFTERWARDS it sends four Branches to the lateral concave or lower parts of the first three Toes, and to the nearest lateral part of the fourth Toe. The first Ramus goes to the inside of the great Toe. The second divides into two, for the corresponding sides of the great Toe and the second. The third being bifurcated in the same manner, goes to the second and third Toes; and the fourth to the third and fourth Toes.

337. THESE Nerves communicate on each side at the Extremities of the Toes, and in their passage, give Filaments to the Musculi Lumbricales, Interossei, and neighbouring Ligaments and Integuments.

338. THE external Plantaris passes between the Musculus Lumbricalium Accessorius, and the Flexor Digitorum Brevis, giving Filaments to these Muscles, to the Interossei, and to the Hypothenar Minimi Digiti; and afterwards it divides into two Branches.

339. THE first Branch runs in the Interstice between the last two Toes, and being divided, goes to the corresponding lateral parts of both. The other Branch goes to the inferiour external lateral part of the little Toe.

340. DURING this Course, the external Nervus Plantaris supplies the Aponeurosis Plantaris, and the Ligaments and Integuments in the same manner as the rest.

341. THE small Sciatic Ramus or Sciaticus Externus, called likewise Sciatico-Peronæus, runs outward over the Head of the Fibula; and is divided into several Rami, among which there are three or four considerable, one posterioir, one superiour and anteriour, one internal and anteriour, and one external and anteriour.

342. THE posterioir Ramus runs down between the Integuments and the Fibula, as low as the outer Ankle, and terminates in the outside of the Foot; having detached several Cutaneous Filaments in its passage.

343. ABOUT the middle of the Fibula, it sends out a small Ramus, which joins another Ramus from the large or tibial Ramus of the Sciatic Nerve, and is distributed together with it in the manner already said.

344. THE posterioir Ramus of the small Sciatic Branch, having reached the outer Ankle, runs up a little way on the Foot, towards the Root of the fourth Toe, where it divides into two smaller Rami.

345. ONE of these Rami divides into two others, for the corresponding lateral parts of the third and fourth Toes; the other goes to the external lateral part of the fourth Toe, where it joins a Ramus of the external Nervus Plantaris, which is distributed to the last two Toes.

346. AFTER having sent off the posteriour Ramus, the small Sciatic Branch runs outward over the Head of the Fibula ; and having given some Filaments to the Gastrocnemii and Soleus, it runs a-cross the upper Extremity of the Peronæus Posticus from behind forward.

347. AFTERWARD it passes between the Bone and the Muscle last named, and sends several Filaments forward to the neighbouring parts, and then produces the three or four Rami already mentioned, which are distributed in the following manner.

348. THE superiour and anteriour Ramus runs a little transversely between the Head of the Fibula and the upper Extremity of the Extensor Digitorum Longus ; and having given Filaments to this Muscle, and to the Extensor Pollicis Longus, it is distributed to the upper Extremity of the Tibialis Anticus, giving Filaments to the neighbouring Integuments.

349. THE inner anteriour Ramus runs down on the fore-side of the interosseous Ligament, between the Extensor Pollicis Longus and Tibialis Anticus, giving Filaments to each of these Muscles.

350. IT passes afterwards under the annular Ligament of the Extensor Muscles, behind the Extensor Pollicis, to the upper part of the Foot, under the Extensor Digitorum Brevis. In its passage, it gives Filaments to that Muscle, and to the first superiour Interossei.

351. HAVING communicated by a Filament with the external anteriour Ramus, it is spent on the corresponding lateral parts of the first two Toes.

352. THE external anteriour Ramus of the small Sciatic Branch, runs down betwixt the Fibula and the Peronæus Longus, and then between the Peronæus Medius and Extensor Digitorum Longus ; to which, and to the neighbouring Ligaments, it gives Filaments all the way to the upper side of the Foot.

353. IN this course, having run along about two third parts of the Leg, and having reached the great annular Ligament, it runs forward and toward the Integuments, being there divided into two Portions, one of which goes to the Great Toe, the other to the last Toes.

354. THE first Portion of this Ramus gives a Nerve to the internal lateral part of the Great Toe, and is afterwards distributed to the neighbouring Integuments on the convex side of the Foot, and lastly to the corresponding lateral parts of the Great and Second Toes.

355. THE other Portion which goes to the last Toes, is first of all join'd to a Filament of the first Portion, and afterwards to another from the internal anteriour Ramus.

356. AFTER this Union, they are presently divided, and distributed to the last two Toes, and to the Integuments. One Filament arising from this Union, joins a Ramus belonging to the great Sciatic Branch.

357. IT is the common Opinion, that each of the great Sympathetic Nerves begins by a Filament from the sixth Pair belonging to the Medulla Oblongata, and by two Filaments from the fifth Pair ; and that these Filaments do at first compose a very small Nerve which runs backward, to go out

*Nervi Sympathetici
Maximi,
vulgo Inter-
costales.*

out of the Cranium through the bony Canal of the Apophysis Petrosa, and increases gradually in its course downward.

358. BUT having examined attentively the pretended Origin of these Filaments, they seem to me rather to ascend from the Basis of the Cranium with the internal Carotid, and to run from behind forward to join the fifth and sixth Pairs; and I find the Angle formed by this Union to be turned forward, and withal so very acute, that these Nerves cannot be look'd upon as Recurrents.

359. AND as I have ever since that time, that is, for twenty Years past, found this Angle disposed the same way in all the Subjects that I have dissected; I have always been of opinion, that what had been taken for the original Root and descending Stem of the Nerve called Intercostalis, was really an ascending Branch thereof, which as it enters the Cranium, is divided into Filaments, by which it becomes closely united with the two Pairs already named.

360. THE Observation communicated to the Royal Academy by M. *Petit*, Doctor of Physick, concerning the different Size of the Portions of the sixth Pair, appears to be indisputable; he having found this Nerve larger on the fore part, between the Filament of the supposed Intercostal and the Orbit, than on the back part between the same Filament and the Origin of the sixth Pair; and his Experiments concerning the real Co-operation of this Nerve in Vision, are still a farther Confirmation of his Observation.

361. THESE Nerves, as I have said, are commonly called Intercostales, tho' this Name does not agree either with their Situation, or with the Extent of their Course, as we shall presently see; and therefore I believe the name of Sympathetici Majores, or Maximi, will be more proper, because of their frequent Communications with almost all the other principal Nerves of the Body.

362. THE Situation of these two Nerves in general, is on the lateral parts of the whole twenty-four Vertebræ, immediately before the Roots of the transverse Apophyses, and likewise on the lateral Parts of the inside of the Os Sacrum.

363. THROUGH this large extent, they appear like two Ropes divided, and in a manner intersected at different distances, by a great number of gangliform Tubercles, by means of which they communicate backward with the Ganglions of the Medulla Spinalis, by short collateral Filaments; and produce forward, all their particular Ramifications.

364. THESE Ganglions differ more or less from each other in Size, Colour and Consistence; and may be look'd upon as so many Origins or Germina dispersed through this great Pair of Nerves, and consequently as so many little Brains. I shall speak to them more particularly, in the Description of the Head; and it will be sufficient in this place to pursue their Distributions, and the Course of their Ramifications.

365. FOR this purpose, we need only consider these Ganglions, in the same manner that we did the vertebral Nerves, as divided into Cervicalia, Dorsalia, Lumbaria, and Sacra, without pretending to determine the number contained in each Class.

366. THE first Cervical Ganglion is the most considerable in Size, but not in Consistence, representing a soft oblong Tumour of the Figure of an Olive, and situated longitudinally before the Root of the transverse Apophyses of the first three Vertebrae, immediately behind the Pharynx.

367. IT produces from its superiour Extremity a small soft Nerve, which runs up with the internal Carotid Artery of the same side, into the bony Canal of the Apophysis Petrosa.

368. AT its Entry into this Canal, it is divided into several Plexiform Filaments, which at that place surround the Carotid Artery, and accompany all the Incurvations thereof, till it enters the Cranium. They adhere very closely to the Artery, and both they and their Trunks are very tender, having oftentimes neither the Colour, nor Consistence of nervous Filaments; for they are reddish, and sometimes in a manner mucilaginous. We must not mistake for these Plexiform Filaments, some lacerated Portions of the Dura Mater, which line this bony Canal.

369. AMONG these Filaments there are two or three principal ones, which appear to be only a simple Division of the Trunk, and which, as they enter the Cranium, unite again into a small Trunk, more solid than the former. The small superiour Trunk is immediately afterwards divided into Filaments, one of which is united to the Nerve of the sixth Pair, the rest join the fifth Pair, as has been already said. The Filament which goes to the sixth Pair, is commonly single, but I have sometimes found it double, or divided all the way to the Union.

370. IMMEDIATELY below the inferiour Orifice of the bony Canal of the Apophysis Petrosa, and from thence all the way down to the Occipital Condyle on the same side, or to the top of the first Ganglion, the small ascending Trunk is a little stronger, and not altogether so soft, as it is in the Canal.

371. THE first Cervical Ganglion is of a middle Consistence, and adheres very closely to the Trunk of the eighth Pair, or Nervus Sympatheticus Medius, by numerous small communicating Filaments.

372. IT likewise communicates on both sides, by short Branches, with the ninth and tenth Pairs of Nerves of the Medulla Oblongata; with the first, second, and sometimes the third Cervical Pairs; and also with that Branch, which the eighth Pair sends to the Pharynx.

373. IN its passage, it gives Filaments to the Pharynx, to the small neighbouring Muscles, and to the Carotid Artery, from which it receives very fine Capillary Vessels, which are plainly visible in Inflammations; and seem to form a curious Network, with the nervous Filaments.

374. LASTLY, it sends downward a very long nervous Filament, which runs in the Thorax, and joins other Filaments, of which hereafter.

375. THIS Ganglion terminates below, in a small Rope or Trunk, which runs down on the anterior vertebral Muscles of the Neck, in the same Course with the eighth Pair, and the Carotid Artery of the same side; to both which it is connected by membranous Expansions, as by a kind of Vagina, all the way to the last Vertebra of the Neck.

376. IN this Course, the descending Trunk communicates on the outer or back side with the third, fourth, fifth, and often-with the sixth Cervical Pairs, by short Branches, more or less oblique, by which it seems to be gradually increased in Size.

377. AT the Places of these communications, we observe small Ganglions in this Trunk, which however, in some Subjects, are scarcely perceptible; and it is very difficult to determine, by which Extremity these Branches arise, and by which they are inserted.

378. ON the inner or foreside, this Trunk gives off two or three Filaments, which run obliquely downward, toward the Aspera Arteria, into the Thorax. Another Filament goes off, below the first Cervical Ganglion, which passes on the foreside of the Carotid Artery, and joins a Filament of the eighth Pair, with which it forms a small distinct Rope.

379. THIS small Rope runs before the subclavian Vein, and lower down, joins another Filament, which arises behind the subclavian Artery, and runs down in the manner hereafter to be explained, sending off Filaments in its passage to the Œsophagus, and neighbouring Parts.

380. THE Trunk having reached as far as the last Vertebra of the Neck, forms a small Ganglion, called Ganglion Cervicale Infimum, which is pretty solid, and sometimes double.

381. PRESENTLY afterwards, the Trunk turns from within outward, towards the Root of the first Rib, behind the subclavian Artery, where it forms a pretty large Ganglion, which is the first of the Thoracica or Dorsalia.

382. THESE two last mentioned Ganglions are very near each other, being separated only by a very short Portion of the Trunk, which is sometimes double, and forms a kind of small Plexus, behind the subclavian Artery.

383. FROM the Fore-part of the lowest Cervical Ganglion, a small nervous Rope goes out, which runs before the subclavian Artery, bends immediately downward, and ends in the top of the first Dorsal Ganglion, forming by this Course a sort of nervous Arch, which incloses the subclavian Artery.

384. THESE two Ganglions communicate by short Branches more or less oblique, with the neighbouring vertebral Nerves, that is, with the sixth and seventh Cervical Pairs; and sometimes with the fourth, by a long descending Filament. The first Dorsal Ganglion communicates likewise with the first Dorsal Pair of Nerves.

385. THE lowest Cervical, and sometimes the first Dorsal Ganglion, sends down a communicating Filament to the recurrent Nerve of the eighth Pair; and from this Union a Filament is detached, which passes behind the common Trunk of the Axillary and Carotid Arteries, joins another Filament from the eighth Pair, and contributes to the Formation of the Plexus Pulmonaris.

386. FROM the small Plexiform Portion of the Trunk which joins the last Cervical and first Dorsal Ganglions, behind the subclavian Artery, a particular Filament goes out, which unites with the small Trunk, common to the great Sympatheticus, and to the eighth Pair, and runs down before the subclavian Artery, and together with this Filament composes the Plexus Cardiacus.

387. ON the right side, this Filament runs down to the right Ventricle of the Heart, and then between the Aorta and Arteria Pulmonaris, where it com-

communicates with some Filaments from the left Recurrent of the eighth Pair.

388. ON the left side, a Filament goes out from the last Cervical, and another from the first Dorsal or Thoracic Ganglion, which unite together to form a kind of Arch, in which however, nothing is contained.

389. FROM this Arch a Nerve goes out, which runs down between the Curvature of the Aorta, and the left Branch of the Pulmonary Artery, where it communicates with a Filament of the eighth Pair, and forms a Gangliform Plexus, with the like communicating and united Filaments from the right side.

390. FROM this Gangliform Plexus, which may be look'd upon as the Origin of the Plexus Cardiacus superior, a great number of Filaments run down, over the Trunks of the great Blood-Vessels, and over the Auricles and Ventricles of the Heart.

391. THE chief of these Filaments run in the Cellular Substance behind the Aorta, or between that and the Trunk of the Pulmonary Artery, where they are divided into a great many small Nerves, which run before and behind the Aorta, to the Basis and Auricles of the Heart.

392. THE Filaments that run down from the Trunk it self, between the first and last Cervical Ganglions, are united and interwoven in the Thorax, with the Filaments common to the last Cervical and first Dorsal Ganglions, and thus contribute to the Formation of the Plexus Cardiacus, and some part of the Plexus Pulmonaris.

393. THE long Filament of the first Cervical Ganglion contributes likewise to these Plexus. It runs along the inside of the Trunk, and then unites with the Filaments of the last Cervical Ganglion, the first Dorsal Ganglion, and the great Recurrent Nerve.

394. FROM all these Conjunctions a particular Nerve is formed in some Subjects, which meets a like Rope from the other side behind the Aorta; and forms, together with that, a kind of subordinate Trunk, about a Finger's breadth in length, which sends out on all sides several Filaments that are distributed to the neighbouring Parts.

395. FROM the first Dorsal Ganglion, the Trunk runs down on the fore-side of the Heads and Necks of all the Ribs, over the Articular Ligaments by which they are tied to the Vertebrae. On the last false Rib, it bends a little toward the Bodies of the Vertebrae.

396. IN this Course, the Trunk forms a small Ganglion, between each Rib, and communicates backward by two short Filaments, more or less oblique, with the corresponding Dorsal or Costal Nerves.

397. OF these two communicating Filaments, one is more oblique and often smaller than the other; one runs backward, towards the nearest Ganglion of the Costal Nerve, the other runs forward on the Head of the Rib, to the Trunk of the great Sympathetic Nerve; and for this reason, one of these Filaments appears to be more antierior and longer than the other.

398. HAVING reached about half way between its Entry into the Thorax and the last Vertebra of the Back, this Trunk sends commonly five

Branches, obliquely downward on the lateral and a little toward the antierour Part of the Bodies of the Vertebrae.

399. THE first four Branches come commonly from the fifth, sixth, seventh and eighth Thoracic Ganglions, and the fifth arises from several of the following Ganglions. The first is the longest, and the last, the thickest.

400. ALL these Branches approach each other gradually in their Descent as far as the last Vertebra of the Back, where they unite into one large short collateral Rope, which pierces the upper lateral part of the lower Muscle of the Diaphragm, sending some Filaments to the upper side.

401. HAVING got below the Diaphragm, and given off some Filaments to the lower side of that Muscle, this great Trunk produces behind the Glandula Renalis, a kind of irregular Ganglion of a curve oblong Figure, called Ganglion sive Plexus Semilunaris.

402. THE convex side of this Semilunar Plexus or Ganglion, is turned obliquely backward and downward, the concave side forward and upward, one of its Cornua being turned upward, the other forward; so that the inferior Cornua of the two Ganglions on each side, are turned toward each other.

403. THESE Ganglions on each side communicate together, behind the Stomach, on the Cæliac Artery, and likewise with the eighth Pair or Nervus Sympatheticus Medius, chiefly by means of the Nervus Stomachicus posterior, belonging to that Pair.

404. FROM the reciprocal Communication of these two Semilunar Ganglions, a kind of middle Plexus is formed which partly surrounds the Cæliac Artery, and is partly spent on the Mesocolon.

405. THE Semilunar Ganglion on the right side, together with a large Portion of the Plexus Cæliacus, and some Filaments of the Plexus Stomachicus, forms a particular Intertexture, called Plexus Hepaticus.

406. THIS Hepatic Plexus having communicated with some Filaments of the Diaphragmatic Nerve, produces several Filaments which surround the Hepatic Artery and Vena Portæ in form of a reticular Vagina, and accompany the Branches of these Vessels through the whole Substance of the Liver. The Hepatic Plexus supplies likewise the Vesicula Fellea, Ductus Biliaris, Duodenum, Pancreas, and Glandulæ Renales.

407. THE left Semilunar Ganglion, formed by the antierour or collateral Trunk of the left side, produces several Rami, which form the Plexus Splenicus, nearly in the same manner as has been already mentioned.

408. THIS Plexus Splenicus, having communicated with the Hepaticus, and by the Intervention of the Plexus Stomachicus, with the eighth Pair, surrounds the splenic Artery, supplies the Pancreas, and is distributed to the Spleen.

409. THIS left Ganglion is sometimes accompanied by another, which gives Filaments to the Spleen.

410. EACH Semilunar Ganglion sends Rami from its convex side, which being joined to the Filaments of the first Lumbar Ganglions, form an Intertexture called Plexus Renalis, which surrounds the renal Artery, is distributed

to the Kidneys, and Glandulæ Renales, and sends out a Filament, which accompanies the spermatic Vessels.

411. THIS Renal Plexus concurs likewise with the Semilunar Ganglion, in the Formation of the great Mesenteric Plexus, and communicates by several Filaments with the Plexus Coronarius Stomachicus.

412. THE right Renal Plexus communicates particularly with the Plexus Hepaticus; and the left, with the Splenicus; and each of them, by two Filaments, with the true Trunk, on the side of the first two Vertebrae of the Loins. This Portion of the principal Trunk is commonly called the inferior Rope of the intercostal Nerve.

413. THE right and left Semilunar Ganglions send Nervous Fasciculi to each other, which by a particular Intertexture form a kind of flat Ganglion or Plexus, immediately under the Diaphragm, before the Articulation of the last Vertebra of the Back with the first of the Loins.

414. FROM this Plexiform Union, called commonly Plexus Solaris, several Filaments are detached in a radiated manner to the Mesocolon and Mesentery; and some of them go likewise to the Diaphragm.

415. A great number of other Filaments go likewise from it, which with the Ramifications thereof, form a kind of nervous Capsula, or Vagina, round the superiour Mesenteric Artery, and round all its Ramifications on the Intestines, and supply the Mesenteric Glands. This is termed Plexus Mesentericus superior, which comes chiefly from the Filaments of the Plexus Hepaticus and Renalis, and of the right Semilunar Ganglion.

416. THE superior Mesenteric Plexus sends down from its Origin, along the Aorta, and behind the descending Portion of the Mesocolon, between the superiour and inferiour Mesenteric Arteries, several Filaments or nervous Fasciculi differently interwoven, from which a nervous Vagina is likewise formed, that surrounds the inferiour Mesenteric Artery, and its Ramifications on the Intestines. This has been named Plexus Mesentericus inferior.

417. THE descending nervous Fasciculi, between the two Mesenteric Arteries, which may be named Mesenterici Posteriores, receive some communicating Filaments from both Plexus Renales, and likewise communicate with the Trunk of the great Sympathetic Nerve, by Filaments which run down obliquely from the Lumbar Ganglions. Afterwards they detach a Filament on each side, which accompanies the spermatic Vessels.

418. THE Fasciculi Mesenterici Posteriores having produced the Plexus Mesentericus inferior, send other Filaments downward, over the Extremities of the Aorta, behind the inferiour Curvature of the Colon.

419. THESE inferiour Fasciculi or Filaments adhere strongly to the neighbouring Parts of the Peritonæum, and together with other Filaments from both sides of the Trunk, form a third Plexus, which may be called Infra-Mesentericus, or Hypogastricus.

420. THIS Hypogastric Plexus, at the extremity of the last Curvature of the Colon, on the foreside of the last Vertebra of the Loins, is divided into two flat Ganglions which surround the beginning of the Intestinum Rectum backward, to which they are afterwards distributed, and also to the Bladder and

to the Spermatic Vessels ; and having communicated by lateral Filaments, with each Trunk of the great Sympathetic Nerve, they send Filaments to all the parts contained in the Pelvis.

421. THE Trunk of the great Sympathetic Nerve having detached the five Rami which form the collateral Rope, becomes much smaller, and having reached the eleventh Vertebra of the Back, it approaches the collateral Trunk, and perforates the inferiour Muscle of the Diaphragm.

422. AFTERWARDS it runs more forward on the Bodies of the Vertebrae, and increases by the addition of Filaments from the last two Dorsal Pairs of Nerves.

423. IT runs down between the Psoas and neighbouring Tendons of the small Muscle of the Diaphragm, on the lateral parts of the Vertebrae Lumbares and anterior side of the Os Sacrum.

424. AT this place the right and left Sympathetic Trunks approach each other, and at the Extremity of the Os Sacrum, they form a communication in the manner of an inverted Arch.

425. IN its passage, each Trunk receives commonly two Filaments from each Ganglion of the Nervi Lumbares and Sacri, and likewise forms small Ganglions between each Vertebra, which send some Filaments to the neighbouring parts, and others which communicate with the Fasciculi of the Plexus Mesenterici.

426. THE Pairs of Filaments which come from the two or three first Lumbar Ganglions, run a little downward, but the following run gradually upward ; and it ought to be observed that capillary Blood-Vessels are discernable between and upon the Filaments of each Pair.

427. THE inverted Arch or inferiour Union of the two Trunks, gives off together with the two lowest Nervi Sacri, several Filaments to the Rectum, Anus and Muscles of the Coccyx.

428. LASTLY, the great Sympathetic Nerve, from the first Vertebra of the Neck to the Extremity of the Os Sacrum, communicates by Filaments, with all the Vertebral Nerves, as has been already said ; but it must be observed, that in the Thorax, these communicating Filaments are very small and slender, where the Sympathetic Trunk is largest ; and that below the Diaphragm, they are stronger, because there the Trunk diminishes, especially on the Os Sacrum, where it is very small. The same thing is to be observed concerning the Ganglions of the Trunk, the first Cervical Ganglion only excepted.



S E C T. VII.

*A Compendious View of the Parts of the Human Body,
and a Description of the Common Integuments.*

A R T. I.

A View of the Parts of the Human Body.

1. **T**HE Human Body is composed of firm and liquid Parts, commonly called Solids and Fluids. Of the solid Parts, some are hard, others soft and flexible. *Introduction.*
2. THE solid Parts are the chief Subject of Anatomy, properly so called; by which term, borrowed from the *Greek*, we understand not only an artful Decomposition of the Parts of the Body, but also a methodical Demonstration and Description of the Parts when taken to pieces.
3. THE History of the Fluid Parts comes into a System of Anatomy, only occasionally, and by the bye; because it properly belongs to what is called Physiology or the Animal Œconomy.
4. ANATOMISTS ordinarily reduce all the solid Parts under certain general Classes, expressed by the common or generical Names of Bone, Cartilage, Ligament, Fibre, Membrane, Vessel, Artery, Vein, Nerve, Muscle, Gland, Fat, Viscus, Organ, &c.
5. THE Ancients who settled a general Division of the Parts of the Human Body, from the meer outward appearance of their Structure, called some Similar or Simple, and the rest Organical or Compound; but I look on these Terms only as so many Anatomical Words, which express several parts that have nearly the same Structure to outward appearance: and as they are often mentioned, I shall here give an Explication of those which are in most frequent Use.
6. BY Bones, we mean in general the hardest, most solid, and most inflexible parts of the Human Body, the particular History of which is contained in the Description which I have given of the dry and fresh Bones. *Explication of the general Terms of Anatomy.*
7. A Cartilage is a whitish or pearl-coloured Substance, softer than a Bone, but harder than any other Part, smooth, polished, pliable and elastic. I explained the Cartilages in the Description of the fresh Bones.
8. A Ligament is a white, fibrous, compact Substance, more pliable than a Cartilage, difficult to be broken or to be torn, and yielding but a very little when drawn out with force. The Ligaments have been explained at full length in the second Section.
9. THE name of Fibre is given to small Filaments which appear to be the most simple Parts of the Body, and which, by their different Disposition and Connections, compose all the other parts. The Fibres themselves differ

differ in Substance, being either membranous, fleshy, tendinous or bony; in direction, being either streight, oblique, longitudinal, transverse, circular or spiral; and in size, being either large, small, long or short.

10. BY Membrane we understand a pliable Texture of Fibres disposed or interwoven together in the same Plane. They differ in thickness according to the smallness of their Fibres and number of their Planes. These particular Planes are termed Laminæ, and distinguished into external, internal, middle, &c.

11. THE difference of Membranes in general depends on that of the Fibres, of which they are composed. Small Portions of Membranes, especially when they are very thin, are called Pelliculæ; and some membranous Laminæ are united together by the intervention of a particular Substance, composed of this sort of Pellicles, and called the cellular or spongy Substance.

12. VESSELS are Tubes, Ducts or Canals, more or less flexible, composed of different Membranes, the Strata of which are generally termed Tunicæ or Coats. Some of them are divided into Branches, and these again into Rami and Ramifications, which gradually diminish, but still remain hollow.

13. THE general Design of the Vessels is to contain Fluids from the Diversity of which they are distinguished into Blood-Vessels, Vasa Lactea, Lymphatica, &c. The last and smallest Extremities of all sorts of Vessels are generally termed Capillaries.

14. THE Blood-Vessels are of two kinds, one of which receives the Blood from the Heart, and distributes it to all the parts of the Body, which are named Arteries; the other brings the Blood from all the parts, back to the Heart, which are called Veins, and some of these have the name of Sinuses.

15. THE Arteries are thicker than the Veins, and may be distinguished by this Mark in dead Bodies; and in living Bodies they are known by a certain beating, called the Pulse. The Veins lie nearer the Surface of the Body than the Arteries, and are furnished with Valves, that is, with small Membranous Sacculi, fixed at different distances to the sides of their Cavities. The Openings of these Valves are broad, and turned toward that side where the Vein is largest, but their bottoms are turned the contrary way, to that side where the Veins are of the smallest Diameter. In some places these Valves are single, in others double, triple, &c.

16. BY Nerves, Anatomists mean the white Ropes which proceed from the Cerebrum, Cerebellum and spinal Marrow, and are spread over all the parts of the Body by Filaments and Ramifications.

17. EACH Nervous Rope may be looked upon as a membranous Vessel, the Cavity of which is filled by a great number of membranous longitudinal Septa, and by Medullary Filaments which lie betwixt the Septa.

18. MUSCLES are bundles of Fibres, called by Anatomists Fibræ Motrices, of a reddish colour, and of different lengths.

19. THE middle Portion of the moving Fibres is the principal, and differs from the Extremities in being red, thick, soft, and capable of Contraction, whereas

whereas the Extremities are white, small, compact, and incapable of yielding.

20. THIS middle Portion of each moving Fibre is said to be fleshy, and they form what is properly called Flesh. The Extremities are called Tendinous, and the Substance formed by them, Tendons.

21. GLANDS are Clusters or Molecularæ, distinguishable from all the other parts of the Body, by their Form, Consistence, Texture and Connexion.

22. THEY are in general made up of Arteries, Veins, Nerves, and other particular Vessels, and of a Substance which unites all these together, in their different folds, contortions, and intertextures, all invested by a membranous covering.

23. THE Office of Glands is to separate from the Mass of Blood, by means of certain secretory Vessels, Fluids, which they discharge either immediately or by other Vessels termed Excretory; and these Fluids are either accumulated in particular Reservoirs, collected in the common Cavities, or forced out of the Body.

24. FAT and Marrow are equivocal Terms. By the first, we generally understand an oily, soft, white or yellowish Substance, of different Consistences, collected between the Skin and the Muscles, in the Interstices of the Muscles, about the Viscera, &c. and composed partly of a cellulous or spongy Substance, and partly of an oily Matter of different Thicknesses. This oily Matter is called Fat, especially when separated from the cellulous Substance, and likewise Corpus Adiposum by Anatomists.

25. MARROW is one kind of Fat, and differs from it only in the fineness of the membranous Texture, in the Subtlety of the oily Matter, and in its Situation within the Bones. The word Marrow is equivocal in the same Sense with the word Fat.

26. BY Viscera, we commonly understand Parts contained in a great Cavity, without being connected to it through their whole Extent or Circumference. Such are the Stomach, Intestines, &c. in the Abdomen, and the Lungs in the Thorax.

27. ORGAN or Instrument is a Term given to every part capable of any Function, whether it be simple or complex, and in this sense we talk of the Organ of Sight, of Respiration, &c.

28. THE Human Body is commonly divided into the Head, Trunk, and Extremities. The Trunk is again subdivided into the Neck, Thorax and Abdomen; and the Extremities into superiour, called the Arms, and inferior, called the Legs. *General Division of the Human Body.*

29. THE Ancients divided the Body into three great Cavities, which they termed Venters, and into four Extremities. They called the Head the upper Venter, the Thorax the middle Venter, and the Abdomen the lower Venter. The Neck was by some joined to the Head; by others, to the Thorax.

30. THE most natural and plainest Division of the Body, is into the Head, Neck, Thorax, Abdomen, Arms and Legs; each of which Portions may afterwards be subdivided.

31. EACH Portion is to be examined not only with regard to its Surface or external Conformation, but also with regard to its internal Structure or Composition, and to the Viscera and Organs, which it contains or supports.

32. THIS is what gave occasion to the Ancients to divide the Body into Parts containing, and Parts contained; and to subdivide the containing Parts into common and proper. The common containing Parts have been named Integuments, by which they meant chiefly the Skin and Fat.

External Parts of the Head. 33. THE Head viewed on the outside, is divided into the hairy Scalp and Face.

34. THE hairy Scalp covers the upper part of the Os Frontis, the Offa Parietalia, the Os Occipitis, and the upper and lower Portions of the Offa Temporum.

35. THE uppermost Part of the hairy Scalp is termed the Vertex or Fontanella; the back part, Occiput; the lateral Parts, the Temples. The Vertex is distinguished from the Occiput, by a contorted Border of Hair; and the Temples, by the Ears.

36. THE Arteries on each side of the hairy Scalp, are these:

Arteria Carotis Externa, in general.

Arteria Temporalis.

Arteria Occipitalis.

Arteria Angularis, by Communication.

Arteria Cervicalis Posterior, by Communication.

Arteria Vertebralis, by Communication.

Arteria Carotis Interna, by Communication.

37. THE Veins on each side of the hairy Scalp, are these:

Vena Jugularis Externa, in general.

Vena Jugularis Externa Posterior.

Vena Temporalis.

Vena Occipitalis.

Vena Vertebralis.

Vena Jugularis Externa Anterior, by Communication.

Vena Jugularis Interna, by Communication.

Sinus Lateralis Duræ Matris, by Communication.

Vena Axillaris, by Communication.

Vena Cephalica, by Communication.

38. THE Nerves on each side of the hairy Scalp, are these:

Nervi Sub-Occipitales, commonly called the tenth Pair from the Medulla Oblongata.

Par Nonum from the Medulla Oblongata.

Par Primum Cervicale.

Par Secundum Cervicale, by Communication.

Nervi Diaphragmatici, by Communication.

Ramus Frontalis of the Orbital or Ophthalmic Nerve.

Nervus

Nervus Sympatheticus Minor, called the Portio Dura of the Auditory Nerve.

Nervus Sympatheticus Medius, or Nerves of the eighth Pair from the Medulla Oblongata, by Communication.

Nervus Sympatheticus Maximus, commonly termed Intercostalis, by Communication.

39. THE Face comprehends all that Portion of the Surface of the Head, which lies between the hairy Scalp, and the Neck, viz. the Fore-Head, Eye-Brows, Palpebræ, Eyes, Nose, Mouth, Chin, Cheeks and Ears.

40. THE External Parts of the Eye are these: The antierior Portion of the Globe of the Eye, the Membrana Conjunctiva, the Cornea Lucida, Iris, Pupilla, Caruncula Lacrymalis, Angles of the Palpebræ; and the Cilia or Hairs of each Palpebra. The internal Parts are: The Globe of the Eye, the Tunica Sclerotica or Cornea Opaca, the Choroides, Arachnoides, CrySTALLINE, Vitreous Humour, Aqueous Humour, the antierior and posterior Chambers, the Muscles, and the Optic Nerve.

41. THE external Parts of the Ear, are these: The great Concha, the convex side of this Concha, or Hinder-part of the Ear, the great Border, the Fold or Helix, the Concavity, the broad Eminence or Anthelix, the small antierior Eminence or Tragus, the small posterior Eminence or Antitragus, the Lobe or lower Extremity of the Ear, and the Meatus.

42. THE external Parts of the Nose, are these: the upper Extremity or Root of the Nose, the Arch or Back, the Sides of that Arch, the Tip of the Nose, the Alæ, the Nares and the Septum Narium. The internal Parts are the Cavity and Bottom of the Nares, the Convolutions, the maxillary, sphenoidal and frontal Sinuses.

43. THE external Parts of the Mouth, are these: The Lips, one upper, the other lower, the Angles or Commissures of the Lips, the Border or Edge of each Lip, the Fossula which runs from the Septum Narium to the Edge of the upper Lip, and the transverse Fold which separates the under Lip from the Chin.

44. THE internal Parts of the Mouth are these: The Palate, the Septum Palati, the Uvula, the Amygdalæ, Gums, Fræna of the Lips, the Tongue, its Apex, Root, Sides and Frænum. The other internal Parts of the Mouth, Eye, Nose and Ear, such as the Glands, Membranes, Muscles, &c. must be referred to the parricular Descriptions of these Parts.

45. THE Cheeks are the lateral Parts of the Face, reaching downward from the Eyes and Temples, between the Nose and Ears. The upper prominent Part of the Cheek, is commonly termed Mala.

46. THE Chin is the antierior Protuberance, by which the lower part of the Face is terminated, from whence it runs all the way to the Neck. This under part of the Chin, is termed the Basis, and it is distinguished from the Throat, by a transverse Fold, which reaches from Ear to Ear. In the middle of the Chin, there is sometimes a Fossula or Depression.

47. THE exteriour Arteries which belong to each side of the Face, are these :

Arteria Carotis Externa.

Arteria Carotis Interna, by Communication.

Arteria Vertebralis, by Communication.

Arteria Cervicalis, by Communication.

48. THE exteriour Veins distributed to each side of the Face, are these :

Vena Jugularis Externa.

Vena Jugularis Interna, by Communication.

Vena Vertebralis, by Communication.

49. THE exteriour Nerves spread on each side of the Face, are these :

Nervus Olfactorius.

Nervus Opticus.

Nervus Orbitarius five Ophthalmicus, which is the first Branch of the fifth Pair from the Medulla Oblongata.

Nervus Maxillaris Superior.

Nervus Maxillaris Inferior.

Nervus Trochlearis five Patheticus, which is the fourth Pair.

Nervus Motor Oculi Externus five Muscularis Externus, which is the sixth Pair.

Nervus Sympatheticus Minimus, or the Portio Dura of the Auditory Nerve.

Nervus Sympatheticus Medius, which is the eighth Pair.

Nervus Sympatheticus Maximus five Universalis, commonly called Intercostalis.

Nervus Hypoglossus Major, which is the ninth Pair.

The second Pair of the Nervi Cervicales.

50. THE Arteries of the Fore-Head, are these :

Arteria Temporalis, which is a Branch of the external Carotid.

Arteria Angularis, which is a Branch of the internal Carotid.

Arteria Carotis Interna, by Communication.

51. THE Veins of the Fore-Head, are these :

Vena Frontalis, formerly called Præparata.

Vena Temporalis.

Vena Angularis.

Sinus Orbitarius.

Sinus Longitudinalis superior, by Communication.

Sinus Longitudinalis inferior, by Communication.

Vena Jugularis interna, by Communication.

52. THE Nerves of the Fore-Head, are these :

Nervus Orbitarius five Ophthalmicus, which is the first Branch of the fifth Pair from the Medulla Oblongata.

Nervu

Nervus Maxillaris superior.

Nervus Maxillaris inferior.

Nervus Sympatheticus minor, which is the Portio Dura of the Nervus Auditorius.

53. THE Arteries which go to the Eye, are these :

Arteria Temporalis, which is a Branch of the external Carotid.

Arteria Maxillaris Externa five Angularis, which is a Branch of the external Carotid.

Arteria Maxillaris interna, which is a Branch of the external Carotid.

Arteria Carotis interna.

54. THE Veins which belong to the Eye, are these :

Vena Temporalis, which is a Branch of the posterioir external Jugular.

Vena Angularis, which is a Branch of the anteriour external Jugular.

Vena Frontalis, formerly named Præparata, which is a Branch of the anteriour external Jugular.

Sinus Orbitarius.

Sinus Longitudinalis, by Communication.

Vena Jugularis interna, by Communication.

55. THE Nerves belonging to the Eye, are these :

Nervus Olfactorius, by Communication.

Nervus Opticus.

Nervus Motor communis, or the third Pair.

Nervus Trochlearis, or the fourth Pair.

Nervus Orbitarius five Ophthalmicus, a Branch of the fifth Pair.

Nervus Maxillaris superior, a Branch of the fifth Pair.

Nervus Motor Externus.

Nervus Sympatheticus minor, or the Portio Dura of the Auditory Nerve.

Nervus Sympatheticus Maximus five Universalis, commonly called Intercoftalis.

56. THE Arteries distributed to the Nose, are these :

The same Arteries with those which go to the Eye, among which the internal Carotid supplies the Nose, by Communication.

Arteria Labiorum Orbicularis, by Communication.

57. THE Veins belonging to the Nose, are these :

All the Veins already mentioned, as belonging to the Eye.

58. THE Nerves which go to the Nose, are these :

Nervi Olfactorii.

THE ANATOMY OF

Nervus Orbitarius five Ophthalmicus, a Branch of the fifth Pair, both immediately, and by Communication.

Nervi Motores communes, or the third Pair, by Communication.

Nervi Maxillares superiores, Branches of the sixth Pair.

Nervus Sympatheticus Minimus.

Nervus Sympatheticus Medius, by Communication.

59. THE Arteries which go to the Ear, are these :

Arteria Temporalis, a Branch of the external Carotid.

Arteria Auricularis, a Branch of the Temporalis.

Arteria Occipitalis, by Communication.

Arteria Vertebralis, by means of the Arteria Basilaris, which is a Continuation of it.

Arteria Carotis interna, by Communication with the Arteria Basilaris.

60. THE Veins belonging to the Ear, are these :

Vena Temporalis.

Vena Occipitalis.

Vena Cervicalis.

Vena Maxillaris : these three being Branches of the Jugularis externa.

Vena Jugularis interna, by several Communications.

Sinus Petrosus Duræ Matris.

61. THE Nerves distributed to the Ear, are these :

Nervus Maxillaris inferior, the third Branch of the fifth Pair.

Nervus Auditorius, the seventh Pair.

Nervus Sympatheticus minimus, the Portio Dura of the Auditory Nerve.

Nervus Hypoglossus externus, the ninth Pair, by Communication.

Nervus Sub-Occipitalis, the tenth Pair, by Communication.

The second Cervical Pair.

Nervus Sympatheticus Medius, the eighth Pair.

Nervus Sympatheticus Universalis, commonly called Intercoastalis.

62. THE Arteries which go the Mouth, Tongue, &c. are these :

The Artery of the Chin.

Arteria Coronaria five Orbicularis Labiorum, both being Branches of the external Carotid.

Arteria Maxillaris interna.

Arteria Sub-Lingualis.

63. THE Veins belonging to the Mouth, Tongue, &c. are these :

Vena Maxillaris externa.

Vena Maxillaris interna.

Vena

Venæ Raninæ. All these are Branches of the external Jugular.
 Vena Jugularis interna, by several Communications.
 Vena Gutturalis superior, a Branch of the internal Jugular.
 Vena Axillaris, when it sends off the Guttural Vein.

64. THE Nerves distributed to the Mouth, Tongue, and salivary Glands, &c. are these :

Nervus Maxillaris superior.
 Nervus Maxillaris inferior, both Branches of the fifth Pair.
 Nervus Sympatheticus minimus, or Portio Dura of the Auditory Nerve.
 Nervus Sympatheticus Medius, the eighth Pair.
 The ninth Pair from the Medulla Oblongata.
 The second Pair of Cervical Nerves.
 Nervus Sympatheticus maximus, by Communication.

65. THE Cheeks on each side are furnished with Arteries and Veins from the nearest Ramifications of the temporal and maxillary Arteries and Veins ; and with Nerves from the Portio Dura of the auditory Nerve, and from the superiour and inferiour maxillary Nerves.

66. THE Neck in general is divided into the anteriour Part or Throat, *Parts of the Neck in general.* and posteriour Part or Nape. The Throat begins by an Eminence, and terminates by a Fossula. The Nape begins by a Fossula, which as it descends, is gradually lost. The Neck contains the Larynx, a part of the Trachea Arteria, the Pharynx, a part of the Œsophagus, the Musculi Cutanei, Sterno-Mastoidæi, Sterno-Hyoidæi, Thyro-Hyoidæi, Omo-Hyoidæi, Splenius, Complexus, the Musculi Vertebrales, which lie upon the first seven Vertebrae, and a Portion of the Medulla Spinalis.

67. THE Arteries which go to the Neck, are these :

Arteriæ Carotides, in general.
 Arteriæ Carotides externæ.
 Arteriæ Carotides internæ.
 Arteriæ Vertebrales.
 Arteriæ Cervicales.

68. The Veins belonging to the Neck, are these :

Venæ Jugulares, in general.
 Venæ Jugulares externæ.
 Venæ Jugulares internæ.
 Venæ Cervicales.
 Venæ Vertebrales.

69. THE Nerves distributed to the Neck, are these :

Nervi Sympathetici minimi, or the Portio Dura of the Auditory Nerves.
 Nervi Sympathetici Medii, the eighth Pair.

Nervi

Nervi Accessorii Octavi Paris.

The ninth Pair.

Nervi Sub-Occipitales, or the tenth Pair.

The seventh Cervical Pair.

Nervi Sympathetici Maximi.

*Parts of the
Thorax.*

70. By the Thorax, we commonly understand all that part of the Body, which answers to the Extent of the Sternum, Ribs and Vertebrae of the Back, both outwardly and inwardly.

71. THE Thorax is divided into the antierour Part, called commonly the Breast, the posterour Part called the Back, and the lateral Parts called the right and left Sides.

72. THE external Parts of the Thorax, besides the Skin and Membrana Adiposa, are principally the Mammæ, and the Muscles which cover the Ribs, and fill the Spaces between them. In the Mammæ we see the Papillæ or Nipples, and a small colour'd Circle, which surrounds them. The Muscles are the Pectorales Majores and Minores, Subclavii, Serrati Majores, Serrati Superiores Postici, Latissimi Dorsi, and Vertebrales, and to these we may add the Muscles, which cover the Scapula.

73. THE internal Parts of the Thorax, are contained in the large Cavity of that Portion of the Trunk, which the Ancients called the middle Venter; but the Moderns name it simply, the Cavity of the Breast. This Cavity is lined by a Membrane, named Pleura, and divided into two lateral Cavities, by a membranous Septum named Mediastinum, which is a Production or Duplicature of the Pleura.

74. These Parts are the Heart, Pericardium, Trunk of the Aorta, great Arch of the Aorta, Trunks of the Carotid Arteries, subclavian Arteries, Trunks of the vertebral and axillary Arteries, the superiour Portion of the descending Aorta, the intercostal Arteries, the Vena Cava superior, Vena Azygos, subclavian Veins, Trunks of the Jugular, vertebral and axillary Veins, a Portion of the Aspera Arteria, and of the Oesophagus; the Ductus Lacteus, or Thoracicus, the Lungs, Pulmonary Artery, Pulmonary Veins, &c.

75. THE Arteries and Veins, which particularly belong to the Thorax, are these:

Arteriæ & Venæ Thoracicæ, superiores & inferiores.

Arteriæ & Venæ Mammariæ, internæ & externæ.

Arteriæ & Venæ Intercostales, superiores & inferiores.

Arteriæ & Venæ Spinales, with the venal Sinuses of the Canal of the Spine.

76. THE Nerves distributed to the Thorax, are these:

Nervi Sympathetici Medii, or the eighth Pair.

Nervi Sympathetici Universales, commonly called Intercostales.

The last Cervical Pair.

The twelve Dorsal Pairs.

Nervi Diaphragmatici.

77. THE Cavity of the Thorax is terminated downward, by the Diaphragm which parts it from the Abdomen.

78. THE Abdomen begins immediately under the Thorax, and terminates at the Bottom of the Pelvis of the *Ossa Innominata*. Its Circumference or outer Surface is divided into Regions, of which there are three antierior, viz. the Epigastric or superiour Region, the Umbilical or middle Region, and the Hypogastric or lower Region. There is but one posterioir Region, named *Regio Lumbaris*. *Parts of the Abdomen.*

79. THE Epigastric Region begins immediately under the Appendix Eniformis at a small superficial Depressiion, called the Pit of the Stomach, and in adult Subjects ends above the Navel at a transverse Line, supposed to be drawn between the last false Ribs on each side.

80. THIS Region is subdivided into three Parts, one middle, named Epigastrium, and two lateral, termed Hypochondria. The Epigastrium takes in all that Space which lies between the false Ribs of both sides, and the Hypochondria are the places covered by the false Ribs.

81. THE Umbilical Region begins in Adults, above the Navel, at the transverse Line already mentioned, and ends below the Navel at another transverse Line, supposed to be drawn parallel to the former, between the two Cristæ of the *Ossa Ilium*.

82. THIS Region is likewise divided into three Parts, one middle, which is properly the *Regio Umbilicalis*, and two lateral, called *Iliæ* or the Flanks; and they comprehend the Space between the false Ribs and upper part of the *Os Ilium* on each side.

83. THE Hypogastric Region is extended downward from the inferiour Limit of the Umbilical Region, and is divided into three Parts, one middle, called Pubis, and two lateral, called Inguina or the Groins.

84. THE Lumbar Region is the posterioir part of the Abdomen, and comprehends all that Space which reaches from the lowest Ribs on each side, and the last Vertebra of the Back, to the *Os Sacrum* and neighbouring parts of the *Ossa Ilium*. The lateral parts of this Region are termed the Loins, but the middle part has no proper name in Men.

85. LASTLY, the Bottom of the Abdomen which answers to the Pelvis of the Sceleton, is terminated antieriorly by the Pudenda or Parts of Generation, and posterioirly by the Clunes or Buttocks, and Anus. The Buttocks are separated by a Fossa which leads to the Anus, and each Buttock is terminated downward by a large Fold which distinguishes it from the rest of the Thigh.

86. THIS Lumbar Region takes in likewise the *Musculus Quadratus Lumborum* on each side, the lower Portions of the *Sacro-Lumbares*, of the *Longissimi* and *Latissimi Dorsi*, the *Musculus Sacer*, &c.

87. THE Space between the Anus and the parts of Generation, is called *Perinæum*, and is divided into two equal lateral Parts by a very distinct Line, which is longer in Males than in Females, as we shall see in another place.

88. THE Cavity of the Abdomen, formed by the Parts already mentioned, (all which are covered by the Skin and *Membrana Adiposa*) is lined on the inside by a particular Membrane, called *Peritonæum*. It is separated from the

the Cavity of the Thorax by the Diaphragm, and terminated below by the Musculi Levatores Ani.

89. THIS Cavity contains the Stomach, and the Intestines, which are commonly divided into three small, named Duodenum, Jejunum and Ileum; and three large, called Cæcum, Colon and Rectum. It contains likewise the Mesentery, Mesocolon, Omentum, Liver, Gall Bladder, Spleen, Pancreas, Glands of the Mesentery, Vasa Lactea, Receptaculum Chyli, Kidneys, Renal Glands, Ureters, Bladder, and the internal Parts of Generation in both Sexes.

90. THE principal Arteries of the Abdomen are these:

Arteria Epigastrica Superior, which is the lowest Portion of the Mammaria Interna.

Aorta Inferior.

Arteria Cæliaca.

Arteria Mesenterica Superior.

Arteriæ Renales, called formerly Emulgentes.

Arteriæ Spermaticæ.

Arteria Mesenterica Inferior.

Arteriæ Lumbares.

Arteriæ Iliacæ.

Arteriæ Hypogastricæ.

Arteriæ Epigastricæ Inferiores.

Arteriæ Hæmorrhoidales.

Arteriæ Pudicæ.

91. THE principal Veins of the Abdomen are these:

The inferior Portions of the Venæ Mammariæ Internæ.

Venæ Renales.

Venæ Lumbares.

Venæ Spermaticæ.

Venæ Iliacæ.

Venæ Hypogastricæ.

Vena Portæ Ventralis.

Vena Portæ Hepatica.

Vena Mesaraica Major.

Vena Splenica.

Vena Mesaraica Minor five Hæmorrhoidalis Interna.

92. THE principal Nerves of the Abdomen are these:

Nervi Stomachici, formed by the Extremity of the Sympathetici Medii or eighth Pair.

Nervi Sympathetici Maximi, the inferior Portion.

The two Semilunar or Plexiform Ganglions.

Plexus Stomachicus.

Plexus Hepaticus.

Plexus Splenicus.

Plexus

Plexus Renales.

Plexus Mesentericus Superior.

Plexus Mesentericus Inferior.

Nervi Lumbares.

Nervi Sacri.

Nervi Crurales, their Origin.

Nervi Sciatici, their Origin.

93. THE whole Arm is divided, as in the Sceleton, into the Shoulder, the Arm properly so called, the Fore-Arm and the Hand. But to these we must here add the Stump of the Shoulder, the Axilla or Arm-pit, the Elbow, the Fold of the Arm, and the Hollow of the Hand. *Parts of the upper Extremities.*

94. WHAT is called the Stump of the Shoulder, is formed by the fleshy Belly of the Musculus Deltoides; and the Axilla, by the corresponding Edges of the Pectoralis Major and Latissimus Dorsi. The Elbow answers to the Olecranon; the Fold of the Arm is on the fore-side of the Articulation of the Os Humeri, with the Bones of the Fore-Arm, and the Hollow of the Hand is in the middle of the Palm.

95. THE Arm, properly so called, is principally covered from the Shoulder downward, by the Biceps, Brachialis and the three Anconæi. The Fore-Arm is furnished with those Muscles which move the Radius on the Ulna, and the Carpus on the Fore-Arm. The Hand has few very considerable fleshy Parts, except the Thenar and Hypothenar, between which the Hollow of the Hand is formed.

96. THE Arteries of the whole upper Extremity are these:

Arteria Axillaris.

Arteria Humeralis.

Arteriæ Scapulares.

Arteria Articularis.

Arteria Brachialis.

Arteriæ Collaterales.

Arteria Cubitalis.

Arteria Radialis.

Arteria Interossea Anterior.

Arteriæ Interossee Posteriores.

The arterial Arches in the Palm of the Hand.

97. THE Veins of the whole upper Extremity are these:

Vena Cephalica Minor.

Vena Jugularis Externa, by communication with the small Cephalica.

Vena Axillaris.

Venæ Musculares.

Venæ Scapulares.

Vena Brachii Cephalica.

Vena Brachii Basilica.

Venæ Satellites Arteriæ Brachialis.

Vena Profunda Superior.

Vena Mediana, viz. Mediana Cubitalis, Mediana Basilica, Mediana Radialis five Cephalica, and Mediana Media or Major.

Vena Profunda Cubiti.

Vena Basilica Cubiti five Cubitalis.

Vena Cephalica Cubiti five Radialis.

Venæ Cubiti Satellites.

Vena Cephalica Pollicis.

Vena Salvatella five Auricularis.

Areolæ Venosæ Dorſi Manus.

98. THE Nerves of the whole upper Extremity are these:

Nervi Brachiales in general, formed by the last four or five Cervical and first Dorſal Pairs.

Nervus Musculo-Cutaneus.

Nervus Medianus.

Nervus Cubitalis.

Nervus Cutaneus Internus.

Nervus Radialis.

Nervus Axillaris five Articularis.

Parts of the
lower Ex-
tremities.

99. THE lower Extremities of the whole Body are divided, as those of the Sceleton, into the Thigh, Leg and Foot.

100. THE Thigh begins anteriorly on one side of the Fold of the Groin; and posteriorly, a little above the lower half of the Buttock. It terminates anteriorly at the Patella on the Knee, and posteriorly at the Poples or Ham. It is formed chiefly by the Muscles which surround the Os Femoris, and are themselves invested by the Fascia Lata, viz. the Glutæus Maximus, two Vasti, Crureus, Biceps, Triceps, Semi-Membranosus, Semi-Tendinosus, Gracilis Internus, Gracilis Anterior or Rectus and Sartorius.

101. THE Leg has but very few Muscles on the forepart, but a great many large ones behind; where the Gastrocnemii and Soleus form a kind of Belly, called the Calf of the Leg. The Leg begins anteriorly at the Knee, below the Patella, and posteriorly at the Poples; and it terminates below, at the Ankles.

102. BESIDES the parts of the Foot mentioned in the Description of the Sceleton, that convex part near its Articulation with the Leg, is termed the Neck of the Foot; and the under Part, which is the Basis of the whole lower Extremity, the Sole of the Foot. The fleshy Parts are not more considerable on the Foot than on the Hand.

103. THE Arteries of the whole lower Extremity are these:

Arteria Obturatrix, a Branch of the Hypogastrica.

Arteria Glutæa, a Branch of the Hypogastrica.

Arteria Sciatica, by Communication.

Arteria Pudica, by Communication.

Arteria Cruralis.

Arteria Poplitea.

Arteria

Arteria Tibialis Anterior.

Arteria Tibialis Posterior.

Arteria Peronæa.

Arteria Plantaris.

104. THE Veins of the whole lower Extremity are these :

Vena Obturatrix.

Vena Glutæa.

Vena Cruralis.

Vena Magna Saphena.

Vena Sciatica.

Vena Parva Saphena five Saphena Externa.

Vena Poplitea.

Venæ Tibiales

Vena Peronæa.

Vena Plantaris.

105. THE Nerves of the whole lower Extremity are these :

Nervus Cruralis, formed by a Complication of the five Lumbares, especially of the first four.

Nervus Sciaticus, formed by the Union of the last two Lumbares, and first three Sacri.

Nervus Sympatheticus Maximus, by Communication with the Nervi Lumbares and Sacri.

Nervus Popliteus.

Nervus Sciaticus Internus five Popliteus Internus.

Nervus Sciaticus Externus five Popliteus Externus.

Nervus Plantaris Externus.

Nervus Plantaris Internus.

A R T. II.

A Description of the Common Integuments of the Body.

106. **A**LL the parts of the Human Body are invested by several common and universal Coverings, to which Anatomists give the name *Introduction* of Integuments.

107. THERE have been many Disputes about the Number of these Integuments. The Ancients reckoned up five, viz. the Epidermis, Skin, Membrana Adiposa, Panniculus Carnosus, and Membrana Musculorum Communis.

108. THE first three of these Coverings are truly common or universal, that is, extended over all Parts of the Body ; but properly speaking, they ought to be reduced to two, for I look upon the Epidermis rather as a part or an Epiphyfis of the Skin, than as an Integument.

109. THE two other Coverings mentioned by the Ancients, are not universal, but confined to particular Parts of the Body.

§. 1. *The Skin.*

110. THE Skin is a Substance of very large Extent, made up of several kinds of tendinous, membranous, vascular and nervous Fibres, the Inter-
texture of which is so much the more wonderful as it is difficult to unfold;
for their Directions are as various as those of the Stuff of which an Hat consists.

111. THIS Texture is what we commonly call Leather, and it makes, as
it were, the Body of the Skin. It is not easily torn, may be elongated in
all Directions, and afterwards recovers it self, as we see in fat Persons, in
Women with Child, and in Swellings; and it is thicker and more compact in
some Places, than in others.

112. ITS Thickness and Compactness are not however, always propor-
tionable; for on the posteriour Parts of the Body, it is thicker and more lax
than on the Fore-parts; and on the Palms of the Hands, and Soles of the
Feet, it is both very thick, and very solid. It is generally more difficult to
be pierced by pointed Instruments, in the Belly, than in the Back.

113. THE outer Surface of this Substance is furnished with small Emi-
nences, which Anatomists have thought fit to call Papillæ, in which the capil-
lary Filaments of the Cutaneous Nerves terminate by small radiated Pencils.

114. THESE Papillæ differ very much in Figure and Disposition, in the
different Parts of the Body, and they may be distinguished into several
Kinds.

115. THE greatest part of them is flat, of different Breadths, and sepa-
rated by Sulci, which form a kind of irregular Lozenges. The Pyramidal
Figure ascribed to them, is not natural, and appears only when they are
contracted by Cold, by Diseases, by boiling or by some other artificial Pre-
paration which alters their ordinary Structure.

116. THE Papillæ of the Palm of the Hand, of the Sole of the Foot, and
of the Fingers and Toes, are higher than on the other Parts of the Body;
but they are likewise smaller, closely united together, and placed as it were,
endwise, with respect to each other, in particular Rows, which represent on
the Skin all kinds of Lines, streight, crooked, waving, spiral, &c. These
several Lines are often distinctly visible in those Parts of the Palm of the
Hand, which are next the first Phalanges of the Fingers.

117. THE Red part of the Lips is made up of Papillæ, representing very
fine Hairs or Villi closely united together.

118. THERE is another particular kind under the Nails; the Papillæ being
there more pointed, or in a manner, conical, and turned obliquely toward the
Ends of the Fingers. Those which are found in the hairy Scalp, Scrotum,
&c. are still of other kinds.

119. THE Papillæ of the first and second kinds appear to be surrounded
at their Bases, by a soft mucilaginous and pretty viscid Substance, which
fills the Interstices between them, and represents a kind of Net-work or Sieve,
the Mashs or Holes of which surround each Papilla. This Substance is
commonly called Corpus Reticulare or Mucosum.

120. THE Origin of this Reticular or Mucous Body, has not hitherto been sufficiently explained, and it has not been determined, whether it forms an universal Integument, or whether it belongs more properly to the Skin, than to the Papillæ and Epidermis.

121. To demonstrate this Reticular Substance in public Courses, the common Method is to take the boil'd Tongues of Oxen or Sheep; but this Method is fallacious, and may lead the greatest number of the Spectators into Mistakes, as I shall show in another Place.

122. IN Inflammations we observe a reticular Texture of capillary Vessels, more or less extended on the Surface of the Skin; and curious Anatomists demonstrate the same thing, by fine Injections, which may be look'd upon as artificial Inflammations. But neither of these Methods proves that in the natural State, these Vessels are Blood-Vessels, that is, that they contain the red Portion of the Blood.

123. IT is more probable that this vascular Texture is only a Continuation or Production of the very small Capillaries of the Arteries and Veins, which in the natural State transmit only the serous Part of the Blood, while the red Part continues its Course through wider Ramifications, which more properly retain the name of Blood-Vessels.

124. THIS vascular Texture is of various Forms and Figures in the different Parts of the Body. It is not the same in the Face, with what it is elsewhere, neither is it alike on all the Parts of the Face, as may be discovered by the most ordinary Microscopes; and from hence we might perhaps be enabled to give a reason, why one part of the Body turns red, more easily than another.

125. THE inner Surface of the Skin is covered by very small Tubercles, called commonly Cutaneous Glands, and they are likewise termed Glandulæ Miliæres, because of some Resemblance which they are supposed to bear to Millet-Seeds.

126. THESE Tubercles are partly fixed in small Fossulæ, in the Substance of the Skin, which answer to the same number of small Cavities, in the Corpus Adiposum. Their excretory Ducts open on the outer Surface of the Skin, sometimes in the Papillæ, and sometimes on one side of them, as may be seen in the Ends of the Fingers, even without a Microscope.

127. THE greatest part of them furnishes Sweat, and others, a fatty, oily Matter of different Thicknesses, as in the hairy Scalp, in the Back, behind the Ears, and at the lower part of the Nose, where this Matter may be squeezed out, in form of small Worms. On the Head, this is called the Dandriff, and Filth or Nastiness on the other Parts of the Body.

128. BY macerating the Skin in Water, or in any other proper Liquor, these Corpuscles become more visible, especially in the Skin of the lower part of the Nose, and of the Axilla. The late M. *Duvernay* demonstrated to the Royal Academy, that the Structure of some of these Cutaneous Glands resemble the Circumvolutions of small Intestines plentifully stored with Capillary Vessels. The illustrious M. *Morgagni* Professor at *Padua* has given the

the name of *Glandulæ Sebaceæ* to those which furnish the unctuous Matter above mentioned.

129. BESIDES these Corpuscles, there are other small solid Bodies, almost of an oval figure, contained in the Substance of the Skin. These are the Roots or Bulbs from whence the Hairs arise, and some of them are situated within the inner Surface of the Skin, as I shall show hereafter.

130. THE Skin has several considerable Openings, some of which have particular Names; such as the Fissure of the Palpebræ, the Nares, the Mouth, the external Foramen of the Ears, the Anus and Openings of the Parts of Generation.

131. BESIDES these, it is perforated by an infinite number of small Holes, called Pores, which are of two kinds. Some are more or less perceivable by the naked Eye: such as the Orifices of the milky Ducts of the Mammæ, the Orifices of the excretory Canals of the Cutaneous Glands, and the Passages of the Hairs.

132. THE other Pores are imperceptible to the naked Eye, but visible through a Microscope; and their Existence is likewise proved by the Cutaneous Transpiration, and by the Effects of Topical Applications: and from these two Phænomena, they have been divided into arterial and venal Pores.

133. WE ought likewise to observe the Adhesions and Folds of the Skin. It is every where united to the Corpus Adiposum, as shall be said hereafter; but it adheres to it much more closely in some Parts, than in others, as in the Palm of the Hand, Sole of the Foot, Elbow and Knee.

134. SOME Plicæ or Folds in the Skin, depend on the Structure of the Membrana Adiposa or Cellularis, as those in the Neck and Buttocks; others do not depend on that Membrane, such as the Rugæ in the Fore-head, Palpebræ, &c. which are formed by Cutaneous Muscles, and disposed more or less in a contrary Direction to these Muscles. These Folds increase with Age.

135. THERE is besides, a particular kind of Folds in the Skin of the Elbow, Knee, and Condyles of the Fingers and Toes, which are owing neither to the Conformation of the Membrana Adiposa, nor to any Muscle.

136. LASTLY, there is a kind of Plicæ, or rather Lines, which cross the Palm of the Hand, Sole of the Foot, and corresponding Sides of the Fingers and Toes in different Directions. These serve for Employment to Fortune-tellers, whose pretended Art is contrary to Religion, and despised by all Men of Sense.

§. 2. *The Cuticula or Epidermis.*

137. THE outside of the Skin is covered by a thin transparent Web, closely joined to it, which is called Epidermis, Cuticula or the Scarf-Skin.

138. THE Substance of the Cuticula appears to be very uniform on the side next the Skin, and to be composed on the other side, of a great number of very fine small squamous Laminæ, without any appearance of a fibrous

or vascular Texture, except some small Filaments by which it is connected to the Papillæ, and which perhaps are detached from thence.

139. THIS Substance is very solid and compact, but yet capable of being extended and thicken'd, as we see by steeping it in Water, and by the Blisters raised on the Skin by Veficatories, or any other means ; and from thence it would seem, that it is of a spongy Texture. It yields very much in Swellings ; but not so much as the Skin, without breaking or cracking.

140. THE Origin of the Epidermis is as obscure, as its Regeneration is evident, sudden and surprising ; for let it be destroyed ever so often, it still grows again. It probably arises from a Substance that transudes from the Papillæ, and therefore the Ancients were in the right to call it an Efflorescence of the Skin.

141. WE must not however imagine, that it is the Air which dries this mucilaginous Matter, and gives it the form of the Epidermis ; because it is found equally in the Fœtus, which swims continually in Water ; and it grows even on the Palate when it has been destroyed by too hot Food ; and under Plaisters applied to any Part of the Body.

142. HARD and reiterated Frictions loosen it insensibly, and presently afterward, a new Stratum arises, which thrusts the first outward, and may it self be loosened, and thrust outward by a third Stratum, and so on.

143. IT is nearly in this manner, that Callosities are formed on the Feet, Hands, and Knees ; and the several Laminæ or Strata observable at the same time, on many other Parts of the Body, are owing to the same Cause, tho' many Anatomists have look'd upon them to be natural. It must be acknowledged, however, that on the Palms of the Hands, and Soles of the Feet, the Epidermis is commonly thicker than on any other Part.

144. THE Epidermis adheres very closely to the Cutaneous Papillæ, from which it may be separated by boiling ; or which is a much better way, by steeping for a long time, in cold Water. It is not impossible to separate it with the Knife, but this Management teaches us nothing of its Structure.

145. IT adheres still closer to the Corpus Reticulare, which is easily raised along with it ; and they seem to be true Portions or Continuations of each other.

146. IT is generally believed, that the Colour of the Epidermis is naturally white ; and that the apparent Colour thereof, is owing to that of the Corpus Mucosum. But when we examine separately the Epidermis of Negroes, we find no other Whiteness in it, than in a thin transparent Lamina of black Horn.

147. THE Epidermis covers the Skin through its whole Extent, except at the Places where the Nails lie. It is mark'd with the same Furrows and Lozenges as the Skin, and has the same Openings and Pores ; and tho' it may be said to pass the Bounds of the Skin, where it is continued inward, through the great Openings, yet at these Places it loses the name of Epidermis.

148. WHEN we examine narrowly the small Pores or Holes, through which the Sweat passes, the Epidermis seems to enter these, in order to compleat the excretory Tubes of the Cutaneous Glands. The Fossulæ of the Hairs.

Hairs have likewise the same Productions of the Epidermis, and it seems to give a sort of Coat or Bark to the Hairs themselves. Lastly, the almost imperceptible Ducts of the Cutaneous Pores are lined by it.

149. HAVING macerated the Skin for a long while in Water, the Epidermis, with all its Elongations, may be separated from it; and in that case these Productions carry along with them, the Hairs, the Bulbs, and even the axillary Glands.

150. BY this Observation, we may explain, how Blisters may remain for a long time on the Skin, without giving passage through these Holes, to the Matter which they contain; which Holes ought to be increased, one would think, by this Dilatation and Tension of the Epidermis.

151. FOR when the Epidermis is separated from the Skin, it carries along with it some Parts of these Cutaneous Fibres, which being compressed by the Matter contained in the Blister, shut the Pores of the separated Epidermis, like so many Valves; and it is probably these small Portions which have been taken for Valves of the Cutaneous Tubes.

§. 3. *Uses of the Skin.*

152. IT is chiefly and properly the filamentary Substance, called the Body of the Skin, which is the universal Integument of the Body, and the Basis of all the other Cutaneous Parts, each of which has its particular Uses.

153. THE Skin is able to resist external Injuries to a certain Degree, and such Impressions, Frictions, Strokes, &c. to which the Human Body is often liable, as would hurt, wound and disorder the Parts of which it is composed, if they were not defended by the Skin.

154. THE Papillæ are the Organ of Feeling, and contribute to an universal Evacuation, called insensible Transpiration. They likewise serve to transmit from without, inwards, the subtle Particles or Impressions of some things, applied to the Skin. The first of these three Uses depends on the Extremities of the Nerves, the second on the arterial Productions, and the third on the Productions of the Veins.

155. THE Cutaneous Glands secrete an oily Humour of different Consistences, and they are likewise the Origin of Sweat. But without the Epidermis, both Papillæ and Glands would be disturbed in their Functions, on which great Disorders must ensue.

156. IN order to explain the Mechanism of Feeling, or of the Touch, we should first be made acquainted with the Senses in general, for which this is not a proper place; and therefore all that I shall observe here, is, that there are at least two Sorts of Feeling, one general, the other particular.

157. PARTICULAR Feeling is accompanied with a certain determinate Impression, by which we are enabled to discern Objects in a very distinct Manner, and this is properly what is called the Touch; the proper Organ of which is at the inside of the Ends of the Fingers. General Feeling is indeterminate and indistinct, not being accompanied with the same Impression as the former.

158. THESE Differences in the Sense of Feeling, depend on those of the Papillæ, which, in effect, appear to be more close, and made up of a greater number of nervous Filaments at the Ends of the Fingers, than any where else; for the nervous Ropes that go to the Fingers, are proportionably larger than those that go to any other Part of the Body.

159. THE Epidermis serves to keep the Pencils or nervous Filaments of the Papillæ, in an even Situation, and without Confusion, and it likewise moderates the Impressions of external Objects. Particular as well as general Feeling is more or less perfect, in proportion to the Thinness of the Epidermis, Callosities in which, weaken and sometimes destroy both.

160. ANOTHER Use of the Epidermis is to regulate the Cutaneous Evacuations already mentioned, the most considerable of which is insensible Transpiration. By this we understand a fine Exhalation, or a kind of subtle Smoke, which flows out of the Body imperceptibly, and in different Quantities. It might be called Cutaneous Transpiration, to distinguish it from Pulmonary Transpiration, of which hereafter.

161. THIS Cutaneous Exhalation becomes sensible, by applying the End of the Finger, or Palm of the Hand to the Surface of a Looking-Glass, or of any other polished Body; for it presently looks dull and appears to be covered with a condensed Vapour. It seems to me, that the convex side of the Hand and Fingers, do not furnish so great a Quantity of this Exhalation, as the Palm of the Hand and the insides of the Fingers, especially the Extremities, which points out one Use of this Transpiration, viz. to keep the nervous Filaments in due order for particular Feeling.

162. ANOTHER Proof of insensible Transpiration, is the famous Experiment of *Sanctorius*, continued for thirty Years without interruption, by which he found that this Evacuation in one Day, was equal to all the sensible Evacuations for fifteen Days.

163. THIS Calculation is not agreeable to what has been made in other Countries, particularly those from the like Experiments made by M. *Dodart* and *Morin* of the Royal Academy of Sciences, and by Dr. *James Keil*, as published in his *Statica Britannica*. Neither can the Ballance inform us, whether the Cutaneous Transpiration is greater or less than the Pulmonary.

164. A long time ago, I discovered a Method to render this Transpiration visible, to the distance of about half a Foot from the Body, and I mentioned it in a Thesis printed at *Copenhagen*. If we look at the Shadow of a bare Head on a white Wall, in a bright Sun-shiny Day, and in the Summer-Season, we will perceive very distinctly the Shadow of a flying Smoke, rising out of the Head, and mounting upward, tho' we cannot see the Smoke itself. We may try the same Experiment with a Dog or Fowl, &c.

165. IT is much in the same manner, that the invisible Exhalations from burning Charcoal throw a very distinct Shadow; and that the invisible Smoke of a Chafing-Dish, Warming-Pan, Stove, &c. make all distant Objects appear trembling, when view'd either over or on either side of those Utensils.

166. THE insensible Cutaneous Evacuation is performed simply, and without any Artifice, through the small Pores already mentioned, much in the same manner as we observe the Smoke to arise from the Intrails of an Animal newly killed and opened. It is a particular and continual Discharge of the Serum of the Blood through the capillary Vessels of the Skin.

167. IT is naturally very moderate, and it is more abundant in the Summer, before a good Fire, after strong Exercise, and during the Distribution of the Chyle; than in the Winter, in cold Places, during Inaction, and before Meals.

168. THE transpired Matter appears to be in some degree saline, as may be observed by applying the Tongue to the Palm of the Hand, when it has not been washed lately before. This is perhaps the reason, why we feel less Pain when a Wound is touched with the Finger cover'd with Silk, than with the naked Finger; but this Inconveniency might easily be prevented by washing the Hands and Fingers very well, immediately before we begin to dress Wounds.

169. THE Matter of the other two Cutaneous Evacuations, the Sweat and thick oily Substance, comes chiefly from the Glands of the Skin. Each of them differs according to the different Parts of the Body where they are found, as may be observed both of the Filth and Sweat of the Head, Armpits, Hands, Feet, &c.

170. THIS Filth or Nastiness of the Skin, is an unctuous or fatty Matter, collected insensibly on the Epidermis, where it thickens and forms a sort of Varnish, which in time becomes prejudicial, by stopping up the Passages of Cutaneous Transpiration.

171. THIS Collection is more readily made in Winter, than in Summer; and this is the reason why it is more difficult to keep the Hands clean in cold, than in warm Weather. And while I am dissecting in Winter, the oftener I wash my Hands, the less sensible they are of Cold.

§. 4. *The Membrana Adiposa, and Fat.*

172. THE second universal Integument of the Human Body, is the *Membrana Adiposa*, or *Corpus Adiposum*. This is not, however, a single Membrane, but a Congeries of a great number of membranous Laminæ, joined irregularly to each other at different distances, so as to form numerous Interstices of different Capacities, which communicate with each other. These Interstices have been named *Cellulæ*, and the Substance made up of them, the cellulous Substance.

173. THE Thickness of the *Membrana Adiposa*, is not the same all over the Body, and depends on the number of Laminæ, of which it is made up. It adheres very closely to the Skin, runs in between the Muscles in general, and between their several Fibres in particular, and communicates with the Membrane, which lines the inside of the Thorax and Abdomen.

174. THIS Structure is demonstrated every day by Butchers, in blowing up their Meat, when newly killed; in doing which, they not only swell the *Membrana*

Membrana Adiposa, but the Air insinuates it self likewise in the Interstices of the Muscles, and penetrates even to the Viscera, producing a kind of artificial Emphysema.

175. THESE cellular Interstices are so many little Bags or Satchels, filled with an unctuous or oily Juice, more or less liquid, which is called Fat, the different Consistence of which depends not only on that of the oily Substance, but on the Size, Extent and Subdivision of the Cells.

176. IT is generally known, that the illustrious *Malpighi*, took a great deal of pains about this Substance; that in Birds and Frogs, the Viscera and Vessels of which are transparent, he thought he saw a kind of Ductus Adiposi; and that by pressing these Ducts, he observed oily Drops to run distinctly into the small Ramifications of the Vena Portæ.

177. THE Manufacture of Soap, the Composition of the Unguentum Nutritum, and the different Mixtures of Oils with saline and acid Liquors, give us some Idea at least, of the Formation of the Fat in the Human Body; but the Organ which separates it from the Mass of Blood, which ought to be the Subject of our present Inquiry, is not as yet sufficiently known.

178. FAT is more fluid in living, than in dead Bodies. It melts with the heat of the Fingers in handling it, and its Fluidity is in part obstructed by the Sacculi, which contain it. To take it intirely out of these Bags, the Method is to set the whole over the Fire, in a proper Vessel; for then the Bags burst, and swim in Clusters in the true oily Fluid.

179. THIS Substance increaseth in Quantity in the Body, by Rest and Good Living; and on the contrary, diminishes by hard Labour, and a spare Diet. Why Nourishment should have this Effect, is easily conceived, and it is likewise easy to see that an idle sedentary Life must render the Fat less fluid, and consequently more capable of blocking up the Passages of insensible Transpiration, through which it would otherwise run off.

180. HARD Labour dissolves it, and consequently fits it for passing out of the Body, with the other Matter of insensible Transpiration. Some are of opinion, that it returns into the Mass of Blood, by the capillary Veins, and that it can, for some certain time, supply the Want of Nourishment.

181. BY this, they think, the long Abstinence of some Animals may be explained; but I am apt to believe, that the meer Decrease of Cutaneous Transpiration, occasion'd by the continual Rest and Inaction of these Animals, has a great share in this Effect.

182. THE proportional Differences, in the Thickness of this Membrana Adiposa, are determined, and may be observed to be regular in some Parts of the Body, where either Beauty or Use required it.

183. THUS we find it in great Quantities, where the Interstices of the Muscles would otherwise have left disagreeable hollow or void Places; but being filled, and as it were padded with Fat, the Skin is raised, and an agreeable Form given to the Part.

184. THE Appearance of a Person moderately fat, of a Person extremely lean, and of a dead Carcass, from which all the Fat has been removed, proves sufficiently what I have said.

185. IN some parts of the Body the Fat serves for a Cushion, Pillow or Mattress, as on the Buttocks, where the Laminæ and Cells are very numerous. In other parts, this Membrane has few or no Laminæ, and consequently little or no Fat, as on the Fore-Head, Elbows, &c.

186. IN some Places it seems to be braced down by a kind of natural Contraction in form of a Fold; as in that Fold which separates the Basis of the Chin from the Neck; and in that which distinguishes the Buttocks from the rest of the Thigh. We observe it likewise to be intirely sunk, or as it were perforated by a kind of Dimple or Fossula, as in the Navel of fat Persons.

187. THESE Depressions and Folds are never obliterated, let the Person be ever so fat, because they are natural, and depend on the particular Conformation of the Membrana Adiposa, the Laminæ of which are wanting at these Places.

188. THE Fat is likewise of great use to the Muscles in preserving the Flexibility necessary for their Actions, and in preventing or lessening their mutual Frictions. This Use is of the same kind with that of the unctuous Matter found in the Joints, which was explained in the Description of the fresh Bones.

189. LASTLY, the Fat, as a fine oily Substance in its natural State, may be some defence against the Cold, which we find makes more Impression on lean than on fat Persons. It is for this reason that to guard themselves against the excessive Colds of hard Winters, and to prevent Chilblains, Travellers rub the Extremities of their Bodies, and especially their Feet, with spirituous Oils, such as that of Turpentine, &c.

190. THIS Mass of Fat, which makes an universal Integument of the Body, is different from that which is found in the Abdomen, Thorax, Canal of the Spina Dorsi, Articulations of the Bones, and in the Bones themselves.

191. BUT the difference of all these particular Masses of Fat consists chiefly, as I have said, in the thickness or fineness of the Pellicles, in the largeness or smallness of the Cells, and in the Consistence, Fluidity and Subtlety of the oily Matter.

§. 5. *The Nails.*

192. THE Nails are looked upon by some as Productions of the Cutaneous Papillæ, and by others, as a Continuation of the Epidermis. This last Opinion agrees with Experiments made by Maceration, by means of which the Epidermis may be separated intire from the Hands and Feet, like a Glove or Sock.

193. IN this Experiment we see the Nails part from the Papillæ and go along with the Epidermis, to which they remain united like a kind of Appendix; and yet their Substance and Structure appears to be very different from that of the Epidermis.

194. THEIR Substance is like that of Horn, and they are composed of several Planes of longitudinal Fibres foddered together. These Strata end at the Extremity of each Finger, and are all nearly of an equal Thickness, but of different Lengths.

195. THE external Plane or Stratum is the longest, and the rest decrease gradually, the innermost being the shortest; so that the Nail increases in thickness from its Union with the Epidermis where it is thinnest, to the end of the Finger where it is thickest.

196. THE graduated Extremities or Roots of all the Fibres of which these Planes consist, are hollowed for the Reception of the same number of very small oblique Papillæ, which are Continuations of the true Skin, which having reached to the Root of the Nail, forms a Semilunar Fold in which that Root is lodged.

197. AFTER this Semilunar Fold, the Skin is continued on the whole inner Surface of the Nail, the Papillæ insinuating themselves in the manner already said. The Fold of the Skin is accompanied by the Epidermis, to the Root of the Nail exteriorly, to which it adheres very closely.

198. THREE Parts are generally distinguished in the Nail, the Root, Body and Extremity. The Root is white and in form of a Crescent; and the greatest part of it is hid under the Semilunar Fold already mentioned.

199. THE Crescent and the Fold lie in contrary Directions to each other. The Body of the Nail is naturally arched, transparent and appears of the Colour of the Cutaneous Papillæ which lie under it. The Extremity of the Nail does not adhere to any thing, and still continues to grow as often as it is cut.

200. THE principal Use of the Nails is to strengthen the ends of the Fingers and Toes, and to hinder them from being inverted towards the convex side of the Hand or Foot, when we handle or press upon any thing hard. For in the Hand, the strongest and most frequent impressions are made on the side of the Palm, and in the Foot, on the Sole; and therefore the Nails serve rather for Buttresses than for Shields.

§. 6. *The Hairs.*

201. THE Hairs belong as much to the Integuments as the Nails. They are a kind of Reeds or Rushes, the Roots or Bulbs of which lie toward that side of the Skin which is next the Membrana Adiposa. The Trunk or beginning of the Stem perforates the Skin, and the rest of the Stem advances beyond the outer Surface of the Skin, to a certain distance, which is very various in the different parts of the Body.

202. WHEN the different Hairs are examined by a Microscope, we find the Roots more or less Oval, the largest Extremity being either turned toward or fixed in the Corpus Adiposum. The smallest Extremity is turned toward the Skin, and in some Places fixed in the Skin.

203. THIS Oval Root is covered by a whitish strong Membrane, in some measure Elastic, and it is connected either to the Skin, to the Corpus Adiposum,

posum, or to both, by a great Number of very fine Vessels and nervous Filaments.

204. WITHIN the Root, we observe a kind of Glue, some very fine Filaments of which advance toward the small Extremity, where they unite and form the Stem, which passes through this small Extremity to the Skin. As the Stem passes through the Root, the outer Membrane is elongated in form of a Tube which closely invests the Stem, and is intirely united to it.

205. THE Stem having reached the Surface of the Skin, pierces the Bottom of a small Fossula between the Papillæ, or sometimes a particular Papilla, and there it meets the Epidermis, which seems to be inverted round it, and to unite with it entirely. A sort of unctuous Matter transudes through the sides of the Fossula, which is bestowed on the Stem, and accompanies it more or less, as it runs out from the Skin, in form of an Hair.

206. HAIRS differ in Length, Thickness, and Solidity, in the different Parts of the Body. Those on the Head, are called in *English* by the general name of Hairs; those which are disposed Archwise above the Eyes, Supercilia, or the Eye-Brows; those on the Edges of the Palpebræ, Cilia, or the Eye-Lashes; and those which surround the Mouth, and cover the Chin, the Beard. In other Parts of the Body, they have no particular Names; and their different Lengths, Thickneses, &c. in all these Parts, are sufficiently known.

207. THEIR natural Figure seems to be rather Cylindrical, than Angular; which is chiefly accidental. Their Colour is probably the same with that of the Glue, or medullary Matter of the Root, the different Consistence of which, makes the Hairs more or less hard, flexible, &c. Lastly, their streight or crooked Direction must depend on that of the Holes, through which the Stems pass.

208. THE Use of the Hairs, with respect to the Human Body in general, is not sufficiently known to be determined with certainty. Their Uses, with regard to some particular Parts may be discovered, as we shall see in the Description of these Parts.

§. 7. *The supposed Integuments of the Ancients.*

209. BESIDES the Integuments, which I have here described, the Ancients reckon'd two others, the Panniculus Carnosus, and Membrana Communis Musculorum.

210. THE Panniculus Carnosus is found in Quadrupeds, but not in Men, whose Cutaneous Muscles are in a very small number, and most of them of a very small Extent, except that which I call Musculus Cutaneus in particular; but even that Muscle cannot in any tolerable sense be reckoned a common Integument.

211. THERE is no common Membrane of the Muscles, which covers the Body like an Integument; it being no more than particular Expansions of the

the Membranes of some Muscles, or Aponeurotic Expansions from other Muscles.

212. THE Elongations of the Lamina of the Membrana Adiposa, or Cellularis, may likewise have given rise to this Mistake, especially in such Places, where this Membrane is closely united to the proper Membrane of the Muscles.



SECT.

S E C T. VIII.

A Description of the Abdomen.

Introduction. 1. **I**N the compendious View of the Parts of the Human Body, I gave a general Description and Division of the Abdomen, with a particular Enumeration of the external and internal Parts of which it is composed, and which it contains or supports. Therefore, that I may not be obliged to repeat these general Things, I must desire the Reader to revise what was there said, before he begins this Section.

*External
Conforma-
tion of the
Abdomen.*

2. THE whole Fore-part of the Abdomen forms an oblong Convexity, like an oval Vault, more or less prominent in the natural State, in proportion to the quantity of Fat upon it, and of Food contain'd in it, or to the different Degrees of Pregnancy in Women. The Hypogastric and Umbilical Regions are more subject to these Varieties, than the Epigastric Region.

3. ON the sides, between the Hypochondria, and Ossa Ilium or Haunch, the Abdomen is commonly a little contracted; and backward, about the middle of the Regio Lumbaris, it is gently depressed, forming a kind of transverse Cavity, answering to the natural Incurvation of the Lumbar Portion of the Spina Dorsi, described in Sect. I.

4. THIS antierour Convexity, and posterour Cavity change, as we sit, stand, kneel, lie at our full length, or with the Thighs bent; and these Variations depend on the particular Situation of the Ossa Innominata, in these different Postures.

5. IN standing, the Convexity of the Belly, and Cavity of the Loins, are more considerable, than in most other Situations; for then the lower Extremity of the Os Sacrum, is turned very far back, and consequently the Os Pubis, very much down. In this Situation of the Pelvis, the Intestines fall naturally forward, and thus increase the Convexity of the Abdomen; and as the Vertebrae of the Loins are very much bent at the same time, the Cavity in that place must likewise be very considerable.

6. IN kneeling, the Ossa Pubis are still lower than when we stand; and this not only increases the Hollow of the Loins, and throws the Abdomen and its Viscera more outward or forward, but also in some measure, strains the Abdominal Muscles; which is so uneasy to some Persons, as to cause them to faint away.

7. THIS Depression of the Os Pubis in kneeling, depends partly on the Tension of the two Musculi Recti Anteriores, the lower Tendons of which are in this Situation, drawn with Violence under the Condylode Pulley of the Os Femoris.

8. WHEN we sit in the common manner, that is, with the Thighs stretched out in a plane Parallel to that of the Seat, the Convexity of the Belly and Hollow of the Loins diminish.

9. FOR the Pelvis being in this Situation, supported on the Tubercula Ischii, and these Tubercles being very near the Fore-part of the Pelvis; the Trunk of the Body pressing on the Os Sacrum, must lower the Pelvis behind, and raise it before.

10. WHEN we lie upon the Back at full length, and with the Thighs extended, the Belly is less convex, but more stretched and hard; whereas, when the Thighs are bent, it is soft and lax. In this Situation, the Regio Lumbaris is almost flat and very little depressed.

11. WHEN we lie on the Back, and raise the Head, or endeavour to raise it, we feel a Tension in the Fore-part of the Abdomen, which increases in proportion to the force we use in raising the Head.

12. THESE Varieties of the external Conformation of the Abdomen have a near Relation to so great a number of other Phænomena, in the Animal Œconomy of the Human Body, that it would require a whole Volume to explain all the Particulars thereof; neither are Details of this kind very proper in a Work designed to be purely Anatomical, in which, consequently, our main Business is to give a full and accurate Description of the true Structure of the Parts, and only to point out in general their principal Uses. The rest I resolve to make the Subject of another Work, as I have already said.

13. I mentioned the Integuments of the Abdomen in general, in the compendious View of the Parts. Fewer Papillæ appear in the Skin of the Belly than any where else. The antierior Portion of it is not only thinner and more compact than the posterioir, as has been already observed, but it has this likewise peculiar to it, that it may be naturally increased very much in breadth, and sometimes in a very extraordinary manner, without losing any thing of its thickness, in proportion to what it gains in breadth.

*Integuments
of the Ab-
domen.*

14. THIS Peculiarity likewise belongs to the Epidermis. I here speak only of what is observable in the natural State of Corpulency or Pregnancy, but I have not as yet been able to discover, what it is in the Texture or Structure of this Skin and Epidermis, on which this Peculiarity depends. All that I have been able to remark about it, was in the dead Body of a Woman, whose Belly was contracted and fallen; namely, that on the Surface of the Skin there was a great number of Lozenges disposed in a reticular manner.

15. THE Marks of these superficial Lozenges were in the Epidermis. They were composed of several fine Lines, which altogether extended to a sensible breadth. The Areas or Meshes of these Lozenges, which seem'd to be about the sixth part of an Inch in breadth, were very flat and thin.

16. IN the manner in which *Steno* used to open Bodies, by making two longitudinal Incisions in the Integuments, and so leaving a middle Band made up of the Skin and Fat, in their true places, it is easy to demonstrate the Union of the Aponeurotic or tendinous Productions with the Arteries, Veins and Nerves, in order to form the Skin of the Abdomen; and the same use might be made of this Method, in other Parts of the Skin, as I shall show in another Place.

17. THE Cells of the Membrana Adiposa which covers the convex part of the Abdomen, are disposed in a very regular manner, as I discovered by that Method of opening Bodies, which I have always made use of, both in my publick and private Courses. This Method is to make two oblique Incisions in the Integuments, from the Navel to the Groins, and to separate this angular Portion of the Integuments, and throw it down over the Parts of Generation, that they may be covered, during the Demonstration.

18. THIS Triangular Portion being thus inverted, there appears on the inner Surface of the Membrana Adiposa, a longitudinal Line like a kind of Raphe, produced by the meeting of these cellular Rows, which form Angles successively, one above another, opposite to the Linea Alba of the Abdomen. The Cells in these Rows are more oblong than the rest, and in a manner oval, or like a Grain of Wheat.

*Cavity of
the Abdomen.*

19. THE Appendix Ensisformis of the Sternum, the Cartilaginous Portions of the last Pair of true Ribs; those of the first four Pairs of false Ribs, all the fifth Pair, the five Lumbar Vertebræ, the Ossâ Innominata, the Os Sacrum, and Os Coccygis, form the bony Sides of the Cavity of the Abdomen.

20. THE Diaphragm, the Muscles called particularly Musculi Abdominis, the Quadrati Lumborum, Psoai, Iliaci, the Muscles of the Coccyx, and of the Intestinum Rectum, form the chief part of the Circumference of this Cavity, and its whole inner Surface is lined by a membranous Expansion termed Peritonæum; all these Parts being covered by the Integuments already spoken to. As additional or auxiliary Parts, we might likewise add some Portions of the Sacro-Lumbares, Longissimi Dorsi, Vertebrales, Glutæi, &c.

21. THE Cavity of the Abdomen is of an irregularly oval Figure, but still symmetrical. On the foreside it is uniformly arched or oval, and its greatest Capacity is even with the Navel, and nearest Part of the Hypogastrium. On the upper side it is bounded by a Portion of a Vault, very much inclin'd. On the backside, it is in a manner divided into two Cavities by the jutting out of the Vertebræ of the Loins. On the lower side, it contracts gradually all the way to what I call the little Edge of the Pelvis, and from thence expands again a little, as far as the Os Coccygis, and Tubercles of the Ischium, terminating in the void Space between these three Parts.

§. 1. Peritonæum.

22. HAVING carefully removed the Muscles of the Abdomen, the first thing we discover is a very considerable membranous Covering, which adheres immediately to the inner Surface of the Musculi Transversi, and of all the other Parts of this Cavity; and involves and invests all the Viscera contained therein, as in a kind of Bag. This Membrane is named Peritonæum, from a Greek Word, which signifies to be spread around.

23. THE Peritonæum in general is a Membrane of a pretty close Texture, and yet very limber and capable of a very great Extension; after which it can recover it self, and be contracted to its ordinary Size; as we see in Pregnancy, Dropsies, Corpulency and Repletion.

24. IT seems to be made up at least of two Portions, one internal, the other external; which have been looked upon by many Anatomists, as a Duplicature of two distinct membranous Laminæ. But properly speaking, the internal Portion alone deserves the name of a membranous Lamina, as being the main Body of the Peritonæum. The external Portion is no more than a kind of fibrous or follicular Apophysis of the internal; and may properly enough be termed the cellular Substance of the Peritonæum.

25. THE true membranous Lamina, commonly called the internal Lamina, is very smooth, and polished on that side which is turned to the Cavity and Viscera of the Abdomen, and continually moisten'd by a serous Fluid discharged through almost imperceptible Pores.

26. THESE Pores may be seen by spreading a Portion of the Peritonæum on the end of the Finger, and then pulling it very tight on all sides; for then the Pores are dilated, and small Drops may be observed to run from them, even without a Microscope.

27. THE Sources of this Fluid are not as yet sufficiently known. Perhaps it comes out by a kind of Transudation or Transpiration, like that which we observe in Animals newly killed. The whitish Corpuscles found in diseased Subjects are no Proof of the Glands, which some Anatomists place there in the natural State.

28. THE cellular Substance, or external Portion of the Peritonæum, adheres very closely to the Parts which form the insides of the Cavity of the Abdomen, and it is not every where of an equal thickness. In some places it is in a very small quantity, and scarcely any appears at the tendinous or aponeurotic Portions of the Musculi Transversi, and on the lower side of the Diaphragm.

29. IN all other places, it is thicker, and forms Cells expanded into very fine Laminæ, which in diseased Subjects become sometimes so broad and thick, as to resemble so many distinct Membranes.

30. IN some places, this Substance is every way like a Membrana Adiposa, being fill'd with Fat, as round the Kidneys, and along the fleshy Portions of the transverse Muscles to which it adheres. It intirely surrounds some Parts, as the Bladder, Ureters, Kidneys, spermatic Vessels, &c. and it is in these places improperly term'd the Duplicature of the Peritonæum.

31. BESIDES these Differences in thickness, the cellular Substance has several Elongations, which have been called Productions of the Peritonæum. Two of these Productions accompany and invest the spermatic Ropes in Males, and the vascular Ropes, commonly called the round Ligaments, in Women. There are other two, which pass under the Ligamentum Fallopii, with the crural Vessels, which they involve and they are gradually lost in their Course downward.

32. To these four Productions of the cellular Substance of the Peritonæum, we may add a fifth, which is spread on the Neck of the Bladder, and perhaps a sixth, which accompanies the Intestinum Rectum. All these Elongations pass out of the Cavity of the Abdomen, and may be termed external, to distinguish them from others that remain in the Abdomen, and are called internal, of which hereafter.

33. THE great Blood-Vessels, that is, the Aorta and Vena Cava are likewise involved in this cellular Substance of the Peritonæum. In a word, it involves immediately and separately all the Parts and Organs, which are commonly said to lie in the Duplicature of the Peritonæum.

34. The true Lamina or membranous Portion of the Peritonæum, is connected by the Intervention of the cellular Substance, to the inner Surface of the Cavity of the Abdomen, but it does not naturally accompany the external Elongations of that Substance. It only covers the Origin or Basis of these Productions, without any Alteration in its own Surface, at these Places.

35. It has nevertheless, Productions of its own, but they are very different from those of the cellular Substance; for they run from without, inward, that is, they advance from the convex side of the great Bag of the Peritonæum, into the Cavity of that Bag, some more, some less, and also in different manners; as if the sides of a large Ball or Bladder were thrust inward into the Cavity of the Ball or Bladder.

36. OF these internal Elongations or Intropressions of the true Lamina of the Peritonæum, some are simply folded, like a Duplicature; some are expanded like inverted Bags or Sacculi to contain some Viscus; some begin by a simple Duplicature, and are afterwards expanded into a Cavity which contains some Organ; some are alternately extended in the form of simple Duplicatures, and of Cavities; and lastly, some form only a small Eminence on the inner Surface of the great Cavity of the Peritonæum.

37. UNDER the first Species of these Productions, we may bring the membranous Ligaments of the Abdomen, such as those of the Liver, Colon, &c. We see the second Species in the external Membrane of the Liver; the third, in the Mesentery; the fourth, in the Mesocolon; and the fifth, at the Kidneys and Ureters.

38. BESIDES the external Productions of the cellular Substance of the Peritonæum, it has the same number of internal Elongations with the true Lamina; which lie between all the Duplicatures, and line the insides of all the Cavities, or that side next the Viscera contained in them.

39. THE Uses of the Peritonæum in general seem to be very evident from the Description which I have given of it; and the chief of these Uses are, to line the Cavity of the Abdomen, to invest the Viscera contained in that Cavity as in a common Bag, to supply them with particular Coats, to form Productions, Ligaments, Connexions, Folds, Vaginæ, &c. as we shall see hereafter.

40. THE fine Fluid which transudes through the whole internal Surface of the Peritonæum, prevents the Inconveniencies which might arise from the continual

continual Frictions and Motions, to which the Viscera of the Abdomen are exposed either naturally or by external Impulses.

41. I must here observe, that it is the common Custom to demonstrate four Ligamentary Ropes, termed the Umbilical Vessels, before the Peritonæum is opened, because they adhere to the Umbilicus, and three of them are really Vessels in the Fœtus, *viz.* two umbilical Arteries, and one Vein. We are in a manner obliged to submit to this Custom, in publick anatomical Demonstrations, where we have but one Subject for the whole; but as I am here under no such necessity, I refer the Description of these Ligaments to other more proper places of this Work. The venal Ligament shall be described in the History of the Liver; and the two arterial Ligaments, together with the Urachus, which is the fourth, in the History of the Bladder.

42. It is sufficient to observe here in general, that three of these umbilical Ropes or Ligaments are involved separately, and sustained by a Production or Duplication, which the Peritonæum sends into the Cavity of the Abdomen, in form of a Falx. In the publick Dissections and Demonstrations which I made at the Physick-Schools in 1726, I show'd the manner of demonstrating these Falces, and of distinguishing them from the ligamentary Ropes.

§. 2. *Ventriculus.*

43. THE Stomach is a great Bag or Reservoir, situated partly in the left *Situation* Hypochondrium and partly in the Epigastrium. *and Figure of the Stomach.*

44. THE Figure of the Stomach is like that of a Bag-Pipe, that is, it is oblong, incurvated, large and capacious at one end, and small and contracted at the other. We see this Figure most evidently, when the Stomach is moderately filled with Air or with any other Fluid.

45. THE Curvature of the Stomach gives us occasion to distinguish two Arches in it, one large, which runs along the greatest Convexity, and one small, directly opposite to the former. I name these Arches the great and small Curvatures of the Stomach; and by the sides of the Stomach, I understand the two lateral Portions which lie between the two Arches.

46. THE Stomach has two Extremities, one large, and one small like a crooked Funnel. It has two Openings, called the Orifices of the Stomach, one between the great Extremity and the small Curvature, the other at the end of the small or contracted Extremity. The first Opening is a Continuation of the Œsophagus; the other joins the Intestinal Canal, and is called by the name of Pylorus.

47. THE Stomach is not situated in the left Hypochondrium, and Epigastric Region in the manner represented in most of the Figures. It lies transversely, obliquely and almost laterally, in such a manner, as that the great Extremity and the Orifice next it, are on the left hand, and the small Extremity with its Orifice or the Pylorus, on the right hand, and lower and more inclined than the former. Therefore we ought with the ancient Anatomists to call one of these Orifices superiour, the other inferior.

48. THE great Extremity of the Stomach is in the left Hypochondrium, and for the most part immediately under the Diaphragm. Yet the superiour Orifice is not in the left Hypochondrium, but almost opposite to, and very near the middle of the Bodies of the lowest Vertebrae of the Back.

49. THE small Extremity of the Stomach does not reach to the right Hypochondrium. It bends obliquely backward toward the upper Orifice, so that the Pylorus lies about two fingers breadth from the Body of the Vertebrae, immediately under the small Portion of the Liver, and consequently lower down, and more forward than the other Orifice, by almost the same distance. This Extremity of the Stomach has sometimes a particular Dilatation on the side next the great Curvature.

50. ACCORDING to this natural Situation, the Stomach, especially when full, lies so as that the great Curvature is turned more forward than downward, and the small Curvature more backward than upward.

51. ONE of the lateral convex Sides is turned upward, the other downward; and not forward and backward as they appear in dead Bodies, where the Intestines do not support them in their natural Situation.

52. IF we divide the Stomach along the two Curvatures into two equal Parts, we shall see that the two Orifices do not both adhere to the same half of this Division, as we would be apt to imagine according to the common Notion; but that the Diaphragmatic Orifice is intirely in the upper half, and the Intestinal Orifice in the lower half.

53. THEREFORE the Body of the Stomach is so far from lying in the same Plane with the Œsophagus, as it is commonly represented in Figures drawn from a Stomach taken out of the Body and laid upon a Table; that it forms an Angle or Fold, immediately at the passage of the Œsophagus through the small Muscle of the Diaphragm; and it is on account of this Angle that the superiour Orifice is turned backward.

*Structure of
the Stomach.*

54. THE Stomach is composed of several Parts, the chief of which are the different Strata which form its Substance, to which Anatomists give the name of Tunicae or Coats. These Coats are commonly reckoned to be four in number, the outer or common, the fleshy or muscular, the nervous or aponeurotic, and the villous or inner Coat; and they are afterwards subdivided several ways.

55. THE first or outermost Coat is simply membranous, being one of the internal Productions of the Peritonæum. This appears evidently at the Connexion of the superiour Orifice with the Diaphragm, where the external Membrane of the Stomach is really continuous with the Membrane, which lines the inferiour Surface of the Diaphragm; and it is from this that it has been named the common Coat.

56. THE second or muscular Coat is made up of several Planes of Fibres, which may all be reduced to two, one external, the other internal. The external Coat is longitudinal, tho' in different respects, following nearly the Direction of the Curvatures and Convexities of the Stomach; and the internal Plane is transversely circular.

57. THE Fibres of the external Plane run slanting in several places, and are intersected by small oblique whitish Lines, which seem to be in some measure Tendinous. This Plane is strengthened by a particular Fasciculus which runs along the small Curvature, its Fibres appearing to be less oblique than those of the great Plane.

58. THE Fibres of the inner or circular Plane of this muscular Coat are stronger than those of the outer Plane. They are rather Segments which unite at different distances, than intire Circles; and they are likewise intersected by great numbers of small white Lines, in some measure Tendinous, and very oblique, which all together represent a kind of Net-work, the Areolæ or Meshes of which are very narrow.

59. As these Circles or Segments advance on the great Extremity of the Stomach, they diminish gradually, and form a kind of muscular Vortex, the Center of which is in the middle of that Extremity.

60. BETWEEN the outer and inner Planes, round the superiour Orifice, there are two distinct Planes, about the breadth of a Finger, and very oblique, which surround this Orifice in opposite Directions, and intersect each other where they meet on the two lateral Sides.

61. ALONG the middle of each lateral side of the small Extremity, there runs a tendinous or ligamentary flat Portion, above a quarter of an Inch in breadth, which terminates in the Pylorus. These two Portions lie between the common and muscular Coats, and adhere very strongly to the first.

62. BETWEEN the same two Coats, there is a cellular Substance which adheres very closely to the external Coat, and insinuates itself between the fleshy Fibres of the second, all the way to the third, as may be perceived by blowing it up. Some make it a distinct Coat, and call it Tunica Cellulosa, but it is no more than the cellular Portion of the membranous Coat, like the cellular Portion of the Peritonæum.

63. THE third Coat, called commonly Tunica Nervosa, sustains on its convex side, a very large reticular Distribution of capillary Vessels and Nerves. On the concave side it seems to be of a very loose Texture, and as it were spongy or filamentary, containing a great number of small Glandular Bodies, especially near the small Curvature and small Extremity of the Stomach.

64. THIS spongy Texture resembles fine Cotton, as may be seen, by macerating it a little in clear Water, which swells it considerably in a very short space of time. It is supported by a kind of Ground-work of very fine ligamentary or aponeurotic Filaments which intersect each other obliquely, much in the same manner as the third Coat of the Intestines, of which hereafter; and it adheres to the convex side of the villous Coat.

65. THE fourth Coat of the Stomach is termed Villosa, because when it swims in clear Water, some have imagined they saw something in it like the Pile of Velvet. The Ancients called it Tunica Fungosa, and perhaps this name agrees best with its true Structure. We observe in it a great number of small Holes answering to the small Glands already mentioned.

66. THESE two Coats are of a larger extent than the two former, and they join in forming large Rugæ on the concave Surface of the Stomach, the

the greatest part of which are transverse, tho' irregular and waving. There are likewise some longitudinal ones, which intersect the others, but at the Pylorus they all become longitudinal, and terminate there.

67. AT the superiour Orifice of the Stomach, these Rugæ are in a manner radiated, and seem to be a Continuation of the Plicæ or Folds of the Œsophagus; only they are thicker, and where these Rugæ and Plicæ meet, they form a sort of Crown, which distinguishes the superiour Orifice of the Stomach from the inferiour Extremity of the Œsophagus.

68. IN the Interstices of these Rugæ, there is often found a sort of slimy Mucus, with which the whole Cavity of the Stomach seems likewise to be moisten'd. This Mucus is much more fluid in living Bodies, and is supplied by the Glands of the Stomach. It may be termed Succus Gastricus or Stomachicus.

69. ON the inner Surface of the small Extremity of the Stomach, at the place where it ends in the intestinal Canal, we observe a broad, thin, circular Border, with a roundish Hole in the middle. This Hole is the inferiour Orifice of the Stomach, called by the *Greeks* Pylorus, which signifies a Porter.

70. THIS Border is a Fold or Duplication of the two inner Coats of the Stomach, the Nervosa and Villosa; and it is formed in part by a Fasciculus of fleshy Fibres, fixed in the Duplication of the Tunica Nervosa, and distinguished not only from the other fleshy Fibres of the Extremity of the Stomach, but also from those of the Intestines, by a thin, whitish Circle, which appears even through the external or common Coat, round the Union of the Stomach and Intestines.

71. THE Figure of the Pylorus is that of a Ring, transversely flattened, the inner Edge of which, or that next the Center, is turned obliquely toward the Intestines, like a broad Portion of a Funnel. This inner Edge runs naturally more or less into little Plaits or Gathers, like the Mouth of a Purse almost shut; all which Particulars are very different from what Figures and dried Preparations would make us believe. It is therefore a kind of Sphincter, which can contract the inferiour Orifice of the Stomach, but seems not capable of shutting it quite close.

Arteries of the Stomach. 72. THE principal Arteries of the Stomach are the Coronaria Ventriculi, which runs along the small Curvature, and the two Gastricæ, that is, the Sinistra or Major, and Dextra or Minor, both which form one common Artery, which runs along the great Curvature. The Coronaria Ventriculi becomes united in the same manner with the Pylorica, and both make one common Vessel.

73. THESE two Arterial Arches send a great number of Branches toward each other on both sides of the Stomach; and these Branches are gradually ramified in different Directions, by very frequent Divisions and Subdivisions, the greatest part of which communicate with those from the other Artery.

74. FROM these frequent Ramifications and Communications of the arterial Arches of the Stomach, two different reticular Textures arise, whereof one

one which is the largest, lies between the common and muscular Coats in the cellular Substance found there; the other, which is very fine, lies on the Surface of the Tunica Nervosa. This latter is a Production of the first, being formed by means of a great Number of very short Rami, which go out from the other, and pass through the small Interstices between the Fibres of the muscular Coat.

75. By artificial Injections we can show a third extremely fine reticular Texture of capillary Vessels, which run between the Glandular Bodies and Papillæ of the Tunica Villosa. These do not seem in the natural State to be purely Blood-Vessels, as Inflammations and Injections may incline us to think.

76. THE Arteries of the Stomach come originally from the Cæliaca, by means of the Hepatica, Splenica, and Coronaria. The Pylorica and Mesenterica superior likewise contribute to them by Communications, more or less immediate. They communicate also with the Mammariæ Internæ and Diaphragmaticæ, and by means of the Epigastrica sinistra, with the Mesenterica Inferior.

77. THE Veins of the Stomach are Ramifications of the Vena Portæ in general, and in particular, of the Mesaraica Major, Splenica, and Hæmorrhoidalis Interna, the Distribution of which, may be seen in the Description of the Veins. They accompany the Arteries more or less, and form nearly the same kinds of Arches and reticular Textures, with this difference, that they are proportionably greater, their reticular Areolæ larger, and their external Communications more frequent.

78. BETWEEN the common and muscular Coats of the Stomach, we find a great number of Nerves of different sizes. Many of them accompany each other, in form of a broad flat Fasciculus, along the small Curvature of the Stomach, from the superiour to the inferiour Orifice. The rest are spread in different Directions, on the Sides, Extremities and great Curvature, forming at different distances a kind of reticular Plexus, from which a great number of Filaments are detached to the inner Coats.

79. THEY arise chiefly from the Nervi Sympathetici Medii, or eighth Pair, by means of the Plexus Coronarius Stomachicus formed round the superiour Orifice of the Stomach, by the Expansion of the Extremities of two large Ropes, which run down upon the Œsophagus, by the name of Nervi Stomachici. The great sympathetic Nerve, commonly called Intercoastalis, contributes likewise to them, by communicating Filaments, which the Plexus Stomachicus receives from the Semilunar Ganglions of the Plexus Hepaticus, and particularly from the Plexus Splenicus.

80. THE Stomach receives in general, whatever the Mouth and Tongue send thither, through the Canal of the Œsophagus, but its particular use is to receive the Aliments, to contain them for a longer or shorter time, in proportion as they are more solid or fluid, and to digest them, that is, to put them in a condition to be turned into that nutritious Fluid, called Chyle.

81. THIS Operation, which goes by the general name of Digestion, and by which Chylification begins, is performed partly by the Succus Gastricus, which flows continually from the Tunica Villosa, and partly by the continual Contraction and Relaxation of the muscular Coat. These Motions in Men are but very weak, and no ways sufficient for Digestion, without the assistance of the alternate Motions of the Diaphragm, and Muscles of the Abdomen.

82. THE Pylorus, or fleshy Circle of the inferiour Orifice of the Stomach, serves to retain the Aliments in it, till they have acquired a sufficient Degree of Fluidity, to pass easily through that Opening. I say easily, for by a particular Irritation of the muscular Coat of the Stomach, and still more by a violent Contraction of the Diaphragm and Muscles of the Abdomen, the Contents of the Stomach may be very soon forced towards the small Extremity, and pushed through the Pylorus.

83. THE gentle and alternate Motions of the orbicular Fibres of the muscular Coat, may assist in sending through the Pylorus, in the natural way, the Aliment that is sufficiently digested. This was called the Peristaltic or Vermicular Motion, by those who believed that it is successively reiterated, like that of Earth-Worms when they creep.

84. TRITURATION might be a proper enough Term for this Operation, provided it be made to signify only a gentle Agitation or Action of the fleshy Fibres, in a Substance continually moisten'd by the Gastric Liquor, and not a violent grinding of a dry Substance.

85. THE Situation of the Stomach, which is nearly transverse, is likewise of use in making the Aliment remain long enough in that Cavity, and may serve to make the length of this Stay, in some measure, arbitrary, by means of the different Postures of the Body; for when we lie on the left side, the Aliment must remain longer, than when we lie on the right, &c.

86. THE Obliquity of the Stomach may serve to clear up a Difficulty, that very much torments those who believe, that both Orifices of the Stomach lie in the same Level; which is, how any heavy Substance once got into the Stomach, can ever rise again to this Level, to pass into the Intestines.

§. 3. *The Intestines in general, and Intestinum Duodenum in particular.*

*Situation,
Size, and
Division of
the In-
testines.*

87. BETWEEN the Pylorus and the very lowest part of the Abdomen, lies a long Canal, bent in a great many different Directions, by numerous Convolutions or Turnings, called the Intestines.

88. THIS Canal thus folded and turned, forms a considerable Bulk, which fills the greatest part of the Cavity of the Abdomen; and it is connected through its whole Extent, to membranous Productions or Continuations of the Peritonæum, principally to those called the Mesentery and Mesocolon, of which hereafter.

89. THE Incurvations of the intestinal Canal form two Arches, a small one by which it is connected to the Mesentery and Mesocolon, and a great one on the opposite side, which lies loose. The whole Canal is generally about seven or eight times as long as the Subject.

90. THE intestinal Canal is neither of an equal Size nor Thickness through its whole length, from whence Anatomists have taken occasion to consider its different Portions, as so many particular Intestines, and to divide them all into small and great.

91. AND as they still found some Differences in each Class taken all together, they divided each into three Portions, which they distinguished by particular Names. In the small Intestines, the three Portions are named Duodenum, Jejunum, and Ileum; and in the great Intestines, Cæcum, Colon and Rectum.

92. THE Intestines in general are composed of several Coats, much in *Structure* the same manner with the Stomach. The first and outermost is a Continuation of the Mesentery, or of some other Elongation or Duplication of the *of the Intestines.* Peritonæum.

93. THIS is commonly termed, the common Coat, and it has a cellular Substance on its inner Surface, like that of the Stomach, which M. *Ruyfch* thought fit to call a distinct Coat, by the name of Tunica Cellulosa.

94. THE second Coat of the Intestines is fleshy or muscular, and made up of two Planes, one external, the other internal. The external Plane is very thin, and its Fibres longitudinal; the internal Plane is thicker, and its Fibres run transversely round the Circumference of the intestinal Cylinder.

95. I am not of opinion, that these Fibres are spiral, nor that they are perfect Circles or Rings; but they seem rather to be Segments of Circles, disposed much in the same manner, as in the Stomach, and thus surrounding intirely the intestinal Canal.

96. THESE two Planes adhere closely together, and are separated with great difficulty. They adhere likewise to the common Coat, by the Intervention of the cellular Substance, which is in greater quantities on the side next the Mesentery than on the other.

97. THE third Coat is called Nervosa, and is something like that of the Stomach. It has a particular Plane, which serves as a Basis to sustain it, made up of very fine, strong, oblique Fibres, which seem to be of the ligamentary or tendinous kind.

98. To see this Plane distinctly, a Portion of the Intestines must be inflated; the common Coat removed, and the fleshy Fibres scraped off.

99. THIS Coat sustains two reticular Substances which are both vascular, one arterial, the other venal, accompanied by a great number of nervous Filaments. These Vessels and Nerves are Productions of the Mesenteric Vessels and Nerves; and as they surround the whole Canal of the Intestines, some Anatomists have formed them into a distinct Coat, by the name of Tunica Vasculosa.

100. The nervous Coat sends off from its inner Surface a great number of Portions of Septa, more or less circular, which contribute to the Formation of what are called Valvulæ Conniventes, of which hereafter. It likewise seems to sustain several different Glandular Bodies, which we discover in the Cavity of the Intestines.

101. THE fourth or innermost Coat is very soft, and is named *Tunica Villosa*. It has the same Extent with the third Coat, which supports it, and it lines all the Septa of that third Coat; but it is not uniform, through the whole Canal, as we shall show in the particular Description.

*Intestina
Tenuia.*

102. THE small Intestines form one continued uniform Canal; and tho' three Portions of it have three different Names, yet we have no sufficient Marks whereby to distinguish them, to fix the precise Extent or Length of each Portion or to settle its just Limits.

103. THE first and smallest Portion of the whole Canal, is called *Duodenum*; the second, which is much longer, *Jejunum*; and the third, which is still longer than the second, *Ileum*.

*Situation
and Con-
nexion of the
Duodenum.*

104. THE first Portion of the small Intestines was called *Duodenum*, from the length ascribed to it by the Ancients, viz. the breadth of twelve Fingers; and the Moderns need not cavil much about this length, if it is measured with the Ends of the Fingers of the Subject.

105. THIS Intestine having arisen from the *Pylorus*, is immediately bent a little backward, and obliquely downward; then it bends a second time toward the right Kidney, to which it is a little connected, and from thence passes before the Renal Artery and Vein, ascending insensibly from right to left, till it gets before the Aorta and last *Vertebræ* of the Back. It continues its Course obliquely forward, by a gentle Turn, which may be reckon'd a third Incurvation, and also the Extremity of the *Duodenum*.

106. THROUGH this whole Course, the *Duodenum* is firmly bound down by Folds of the *Peritonæum*, especially by a transverse *Duplicature* which gives Origin to the *Mesocolon*. The two *Laminæ* of this *Duplicature* being at first separate, and soon afterwards uniting, must leave a triangular Space between them, which is lined with a cellular Substance.

107. IT is in this Space that the *Duodenum* adheres by means of the cellular Substance, to the Parts already named; and the Intestine is contained therein, as in a Case, so that without Dissection, we can see nothing but its two Extremities, and even these are hid by the Colon, and by the first *Convolutions* of the *Jejunum*.

*Structure of
the Duode-
num.*

108. THE first Coat of the *Duodenum* is consequently different from that of the other small Intestines, having this peculiar to it, that it does not invest the whole Circumference of the Intestine, because through the greatest Part of its length, it lies in the triangular Space already mentioned; and for the same reason there is a greater Quantity of cellular Substance belongs to the outer Coat of the *Duodenum*, than to that of the other Intestines.

109. THE muscular Coat of the *Duodenum* is thicker than in the *Jejunum* and *Ileum*.

110. THE *Tunica Nervosa* and *Villosa* form conjointly on the insides of this Intestine, a great number of small *Duplicatures* which advance into the Cavity more or less directly, like Portions of circular Planes, with one Edge fixed to the Intestine, and the other, loose. These are what Anatomists call *Valvulæ Conniventes*.

111. THE loose or floating Edge of these Valves, is formed into small Gathers or Waves in the natural State. I say designedly, in the natural State, to rectify the false Ideas which dry Preparations of the Intestines are apt to beget. The whole Surface of these Duplicatures or Valves, is villous as well as that of the Interstices between them.

112. THE Villi of this Intestine are thicker than in the Stomach; but the Texture of them in Man, is not like Hairs, as they are commonly represented in Figures; but rather like that of a fungous, granulated Substance composed of an infinite number of very fine Papillæ of different Figures, in which we see through a Microscope, a multitude of depress'd Points or Pores, by which their whole Surface seems to be pierced.

113. BY the same Help, we observe on different places of the inner Surface of this Intestine, several round villous Tubercles, rising like small *Verucæ* at different distances from each other.

114. THIS Substance sustains an infinite number of capillary Vessels, of different kinds; for besides the Blood-Vessels, we sometimes observe a great number of white Filaments which run through it, and end at its inner Surface, like so many capillary Roots of the Vessels, called *Venæ Lactææ*.

115. THE fungous Substance which binds these capillary Filaments together, and surrounds them, is very tender, and the capillary Extremities of the small Blood-Vessels distributed through it, seem to be turned toward the Pores of the Papillæ. Through these Pores, a mucous Fluid more or less transparent, is discharged, which continually moistens the Cavity of the Intestine.

116. THE internal Surface of the Duodenum is furnished with a great number of small flat glandular Tubercles, raised on the sides, and depressed in the middle by a kind of Fossula; and they are more numerous, near the beginning of this Intestine than any where else. About the Pylorus, they lie in a manner in Heaps or Clusters, and from thence the distance between them increases gradually all the way to the other Extremity, where they are single.

117. THESE Glands, when examined carefully, appear like little Bladders, with the Orifices turned toward the Cavity of the Intestine, and the Bodies fixed in the spongy Substance next the nervous Coat. They furnish a particular Fluid, which is often found to be viscid.

118. IN the inner Surface of the Duodenum, almost at the lower part of the first Incurvation, and on the shortest side, there is a longitudinal Eminence, in the Point or Apex of which, lies a particular Opening, which is the Orifice of the Ductus Biliaris, within which the Ductus Pancreaticus likewise opens.

119. THIS Intestine is commonly the widest, tho' the shortest of the Intestina Tenuia, and is invested by more cellular Substance, especially while within its triangular Case, where it wants the outer Coat, which the others have; and consequently it is more easily dilatable, by the Substances which might otherwise stick within it.

*Glands of
the Duode-
num.*

*The Biliary
Orifice of the
Duodenum.*

§. 4. *Intestinum Jejunum.*

*Situation and
Size of the
Jejunum.*

120. THE Jejunum, so called, because it is oftener found empty than the Ileum, begins at the last Incurvation of the Duodenum, and is there connected to the beginning of the Mesocolon.

121. FROM thence it bends downward from left to right, and obliquely forward, or from the Vertebrae, and makes several Convolutions, which lie chiefly in the upper part of the umbilical Region. Through all this Course, it is connected to the Mesentery in the manner that shall be explained hereafter.

122. IT is a pretty difficult matter to fix the exact Bounds between this Intestine and the Ileum. The external Marks of a redder Colour in the one than in the other, tho' pretty common, are not constant; and the internal Marks fixed from the Plurality of Valvulae Conniventes are indeterminate, and oftentimes appear only from Dissection.

123. THESE two Intestines may be better distinguished by their different Situations, which are pretty regular; but as even this Mark is not particular enough, the most easy way that I have been able to contrive, and which will in most Cases be found sufficiently exact, is to divide both Intestines into five Parts; and to allow nearly two fifths to the Jejunum, and three fifths and a little more to the Ileum.

*Structure of
the Jejunum.*

124. THE Coats of the Jejunum are nearly of the same Structure with those of the Duodenum, but thinner. The common Coat is a Continuation of the Mesentery; and the cellular Substance is in less quantity than in the Duodenum; and indeed seems to be altogether wanting along the great Curvature of the Convolutions, where the longitudinal Fibres of the muscular Coat adhere very closely to the external Membrane.

125. THIS muscular Coat is not so strong as that of the Duodenum. The longitudinal Plane of Fibres is very thin, and almost imperceptible, except along the great Curvature, opposite to the Connexion of the Mesentery, where we see through the membranous Coat, a kind of whitish ligamentary Band, about the third part of an Inch in breadth, which is continued along the great Curvature of all the Convolutions of this Intestine, and of the Ileum.

126. THIS ligamentary Band is like those which we observe on the sides of the small Extremity of the Stomach. It adheres perfectly to the membranous Coat and to the longitudinal Fibres of the muscular Coat, which are here more visible, and appear to be stronger than in any other place.

127. THE Tunica Nervosa, which I choose rather to call Reticularis, and its proper cellular or lanuginous Substance, have nothing peculiar to them more than has been already said about the Intestines in general. By blowing artfully into this Substance, it may be made to swell so much, round the whole Cavity of the Intestine, as to destroy all the Duplicatures or Valvulae Conniventes.

128. THESE Valves in this Intestine are very broad, very numerous, and very near each other. On the side of the great Curvature, their Circumference is continuous and uniform; but next the small Curvature, there are several Breaks in them, the Extremities of some, advancing beyond the rest, and terminating in Points. Some of these Valves go quite round, others only some part of the way, and some of them are very small, which go obliquely between two large ones, forming a kind of Communication.

129. THE Papillæ of the Tunica Villosa are here more rais'd, more loose and floating than in the Duodenum, and each of them seems to be divided into several others, by Incisures of a very singular kind. In other respects they agree pretty much with what was said in the Description of the Intestines in general. The Observations and Figures published by *M. Helvetius*, first Physician to the *French Queen*, in the Memoirs of the Royal Academy, express these Papillæ, and the whole Tunica Reticularis very justly.

130. THE Glandular Lacunæ of the Jejunum are of the same Structure with the Glandulæ Brunneri or Duodenales; but they are disposed in a different manner. They are partly single at different distances from each other, and partly in several Clusters, like flat oblong Bunches of Grapes, called Plexus Glandulosi Peyerii. These are in the largest quantity near the great Curvature, and they cross through several Valvulæ Conniventes at once.

131. THE Vessels, Nerves, Connexions, &c. must be referred till the Mesentery has been described.

§. 5. *Intestinum Ileum.*

132. THE Convolutions of the Intestinum Ileum surround those of the Jejunum on the two lateral and lower Sides, and it passes in a winding Course from the left Side, by the Hypogastrium, to the right Side, where it terminates a little below the right Kidney, joining the Intestina Crassa, in the manner that I shall relate hereafter. The lateral Convolutions are supported by the Ossa Ilium, so called, not from this Intestine, but from the Region of the Abdomen, termed Iliac.

133. THE Structure of the Ileum is much the same with that of the Jejunum; only the internal Duplicatures or Valvulæ Conniventes decrease gradually, both in number and size. Near the Extremity of the Ileum their Direction is changed, and instead of being transverse or circular, they become longitudinal, and terminate in a kind of Pylorus which advances into the Cavity of the great Intestines, as we shall see presently.

134. WE observe likewise in this Intestine, as in the Jejunum, single or solitary Glands or Lacunæ, and also reticular Glands, or Glands in Clusters, the last of which at the extremity of this Intestine, is oftentimes of a great extent; but the greatest part of these Glands appear to be flatter here than in the Jejunum. The cellular Substance of the external Coat is in less quantities than in the foregoing Intestines, and the Ileum appears commonly more pale, or not so red as the Jejunum.

135. THE Vessels, Nerves, Connexions, &c. must be referred to the History of the Mesentery.

§. 6. *The Intestina Crassa in general, and Intestinum Cæcum in particular.*

136. THE great Intestines are one continued Canal, divided into three Portions, like the small ones. This Canal begins by a kind of Sacculus or Bag, which is reckon'd the first of the three Portions, and called Cæcum. The second Portion, called Colon, is the longest of the three, and is distinguished from them by a great number of particular Eminences or Convexities, which appear on its outer Surface through its whole length. The last Portion is named Rectum, being more uniform, narrower, thicker, and much shorter than the Colon.

137. THE Structure of the great Intestines is nearly the same with that of the small ones, in regard, both to the Number and Disposition of their Coats. They are shorter, and have fewer Convolutions, but are much more capacious. The Coats in general are stronger, but especially the muscular Coat. The Villi and mucilaginous Glands are different, and there are several other things relating to them, which will come in better in the particular History.

*Situation
and Structure of the
Cæcum.*

138. THE Intestinum Cæcum is only a round short broad Bag, the Bottom of which is turned downward, and the Mouth or Opening upward. It lies under the right Kidney, and is hid by the last Convolution of the Ileum. It is about three Fingers breadth in length, and its Diameter is more than double that of the small Intestines.

*Appendicula
Vermiformis.*

139. ON one side of the Bottom of the Cæcum lies an Appendix, resembling a small Intestine, nearly of the same length with the Cæcum, but very slender. It is termed Appendicula Vermiformis, from its supposed resemblance to an Earth-worm. Its common Diameter is not above a quarter of an Inch. By one Extremity, it opens laterally, and a little obliquely into the Bottom of the Cæcum; and the other Extremity is closed, being sometimes greater, sometimes smaller than the rest of the Appendix.

140. IT has some Contortions, like those of a Worm when it is touched, from whence comes the Epithet of Vermicularis or Vermiformis; and it may likewise be compared to the Gills or Pendants of a Turkey-Cock. Its Structure resembles nearly that of the other Intestines.

141. THE internal Coat of this Appendix is folliculous, like that of the Duodenum; and it is likewise Reticular, the Mashies being the Glandular Lacunæ, which continually discharge a Fluid into its Cavity.

142. IT has been often disputed whether this Appendix or the large Portion, which is as it were, the Head of the Colon, ought to be called the Cæcum; but the general Division of the Intestines into great and small, leave no room to doubt of its being only an Appendix in Man; whatever reason there may be for talking differently with respect to Brutes and Birds.

143. THROUGH the membranous or common Coat of the Cæcum, we see three white ligamentary Bands, which adhere very closely, both to the outer

and

and muscular Coat. One of them is hid by the adhesion of the Mesocolon; and all the three divide the Cæcum longitudinally into three parts more or less equal.

144. THEY all unite on the Appendicula Vermiformis, and cover its whole outer side immediately under the common Coat. Tho' they appear exteriorly on the Cæcum to be ligamentary, they are made up interiorly of fleshy Fibres which accompany and strengthen the longitudinal Fibres of the muscular Coat.

145. THE villous Substance of the inner Coat of the Cæcum is very short, and furnished in several places with Glandular Lacunæ or solitary Glands, broader than those of the small Intestines.

146. THESE Glandular Lacunæ or Folliculi are flattened and depressed in the middle like Small-Pox. When we blow through a Pipe into these Lacunæ without touching them, the Folliculi are inflated, and represent little Caps with a Hole in the middle of their convex Side.

§. 7. *Intestinum Colon.*

147. THE Colon is the most considerable of all the Intestines. From the Cæcum, of which it is a Continuation, it reaches in form of an Arch, above the umbilical Region, and to the lower part of the left Hypochondrium. Its Continuity is however a little interrupted by the Ileum, which advances into the Cavity of the Colon, and together with a certain Fold of that Intestine, forms what is called Valvula Coli.

*Situation
and Struc-
ture of the
Colon.*

148. THE whole convex side of the Colon is divided longitudinally into three Parts, by three ligamentary Bands, continued from those of the Cæcum, and of the same Structure with these. Two of these Bands run on each side, along the great Curvature of the Colon; and the third along the small Curvature.

149. THE uppermost Band of the two that belong to the great Curvature, is the broadest of the three; that which belongs to the small Curvature is the narrowest, and lay hid by the Connexion of the Mesocolon, till it was brought to light by *M. Morgagni*.

150. THESE three longitudinal Bands do the Office of longitudinal Fræna, between which this Intestine is through its whole length alternately depressed into transverse Folds, and raised into considerable Eminences. All the Folds are Duplicatures, which form Portions of Valvulæ Conniventes in the Cavity of the Intestine; and the Eminences form Receptacles, called the Cells of the Colon.

151. ALL the Coats of the Colon concur equally to the Formation of these Duplicatures and Cells, the Depth of which decreases gradually toward the Extremity of the Intestine; and neither of them go any further than the ligamentary Bands.

152. THESE Portions of the Colon which are immediately covered by the ligamentary Bands, are smooth and without Rugæ, and therefore if these

Bands alone are cut a-cross, the Intestine is not elongated sufficiently to destroy all the Folds and Cells.

153. THE common Coat on one side is a Continuation of the Mesocolon, and on the other side it contributes by the same Continuation, to form the Omentum. The longitudinal Fibres of the muscular Coat are very slender; and those which answer to the annular or circular Fibres of the small Intestines, are only Segments stretched over the Eminences and Folds. The other Coats are nearly as in the Cæcum; only the Glandular Lacunæ or solitary Glands are broader and more numerous.

154. THE Arch of the Colon begins under the right Kidney, near the Hanch. It runs up on the foreside of that Kidney to which it is connected, passes under the Vesicula Fellis, which tinges it with a yellow Colour at that place, and continues its Course before the first Incurvation of the Duodenum, to which it adheres, and partly hides it. In this part of its Course, therefore, there is a remarkable Connexion between the Colon, Duodenum, right Kidney, and Vesicula Fellis.

155. FROM thence the Arch of the Colon runs before the great Convexity of the Stomach, and sometimes a little lower, then turns backward under the Spleen, in the left Hypochondrium, runs down on the foreside of the left Kidney to which it is connected; below this Kidney turns toward the Vertebræ, and terminates there by a double Incurvation, or by two opposite Convolutions, which represent in some measure an inverted Roman S.

156. THESE last Convolutions of the Colon are sometimes multiplied, and even advance to the right side of the Pelvis; and along the great Arch, and the two last Incurvations, there are a kind of Fringes, called Appendices Coli Adiposæ, which I shall afterwards explain, as also the Connexions of the Colon with the Mesocolon and Omentum.

Valvula Coli. 157. AT the Place where the Cæcum joins the Colon, one Portion of the Circumference of both is depressed, and forms a large Fold on the inside, which advances into the Cavity of the Intestine. It is a little open in the middle, and its Extremities are very thick, by reason of the mutual Duplication of the Coats of the Cæcum and Colon.

158. THE Extremity of the Ileum is at it were grafted in the Opening of this Fold, and strongly united to its Sides by the adhesion of its transverse Fibres, to the transverse Fibres of the Cæcum and Colon.

159. THIS Union forms a pretty thick Ring, which likewise advances into the common Cavity of the Cæcum and Colon, where it is wrinkled or form'd into gathers, almost like the lower Extremity of the Œsophagus, the Pylorus or inside of the Anus. Its Circumference is more or less Oval, and by a kind of Continuity with the common Fold of the Cæcum and Colon, it forms two Productions, which *M. Morgagni* calls the Fræna of the Valvula Coli.

160. THE membranous Coat of the Extremity of the Ileum is continued on the Cæcum and Colon, without sinking into any Fold, at the place where the Ileum enters the Colon. The longitudinal Fibres of the muscular

cular Coat seem here to be confounded with the nearest circular Fibres of the Cæcum and Colon.

161. THE inner Portion of the muscular Coat of the Ileum, runs in between the circular Fibres of the Ileum and Colon, as into a common Fold of these two Intestines, from all which a pretty thick short Portion of a fleshy Tube is formed, which is the circular rising already mentioned.

162. THE Tunica Nervosa and Villosa of the Extremity of the Ileum likewise enter the common Cavity of the Cæcum and Colon, and on the Edge of the circular Rising, join the like Coats of these two Intestines, so that the circular Rising or short muscular Tube is covered both on the outer and inner sides by a nervous and villous Coat; that on the inside being supplied by the Ileum, and the other by the two great Intestines.

163. THE best Method to demonstrate the Structure and Composition of this Valve, is in clear Water, and by a particular Section, while the Intestine is fresh, and has not been altered by any Disease, in the manner that I demonstrated publicly in the Physick-Schools in 1726. In another Work, I shall explain particularly, the way of managing this and other such Dissections; the greatest part of which Method, I have already communicated, both in my publick and private Courses.

164. THE Situation of this Extremity of the Ileum is most commonly transverse, and is inserted almost in the same Direction in the common Cavity of the two Intestines, already mentioned, but it is often a little more inclined toward the Cæcum, than to the Colon; and whereas in all other places, the Ileum is wide and easily dilatable, it is very narrow at its Insertion, and its sides more solid, and firm.

165. IT is chiefly in this Structure that the Mechanism of the Insertion of the Ileum, in the Cæcum and Colon consists; about which Insertion or Opening, Authors are very much divided, some reckoning it a Valve, others, only a Sphincter.

166. IT is very evident from what I have said, that it is a double Machine contrived to hinder the return of the Excrements into the Ileum, because it can produce this Effect partly as a Valve, and partly as a kind of Sphincter. The dried Preparations of this Part give a very false Idea of its Structure and Conformation; and the same thing is to be said of the opening of the Appendicula Vermiformis into the Cæcum.

167. THE capacious Arch of the Colon is connected by both Extremities to the Regio Lumbaris, near the Kidneys, by two particular Ligaments, one on the right side, the other on the left, which are only small Duplicatures of the Peritonæum, more or less transverse.

168. THE remaining Portion, which forms the two Convolutions in form of the *Roman S*, contracts below the left Kidney, being narrower there, than lower down. The Coats of this Portion become gradually thicker and stronger, and likewise the ligamentary Bands, which approach each other by degrees, and seem to increase in breadth.

169. THE Vessels, Nerves, &c. will be found in the Description of the Mesentery.

§. 8. *Intestinum Rectum and Anus.*

*Situation,
Figure, and
Size of the
Rectum.*

170. THE last of all the Intestines, is named Rectum, or the streight Gut, from its Situation ; for when view'd directly forward, it appears to run down in a streight Course from the last Vertebra of the Loins, on the foreside of the Os Sacrum, all the way to the Os Coccygis, where it ends in what is called the Anus.

171. THIS Intestine, properly speaking, is a true Continuation of the last Convolution of the Colon, and it is the Repository, Sink, and Common Sewer of the whole intestinal Canal. It has likewise a special Relation to the Bladder, and to the Parts of Generation in both Sexes.

172. THE Rectum having pass'd below the last Vertebra of the Loins, to the inside of the Os Sacrum, is bent backward on that concave side, to which it is connected, in the manner that shall be afterwards explained ; and having reached the Os Coccygis, it runs likewise in the Direction of that Bone, and bends a little forward, terminating beyond the Extremity of the Coccyx.

173. THE Figure of this Intestine varies according as it is full or empty. When empty, it is irregularly cylindrical, and sinks in by a kind of transverse Folds, and in that State, it is about three fingers breadth in Diameter, more or less. When full, it is wider in proportion to the quantity of Feces, Wind, or whatever else is contain'd in it ; and it may be extended to the Size of a large Bladder, so as to represent a kind of Stomach.

*Structure of
the Rectum.*

174. THE membranous Coat often contains a great quantity of Fat, spread between it and the muscular Coat, and forming round the Intestine numerous Eminences, in the room of the Appendices Adiposæ of the Colon, which shall be explained in the History of the Omentum.

175. THE muscular or fleshy Coat is very thick : the longitudinal Fibres, which in the other Intestines are very thin, are in this stronger than the circular Fibres of the rest. The ligamentary Bands continue to increase in breadth, and to approach each other, as has been said, and it is to the fleshy Fibres of these Bands, that the Thickness of the longitudinal Fibres seems to be owing.

176. THE nervous or filamentous and internal Coats, are larger here, than in the other Intestines ; and when the Rectum is empty, they form a great number of waving Rugæ in its Cavity, which disappear, in proportion as that Cavity is filled.

177. THE innermost Coat is very improperly termed Villosa, and scarce deserves the name of Papillaris, because of the Smallness of the little Corpuscles spread on its Surface. It contains a great number of single or solitary Glands ; and it is always moisten'd by a Mucus of different Consistences, discharged by these Glands or Folliculi, and perhaps by the Corpuscles also.

178. NEAR the Extremity of this Intestine, the Rugæ or Folds become in a manner longitudinal, and at last, towards the Circumference of the inner Margin of the Anus, they form little Bags or Semilunar Lacunæ, the Openings of

of which are turned upward, toward the Cavity of the Intestine. These Lacunæ are something like those at the lower Extremity of the Œsophagus, or upper Orifice of the Stomach.

179. AT length the Extremity of the Rectum contracts and terminates by a narrow Orifice called the Anus, the sides of which are disposed in close Folds or Gathers. This Extremity of the Intestine has several Muscles belonging to it, some of which surround it like Sphincters, the rest are broad fleshy Planes inserted in it, and which being likewise fixed to other Parts, sustain it in its natural Situation, and restore it to that Situation, when disturbed by the Force necessary for the Exclusion of the Feces. These latter Muscles are termed Levatores Ani, the first go by the general Name of Sphincters.

180. THESE Sphincters are three in number, one intestinal or orbicular, and two cutaneous or oval; whereof one is large, superiour, and internal; the other small, inferiour and external.

181. THE intestinal or orbicular Sphincter of the Anus consists meerly in an Augmentation of the inferiour Portion of the fleshy Fibres of the Extremity of the Rectum.

182. In the Description of the fresh Bones, I omitted two Ligaments, one call'd Ligamentum Cutaneum Ossis Coccygis, the other Ligamentum Pubis Interosseum. This last I demonstrated in my publick Dissections in the Year 1726, and the other about four Years before. These two Ligaments must be here described, before I proceed to the Cutaneous Sphincters.

183. THE Cutaneous Ligament goes out anteriorly, from the Extremity of the Os Coccygis. It is very slender, and divides into two Portions at the Orifice of the Anus, which run into the Membrana Adiposa, and are inserted in the Skin on each side of the Anus, by a kind of Expansion, and continuing to divaricate, they are lost on the two sides of the Perinæum.

184. THE interosseous Ligament of the Ossa Pubis is a very strong triangular Membrane, fixed by two of its Edges in the inferiour Rami of these Bones, all the way up to their common Symphysis. The third Edge, which is the lowest, is loose; and this whole Membrane, the middle of which is perforated by a particular Hole, is stretched very tight between the two Bones, and under their cartilaginous Arch, to which it adheres very closely.

185. AT the lower part of this interosseous Ligament, along its whole lower or loose Edge, lies a Digastric Muscle, fixed by its two Extremities in the Rami of the Ossa Pubis, its middle Tendon lying on the middle of the Edge of the Ligament. The Description of that Muscle does not belong to this place; and I mention it here, only because of the Relation it bears to the Cutaneous Sphincters of the Anus. It is called by some, Musculus transversalis Urethræ; by others, Musculus Triangularis.

186. THE Cutaneous Sphincters have each an anterior and posterior Insertion, ending both ways in a kind of Point, and comprehending the Orifice of the Anus, between their middle Portions.

187. THEY are distinguished from each other by their Situation, by their Size, and by a kind of white cellular Line. The greatest of the two appears

to be double, and the smallest lies nearest the Skin, and adheres most closely to it.

188. THEY are inserted backward, partly in the Apex of the Os Coccygis; and partly in the contiguous Portion of the Cutaneous Ligament of that Bone. Forward their chief Insertion is in the middle Tendon of the Transversalis Urethræ; and they have likewise some Connexions to other Muscles of the Urethra, of which hereafter.

189. THE Levatores Ani are broad, thin, muscular Portions, fixed by one Extremity of their fleshy Fibres round the concave side of the inferior Portion of the Pelvis, from the Symphysis of the Offa Pubis, beyond the Spine of the Ischium. The other Extremity of these Fibres runs down on each side behind, and under the Curvature of the end of the Rectum, where they meet together, and unite from the Basis of the Os Coccygis all the way to the Margin of the Anus.

190. BY their superiour Insertions, these Portions are on each side of the Pelvis divided into three Classes, an anterior, middle and posterior Class. The two anterior Classes reach from about the middle of the Symphysis of the Offa Pubis, to the upper Border of the Foramina Ovalia of the Pelvis. The middle Classes continue the same Course immediately above the Insertion of the Obturator internus, on the Offa Ischium, and a little on the Offa Ilium. The posterior Classes are spread on the inner sides of the Offa Ischium to the spinal Apophyses of these Bones, and even a little beyond these, on the Ligamenta Sacro-Sciatica.

191. THE anterior Portions are in their passage connected to the prostate Glands, to the Neck of the Bladder, to the Bulb of the Urethra, as shall be shown in the Description of these Parts; and they sometimes send Fibres to the Musculus transversalis Urethræ above mentioned.

192. THE Fibres of all these Portions having by their superiour Insertions formed this large and ample Circumference, run down obliquely from before backward, contracting in breadth, and approaching each other in the manner of truncated Radii; and behind, and under the Extremity of the Rectum, they form a Digastric Muscle, something like the Mylo-Hyoideus; which terminates the bony Pelvis below; and forms the Bottom of the Cavity of the Abdomen, as the Diaphragm forms the upper Part.

193. IT is here necessary to observe, that the Muscles of the Os Coccygis, described §. 3. may be look'd upon as Assistants to the Levatores.

194. WE ought likewise to remark, that the Margin or Edge of the Anus is form'd by the Union of the Skin and Epidermis, with the internal Coat of the Rectum; so that the most superficial Portion of that Coat seems to be a Continuation of the Epidermis.

195. I refer the Arteries, Veins, Nerves, Connexions, Uses, &c. to the place already mention'd in the Description of the other Intestines.

§. 9. *Mesenterium & Mesocolon.*

196. THIS great Bundle of Intestines is not left to move at random in the Cavity of the Abdomen; but artfully bound down, by a membranous Web, which prevents the intestinal Convolutions from being intangled in each other, and from being twisted or compressed in all their different ways of meeting; and yet allows them a gentle floating, but limited Motion. *Division of the Mesentery, &c.*

197. THIS Web goes still by the ancient Greek Name of Mesentery, as being in some measure in the middle of the Intestines. It is distinguished into two Portions, one of which being very broad and very much plaited, connects the small Intestines; the other, which is long and incurvated, does the same Office to the great Intestines.

198. THESE two Portions are in reality only one and the same Continuation of the membranous Lamina of the Peritonæum doubled back upon it self, and they are distinguished only by their breadth. Taken both together, they form a kind of spiral Roll, more or less plaited in its Circumference. The first Portion has retained the name of Mesentery, the other is termed Mesocolon.

199. THE Mesentery begins at the last Incurvation of the Duodenum, and runs obliquely from left to right, along the Vertebrae of the Loins. In this space, the membranous Portion of the Peritonæum is detached on both hands, produces a Duplitecture by two Elongations or particular Laminæ applied to each other, and thus forms the Mesentery. *Structure of the Mesentery, &c.*

200. It is narrow at its upper and lower Parts, but chiefly at the upper. The middle Portion is very broad, and the Edge of it next the Intestines is every where very much plaited. These Plaits or Folds are only waving Inflexions, such as may be observed in the Edge of a Piece of Shamoy, which has been often drawn through the Fingers. They make this Edge of the Mesentery very long, and they run through about one third of its Breadth.

201. THE two Laminæ are joined together by a cellular Substance, which contains Glands, Vessels and Nerves, that shall be described hereafter; and in some Subjects it has a great quantity of Fat, which keeps the two Laminæ at a good distance from each other.

202. ALONG the whole Circumference of the Mesentery, the two Laminæ are naturally separated, and applied to the two sides of the small Intestines which they invest by their Union or rather reciprocal Continuation on the great Curvature of that Canal, and carry it as in a Scarf or Sling. This is what forms the external or membranous Coat of the Intestines.

203. THE Mesocolon is the Continuation of the Mesentery, which having reached the Extremity of the Ileum, contracts and changes its name. At this place the particular Lamina which is turned to the right side, forms a small transverse Fold, called Ligamentum Coli Dextrum.

204. AFTERWARDS the Mesocolon ascends toward the right Kidney, where it seems to be lost by the immediate Adhesion of the Colon to that Kidney, and to the first Incurvation of the Duodenum. Then it appears again,

again, and increasing in breadth, it continues its Course almost transversely under the Liver, Stomach and Spleen, where it begins to turn downward, under the left Hypochondrium toward the Kidney on the same side.

205. THROUGH this whole Course, the Mesocolon extends in breadth, and forms nearly a transverse semicircular Plane, very little plaited at its great Circumference. By this Circumference or Edge, it is connected to the Colon; and hides that ligamentary Band of this Intestine, which runs along its small Curvature. By its short or small Edge, it forms the triangular Case of the Duodenum, and by its great Edge, the external Coat of the Colon, in the same manner as the Mesentery does that of the small Intestines. As it passes under the large Extremity of the Stomach, it adheres a little to the lower Portion of that Extremity, as the Diaphragm does to the upper.

206. HAVING got below the left Kidney, it contracts and forms another transverse Fold, called *Ligamentum Coli Sinistrum*. Afterwards it expands again, but not so much as in the upper Part, and runs down on the left Psoas Muscle, toward the last Vertebrae of the Loins. This descending Portion is fixed to the Convolutions of the Colon in the same manner as the superiour Portion is to the Arch of that Intestine.

207. THE Intestinum Rectum is likewise invested by a particular Production of the Peritonæum, called commonly by the barbarous Name of *Meso-Rectum*. This Production is very narrow, and about the middle of the foreside of the Rectum, it forms a transverse semicircular Fold, which appears when the Intestine is empty; but is lost, when it is filled.

§. 10. *Glandulae Mesentericae, Vasa Lymphatica & Lactea.*

Glands of
the Mesen-
tery.

208. BETWEEN the Laminæ of the Mesentery, a great number of Glands lies scattered through the cellular Substance. In the natural State, these Glands are something of the figure of Lentils or little round Beans; some of them being orbicular, others oval, but all of them a little flattened, and in corpulent Subjects we find them surrounded with Fat.

209. THESE Glands are of the number of those that Anatomists call *Glandulae Conglobatae*, the Structure of which is not as yet sufficiently known. They seem to be of a cellular Substance, surrounded by a very fine Membrane or Coat, on which by the help of Microscopes, we discover an Intertexture of particular Filaments, which *Malpighi* believed to be fleshy Fibres.

210. THE nicest anatomical Injections have not hitherto given us any Satisfaction about these Particulars; for tho' they be made with all possible Care, they always fill the folliculous Texture of these Glands. And tho' by means of these Injections, we may discover a great many Vessels, which were before invisible, we are not a whit the nearer our Purpose, because we cannot by this Method distinguish the Secretory, Excretory, and Blood-Vessels from each other.

Lymphatic
Vessels.

211. BESIDES the Blood-Vessels, which are distributed in a reticular manner in the Mesenteric Glands, and besides many nervous Filaments spread through

through them; we discover an infinite number of small Vessels of another kind, running from Gland to Gland.

212. THESE Vessels are extremely thin and transparent, and furnished on the inside with numerous Valves, which appear on the outside like little small Knots very near each other. They go out from each Gland by Ramifications, as by so many Roots, and having formed a small Trunk, they are again divided, and enter some neighbouring Gland by the same kind of Ramifications by which they went out from the former.

213. THEY are termed Lymphatic Vessels, because for the most part, they contain a very clear, limpid, tho' mucilaginous Serum, call'd Lympha by Anatomists. But as they have likewise been observed to be filled with a white milky Fluid, called Chyle, they have been called Vasa Chylifera, or Venæ Lactææ. They have the name of Veins, because their Valves are disposed as those of the ordinary Blood-Veins, and because the Fluid which they contain, runs from smaller into larger Tubes.

214. I have always divided the lacteal Vessels into three Classes in the Human Body, and sometimes into four.

215. THEY derive their first Origin from the Tunica Villosa of the Intestines, and chiefly from that of the small Intestines, by a great number of small capillary Roots, as has been already said. From these Roots there arises between the Coats of the Intestines, a kind of Rete Mirabile, which surrounds almost the whole Circumference of the intestinal Canal, between the muscular and external Coat.

216. THIS reticular Texture of lacteal Vessels keeps close to the external Coat, and leaves the Canal along with it, on the side of the Mesentery, where it forms two Planes of Ramifications, plainly distinguished from each other by the cellular Substance, and adhering closely to the inside of the two Membranes of the Mesentery. In this separate State, they run on the Laminae of the Mesentery, as far as the first Mesenteric Glands, where they unite again into one Plane. All this I reckon the first Class of Lacteals.

217. AFTER this Union, the lacteal Vessels are distributed almost uniformly through the whole Extent of the Mesentery from its Circumference to its Origin or Adhesion to the Vertebrae of the Back, between the Mesenteric Glands, which they join in the manner already said, and form frequent Anastomoses or Communications. This is the second Class.

218. HAVING pass'd through the Mesentery in this manner, the Ramifications begin to unite as they approach the Spina Dorsi, and consequently their Number is lessened, and their Size increased; and having passed the last Mesenteric Glands, they terminate about the middle of the Adhesion of the Mesocolon in small common Trunks, which receive a great number of Lymphatic Vessels from the Glandulae Lumbares, and others below these. This is the third Class.

219. A fourth Class may be made of the lacteal Vessels of the great Intestines; of which I demonstrated several very full of Chyle, to the Royal Academy, in an Human Colon. The late M. Mery a Member of the same Academy, who was not easily convinced of any thing, from Observations made

by others, having seen that with the end of my Finger, I could push the white Liquor uniformly into the Colon in several places, seem'd at first to be satisfied ; but for his farther Conviction, he desired me to open one of these Vessels before him, with the Point of a Lancet, and to take out a Drop of the Liquor, which having laid upon the Nail of my Thumb, he was intirely convinced.

220. THE lacteal Vessels are not always apparent in Human Subjects. But we may see them in those who die either a violent or sudden Death, soon after a Meal ; and they remain visible even in the Intestines, for a long time after Death, when a great number of the Mesenteric Glands have become Scirrhus, especially in Children.

221. IT is the common Custom to demonstrate the Lacteals in living Animals, opened about three Hours after a full Meal, especially of Milk. This is a very troublesome way, and very often hinders us from seeing a great part of this beautiful Phænomenon. It is much easier and better to kill the Animal about an Hour after it has filled its Belly, or sooner, if the Food be liquid ; and this is the Method which I have always used with success, in my private Courses.

Receptaculum Chyli.

222. THE lacteal Vessels of the third Class, or those that lie between the Mesenteric Glands and middle Adhesion of the Mesocolon to the Spina Dorfi, run down on the Body of the inferiour Aorta, between the Extremities of the small Muscle of the Diaphragm, and terminate in a kind of Cistern, call'd by some Receptaculum Chyli, by others Receptaculum Pecqueti, from M. Pecquet a Physician at Dieppe in Normandy, who first demonstrated by incontestable Experiments, this Receptacle, which had been long before discovered by Eustachius.

223. THE greatest part of the Receptaculum Chyli lies behind the right Portion of the inferiour Muscle of the Diaphragm, on the right side of the Aorta, at the Union of the last Vertebra of the Back with the first of the Loins. It is a kind of membranous Vesicle, the Conformation of which is various in Human Subjects. Sometimes it is of an uniform long oval figure, like the Vesicula Fellis ; sometimes it is divided by Strictures, into several small roundish Bags more or less flatted, and sometimes it surrounds the Trunk of the Aorta like a Collar.

224. IT is composed of very thin Coats, and its Cavity is divided by small Pelliculæ or membranous Septa, the Disposition of which is irregular. It is chiefly round the lower part of this Receptacle, that the last Lacteal Vessels are inserted, some on the sides, and some behind the Aorta ; and they are accompanied by numerous lymphatic Vessels, of which in another place. The upper Portion is contracted between the Aorta and Vena Azygos, and forms a particular Canal, which runs up through the Thorax, by the name of Ductus Thoracicus, which shall be described in the next Section.

§. 11. *The Blood-Vessels and Nerves of the Intestines.*

225. THE Duodenum has commonly a particular Artery called Duodenalis or Intestinalis, which comes indifferently from the Stomachica Coronaria, Pylorica, Gastrica Major or Hepatica. It has likewise several distinct Ramifications from these Trunks, and from the Mesenterica Superior and Splenica, which Ramifications communicate with each other. *Blood-Vessels of the Intestines.*

226. THE Arteria Duodenalis, and the other additional small Arteries, form a vascular Network round the muscular Coat of the Intestine, which sends out a great number of Capillaries towards both the outer and inner sides, that make the whole Intestine look of a red Colour.

227. THE Veins of the Duodenum are Rami of the Vena Portæ, and the Distribution and Denomination thereof, is pretty much the same with that of the Arteries; only they communicate more with each other, than the Arteries, and also with the great Hæmorrhoidal Vein.

228. THE venal Ramifications form round the Duodenum, a Network like that of the Arteries; and the same kind of vascular Texture is more or less to be found on all the other Intestines.

229. THE Arteries of the Jejunum come chiefly from the Mesenterica superior; and some, from the ascending Branch of the Mesenterica inferior. The Veins are for the most part Branches of the great Mesaraica; and the rest come from the Splenica and small Mesaraica or Hæmorrhoidalis Interna.

230. THE principal subaltern Trunks of these Arteries and Veins accompany each other through the cellular Substance, between the Laminæ of the Mesentery, are distributed by Branches and Rami, and form the Mashies, Lozenges and Arches mentioned in the Description of the Arteries and Veins. The last of these Arches and Lozenges, or those next to the Intestine, produce two small vascular Planes, which separate from each other very distinctly, and surround the intestinal Canal in a reticular manner.

231. THE Blood-Vessels of the Ileum come from the same Sources with those of the Jejunum, as has been said in the History of the Arteries and Veins; and it ought to be observed concerning both these Vessels, and those of the Jejunum, that in their whole Course through the Mesentery, they give Ramifications to the Glands, Laminæ and cellular Substance of the Mesentery; and also that there is a kind of Communication between several small Mesaraic Veins, and the capillary Rami of the Venæ Lumbares and Spermaticæ.

232. THE Arteries of the Cæcum and Appendicula Vermiformis, are Ramifications of the last Branch from the convex side of the Mesenterica superior; and they have likewise some small ones from the second and third Branches, when both are found. The Veins of these two Parts are Ramifications of the great Mesaraica, and one of these Rami is by *Riolan* termed Vena Cæcalis.

233. THE straight Portion of the Arch of the Colon, or that which is an immediate Continuation of the Cæcum, is supplied with Arteries by the second Branch

Branch that comes from the concave side of the Mesenterica superior, and likewise a little by the third, when there is a third.

234. THE superiour or middle Portion of the Arch of the Colon, is furnished by the first Branch from the same side of the Mesenterica superior, which by a Bifurcation communicates on both hands, with the other Portions of the Arch of the Colon.

235. THE left Portion of this Arch derives its Arteries partly from the first Branch of the same Mesenterica, and partly from that of the Mesenterica inferior, which two Branches form the celebrated Communication or common Arch of the two Mesentericæ.

236. BY means of this Communication or Continuation, in case one Artery should be obstructed or compressed, the other would furnish Blood to all the Branches below the place of the Obstruction. The second Branch of the Mesenterica inferior gives likewise small Arteries to the left Extremity of the Colon.

237. THE descending Convolutions of the Colon, which represent a Roman S, are supplied by the other Branches of the Mesenterica inferior, the last of which forms the Hæmorrhoidalis interna.

238. THE Veins of all these Portions of the Colon, are Branches and Ramifications of the Vena Portæ Ventralis, and principally of the subaltern Trunks, the Mesaraica Major, and Mesaraica Minor or Hæmorrhoidalis Interna. The Distribution of these Branches and Ramifications, is in some measure the same with that of the Arteries, as may be seen in the Description of the Veins.

239. THE Arteries of the Rectum are furnished by the Hæmorrhoidalis Interna, the last Branch of the Mesenterica inferior, which communicates with the Hypogastrica, and particularly with the Hæmorrhoidalis externa, a Production of one of these Arteries.

240. THE Veins of the Rectum are Ramifications of the last Branches of the Mesaraica Minor or Hæmorrhoidalis Interna, and they communicate with the Hæmorrhoidales Externæ, which are Rami of one of the Hypogastricæ. They communicate likewise with the capillary Ramifications of the other Hypogastric Veins, which go to the internal Parts of Generation of both Sexes.

241. IT is here to be observed in general, that there is a successive Continuation more or less simple or multiplied, between all the Arteries of the intestinal Canal, and likewise between all the Veins; and also that the Veins are here thinner and more capacious than the Arteries in a greater proportion than in the other Parts of the Body.

*Nerves of
the In-
testines.*

242. THE Nerves of the Duodenum are the middle Plexus of the semilunar Ganglion, and some Filaments of the Plexus Stomachicus and Hepaticus.

243. THE Nerves of the Jejunum, Ileum, and Mesenteric Glands, are the Plexus Mesentericus superior, the posterior Mesenteric Fasciculi, and the Plexus Mesentericus inferior.

244. THE Nerves of the Cæcum are the posterior Mesenteric Fasciculi or Plexus, and the Plexus Mesentericus inferior.

245. THE Nerves of the Arch of the Colon are the same Fasciculi, and the two Plexus Mesenterici.

246. THE Nerves of the last Convolutions of the Colon are the posterior Mesenteric Fasciculi, and the Plexus Mesentericus inferior, and Sub-Mesentericus.

247. THE Nerves of the Rectum are the Plexus Mesentericus inferior, Plexus Sub-Mesentericus or Hypogastricus, and the two Ganglions of that Plexus.

248. THE Nerves of the Anus, and of its Muscles, are the Ganglions of the Plexus Sub-Mesentericus, the inferior Rope of both Sympathetici Maximi, and the common Arch of the Extremities of both Ropes.

249. BEFORE I proceed to the Liver, it must be remarked that the Omentum and Appendices Adiposæ have so near a relation to the Liver and Spleen, that it is impossible to describe them without mentioning several Things belonging to these two Viscera; and therefore, I think it more proper to give the History of these, after that of the other two, and even of the Pancreas, than to begin the History of the Parts contained in the Cavity of the Abdomen by that of the Omentum, as is commonly done.

250. FOR the same reason, I shall not give the Uses of these Parts, till after they have been all explained; and together with these Uses, I shall speak to those of the intestinal Canal, Mesentery, Vasa Lactea, Mesenteric Glands, Muscles of the Anus, &c.

§. 12. *Hepar & Vesicula Felleis.*

251. THE Liver is a large and pretty solid Mass, of a dark red Colour, a little inclined to yellow, situated immediately under the Arch of the Diaphragm, partly in the right Hypochondrium, which it fills almost intirely, and partly in the Epigastrium, between the Appendix Ensiformis and Spina Dorsi, and terminating commonly in the left Hypochondrium, into which it sometimes runs a considerable way.

*Situation,
Figure and
Division of
the Liver.*

252. THE Figure of the Liver is irregular, it being arched or convex on the upper part, unequally concave on the lower, and very thick on the right and back sides. Towards the left and antierior sides its Thickness decreases very much, and terminates there by a kind of Edge; and it is broader from right to left, than from before backwards.

253. THE Liver may be divided into two Extremities, one great, the other small; two Edges, one antierior, and one posterior; two Sides, one superiour and convex, which is smooth, polished and proportioned to the Arch of the Diaphragm, and one inferior, concave and uneven, with several Eminences and Depressions, of which hereafter.

254. IT may likewise be divided into two lateral Parts called Lobes; one of which is termed the great or right Lobe, the other, the small or left Lobe. These two Lobes are distinguished above, by a membranous Ligament; and below very plainly, by a considerable Scissure lying in the same Direction with the superiour Ligament.

255. THE Eminences on the concave side of the Liver belong to the great Lobe. The principal Eminence is a sort of triangular or pyramidal Apophysis situated backward near the great Scissure which distinguishes the two Lobes.

256. THIS triangular Eminence is termed Lobulus Spigelii, or simply the small Lobe of the Liver. One of its Angles advances a considerable way toward the middle of the lower side of the great Lobe, and is lost there. This Angle I call the Root of the Lobulus. Toward the fore-side, there is another Eminence less prominent but broader; and to this Eminence and the former, the Ancients gave the general Name of Portæ.

257. THE Depressions on the concave or lower side of the Liver, which deserve our Attention, are four in number. The first is the Scissure that separates the two Lobes, which runs a-cross the concave side, from the Eminences already mentioned to the anteriour Edge, where it terminates by a Notch of different Depths in different Subjects. This is termed the great Scissure of the Liver and in some Subjects, part of it is an intire Tube.

258. THE second Depression is situated transversely between the two Eminences of the great Lobe, and filled by the Sinus of the Vena Portæ, so called by the Ancients, because it lies between the Eminencies of the same Name. The third Depression is backward, between the great Lobe and Lobulus Spigelii, and the Vena Cava passes through it. The fourth is a kind of Sulcus between the Lobulus and small Lobe of the Liver, which in the Fœtus served to receive a venal Canal lost in Adults, in whom it appears only as a kind of Ligament. This Sulcus is in some measure a Continuation of the great Scissure, and joins the Vena Cava by an acute Angle.

259. BESIDES these four Depressions, there is one on the Fore-part of the great Lobe, in which the Vesicula Fellis is lodged, and it sometimes runs as far as the Edge, where it forms a small Notch. We may likewise reckon among these Depressions, a small superficial Cavity in the posteriour and lateral Part of the lower side of the great Lobe, by which it rests on the right Kidney; and likewise a superficial Cavity in the left Lobe, where it runs over the Stomach.

260. LASTLY, on the posteriour Edge of the Liver, there is a great Sinus common to both Lobes, which gives passage to the Spina Dorsi and Œsophagus, near the place where the Vena Cava descends; and we sometimes meet with Scissures on both sides of the Liver, which are not ordinary.

*Ligaments
of the
Liver.*

261. THE convex side of the Liver, is commonly connected to the Diaphragm by three Ligaments, which are only Continuations of the membranous Lamina of the Peritonæum. One lies near the Edge of the Extremity of each Lobe, and one in the middle, and they are accordingly termed the right, middle and left Ligaments. There is a cellular Substance in the Duplication of each, in which the Blood-Vessels and Lymphatics run, and which sends off a kind of Lamina into the Substance of the Liver.

262. THE right Ligament sometimes connects the great Lobe to the Cartilages of the false Ribs, and the left Ligament, or that of the small Lobe is often double, and advances toward the middle Ligament. This
middle

middle Ligament begins below, in the great Scissure of the Liver, near the Eminences called Portæ, and from thence passes through the anterior Notch and over the convex side of the Liver at the Union of the two Lobes, and is fixed obliquely in the Diaphragm.

263. IT is likewise fixed along the upper and inner Part of the Vagina of the right Musculus Rectus of the Abdomen, in such an oblique manner as to be nearer the Linea Alba below than above.

264. BESIDES these Ligaments the great Lobe of the Liver is likewise connected to the right Ala of the tendinous Portion of the Diaphragm, not by a Ligament, but by a broad and immediate Adhesion, without the intervention of the Membrane of the Peritonæum, which is only folded quite round this Adhesion, to form the external Membrane of all the rest of the Body of the Liver.

265. THIS broad Adhesion is commonly tho' improperly called Ligamentum Coronarium; but in the first place it is not a Ligament, as has been already observed, and secondly it is not circular, but Oval and very Oblong.

266. IT is not on the upper part of the convex side of the Liver, but along the posterior part of the great Lobe, the broad Extremity of the Adhesion lying nearer the Notch, and the pointed Extremity towards the right Hypochondrium.

267. THE middle Ligament called improperly Ligamentum Hepatis Suspendorium, contains in its Duplicature a thick white Rope, like a round Ligament, which was the Umbilical Vein in the Fœtus. Thus the lower part represents a Falx, the convex Edge of which is sharp, and the other rounded.

268. ALL these Ligaments serve to keep the Liver in its proper Situation and to hinder it from inclining too much towards either side: but we must not imagine that any of them serve to suspend it; because it is sufficiently supported by the Stomach and Intestines, especially when they are filled.

269. WHEN the Stomach is empty, or when we fast longer than ordinary, it is a common Expression to say the Stomach pinches us. As the Liver is not then sustained by the Stomach and Intestines, it descends by its own weight, and chiefly by means of the middle Ligament pulls the Diaphragm along with it. It is in that place therefore that we have this uneasy Sensation, and not at the superiour Orifice of the Stomach, as is commonly believed.

270. THE right or great Lobe of the Liver which lies in the right Hypochondrium, rests on the right Kidney, by a small superficial Depression above-mentioned; and it likewise covers a Portion of the Arch of the Colon and the Pylorus. About two third Parts of the small or left Lobe, lie in the Middle of the Epigastrium, and the remaining third Part advances over the Stomach, towards the left Hypochondrium.

271. THIS small Lobe is situated almost Horizontally; the great Lobe is very much inclined, and its thick Extremity runs down almost in a perpendicular Direction to the right Kidney, on which it lies, in the manner already
ready

ready said. This Observation is of use to distinguish the different Parts of the Liver in Wounds and Chirurgical Operations.

272. It may likewise serve to direct us in examining a Liver taken out of the Body; the Situation of which may be otherwise very easily mistaken, especially that of the Parts of the concave side. The Passage of the Vena Cava, between the Body of the great Lobe and the Lobulus Spigellii, may likewise serve for a Rule in placing a detached Liver in its true Situation.

*Structure of
the Liver.*

273. THE Liver is composed of several kinds of Vessels, the Ramifications of which are multiplied in an astonishing manner, and form by the Intertexture of their Capillary Extremities, an innumerable Collection of small pulpy, friable Corpuscles, which are look'd upon to be so many Organs design'd to separate from the Mass of Blood, a particular Fluid termed the Bile.

274. THE greatest part of these Vessels from one end to the other is included in a Membranous Vagina call'd Capsula Venæ Portæ, or Capsula Glissoni, from an *English* Author who first described it particularly.

275. THE Vessel which carries the Blood to the Liver is called Vena Portæ for the reason already given. In the Description of the Veins, I observed that the Vena Portæ might be considered as two large Veins, the Trunks of which are join'd endwise, and send out Branches and Ramifications in opposite Directions to each other; that one of these Veins is ramified in the Liver, the other lying without the Liver and sending its Branches and Ramifications to the Viscera of the Abdomen; and lastly, that the first of these large Veins may be termed Vena Portæ Hepatica, the other Vena Portæ Ventralis.

*Vena Portæ
Hepatica.*

276. THE particular Trunk of the Vena Portæ Hepatica is situated transversely between the broad Anterior Eminence of the great Lobe of the Liver, and the Root of the Lobulus, in a particular Scissure, and forms what is called the Sinus of the Vena Portæ. From this Sinus five principal Branches go out, which are afterwards divided into Millions of Ramifications through the whole Substance of the Liver.

277. At this place, the Vena Portæ lays down the common Office of a Vein, and becomes a kind of Artery as it enters and is again ramified in the Liver. The Extremities of all these Ramifications of the Trunk of the Vena Portæ Hepatica, end in the pulpy friable Corpuscles which seem to be thick Villous Folliculi, when examined through a Microscope in clear Water.

*Pori Bilarii
& Ductus
Hepaticus.*

278. It is in these Folliculi that the Bile is secreted, and it is immediately collected in the same number of Extremities of another kind of Vessels, which unite by numerous Ramifications into one common Trunk. These Ramifications are termed Pori Bilarii, and the Trunk, Ductus Hepaticus; and the Ramifications of these two kinds of Vessels are invested together by the Capsula of the Vena Portæ.

*Hepatic
Veins.*

279. THE Blood deprived of this Bilious Fluid is reconveyed to the Heart, by a great number of venal Ramifications, which afterwards unite into three principal Branches, besides others that are less considerable, that terminate

terminate in the Vena Cava, and are all called by the Name of Vena Hepatica.

280. THE capillary Extremities of the Ramifications of the Vena Cava, join those of the Vena Portæ, and accompany them through the Liver; and yet the great Branches of both Veins intersect each other in several places.

281. WHEN we cut the Liver in Slices, it is easy to distinguish in each Slice, the Ramifications of the Vena Cava from those of the Vena Portæ; the first being thinnest and largest, and adhering closest to the Substance of the Liver: whereas those of the Vena Portæ which are invested by the cellular Capsula, appear to be a little ruffled when empty; because the cellular Capsula subsides, when it is cut, but the other Veins remain uniformly open, their Sides adhering to the Substance of the Liver.

282. THE Liver receives from the Arteria Cælica a particular Branch termed Arteria Hepatica, which being very small, when compar'd with the Bulk of that Viscus, seems designed only for the Nourishment thereof, and not for the Secretion of the Bile. The Plexus Hepaticus formed by the Nervi Sympathetici Maximi & Medii, furnishes a great number of Nerves to the Substance of the Liver. The Ramifications of the Artery and Nervous Plexus are included in the cellular Capsula together with those of the Vena Portæ and Pori Bilarii.

Hepatic Artery and Nerves.

283. THE Pulsation of this Artery has been by some Anatomists taken for that of the Capsula, and by this they have endeavoured to explain the arterial Function of the Vena Portæ: but they have not considered that the Blood in this Vein does not require to be pumped forward; because so swift a Motion would have been prejudicial to the Secretion of the fine Oil of the Bile, for which a slow and almost insensible Motion is necessary.

284. THE Liver is covered exteriorly by a particular Membrane or Coat, which is a Continuation of the Peritonæum. There is likewise a membranous or filamentary Substance that runs thro' this whole Viscus, and connects the Ramifications and Extremities of all its Vessels to each other. This Substance seems to be a complicated Production of the Capsula of the Vena Portæ and of the external Membrane of the Liver.

285. THE outer Surface of this Coat is very smooth, but its inner Surface is uneven, being made up of a great number of thin membranous Laminæ, between which we observe very distinctly, numerous lymphatic Vessels, on both the convex and concave Sides of the Liver; but it is more difficult to trace those which accompany the filamentary Substance through that Viscus.

286. I have already observed that the Substance of the Liver is chiefly made up of an infinite number of pulpy friable Corpuscles, each of which is bounded and in a manner surrounded by a particular Expansion of the Capsula Glissoni, and all these Expansions are connected by common Septa, in some measure resembling a Bee-hive.

287. THESE Corpuscles have several Angles especially in the inner Surface of the Liver; but near the Surface they are raised in the form of small Tubercles. Their pulpy Texture appears like radiated Villi, a small void space being left in the middle of each.

288. IF we blow through a Pipe into the Vena Portæ, Vena Cava, Arteria Hepatica, or Trunk of the Pori Bilarii, but especially through the two Veins, we observe the Liver to swell, and the Corpuscles near the Surface are raised, and become more sensible. If we blow with much force, we burst these Corpuscles, and the Air getting between them and the external Membrane, raises it from the Substance of the Liver in Blisters.

Ductus Cholidochus.

289. THE Ductus Hepaticus, or Trunk of the Pori Bilarii, having run a little way, joins another Canal called Ductus Cysticus or Vesicularis, because it comes from the Vesicula Fellis, as we shall see in the Description of that Organ. These two united Ducts form a common Trunk named Ductus Cholidochus, because it conveys the Bile. This Duct having reached the Incurvation of the Duodenum, insinuates itself through the Coats of that Intestine, and opens into the Cavity thereof, not by a round Papilla, but by an oblong Orifice rounded at the upper part and contracted at the lower, like the Spout of an Ewer, or like a common Tooth-picker.

290. THE Edges of this Orifice are raised, broad and plaited, as we may see by making this Portion of the Duodenum swim in clear Water. At the Entry of this Orifice we see another smaller opening distinct from it, which is the Orifice of the Ductus Pancreaticus, of which hereafter.

Vesicula Fellis.

291. THE Gall-Bladder is a kind of small Bag shaped like a Pear, that is, narrow at one end and wide at the other. The wide Extremity is termed the Fundus or Bottom, the narrow Extremity the Neck, and the middle Portion, the Body. About one third of the Body of the Vesicula lies in a Depression on the concave side of the Liver, from the Trunk or Sinus of the Vena Portæ, where the Neck is situated, to the anterior Edge of the great Lobe, a little toward the right side, where the Bottom is placed, and in some Subjects it advances beyond the Edge.

292. THEREFORE when we stand, the Vesicula Fellis lies in a Plane inclined a little from behind forward. When we lie upon the Back, it is almost inverted. When we lie on the right Side, the Bottom is turned downward; and it is turned upward when we lie on the left Side; and these Situations vary according to the different Degrees of each Posture.

293. THE Gall-Bladder is composed of several Coats; the outermost of which is a Continuation of that which invests the Liver, and consequently of the Peritonæum.

294. THE second Coat is fleshy and made up of two Strata, one longitudinal, the other transverse, the Fibres of which have nearly the same irregular Direction with those of the Stomach; and this Disposition of the Fibres in these Viscera is owing to the different Diameters in the several Portions of them, and to their Incurvation.

295. THESE two Coats are connected by a cellular Substance continued between the Body of the Vesicula and the Liver, all the way to a whitish Stratum, which is look'd upon as the third Coat of the Gall-Bladder answering to the Tunica Nervosa of the Intestines.

226. THE innermost or fourth Coat has on the inside a great number of reticular Folds, filled with small Lacunæ, like perforated Papillæ, especially

cially near the Neck of the Vesicula where these Folds are longitudinal, and afterwards form a kind of small Pylorus with Plaits of the same nature with those in the great one. These Lacunæ are look'd upon to be Glands.

297. THAT Side of the Body of the Vesicula which lies next the Liver is connected to that Viscus by a vast number of Filaments, which run a great way into the Substance of the Liver; and among these Filaments there are some Ducts which form a Communication between the Pori Bilarii and Vesicula. These Ducts have been observed in Brutes a long time ago, and they have been very lately discover'd in Men likewise. They are most numerous near the Neck of the Vesicula, and they are named Ductus Cyst-Hepatici, or Hepatico-Cystici.

298. THE Neck of the Vesicula is formed by the Contraction of the small Extremity; and this Neck bending afterwards in a particular manner, produces a narrow Canal named Ductus Cysticus. This Incurvation represents in some measure the Head of a Bird, of which the Cystic Duct, by the gradual Diminution of its Diameter, expresses the Beak. This cannot be seen when the Liver is extra Situm; and even in Situ it is but very imperfectly seen, when in order to view the concave Side, the Liver is raised and thrust too much against the Diaphragm; for by thus inverting the Liver, the Curvature is disordered, and we see two in the place of one.

299. To see this Curvature in its true natural Situation, the Liver is to be raised but very little, and the Duodenum left untouched; then we must stoop and look under the Liver without disordering any thing. This Incurvation may be of use to hinder too precipitate a Discharge of the Bile contained in the Vesicula, which some Situations of the Body might occasion.

300. THE Neck of the Vesicula is nearly of the same Structure with the other Parts. It has on the inside several reticular Rugæ and some Folds which appear like Fragments of Valvulæ Conniventes, situated very near each other, from the Neck to the Contraction of the Cystic Duct. The first of these Folds is pretty broad and large, and almost circular; the next is more oblique and smaller in size, and the rest diminish in the same manner. Taken all together, they form a kind of spiral Flight, which may be seen through the Neck on the outside, where it sometimes appears like a Screw, especially when the Neck is filled with any Fluid. This Observation is owing to M. Heister.

301. By slitting the Neck and Duct we see all these Folds very distinctly, especially when we examine them in clear Water. When they are viewed in any other manner, they easily deceive us, being mistaken for true Valves because of their transverse Situation. They may however, in some measure supply the place of Valves by hindering the Bile from running too fast into the Duodenum, and the Contents of the Duodenum from entering this Duct.

302. THE internal Surface of all these biliary Ducts, that is, of the Ductus Hepaticus, Cysticus and Cholidochus, being examined through a Microscope in clear Water, appears to be nearly of the same Structure, through their whole Extent.

303. The cystic and hepatic Ducts do not in their ordinary and natural Situation represent the Capital Y of the *Greeks*, where they form the Ductus Cholidochus. After the Incurvation of the Neck of the Vesicula, these two Ducts run very near each other, and they appear to be separated, only by raising up the Liver to view them. The same Disorder happens in an inverted Liver extra Situm; for then the Body of the Liver subsides and is flatten'd, and thereby separates the Ducts; whereas in its true Situation, it is very much incurvated, and the Ducts very near each other.

304. THE Ductus Cholidochus appears rather to be a Continuation of the Ductus Cysticus, than the common Trunk of that and of the Ductus Hepaticus; for I have observed that this last Duct runs for some space within the Sides of the former, before it opens into the Cavity, much in the same manner as the Ductus Cholidochus passes into the Duodenum. I have likewise observed at the opening of the Hepatic into the Cystic Duct, a small loose valvular Membrane, which may hinder the Bile from returning out of the Ductus Cholidochus into the Hepaticus.

305. THE Bile which passes through the Ductus Hepaticus into the Cholidochus, may be called Hepatic; and that which is collected in the Vesicula Fellis, may be termed Cystic. The hepatic Bile flows continually through the Ductus Cholidochus into the Duodenum, whereas the cystic Bile flows only by reason of Plenitude or by Compression.

*Remarks on
the Vessels,
&c. of the
Liver.*

306. THE Trunk of the Vena Portæ Ventralis terminates between the Lobulus and the opposite part of the great Lobe; and there joins the Trunk of the Vena Portæ Hepatica in the transverse Sinus of the Liver, between the right Extremity, and the middle of that Sinus.

307. THE umbilical Ligament and consequently the umbilical Vein in the Fœtus joins the Trunk of the Vena Portæ Hepatica, toward the left Extremity of the transverse Sinus of the Liver. The Canalis Venosus in Man is not exactly opposite to the Vena Umbilicalis, but a little to the right hand; and therefore these three Vessels lie in such a Direction as to form two opposite Angles, resembling those of the Handle of a Wheel or of a Spit.

308. In the Fœtus therefore, the Blood which comes from the umbilical Vein does not run directly through that contained in the Vena Portæ Hepatica in the Sinus, and from thence into the Canalis Venosus; but is obliged to turn from left to right, and so to mix with the Blood in the Vena Portæ, before it enters that Canal which opens into the Trunk of one of the great hepatic Veins of the Vena Cava near the Diaphragm.

309. THE hepatic Vena Portæ gives off commonly five large Branches into the Liver, viz. three from its right Extremity into the great Lobe, and two from its left Extremity into the small Lobe; and from the Interstice between these, a small Branch goes directly to the middle of the convex side of the Liver.

310. THE hepatic Veins are commonly three large Branches of the Trunk of the Vena Cava Inferior, which go out from it by one common Opening, especially two of them, and then separating, they enter the Substance of the Liver, intersecting the Branches of the hepatic Vena Portæ, and are ramified in all Directions in the manner already explained. The inferior Portion

tion of the opening of these Veins into the Vena Cava, forms a kind of semilunar Valve.

311. BELOW these Hepatic Veins, the Vena Cava inferior sends off in its passage by the Liver, several other small Hepatic Veins immediately from the Trunk, which seem to have the same Relation to the Hepatic Artery as the great Veins to the Vena Portæ.

312. THE Passage of the Vena Cava is through the right Portion of the posteriour Sinus of the Liver, and consequently on the side of the great Lobe, which is hollow'd at this place sufficiently to give passage to the Vein, of which it surrounds about three fourths, sometimes more, and sometimes the whole.

313. THIS Passage answers to the Interstice between the Lobulus and the rest of the great Lobe; and its Direction is in the natural State, from above downward, and a little from right to left: but when the Liver is view'd extra Situm, and inverted, it appears very oblique; but still it serves as a Guide to Beginners, who are very apt to be mistaken in examining an inverted Liver, as I have already observed.

314. THE Trunk of the great Vena Portæ, the Hepatic Arteries, the Ductus Hepaticus, or Trunk of the Pori Bilarii, and the Nerves of the Plexus Hepaticus, form all together a large Bundle, before they enter the Liver. The Trunk of the Hepatic Vena Portæ is in the middle of this Bundle, the Hepatic Arteries lie on the right and left sides of this Trunk, the Nerves surround it on all sides, and they communicate with the Plexus Mesentericus superior.

315. AFTERWARDS the first Branches of the Arteries, Nerves and Pori Bilarii, leave the Trunk of the great Vein, and join in the same manner, the Trunk of the small or Hepatic Vena Portæ and its Ramifications in the Capsula Glissoni explained above.

316. ALL these Branches of the Vena Portæ, and of the Arteries, Nerves and Pori Bilarii, accompany each other by Ramifications through the whole Substance of the Liver, forming every where small Fasciculi in the same manner as the large Bundle is formed by their Trunks. Each Ramus of the Vena Portæ, Artery, Nerve, and Pori Bilarius has a proper Vagina, and all the four have a common Vagina distinguished from the former by cellular Septa, which are only Continuations of the Vaginæ of both kinds.

317. THE convex side of the common cellular Vagina is connected quite round, to the Substance of the Liver by numerous Filaments which arise from it, and which form the cellular Substance found between the glandular Corpuscles. The concave side produces the cellular Septa above-mentioned.

318. IN this common Vagina, the Vessels, Ducts and Nerves are disposed in such a manner, as that the Rami of the Vena Portæ chiefly fill the Cavity of it, and is in a lateral Situation; the arterial Ramus and Pori Bilarius lie together on the side of the Vein, and the Nerve is divided into several Filaments, which run in between the Vessels and Ducts, and chiefly accompany the Artery and Pori Bilarius; the Vena Portæ having by much the fewest.

319. THE Uses of the Liver shall be explained after the Description of the Pancreas, Spleen and Omentum, all these Viscera having a great Relation to the Liver.

§. 13. *Pancreas.*

Figure, Division and Situation of the Pancreas.

320. THE Pancreas is a long flat Gland, of that kind which Anatomists call Conglomerate, situated under the Stomach, between the Liver and the Spleen. Its figure resembles that of a Dog's Tongue, and it is divided into two sides, one superiour, the other inferiour; two Edges, one anteriour, the other posteriour; and two Extremities, one large, which represents the Basis of a Tongue, and one small and a little rounded like the Point of a Tongue.

321. THE Pancreas is situated transversely under the Stomach, in the Duplication of the posteriour Portion of the Mesocolon. The large Extremity is connected to the first Incurvation of the Duodenum, and from thence it passes before the rest of that Intestine, all the way to its last Incurvation; so that a great part of the Duodenum lies between the Pancreas, and the Vertebrae of the Back. The small Extremity is fixed to the Omentum near the Spleen.

Structure of the Pancreas.

322. THE Pancreas is composed of a great number of soft glandular Moleculæ, combined in such a manner, as to exhibit the Appearance of one uniform Mass on the outside, the Surface of which is rendered uneven, only by numerous small Convexities, more or less flatted. When these Moleculæ are separated a little from each other, we find along the middle of the Breadth of the Pancreas, a particular Duct, in which several smaller Ducts terminate laterally on each side, like small Rami in a Stem.

323. THIS Canal, named Ductus Pancreaticus, or Ductus Virsungi, from the Discoverer of it in the Human Body, is very thin, white and almost transparent, and the Extremity of the Trunk opens commonly into the Extremity of the Ductus Cholidochus. From thence it diminishes gradually, and terminates in a Point, next the Spleen. The small lateral Branches are likewise pretty large near the Trunk, and very small toward the Edges of the Pancreas, all of them lying in the same Plane like the Branches of the common Filix or Fern.

324. THE Pancreatic Duct is sometimes double in Man, one lying above the other. It is not always of an equal length, and sometimes runs in a winding Course, but always in the same Plane; and it is nearer the lower than the upper side of the Pancreas. It pierces the Coats of the Duodenum, and opens into the Ductus Cholidochus, commonly a little above the prominent Point of the Orifice of that Canal; and sometimes it opens immediately into the Duodenum.

The small Pancreas.

325. IN Man, I observed several Years ago, that where the great Extremity of the Pancreas is connected to the Curvature of the Duodenum, it sends down an Elongation, which adheres very closely to the following Portion of the Intestine; and upon a careful Examination, I found a particular Pancreatic

Pancreatic Duct, ramified like the large one, which ran toward and intersected this great Duct, into the Extremity of which it open'd, after having perforated the Duodenum. This Portion I term Pancreas Minus, and it sometimes opens separately into the Duodenum, in which we likewise observe several small Holes round the Ductus Cholidochus, which answer to the Pancreas.

326. THE Arteries of the Pancreas come from the Pylorica, Duodenalis, and chiefly from the Splenica, which adheres very closely to the whole lower side of the Pancreas near the posterious Edge; and it sends off in its passage a great many Rami, named Arteriæ Pancreaticæ; which go off from each side, more or less transversely. It receives also some small Ramifications from the Gastrica major, and Mesenterica superior. *Blood-Vessels, and Nerves of the Pancreas.*

327. THE Pancreatic Veins are Rami of the Splenica, one of the principal Branches of the Vena Portæ Major or Ventralis. This Vena Splenica runs likewise along the lower side of the Pancreas near the Edge, in a shallow Depression, formed in the Substance of the Gland. These Veins answer to the Arteries of the same Name, and there are likewise other small Veins corresponding to the small Arteries, which are Productions of the great Mesaraica, &c.

328. THE Nerves of the Pancreas come partly from the Plexus Hepaticus, partly from the Plexus Splenicus, and partly from the Plexus Mesentericus superior, and it likewise receives some from the flat Ganglion or Plexiform Intertexture, spoken to in the Description of the Nerves, N° 413. and mentioned by the Name of the transverse Rope, N° 140.

329. THE Pancreatic Duct is not only double in some Subjects, as has been said, but the collateral Branches have Communications in form of Islands in several places, within the Body of the Pancreas. The Uses of this Viscus shall be explained hereafter.

§. 14. Lien.

330. THE Spleen is a bluish Mass, something inclined to red, and of a long oval Figure, being about seven or eight Fingers breadth in length, and four or five in breadth. It is of a softish Substance, and is situated in the left Hypochondrium, between the great Extremity of the Stomach, and the neighbouring false Ribs, under the Edge of the Diaphragm and above the left Kidney. *Situation, Division and Figure of the Spleen.*

331. IT may be naturally divided into Sides, Edges and Extremities, as I have always done in my ordinary Courses, for these many Years past. It has two sides, one external and gently convex, and one internal, which is irregularly concave; two Extremities, one posterious, which is pretty large, and one anterior, which is smaller and more depressed; two Edges, one superior, and one inferior, on both which there are in some Subjects, several Inequalities.

332. THE inner or concave side is divided by a longitudinal Groove or Scissure, into two Planes or Half-sides, one upper, the other lower; and by this

this Groove, the Vessels and Nerves enter in human Subjects. The superiour half-side is broader and more concave than the inferiour, being proportioned to the Convexity of the great Extremity of the Stomach. The inferiour half-side lies backward on the left Kidney, and forward on the Colon; and sometimes this side of the Spleen appears to have two superficial Cavities, one answering to the Convexity of the Stomach, the other to that of the Colon. The convex side of the Spleen is turn'd to the left Ribs.

333. It is connected to the Stomach by the Vessels called *Vasa Brevia*; to the Extremity of the Pancreas by Ramifications of the splenic Artery and Vein, and to the Omentum by Ramifications which the same Artery and Vein send to the Spleen, and which run in the longitudinal Groove.

334. It is connected to the Edge of the Diaphragm by a particular membranous Ligament of different breadths in different Subjects, fixed in its convex side, sometimes near the upper Edge and sometimes near the lower. This Ligament is situated transversely with respect to the whole Body, and longitudinally with respect to the Size of the Spleen. In some Subjects it is connected by other Ligaments to the Stomach and Colon, but in all this there are considerable Varieties.

335. THE Figure of the Spleen is not always regular, and is as various as the Size. Sometimes it has considerable Scissures both in the Sides and Edges, and sometimes it has Appendices. I have sometimes found a kind of small distinct Spleens, more or less round, and connected separately to the Omentum, at some distance from the anterior Extremity of the ordinary Spleen.

*Structure of
the Spleen.*

336. THE Structure of the Spleen is not easy to be unfolded in Man, and it is very different from that of the Spleens of Brutes, from which both publick and private Demonstrations are commonly made.

337. Its Coverings adhere to it so closely in Man, that it is difficult to distinguish the common from the proper Coat; whereas in some Brutes, such as Oxen, Sheep, &c. nothing is more easy; for in such Animals we find two Coats separated by a cellular Substance. This covering seems to be no otherwise a Continuation of the Peritonæum than by the Intervention of the Omentum and Mesocolon; and even in Man the two Coats may be distinguished, where the Vessels enter by the longitudinal Scissure.

338. IN Man the Substance of the Spleen is almost wholly Vascular, that is, composed of the Ramifications of all kinds of Vessels. In Oxen the Substance of the Spleen is chiefly reticular, and in Sheep it is cellular. In Oxen and Sheep there are no venal Ramifications, but instead thereof, only open Sinuses disposed like Branches, except a small Portion of a venal Trunk perforated on all sides, at the Extremity of the Spleen.

339. IN the human Spleen we see something like glandular Corpuscles, as in those of other Animals; and there are numerous venal Ramifications through its whole Extent. Between these Ramifications we every where observe an Appearance of extravasated Blood, lying in a kind of filamentary transparent and very delicate Substance expanded through the whole Spleen.

340. THIS filamentary Substance having furrounded all the Ramifications, terminates in almost imperceptible Cells which communicate with each other; so that if we blow through a small Hole made in the membranous Covering, the whole Spleen will immediately be inflated.

341. THE Surface of the Spleen of Oxen and Calves is visibly full of a great number of lymphatic Vessels, which may at any time be easily demonstrated; but in Man it is a very difficult Matter either to discover or demonstrate them.

342. THE splenic Artery, which is one of the principal Branches of the Coeliaca, runs along the lower side of the Pancreas, as has been already said, and passes from thence in a winding Course to the Spleen. The splenic Vein, which is larger than the Artery, is but little inflected in this part of its Course. *Blood-Vessels and Nerves of the Spleen.*

343. THIS Artery and Vein having got beyond the Extremity of the Pancreas, send out several Rami together, which immediately afterwards divaricate in the same Plane, run in the membranous Duplicature of the neighbouring Portion of the Omentum, and lastly intersect each other in their common Plane, all the way to the Scissure of the inner or concave side of the Spleen.

344. THESE arterial and venal Rami enter the Substance of the Spleen together by the same Scissure; being accompanied by the cellular Substance belonging to the membranous Duplicature of the Omentum. We may likewise observe, that at this place the Coat of the Spleen sends from its concave side, a Portion of a Lamina, which is incurvated in the Scissure and penetrates into the Substance of the Spleen.

345. THE Nerves of the Spleen are very numerous, and come from the Plexus Splenicus, already described. These Nerves send out at different distances round all the arterial Ramifications of the Substance of the Spleen, a great number of Filaments in form of an irregular Network.

346. THE Arteries, Veins, and Nerves having entered the Spleen, are there divided and subdivided into a great number of Ramifications, and accompany each other to the very last Extremities of their Divisions. They are contained in a kind of common cellular Capsula or Vagina, which first furrounds all the three, and then sends off particular Septa between them. This Capsula seems to be formed by a Continuation of the cellular Substance of the Omentum and of that particular Lamina of the Coat of the Spleen which I mentioned above.

347. THE capillary Extremities of all these vascular Ramifications both arterial and venal end in the filamentary Cells already mentioned. *Malpighi* considered them as distinct Capsulæ or Folliculi, containing the same number of small Glands. They all communicate together, so that where-ever we pierce the Coat of the Spleen, we may through that Hole, inflate the whole Viscus.

348. In Oxen and Sheep, there are no venal Ramifications, as I have said. The Vena Splenica having entered the great Extremity of these Spleens, runs first of all for about half an Inch or an Inch, and afterwards instead of of an ordinary Vein we find a Canal perforated on all sides. The beginning of this Canal has still some Remains of the Coats of a Vein; but the

Form of it is soon lost, and then we find nothing but Sinuses or Sulci in the reticular Substance in Oxen, and in the cellular Substance in Sheep.

349. THE splenic Artery and Nerves are there ramified in a particular Vagina, as in Men; and the Extremities of these arterial Ramifications seem to swim or float in the Cells, and to fill their filamentary Substance with Blood. At the ends of several of these Capillaries, I have observed small Corpuscles disposed like Bunches of Grapes; and I have seen two small Tubes going out from each Corpuscle, one long and open, the other small and short, which was lost in the sides of the Spleen.

350. I imagine that the long Tube, the Extremity of which I was not able to find, may be the Origin of a Lymphatic Vessel, especially because these Vessels are so very numerous and visible in an Ox's Spleen, as has been already said. These small Corpuscles may easily be discovered in an Ox's Spleen, when boil'd by a particular Administration, of which I shall say more in another place. They are indeed much larger before than after boiling, but they are not so solid, and subside more easily when cut. The same sort of Corpuscles may be discovered in the Human Spleen, but they are so extremely small, as not to be visible without a Microscope.

351. THE Uses of the Spleen shall be explained after the Description of the Omentum.

§. 15. *Omentum & Appendices Epiploicæ.*

*Situation,
Division and
Connexion of
the Omen-
tum.*

352. THE Omentum is a large, thin, and fine membranous Bag, surrounded on all sides by numerous Portions of Fat, which accompany and even invest the same number of Arteries and Veins adhering closely to each other.

353. THE greatest part of it resembles a kind of flat Purse or a Sports-Man's empty Pouch, and is spread more or less on all the small Intestines from the Stomach to the lower part of the Regio Umbilicalis. Sometimes it goes down to the lower part of the Hypogastrium, and sometimes does not reach beyond the Regio Epigastrica. It is commonly plaited or folded in several places, especially between the Bands of Fat.

354. IT is divided into a superiour, and inferiour; an anterior and posterior, and a right and left Portion. The superiour Portion is in a manner divided into two Borders, one of which is fixed along the great Curvature or convex side of the Arch of the Colon, and the other along the great Curvature of the Stomach. The Commissure or Union of these two Borders on the right side, is fixed to the common Ligament or Adhesion of the Duodenum and Colon, and to the contiguous Parts of these two Intestines. That on the left side is fixed to the longitudinal Scissure of the Spleen, to the Extremity of the Pancreas, and to the convex side of the great Extremity of the Stomach. It is likewise fixed to the membranous Ligament which sustains the Ductus Cholidochus, and connects it to the Vena Portæ Ventralis.

355. BELOW these Adhesions, the other Portions, that is, the anterior, posterior, two lateral and inferiour Portions, which last is the Bottom of the Sacculus Epiploicus, have commonly no fixed Connexions, but lie

loose between the Fore-side of the Cavity of the Abdomen and the Intestines. The antierour and posterour Portions are generally called the Laminæ of the Omentum, but as that Term is ordinarily employed to express the Duplication of some compound Membrane, it would be more convenient to call them Folia, Alæ, or some such Name.

356. THE Membrane of the Omentum is through its whole Extent, made up of two extremely thin Laminæ joined by a cellular Substance; the Quantity of which is very considerable along the Blood-Vessels, which it every where accompanies in broad Bands, proportioned to the Branches and Ramifications of these Vessels. These cellular Bands are more or less filled with Fat according to the Corpulency of the Subject, and for that reason I have called them Bands or Portions of Fat.

Structure of the Omentum.

357. BESIDES this large membranous Bag, which I name the great Omentum, there is another much smaller, which differs from the large one, not only in Size, but also in Figure, Situation and Connexion; and this I name the little Omentum. This small Bag is fixed by its whole Circumference, partly to the small Curvature of the Stomach, and partly to the concave side of the Liver before the Sinus of the Vena Portæ, so as to surround and contain the prominent Portion of the Lobulus.

Little Omentum.

358. THE little Omentum is thinner and more transparent than the other, and its Cavity diminishes gradually from the Circumference to the Bottom, which in some Subjects terminates in several small Cavities or Fossulæ more or less pointed. Its Structure is pretty much the same with that of the great Omentum, it being composed of two Laminæ, with a mixture of the same Portions of Fat, which are considerably finer than in the other.

359. WE see from this Situation of the two Omenta, that in the Space left between the lower side of the Stomach and upper side of the Mesocolon, they have a very broad Communication with each other; so that if either of them contain'd in its Cavity, any Fluid, that Fluid might readily get between the Stomach and Mesocolon, and so pass into the other Bag; especially when the Stomach is empty and consequently its Situation easily changed.

360. THEREFORE by means of this Interstice between the Stomach and Mesocolon, the two Omenta form one Cavity, which opens into the Cavity of the Abdomen by one common Orifice, situated near the Commissure on the right side of the great Omentum. This Orifice is semilunar or semicircular, and formed by the Union of two membranous Ligaments, whereof one connects the beginning of the Duodenum and Neck of the Vesicula Fellea to the Liver; the other connects the contiguous Portion of the Colon to the same Viscus, and extends to the Pancreas. From thence arises an incurvated Border, which surrounds the Root of the Lobulus, leaving an Opening wide enough to admit the end of the Finger.

361. To discover this Orifice of the Omentum, we need only raise a little the great Lobe of the Liver, and find out the Root of the Lobulus, and apply to it a large Pipe wrapt round with Cotton, Wool, or Tow, to hinder the Regress of the Air. Then if we blow gradually, the Air will inflate the sides of the great Omentum, and give it the appearance of a large

Bladder

Bladder irregularly divided into several Lobes or Tubercles by the Bands of Fat, which appear in this State, like so many Fræna between the Lobes.

362. To be sure of succeeding in this Experiment, the two Omenta must be in their natural State, and they must be handled very gently with the Fingers first dipt in Oil. It succeeds better in young, lean Subjects, than in old or fat Subjects.

363. WHEN we touch these Membranes with dry Fingers, they stick to them so closely as hardly to be separated without being torn, as we see by the reticular Holes which appear in those Portions of the Membranes, that have been thus handled. In that case it is to no purpose, to blow through the natural Orifice already mentioned; and it is owing to these small Holes that the Membranes of the Omentum have been supposed to be naturally reticular.

364. THE membranous Laminæ of the little Omentum are continuous partly with the external Membrane of the Liver, partly with that of the Stomach, and a little with the Membrane that lines the neighbouring Portion of the Diaphragm. Those of the great Omentum are continued partly with the same Coat of the Stomach, and partly with the external Covering of the Colon, and consequently with the Mesocolon; and they likewise communicate with the Covering of the Spleen.

365. WE may satisfy ourselves concerning these Continuations, by making a small Hole in one of the Laminæ of the Omentum near the Stomach, Colon, &c. and by blowing into that Hole, through a Pipe well fitted to it; for the Air will gradually insinuate it self under the common Coats of these Viscera: but if the Parts be dry, they must be moisten'd a little, before the Experiment is made.

*Appendices
Epiploicæ.*

366. THE fatty Appendices of the Colon and Rectum have always appear'd to me to be a kind of small Omenta or Appendices Epiploicæ. They are situated at different distances along these Intestines, being particular Elongations of their common or external Coat. They are of the same Structure with the great Omenta, and there is a cellular Substance contained in their Duplicature, more or less filled with Fat, according as the Subject is fat or lean.

367. NEXT the Intestine, each of them forms a broad, thin Basis, and they terminate by irregular Papillæ, thicker than their Bases. These Bases are at first disposed longitudinally, then obliquely, and lastly, more or less transversely, especially near the Rectum, and upon that Intestine.

368. THESE Appendices are for the most part separated from each other; but some of these which have longitudinal Bases communicate together, the Vestiges of these Communications being very narrow, and not very prominent. By blowing through a small Hole made in one of these Appendices, it is inflated like a small irregular Bladder, and the Air passes under the external Coat of the Colon or Rectum.

369. BESIDES these Appendices Epiploicæ, we observe at different distances along the Colon, between the ligamentary Band which lies hid, and one of the other two, that is, on both sides of the Adhesion of the Mesocolon, several

several Adipose Strata, which may likewise be look'd upon as Appendices of the same Nature with the former ; but these Strata are very seldom observed between the two apparent ligamentary Bands of the Colon.

370. THE Arteries and Veins of the great Omentum are Branches of the Gastricæ, and for that reason, go by the Name of Gastro-Epiploicæ, Dextræ and Sinistræ. The Arteries on the right side answer to the Hepatic Artery, and those on the left side to the Splenic, and both communicate with the Arteria Ventriculi Coronaria, and respectively with the Arteriæ Mesentericæ. The Gastro-Epiploic Veins answer in the same manner of Distribution, to the Vena Portæ. *Vessels of the Omentum.*

371. THE Vessels of the little Omentum come chiefly from the Coronariæ Ventriculi, and those of the Appendices and Strata are Ramifications from the reticular Texture of the Arteries and Veins of the Colon and Rectum.

§. 16. *Uses of the Abdominal Viscera described in the thirteen foregoing Paragraphs.*

372. THE Intestines in general finish what the Stomach had begun. The alimentary Pulp having been sufficiently prepared by the Succus Gastricus, or Lymph of the Stomach, undergoes a farther Change by the intestinal Lymph, Bile and Pancreatic Juice, by which the milky Liquor called Chyle is produced, and this Liquor rendered fluid enough to enter the lacteal Vessels through the Tunica Villosa of the small Intestines, while the grosser Portion of the Aliment continues its Course, and becoming gradually thicker as it advances toward the great Intestines, is there collected by the Name of Feces.

373. THE Dilatation of the Intestines is bounded by their common Coat. The undulating, successive and periodical Contraction of the fleshy Fibres, especially of the orbicular Fibres of the muscular Coat, expresses the intestinal Lymph, beats it up into an Emulsion with the alimentary Paste, strains that Emulsion through the lacteal Vessels, and propels the Residuum in the manner already said.

374. THE nervous Coat serves to sustain the Tunica Villosa, and by the oblique Disposition of its Fibres, yields to the Periodical Motions of the muscular Coat, without compressing the Chyliferous Ducts which pass through the Meshes of this Coat in the small Intestines. The Uses of the villous or internal Coat are sufficiently apparent from the Description given of it.

375. THE Length of the small Intestines gives a great Extent to what may be call'd the Strainer of the Chyle, and this Extent is very much enlarged by the numerous Folds termed Valvulæ Conniventes. By means of this large Extent, there is a great quantity of Chyle strained through these Intestines, and the Valves hinder the alimentary Pulp from passing through them too fast, that is, before all the milky Juice has been expressed ; and this

this may be observed chiefly in the Beginning of the Intestines, where these Valves are most numerous and broadest, and the Aliment most fluid.

376. THE Cavity of the great Intestines serves to receive the Feces of the Aliment, and to contain a considerable Quantity thereof for a certain Space of Time, without any inconveniency, and without being obliged to discharge them continually, which would be as great an inconveniency as any. The Incurvation of the Colon, its Cells and Contraction of its last Convolution contribute to this retention of the Feces ; but the Cæcum seems to be the first Organ thereof, because the Feces being first collected there, are obliged afterwards to move in a contrary Direction as they ascend into the Colon.

377. THE Valve of the Colon, which might more properly be termed the Sphincter or Pylorus of the Ileum, hinders the Feces from returning into the small Intestines : I say, the Feces or gross Matter, because it is not certain that this Valve intirely stops that Passage, or that it always hinders any fluid Matter forced downward by the Colon from entering the Ileum, even in a natural State.

378. THE Glandular Lacunæ of the great Intestines furnish continually a kind of Mucilage, which not only defends the internal Coat from the Acrimony of the Feces, but serves also to lubricate these Feces in proportion to their different degrees of Solidity.

379. THE Appendicula Vermiformis is so very small in Adults, that its Use cannot be determined with certainty. Perhaps the mucilaginous Matter in its Cavity, furnished by the numerous Glandular Lacunæ of its internal Coat, which can only be evacuated by Plenitude, may, during its stay there, contract an Acrimony, which may vellicate or stimulate the Cæcum, in order to throw its Contents into the Colon.

380. THE Intestinum Rectum is the last Reservatory of the Feces. The great Thickness of its muscular Coat, and the great Number of longitudinal Fibres by which this Thickness is chiefly formed, enable it to yield to the collected Feces to so great a degree, as to represent a large Bladder or Stomach. The Musculi Levatores Ani serve to suspend the lower Portion of this Intestine, especially when full ; and it is partly by the Contraction of these Muscles which overcome the Sphincter of the Anus, that the Feces are discharged out of the Body. These Sphincters form the third Pylorus of the whole alimentary Canal.

381. THE Mesentery and Mesocolon connect the Intestines, in such a manner, as that they cannot be twisted or run into Knots, without hindering them from sliding and yielding to each other according to the different Postures of the Body, or according as they are more or less empty or full.

382. THE Adhesions of the Mesentery form the Convolution of all the small Intestines into a large Bundle, irregularly round, which fills a great part of the Cavity of the Abdomen, from the Epigastrium downward.

383. THE Mesocolon by its adhesion to the Colon forms a kind of Septum Transversum, between the small Intestines and the Viscera contained in the Epigastrium ; and this Septum supports the Liver and Stomach under the

the Arch of the Diaphragm, just as much as it is sustained by the Intestines. This natural Situation of these Viscera is most commonly altered in dead Bodies opened after the common Method, and without the necessary Precautions.

384. THE breadth of the Mesentery and Mesocolon affords a large extent to the Ramifications of the Arteries, Veins and Nerves distributed through them by innumerable Communications and Anastomoses, by means of which any Portion of the Intestines may be supplied, though the principal Branch which leads to it should happen to be compressed or obstructed.

385. THE cellular Substance in the Duplication of the Mesentery and Mesocolon, serves not only for a soft Bed to all these Ramifications, but also to contain those Collections of Fat, necessary for the Formation of the Bile, as I shall observe hereafter; and the cellular Substance of the Mesentery has likewise one Use peculiar to it, which is to invest the Lymphatic Glands and Lacteal Vessels, and upon this account it is thicker than that of the Mesocolon.

386. THE Lacteal Vessels being first formed by a copious reticular Texture round the Circumference of the Intestines, resembling the vascular Network of that Canal, and afterwards uniting every where through the Duplication of the Mesentery, with the arterial Ramifications which they likewise accompany in many places; it is easy to conceive that the Pulsation of the Mesenteric Arteries must propel the Chyle in the Lacteal Vessels from the Intestines to the Receptaculum Chyli, that Motion being suitable to the Direction of their Valves.

387. THE Liver is the principal Organ for the Secretion of the Bile. The Villi of that immense Number of Glandular Cells of which it is composed, filtrate continually from the Blood of the Vena Portæ, small Drops of Bile which afterwards insinuate themselves into the Pori Bilarii, and are in part lodged in the Vesicula Fellea, and in part run directly into the Duodenum, in the manner already explained in describing the Biliary Ducts.

388. THE Spleen, Omentum, Appendices Epiploicæ, Adipose Strata of the Mesentery, and those of the great Intestines, and even the Pancreas, with the whole Series of Glands in the intestinal Canal, seem to contribute to the Formation of the Bile, as so many auxiliary or rather preparatory Organs; but each of them in a different way.

389. It appears, (1.) That the Venal Blood that returns from all the Intestinal Glands, and from the Pancreas, has left a great Portion of its Serum. (2.) That the Blood which returns from the Spleen has undergone a certain Change, by its Course being mechanically retarded, and likewise that its Texture is altered by the Action of the numerous Nerves sent thither by the Plexus Splenicus. (3.) That the Blood which returns from the Omentum, Appendices Epiploicæ, and from the Strata and other Collections of Fat, is loaded with Oil.

390. THESE three kinds of Venal Blood meet in the Trunk of the Vena Portæ Ventralis, where they are mixed together, and from thence they enter the transverse Sinus or Trunk of the Vena Portæ Hepatica. In this Sinus they are still more intimately mixed, as in a kind of Lake, and become

come one uniform Mass of Blood, which being forced into the Branches of the Vena Portæ Hepatica, only by the supervening Blood, from the other Vena Portæ, and by the lateral Pulsations of the Ramifications of the Hepatic Artery, its Course must be very slow. The Secretion of the Bile depends partly on this slow Motion, and partly on these external Impulses, as I shall show in another place.

391. THE vesicular Bile appears to be more exalted than that in the Hepatic Duct; and by meeting in the Ductus Cholidochus, they seem to compose a third kind of Bile, which without the Cystic or Vesicular Bile would perhaps be too mild; and too acrid without the Hepatic. This Bile mixes in the Duodenum with the Pancreatic Juice, and with that of the intestinal Glands, and from this Mixture a Fluid results, which is proper to separate the Chylous Matter from the gross and useless Part of the alimentary Pulp, as it comes from the Stomach.

§. 17. *Renes & Ureteres.*

*Situation,
Figure, and
Division of
the Kidneys.*

392. THE Kidneys are two pretty solid, glandular Bodies, situated in the posterioir Part of the Cavity of the Abdomen, on each side of the Lumbar Vertebræ, between the last false Ribs, and Ossâ Ilium. The right Kidney lies under the great Lobe of the Liver, and is consequently lower than the left, which lies under the Spleen.

393. THE Figure of the Kidneys resembles that of a large Bean, their Circumference being convex on one side, and concave on the other. The concave Side is turned to the Vertebræ, and the convex Side, the opposite way. Their Length answers to the Distance between the last false Rib, and Os Ilium; they are about half as broad as long, and half as thick as broad.

394. IN each Kidney we observe a fore and back side; an upper and lower Extremity; a great and small Curvature, and a Convexity and Concavity.

395. THE back-side is broader than the fore-side; and the upper Extremity is a little broader and more incurvated than the lower. The Depression in the small Curvature is oblong and uneven, resembling a Sinus, surrounded by several Tubercles; and as it is turned a little toward the fore-side, this side is something narrower than the other.

*Blood-Vessels of the
Kidneys.*

396. THE descending Aorta and inferiour Vena Cava lie between the Kidneys, pretty close to the Bodies of the Vertebræ, and to each other; the Artery being on the left hand, the Vein on the right. Each of these large Vessels sends out transversely toward each side, commonly one capital Branch, which goes to the Kidney, and enters the Sinus or Depression thereof, by several Rami, of which hereafter.

397. THESE Vessels were by the Ancients termed the emulgent Arteries and Veins, but I chuse rather to call them Arteriæ Venæ Renales. Sometimes there are more than one of each kind, which is ofteneft found in the Arteries, sometimes on one side only, and sometimes in both.

398. THE Artery and Vein are not of an equal length, and the difference depends on the Situation of the Aorta and Vena Cava; for the left Renal Artery is shorter than the right, because the Aorta lies nearest the left Kidney; and the left Renal Vein is longer than the right, because the Vena Cava lies furthest from the left Kidney.

399. THESE Vessels are likewise disposed in such a manner, as that the Veins lie more anteriorly than the Arteries; because the Aorta lies close to the Spina Dorsi; whereas the Vena Cava which perforates the Diaphragm at some distance from the Vertebrae, does not join them, till after it has given off the Renal Veins.

400. EACH Renal Artery is surrounded by a nervous Net-work, called *Nerves of the Plexus Renalis*, which furnishes a great number of Filaments to the Kidneys, that come partly from the Semilunar Ganglions of the two great Sympathetic Nerves, and partly from the Plexus Hepaticus and Splenicus. This Renal Plexus sends likewise some Filaments round the Renal Veins.

401. THE Kidneys are surrounded by a very loose membranous and cellular Covering, called *Membrana Adiposa*, because in fat Persons the Cells of this Substance are filled with Fat. This was for a long time impertinently taken for a Duplication of the Peritonæum, the true membranous Lamina of which, covers only the foreside of the Kidneys; and consequently they lie without the Peritonæum, because the Portion of that Membrane that covers them cannot be looked upon as an intire Coat; so that the only common Coat they have, is the cellular Substance which likewise invests the Renal Arteries and Veins in form of a Vagina. *Coats of the Kidneys.*

402. THE proper Coat or Membrane of the Kidneys is composed of two Laminæ, between which there is likewise a very fine cellular Substance, which may be made sensible by blowing through a Pipe between the two Laminæ.

403. THE external Lamina is very thin, and adheres closely to the internal Lamina, by means of the cellular Substance. The internal Lamina penetrates every where by numerous Elongations, into the Substance of the Kidney, from which it cannot be separated without tearing.

404. THE Surface of the external Lamina is very smooth, polished and glistening, and it renders the whole Surface of the Kidney very even and uniform in Adults. In Children, this convex Surface is in a manner divided into several Lobes or Tubercles, almost as in Oxen and Calves; and in grown Persons we sometimes observe the same Inequalities.

405. THE Blood-Vessels having entered the Kidneys, are ramified every way, and these Ramifications send out other capillary Rami, which go all the way to the Surface, where they appear like irregular Stars, and furnish the proper Membrane of the Kidneys. Sometimes these two Ramifications penetrate to the *Membrana Adiposa*, and communicate there with the Arteriæ and Venæ Adiposæ.

406. THE proper Membrane having surrounded the Kidney, all the way to the Sinus, joins the Vessels at that place, and accompanies all their Ramifications through the Body of the Kidney, in form of a Vagina or Cap-

fula, and likewise contributes in part to form the Pelvis and Calices or Infundibula, of which hereafter.

407. WE sometimes observe a considerable Vessel to go in or come out from the convex Surface of the Kidney, but this is not common; and in that case there is a Depression by which the proper Membrane enters, and communicates with that Portion which goes in by the Sinus.

408. THE Tunica Adiposa or common Coat, which likewise invests the great Vessels to their entry into the Kidneys, does not seem to accompany them any further; but terminates at the Sinus, in the Interstices between the Ramifications.

*Structure of
the Kidneys.*

409. WE may distinguish three kinds of Substances in the Kidney; an exterior Substance, which is thick, granulated, and in a manner Cortical; a middle Substance, which is medullary and radiated, called Striata, Sulcata or Tubularis, because it seems to be made up of radiated Tubes; and an inner Substance, which is only a Continuation of the Second, and terminates on the inside by Papillæ; for which reason I have given it the name of Papillaris.

410. THESE three Substances may be seen distinctly in a Kidney cut into two equal Parts, through the great Curvature. The Cortical Substance may be observed round the whole Circumference; and by the Microscope, we perceive it to be of a spongy, granulated, and waving Texture, all its Parts adhering together in a radiated manner. Its Colour is a bright whitish Grey.

411. BY fine anatomical Injections and in Inflammations, we discover an infinity of small Capillary Vessels, which run in various Directions, between and round the different Portions of this Substance, and by the help of a Microscope, we see likewise great numbers of small red Corpuscles more or less round, and disposed almost like Bunches of Currants. These small Corpuscles are perhaps only the Extremities of the cut Vessels, filled either with Blood or with a coloured Injection.

412. THE other two Substances, that is, the Medullary or Striated and Papillary, are really but one and the same Mass, of a more reddish colour, the convex side of which rises at several places into narrow Tubercles, lodged in the same number of Cavities or Depressions. The radiated Striæ are afterwards continued to the Papillary Portion; and the Papillæ form in some measure so many Centers of these Radii, opposite to the Tubercles.

413. THE medullary Substance is likewise distinguished from the Cortical, by the arterial and venal Arches, which send Capillary Ramifications on all hands; and its Colour is more or less red.

414. THE Papillæ, which are only a Continuation of the medullary Substance, as has been said, are often a little paler than that Substance. They are ten or twelve in number, very distinct from each other, resembling the same number of Cones, with very broad Bases and obtuse Apices.

415. AT the Point of each Papilla we see, even without a Microscope, in a small Depression, several very small Holes, through which little Drops may be perceived to run when the Papillæ are compressed. These are little Drops of Urine, which being filtred, partly in the cortical, partly in the medullary or tubular Substance, do afterwards pass through the Substance of the Papillæ, and are discharged by these Orifices.

416. EACH Papilla lies in a kind of membranous Calix or Infundibulum, which opens into a common Cavity, called the Pelvis. This Pelvis is membranous, being of the same Structure with the Calices, of which it is a Continuation; and its Cavity in Man is not uniform, but distinguished into three Portions, each of which contains a certain number of Infundibula or Calices, together with the Papillæ which lie therein: and sometimes we find two or three Papillæ in the same Infundibulum.

*The Pelvis of
the Kidneys.*

417. AT the place where these Infundibula surround the Bases of the Papillæ, they send Productions into the medullary or radiated Substance of the Kidney, which accompany the Blood-Vessels, and serve for Capsulæ or Vaginæ to all the vascular Arches, both Arterial and Venal, and to their different Ramifications, quite through the Cortical Substance, and as far as the Surface of the Kidney.

418. AFTER the Infundibula have contracted in a conical Form round the Apices of the Papillæ, each of them forms a small short Tube or Gullet, which uniting at different distances along the bottom of the Sinus of the Kidney, form three large Tubes which go out from the Sinus, in an oblique Direction from above downwards, and immediately afterwards unite into one Trunk.

Ureters.

419. THIS Trunk becomes a very long Canal, called the Ureter. In Men, the three Tubes supply the place of what is called the Pelvis in Brutes, and might more properly be called the Roots or Branches of the Ureters than the Pelvis; which name would agree best to the Trunk, as being larger than the rest of the Ureter. The Ureters are commonly two in Number, one for each Kidney, but sometimes there are more than two.

420. THE Situation of the Trunk, and of the Roots and Branches of each Ureter, with respect to the renal Artery and Vein, is in the following manner: The Artery is in the upper part of the Sinus, and partly before the Vein. The Vein is about the middle, and between the Artery and Ureter. The Ureter is in the lower part, a little behind the Vein, and it is partly surrounded by one Branch of the Artery.

421. THIS Disposition appears plainer near the antierior than near the posterioir side of the Kidney, because this last is broader than the former; and we likewise see there the three Branches of the Ureter, of which the uppermost is the longest, and the lowest is the shortest, because of their oblique Direction downward.

422. FROM this Description, we see that in the Human Kidney there is no other common or uniform Pelvis, but the Trunk or Head of the Ureter, and the three great Branches. To have a true Idea of their Disposition, we

must

must imagine that the Ureter enters the Kidney by the lower part of the oblong Sinus; that it increases gradually in breadth as it advances, and that it is divided into three Branches, before it enters the Substance of the Kidney.

423. ONE of these Branches may be reckoned a direct Continuation of the Ureter, and it is longer than the rest; being extended from the lower to the upper part of the Sinus, and it may be found without much preparation. The other two Branches are shorter, and cannot be well discovered without an artificial Separation. The Angles between these Branches at their Bases, or at the head of the Ureter, are not pointed as those of other Ramifications, but formed by a round Incurvation, which is generally surrounded by Fat.

424. THESE first Branches of the Ureters produce other small Branches at the bottom of the Sinus, which are disposed in Pairs. These small collateral Branches extend in breadth, and form the Infundibula or Calices, in which the Papillæ are lodged; the great Circumference of which, produces in the Substance of the Kidney, the different Vaginæ of the vascular Arches and of their Ramifications. The internal Lamina of the Kidney is continued round these Vaginæ, and the external Lamina is expanded round the first Branches, round the Trunk, and round all the rest of the Ureter.

425. IF the Trunk of the Ureter be split on that side which is next the Vertebrae, and this Section be continued to the Extremity of the superiour Branch, we may observe immediately above the Trunk, two Holes lying near each other, which are the Orifices of the small collateral Branches, and Gullets of the Infundibula. A little above these Holes, there are other two very much like them, and so on all the way to the Extremity of the superiour Branch, which terminates likewise by these Gullets of the Infundibula; and in each of these Gullets we may observe at least the Apex of one Papilla.

426. A Section begun on the convex Surface of the Kidney, and carried from thence to the Trunk of the Ureter, discovers the Extent of the Papillæ very plainly, and likewise the Infundibula, their Gullets, &c. but it will be difficult to give Beginners a just Idea of the Structure of these Parts, without the other Section.

427. THE Ureters run down obliquely, and with a very small degree of Inflexion, from the Kidneys to the lateral Parts of the inner or anterior side of the Os Sacrum, and passing between the Rectum and Bladder they terminate in the last of these Viscera in the manner that shall be explained hereafter.

428. THEY are composed of three proper Coats; the first of which, that surrounds the rest, is of a whitish Colour, and of a very compact filamentary Texture, being stretched with difficulty, and appearing like a filamentary Substance degenerated. The next Coat is of a reddish Colour, stronger than the first, and made up of different Strata of Fibres, which intersect each other; but it is very hard to determine, whether they are muscular or simply membranous.

429. THE innermost Coat is in some measure ligamentary, and lined by a very fine Membrane, which covers a very delicate reticular Texture of Vessels. It is slightly granulated like shorn Velvet; and moisten'd all over by a mucilaginous Liquor. It has several longitudinal Rugæ, which are intersected by a great number of small transverse Rugæ.

430. BESIDES these proper Coats, the Ureters are invested by the cellular Substance of the Peritonæum; the membranous Lamina of which, covers likewise about two thirds of their Circumference, sometimes more, sometimes less, but never surrounds them intirely: so that when they are examined in their natural Situation, they appear like Ropes lying behind the Peritonæum, and jutting out more or less toward the Cavity of the Abdomen, together with that Portion of the Peritonæum, which covers them.

431. ALL that has been said about the Structure of the Ureters, Pelvis, Arches, Striæ, Fossulæ, and Holes at the Apex of the Papillæ, appears most distinctly, when these Parts are examined in clear Water, as I have already often observed.

§. 18. *Glandulæ Renales, vulgò Capsulæ Atrabiliaræ.*

432. IMMEDIATELY above each Kidney, lies a glandular Body, called by the Ancients Capsulæ Atrabiliaræ; by others Capsulæ Renales, Renes Succenturiati, and Glandulæ Renales; and they might be properly enough termed Glandulæ Supra-Renales. They are situated on the upper Extremity of each Kidney a little obliquely, that is, more toward the inner Edge and Sinus of the Kidney than toward the outer convex Edge.

*Situation,
Figure and
Size of the
Renal
Glands.*

433. EACH Gland is an oblong Body with three sides, three Edges and two Points, like an irregular Crescent with its great or convex Edge, sharp, and the small concave Edge, broad. Its length is about two thirds of the greatest breadth of the Kidney, and the breadth of its middle Portion is about one third of its Extent between the two Extremities, sometimes more, sometimes less. Its Colour is a dark Yellow.

434. IT has one anteriour, one posteriour, and one lower side, which last may be termed the Basis; and it has one upper, and two lower Edges, whereof one is anteriour, the other posteriour. The upper Edge may be called the Crista, and the two lower Edges, the Labia. One of its Extremities is internal, or turned inward toward the Sinus of the Kidney; the other is external, or turned outward toward the gibbous part of the Kidney. The Figure of this glandular Body may likewise be compared to that of a single Cock's-Comb, or to the Top of an Helmet.

435. THE Surface of these Glands is uneven; the fore side is the broadest and the lower side or Basis the narrowest. Along the middle of the anteriour side, a Ridge runs from the Edge of the inner Extremity a little above the Basis, to the Point of the other Extremity, and divides this side into two equal Parts, like the middle Rib of the Leaf of a Tree, and on the lower side under the Basis, there is a kind of Raphe or Suture.

*Structure of
the Renal
Glands.*

436. THE Blood-Vessels of these Glands, come from the Arteriæ, and Venæ Renales, and Diaphragmaticæ, and likewise from the Aorta and Vena Cava, from the Arteria Cæliaca, &c. These Vessels are termed the Capsular Arteries and Veins, and as they enter the Glands, they seem to be invested by a Vagina. They are not always derived from the same Sources, neither is their number the same in all Subjects; and there is commonly a pretty large Vein, which runs along the Ridge. The Nerves on each side, are furnished by the neighbouring Semilunar Ganglion, and by the Renal Plexus which depends on it.

437. IN the inside of these Capsulæ, there is a narrow triangular Cavity, the Surface of which is full of short, strong Villi of a yellowish Colour; but in Children it is reddish, and of a dark brown in aged People. The sides of this Cavity are connected by a great number of Filaments; and they appear to be wholly glandular, that is, to be filled with very fine small Folliculous Corpuscles. Along the top of the Gland, these sides touch each other immediately.

438. IN opening this Cavity, we find a granulated or follicular Substance, which fills it almost intirely; and the Blood-Vessels are distributed on this Substance, as well as on the sides of the Cavity. If the Section be begun at the great Extremity of the Capsula, and be continued through the upper Edge; and if the lateral Portions be afterwards separated, the glandular Body appears like a kind of Crista, raised from the middle of the Bottom of the Cavity.

439. THIS glandular Body or Nucleus, adheres more closely to the Bottom or Basis of the Cavity, than to the two sides, especially near the great Extremity; but yet it may be separated, both from the Basis and Sides, being connected to them by a great number of small Filaments. It adheres least to the Basis near the small Extremity.

440. THE Capsular Vein, which comes ordinarily from the Vena Renalis, is much larger than the Arteries; and it communicates with the inside of the Capsula, much in the same manner as the Vena Splenica, with the Cells of the Spleen, for it may be inflated by blowing into any part of the capsular Cavity, and the Air likewise passes into the Vena Renalis, &c.

441. THIS Cavity contains an unctuous viscid Liquor, of a yellowish red Colour, which with Age, changes gradually into a yellowish Purple, a dark Yellow, and a black Yellow; and sometimes it is perfectly black, but even then if it be spread thin on a large Surface, it appears yellow. I have sometimes found it not only reddish, but mixed with real Blood.

442. THE Uses of these Renal Glands have not as yet been discovered; and all that we know about the Liquor contained in them, is, that it resembles the Bile. They are very large in the Fœtus, and diminish in Adults. These two Phænomena deserve our Attention.

443. THEY lie sometimes directly on the top of the Kidneys, but I never found them on the gibbous part. The Gland on the right side is partly connected to the Diaphragm, under and very near the Adhesion of the great Lobe of the Liver to that Muscle. That on the left side adheres to the Diaphragm

Diaphragm below the Spleen; and both these Connexions are confined to the contiguous Portions of the inferiour Muscle of the Diaphragm. They are involved together with the Kidneys, in the Membrana Adiposa, of which a very thin Portion insinuates it self between the Kidneys and Glands, and also between them and the Diaphragm; so that they adhere to both by the Intervention of the cellular Substance, which in some Subjects contains a Stratum of Fat.

444. THE venal Ridge already mention'd, sinks so deep into the fore-side in some Subjects, that the upper part of this side appears to be separated from the lower; but this is seen most distinctly when the Capsula is examined in clear Water.

445. WHEN the capsular Vein is opened lengthwise with the Point of a Lancet, we discover in it a great many small Holes, many of which are only the Orifices of the Rami of the Vein, others are simple Holes; and it is perhaps through these that the Air passes into the Gland, as already mentioned.

446. ON the outer Surface of these Capsulæ, we observe a very thin, distinct Coat, separate from the cellular Substance that surrounds them. Sometimes this Coat is raised by an uneven Stratum of Fat, which makes it appear granulated; and for the same reason, the Capsulæ are of a pale colour like a Corpus Adiposum.

447. THE Liquor contained in them appears sometimes in the Fœtus, and in young Children, of a bluish Colour inclined to red.

448. To be able to discover the Uses of these Capsulæ, we must not only attend to the two Circumstances already mentioned, but also to their external Conformation, which is commonly more regular in the Fœtus, and in Children, than in Adults and old People. We must likewise consider the Consistence and Solidity of their Substance, which is greater before Birth, and in Childhood, than in an advanced or old Age; in which they are often very flaccid, and very much decay'd: and this perhaps may be the reason, why the Figures given of these Glands taken out of their Membrana Adiposa, are so very irregular and different from what I have demonstrated for above twenty Years past.

§. 19. *Vesica Urinaria.*

449. THE Bladder is a kind of membranous and fleshy Pouch or Bottle, capable of Dilatation and Contraction, situated in the lower part of the Abdomen, immediately behind the Symphysis of the Ossa Pubis, and opposite to the beginning of the Intestinum Rectum. The Figure of it, is nearly that of a short Oval. It is broader on the fore and back sides, than on the lateral Parts; rounder above than below, when empty, and broader below than above, when full.

*Situation,
Figure, and
Division of
the Bladder.*

450. IT is divided into the Body, Neck and Bottom; into an antierior, posterioir, and two lateral Parts. The upper part is termed the Fundus or Bottom.

Bottom, and the Neck is a Portion of the lower part, which is contracted like the Gullet of some Vessels.

*Structure of
the Bladder.*

451. THE Bladder is made up of several Coats, almost like the Stomach. That Part of the external Coat which covers the upper, posteriour and lateral sides of the Bladder, is the true Lamina or Membrane of the Peritonæum; and the rest of it is surrounded by a cellular Substance, by the intervention of which, the Peritonæum is connected to the muscular Coat.

452. THE proper Coats are three in number, one muscular, one nervous, and one villous, which is the innermost. The muscular Coat is composed of several Strata of fleshy Fibres; the outermost of which, are mostly longitudinal; the next to these are more inclined toward each Hand; and the innermost, more and more oblique, and they become at length almost transverse. All these Fibres intersect each other in various manners, and they are connected together by a fine cellular Substance, and may be separated by inflating that Substance.

453. THE nervous Coat is nearly of the same Structure with the Tunica Nervosa of the Stomach.

454. THE internal Coat is something granulated and glandular, and a mucilaginous Serum is continually discharged through it, which moistens the inner Surface of the Bladder, and defends it against the Acrimony of the Urine. It appears sometimes altogether uneven on the inner side, being full of Eminences and irregular Rugæ when empty, and in its natural State of Contraction. These Inequalities disappear when the Bladder is full, or when it is artificially distended by Air, or by injecting any Liquid.

Urachus.

455. AT the top of the Bladder above the Symphysis of the Ossa Pubis, we observe a ligamentary Rope, which runs up between the Peritonæum and the Linea Alba of the Abdomen, all the way to the Navel, diminishing gradually in thickness, as it ascends. This Rope had a particular use in the Fœtus, as shall be said in another place. It is sufficient to add here, that it is in part originally a Production of the inner Coats of the Bladder, which Production is termed Urachus.

*Arteriæ
Umbilicales.*

456. THIS Rope is composed likewise of two other ligamentary Elongations, which are the Extremities of the umbilical Arteries. These Arteries come from the Hypogastricæ, run up by the sides of the Bladder, and remain hollow and filled with Blood, even in Adults, as high as the middle of the Bladder, through all which Space they likewise send off Ramifications. Afterwards they lose their Cavity, and become ligamentary as they ascend. At the upper part of the Bladder, they approach each other, and joining the Urachus, form that Rope, which may be termed the superiour Ligament of the Bladder.

457. THE external Fibres of the muscular Coat, are more numerous than the internal; and the most longitudinal anterior Fibres, form a kind of Incurvation round the Urachus at the top of the Bladder, much like that of one of the fleshy Portions, which surround the superiour Orifice of the Stomach, and lower Extremity of the Œsophagus. This Incurvation passes behind the Urachus.

458. THE Portion of the Peritonæum, which covers the posteriour convex side of the Bladder, forms a very prominent, transverse Fold, when the Bladder is contracted which disappears when the Bladder is extended. This Fold surrounds the posteriour half of the Bladder, and its two Extremities are elongated toward each side; by which Elongations a kind of lateral Ligaments of the Body of the Bladder is formed, which are more considerable in Children, than in Adults.

459. THE lower part of the Bladder, which deserves the name of Fundus much better than the upper Part, is perforated by three Openings, one anteriour, and two posteriour. The anteriour Opening is formed by an Elongation of all the proper Coats, in form of a Gullet, turned much in the same manner with the inner Orifice of the Rostrum of the Head of an Alembic. This Elongation is called the Neck of the Bladder, the Description of which belongs to that of the Parts of Generation in Men.

460. THE other two Openings in the true Fundus of the Bladder, are formed by the Ureters, which in their Course downward already described, run behind the spermatic Vessels, and then behind the lower part of the Bladder, approaching each other. Each Ureter lies between the umbilical Artery, and Vas Deferens of the same side; the Artery lying on the outside of the Ureter, and the Vas Deferens on the inside.

461. AFTERWARDS they get between the Vasa Deferentia and the Bladder, crossing these Canals; and then at about a Finger's breadth from each other, they begin to pierce the Coats of the Bladder. They run a little way between the muscular and nervous Coats, and open into the Bladder obliquely, something nearer each other, than when they first entered its Coats.

462. THE Orifices of the Ureters in the Bladder are something oval and narrower than the Cavity of the Ureters immediately above them. The Edge of these Orifices is very thin, and seems to be formed meerly by the Union of the internal Coat of the Bladder, with that of the Ureters.

463. THE Arteries of the Bladder are furnished by the Hypogastricæ *Blood-Vessels and Nerves of the Bladder.* or Iliacæ internæ; being Rami of the Arteria Sciatica, Epigastrica and Umbilicalis on each side. The Veins come from those of the same Names with the Arteries.

464. THE Nerves of the Bladder come from the Crurales, and also from the Sympathetici Maximi, by means of their Communication with the Crurales. It has likewise some Nerves from the Plexus Mesentericus inferior.

465. BESIDES the Ligaments already mentioned, there are likewise two small ones, by which the anteriour part of the true Fundus of the Bladder is connected to the Ossa Pubis, which shall be described with the Neck and Sphincter, after the History of the Parts of Generation in both Sexes; and I refer to the same place, all that relates to the Connexion of the Bladder with the other neighbouring Parts.

§. 20. *The Parts of Generation in Males.*

*Situation in
general, and
Division of
these Parts.*

466. THE Parts of Generation in Males are of different kinds, some of them being wholly contained in the Abdomen, and others lying without it. From this Situation, they might properly enough be divided into external and internal Parts; and all those belonging to the first Class might be described before those of the second.

467. BUT as it is still more proper to have a regard to the Œconomy of these Parts, according to which, their Functions begin in some internal Parts, are continued in some external Parts, return again to the internal, and are finished in the external; I shall follow the same Order in describing them, and this is what I constantly observe in my publick Lectures.

468. THE first of these four Classes comprehends the spermatic Veins and Arteries; the second, the Testes, Epididymes and Scrotum; the third, the Vasa Deferentia, Vesiculæ Seminales, and Prostates; and the fourth, the Corpora Cavernosa, Urethra, Integuments, &c.

469. I formerly made a fifth Class out of some of these Parts, which I look'd upon as accompanying the rest; but I now think it better to include them all in the four Classes that I have mention'd.

*The sper-
matic Ves-
sels.*

470. THE spermatic Arteries go out most commonly from the anterior Part of the inferior Aorta, near each other, and about an Inch lower than the Arteriæ Renales. Their Origin oftentimes varies; for I have observed them to arise from the Renal Artery; and sometimes they go out higher, lower or more laterally than is common, and each Artery has been seen to arise from different Places.

471. THEY run down obliquely in the posterior part of the Abdomen, within the cellular Substance of the Peritonæum, passing insensibly from behind, forward; and so parting gradually more and more from the Aorta, they cross over the foreside of the Ureters, and run through the Openings or Rings of the abdominal Muscles, along with the Elongations or Productions of the cellular Portion of the Peritonæum.

472. THEY are small at their Origin, and in their Course downward, they give off pretty considerable lateral Ramifications, to the Membrana Adiposa, Peritonæum, and also to the Mesentery, where they seem to communicate with the Mesenteric Arteries.

473. THEY sometimes pass through the Areolæ, or Meshes of the spermatic Veins; and before they go out of the Abdomen, they are divided into very fine Rami, which run in a more or less winding Course, almost parallel to each other.

474. AFTERWARDS they enter the cellular Productions of the Peritonæum, which serve them for Vaginæ. They do not fluctuate indifferently from one side to the other of these Vaginæ; but are connected along their inner Surface by thin membranous Laminæ, which are likewise Continuations of the cellular Substance of the Peritonæum.

475. THE Arteries continue the same winding Course within these Vaginae, passing before the Vasa Deferentia, which are likewise contained in them; and at length they terminate by Ramifications in the Epididymes and Testes, in the manner that shall be afterwards explained.

476. THE spermatic Veins accompany the Arteries, and have nearly the same Course. The right Vein arises commonly from the Trunk of the Vena Cava, in the same manner as the Artery from the Aorta; and I have sometimes observed it to go out from the Union of the right Renal Vein with the Vena Cava, and sometimes I have seen three Veins on the right side, go out separately from the Trunk of the Vena Cava. The left spermatic Vein arises most commonly from the Vena Renalis Sinistra.

477. IN their Course downward, they first join the Arteries, and together with them, enter the cellular Productions of the Peritonæum, to which they are connected in the same manner. From their Origin to their Passage through the Openings or Rings of the abdominal Muscles, they send off several Rami to the Membrana Adiposa of the Kidneys, Peritonæum and Mesentery, where they seem to communicate with the Venæ Mesaraicæ, and consequently with the Vena Portæ.

478. A little below the place where they cross over the Ureters, they send out a considerable Branch, which is afterwards divided into two Rami, one of which communicates with the Vena Capsularis, and the other oftentimes with the Renalis; and lower down they give out the Vein, which communicates with the Vena Mesaraica, as already observed.

479. THEY differ from the spermatic Arteries, not only in that they are larger, and their Coats thinner, but also in being more divided and multiplied, as they descend to the Rings of the abdominal Muscles; and as they gradually produce a large Fasciculus of Ramifications, the Ancients gave to them and to the Arteries, the Name of Vasa Pyramidalia.

480. THESE Ramifications often communicate with each other in this Course, and form a great number of Areolæ, Contortions and Convolutions, so as to represent a kind of Plexus, which is connected to the cellular Vagina of each side, by very fine Laminæ; and the Artery which accompanies the Vein, crosses it in several places, and runs through the Areolæ in different Directions. These frequent Convolutions gave rise to the Name of Vasa Pampiniformia, formerly given to these Vessels; and their particular Adhesions to each other at some places, made it be believed, that there were real Anastomoses between the Artery and the Vein.

481. *Leal Lealis* an Italian Anatomist not attending to the lateral Ramifications of the spermatic Arteries and Veins, believed himself able to establish and demonstrate these pretended Anastomoses. The Experiments made by him on living Animals, prove nothing. His way was to make a common Ligature on both Vessels, a little above the Testicle, and another on the Trunk of the Vein, after he had emptied it. Then pressing the Aorta to force the Blood into the spermatic Artery, the Vein which he had before emptied, was found to be presently filled.

482. FROM thence he concluded, that the Course of the Blood to and from the Testicle being obstructed by the inferiour Ligature, there must be some Anastomoses between the two Ligatures, through which the Vein was supplied with Blood. But it is very plain, that this Effect was owing to the lateral Ramifications of the spermatic Artery and Vein, and not to his pretended Anastomosis. These fine lateral Ramifications were well known to *Eustachius*, but had escaped *Leal Lealis*.

Testes.

483. THE Testes are two glandular Bodies, situated near each other, without the Abdomen, below the Interstice between the Groins in an Adult. The Ancients named them Didymi or Gemini. Their size is nearly that of a Pidgeon's Egg, and they are of an oval Figure, a little flatted at each side. We may consider in each Testicle, two Extremities, two Edges and two Sides. One Extremity is situated forward, and a little upward, the other backward, and a little downward; and their Edges lie upward and downward.

484. AT the upper Edge, they have each an Appendix, called Epididymis, together with which it is involved in several Coverings; and they are both suspended in a common Covering, called the Scrotum.

485. EACH Testicle is a spermatic Gland formed by a vast number of fine whitish Tubes, folded and twisted in different manners, and distributed in different Fasciculi, between membranous Septa; the whole being surrounded by a strong common Covering, named Tunica Albuginea.

486. THESE Septa are disposed longitudinally, divaricating from each other on one side, and approaching on the other. They approach each other along one Edge of the Testicle, and terminate in a long narrow whitish Body, as in a kind of Axis.

487. FROM thence they divaricate in a regular manner, and are fixed by their opposite Edges in the inner Surface of the Tunica Albuginea, of which they appear to be a Continuation. This white Body may be termed the Nucleus of the Testicle.

488. FROM this Description, we see that all these Septa are not of an equal Breadth; that the Interstices between them are in some measure triangular; and that the Extent of the small Tubes, which lie therein, must be very considerable. They have been reckoned to amount to many Ells, by taking the Sum of all their several Portions; and they may be easily unfolded by a long Maceration, which destroys the delicate Substance by which all their Folds and Convolution are connected and tied down.

489. ALL these small Canals seem to terminate by a smaller number of common Trunks at the white Body or Nucleus already mentioned; which Trunks do afterwards pierce the upper part of the antierior Extremity of the Testicle, and are disposed in several Folds along the lateral external Part of the upper Edge, all the way to the posterior Extremity. From this Union arises a long whitish, plaited Fasciculus or Bundle, called Epididymis, which is a *Greek* Term signifying an Appendix to the Testicle.

Epididymis.

490. THE Epididymis thus formed, may be reckoned a Production of the Testicle, or a kind of Testis Accessorius; and it resembles in some measure an Arch

Arch supported by its Center or Frame. It is more contracted at the middle, than at the Extremities, by which it is closely united to those of the Testicle.

491. BETWEEN its Extremities it does not immediately touch the Testicle, but is only loosely connected to it, by the Duplicature of a very fine and almost transparent Membrane, as by a kind of Ligament. This Membrane is the Continuation and Duplicature of the Tunica Albuginea or proper Coat of the Testicle, which having supplied the place of a Ligament to the Epididymis, afterwards invests it.

492. THE Epididymis is flat, a little concave on the under side, or that next the Testicle, irregularly convex on the upper side, or that turned from the Testicle; and these two sides are distinguished by two angular Edges; by the innermost of which, it is connected to the Testicle, in the manner already said, but the outer Edge and flat side are loose and free.

493. THE antierior Extremity or Head of the Epididymis arises from the Testicle; and the posterioir Extremity or Tail, which likewise adheres very closely to it, is incurvated from behind, forward, and a little upward, and contracting by degrees, forms a particular Canal, termed Vas Deferens, which shall be described after the Scrotum. By this Description of the Extremities and Edges of the Epididymis, I demonstrated many Years ago, a Method to discover whether a Testicle view'd extra Situm belongs to the right or left side.

494. THE Scrotum is the Cutaneous Covering of the Testes. Outwardly, *Scrotum.* it is a Bag common to both, formed by a Continuation of the Skin of the neighbouring Parts, and commonly very uneven, having a great number of Rugæ on its outer Surface. Interiorly it is fleshy, and forms a muscular Capsula for each Testicle, termed Dartos.

495. THE exterior or cutaneous Portion of the Scrotum is nearly of the same Structure with the Skin in general, of which it is a Continuation; only it is something finer, and it is likewise plentifully stored with sebaceous Glands and Bulbs or Roots of Hairs.

496. THO' it is a common Covering for both Testicles, it is nevertheless distinguished into two lateral Parts by a superficial and uneven prominent Line, which appears like a kind of Suture, and from thence has been termed Raphe.

497. THIS Line is a Continuation of that which divides in the same manner, the Cutaneous Covering of the Penis, and it is continued through the Perinæum, which it divides likewise, all the way to the Anus. It is only superficial, and does not appear on the inside of the Skin.

498. THE inner Surface of this cutaneous Bag is lined by a very thin cellular Membrane, through which the Bulbs and Glands appear very distinctly when we view its inside. The Rugæ of the Scrotum are in the natural State commonly a mark of Health, and then its Size is not very large. It increases in Size, chiefly according to its length, and then the Rugæ disappear more or less according to the Degrees of the preternatural State or Indisposition.

Dartos.

499. THE Dartos or fleshy Portion of the Scrotum, is a true cutaneous Muscle; the Fibres of which are for the most part strongly connected to the Skin, running through the cellular Substance which lies between these two Portions in place of a Membrana Adiposa, but without the least Appearance of Fat. This Muscle is thin, and by the Disposition of its Fibres forms a Bag with two Cavities, or two small Bags joined laterally to each other, and contained within the cutaneous Portion.

500. THE lateral parts of these two Bags, which are turned from each other, are longer than those which are joined together; and by this Union a Septum is formed between the Testes, which may be called Mediastinum Scroti.

501. THE Raphe or Suture already mentioned adheres to the Edge of this Septum, and thereby braces down the middle of the cutaneous Portion, which from thence appears to have in part two Cavities; and this was perhaps what gave occasion to make the *French* Word for the Scrotum to be in the plural Number. The other Edge of the Septum adheres to the Urethra.

502. THE two Bags of the Dartos are lined on the inner or concave side, by a cellular Substance more considerable than that between the convex side and the Skin; so that the fleshy Fibres, all the way to the Septum, lie between two cellular Strata. They run through the outer Stratum, as has been said, to be inserted in the Skin, and by their Contraction, they form the natural Rugæ of the Scrotum.

503. THESE fleshy Fibres have likewise a strict Connection with the internal cellular Membrane, especially at the upper part, below the Groin, where the anterior and external lateral Portions of the Dartos terminate by a kind of tendinous or ligamentary Expansion, which is strongly united to the internal cellular Membrane. I have often shown this, as a particular Fascia Lata, which gives Insertion to the Portions of the Dartos just mentioned, and as a broad Frænum which keeps the same Portions together.

504. THE aponeurotic or ligamentary Expansion of the Dartos is fixed in the Ramus of the Os Pubis, between the musculus Triceps and the Origin of the Corpus Cavernosum of the same side, which shall be described hereafter; all the way to the lower part of the Symphysis of these Bones. The internal Portion of these muscular Bags, or that which forms the Septum Scroti is fixed to the Urethra by means of a Communication between the same ligamentary Expansion, and another, which shall be explained in its proper place.

Vasa Deferentia.

505. THE Vasa Deferentia are two white solid flattened Tubes, one lying on the right Side, the other on the left. From the Epididymis of which they are Continuations, as has been already said, each of them runs up in the cellular Vagina of the Spermatic Vessels, as high as the Openings in the abdominal Muscles; the Blood-Vessels lying forward, and the Vas Deferens behind them.

506. THIS Fasciculus thus formed by the Blood-Vessels, Vas Deferens, and their common Covering, is termed the Spermatic Rope. The Covering

ing is smoother on the outer than on the inner side, and for that reason it has been looked upon as a Vagina; the internal Substance of which is most cellular, and connects all the Vessels together, while the external forms a Covering to invest them.

507. THE Vas Deferens having reached the membranous Lamina of the Peritonæum, where that Lamina runs over the Orifice of the Vagina, separates from the Blood-Vessels, and runs backward, in form of an Arch, in the cellular Substance of the Peritonæum, as far as the nearest side of the Bladder.

508. IT passes afterwards behind the Body of the Bladder to which it adheres very closely, as also to the Lamina of the Peritonæum which covers it, and then continues its arched Course towards the Neck of the Bladder, where both Vasa Deferentia meet, and their Arches terminate.

509. IN this Course, the Vas Deferens passes behind and crosses the neighbouring umbilical Artery, crosses the Extremity of the Ureter of the same side, in its passage between that Extremity and the Bladder, and having got behind the Bladder, it meets the Vas Deferens of the other side, between the Insertions of the Ureters, and they run down together to the Neck of the Bladder.

510. THIS Canal, which at the Origin of the Epididymis is pretty large and plaited, becomes immediately afterward smaller and smoother, and continues in that form till it gets behind the Bladder, where it begins again to be larger and more uneven.

511. IT arises from the angular Portion or posteriour Extremity of the Epididymis, and from thence runs forward in a very oblique Course, on the posteriour half of the Epididymis, where it is a little incurvated as it joins the backside of the Spermatic Vessels.

512. THE Texture of the smooth Portion of this Canal is very solid, and in a manner Cartilaginous, especially near the Surface of its Cavity, which though very narrow, is still kept open by means of the Solidity and Thickness of its Sides.

513. THE Cavity of the Vas Deferens is Cylindrical, though the whole Tube is flat, and its external Circumference oval, as may be seen by cutting it transversely; and the Cavity enlarges as it passes behind the Bladder. The termination of these Canals must be referred to the History of the Urethra.

514. THE particular Coverings of the Testes are commonly called Coats; *Coats of the Testes.* and they are reckoned to be three in number; the Tunica Musculosa, named Cremaster, Vaginalis and Albuginea. The first two are common to each Testicle, and to the Spermatic Rope that belongs to it; and the third is peculiar to the Testicle alone.

515. THE Tunica Vaginalis is the most considerable of the three, and must be described first, in order to conceive the Structure and Connexion of the Cremaster, which is very improperly called a Coat. The Albuginea has been already described with the Testes.

516. THE Tunica Vaginalis is a Continuation of the Vagina of the Spermatic Rope, which, as it approaches the Testicle, is gradually dilated, and forms

forms two Capsulæ, one contained within the other, the external being the longest and broadest at bottom; so that there is a void Space there left between them, in which the Testicle is lodged.

517. THIS Structure may likewise be explained in the following manner. The Vagina having reached as low as the Testicle, is divided into two Laminæ, the innermost of which is the Bottom of the Vagina, and the outermost is expanded round the Testicle, and gives it a Coat, called Vaginalis from the *Latin* Word *Vagina*. The Ancients termed it likewise Elytroides from a *Greek* Word that signifies the same thing.

518. THE inner Surface of this Coat is lined by a fine Membrane, which strengthens the Bottom of the Vagina, and forms a kind of Diaphragm, which prevents all Communication between the Vagina of the Spermatic Rope and the Tunica Vaginalis of the Testicle.

Cremaster.

519. THE Cremaster improperly termed a Coat, is a thin Muscle or fleshy Plane, which runs down round the Vagina of the Spermatic Rope and terminates in the Tunica Vaginalis of the Testicle.

520. IT surrounds almost the whole Vagina, and afterwards expands itself on the upper and external part of the Tunica Vaginalis, in which it is inserted and lost.

521. IT arises partly from the Ligamentum Fallopii, and partly from the lower Edge of the internal oblique Muscle of the Abdomen; and on this account, it seems sometimes to arise from the Spine of the Os Ilium; and it is probable that the Musculus Transversalis likewise contributes something to its Formation.

522. IT is covered by a very fine cellular Membrane, detached from the outside of the Aponeurosis of the Obliquus Externus, round the Opening commonly called the Ring. This Membrane is lost in the cellular Substance of the inside of the Dartos.

523. FROM all this we see that the Cremaster is rather a Muscle of the Tunica Vaginalis, than a particular Coat. Those among the Ancients, who believed it to be a Coat, called it Tunica Erythroides, from a *Greek* Word which signifies red; but this Muscle is not always red, neither is that Colour essentially necessary to a fleshy Substance.

Corpora Cavernosa.

524. THE Corpora Cavernosa are two ligamentary and very limber Tubes, united laterally to each other, through the greatest part of their length, and solid at their two Extremities, two of which are connected together, and rounded like the end of a Finger; the other two divaricate, like the Branches of the *Greek* Y, and diminishing gradually in Size after the Divarication, terminate in an oblique Point. These divaricated and pointed Extremities may be called the Roots, and the round Extremities, the Heads.

525. THESE two Bodies are almost Cylindrical, being round, and of an equal Diameter from the Roots to the Heads, where they are in some measure Conical. The ligamentary Substance of their sides is Elastic, and composed of fine close Fibres, which are partly transverse, and partly more or less oblique.

526. THE Cavity of these ligamentary Tubes is intirely filled by a strong cellular or cavernous Substance, which does not seem to be a Continuation of the Substance of the Sides. These Cells communicate with each other, and are always more or less full of Blood, resembling pretty much the cellular Substance of the Spleen, only with this difference, that the sides of the Cells are thicker in these cavernous Bodies, and without any additional Substance.

527. BY the Union of the two Corpora Cavernosa, two external Grooves are formed, one on the upper side, the other on the lower. The lower Groove is something broader than the upper, and it is filled through its whole length by a third Tube, narrower than the Corpora Cavernosa, called the Urethra, which shall be presently described.

528. THE Roots of the Corpora Cavernosa are fixed each, to the Edge of the small Ramus of the Os Ischium and Os Pubis. They meet at the Symphysis of the Ossa Pubis, where each of them becomes a Cylindrical Tube, and unites with the other in the manner already said.

529. THE Heads or rounded Extremities join the Basis of a distinct Body, called the Glans, which is an expansion of the Urethra, and closely united to it in the manner that shall be explained hereafter.

530. BY the Union of the Corpora Cavernosa from their Roots to their round Extremities or Heads, a particular Septum is formed by the transverse Fibres of both. Between the Fibres of this Septum, several small void Spaces are left, by which the Corpora Cavernosa communicate with each other, and therefore by blowing into one of them, we presently inflate the other. Toward the rounded Extremities, the Septum diminishes every way.

531. THE Urethra is the third spongy Tube which composes the Penis, *Urethra.* and it adheres to the Corpora Cavernosa through the whole length of the inferior Groove formed by their Union. It differs from the other two, both as it is narrower, and as it forms a true hollow Canal. Its Substance is Spongy or Cavernous, except a small Portion next the Bladder, and its inner and outer Surfaces are membranous.

532. IT is at first no more than a membranous Canal continued from the anterior Opening of the Bladder, at the place called the Neck of the Bladder, which is a name that would be more proper for this Portion of the Urethra.

533. ABOUT a Finger's breadth and an half from its Origin, it joins a cavernous Substance like that of the two other Tubes, only smaller, which surrounds it through the whole extent of the inferior Groove of the Corpora Cavernosa.

534. BUT before this spongy Substance begins to surround the Urethra, it forms a distinct oblong Body, like a Pear or Onion, which is connected only to the lower convex side of the Canal, and afterwards being split on each side, invests it quite round. This Body is called the Bulb of the Urethra, being larger than any other part of that Canal, and divided interiorly

by a very fine membranous Septum, into lateral Parts; and therefore when it is inflated, it appears to be double or with two Heads.

Prostatae.

535. THE first Portion of the Urethra, or that which is not covered by the Cavernous Substance, and which from the Bladder to the Bulb is only a membranous Canal, is sustained by a large solid whitish Mass, of the figure of a Chesnut, and situated between the Bladder and the Bulb of the Urethra, its Basis being toward the Bladder, the Apex or Point toward the Urethra, and the Sides lying upward and downward.

536. THIS Body is termed the Prostates, from a *Greek* Word that expresses its Situation before the Vesiculæ Seminales, and implies a Plurality, because it appears to be divided into two lateral Lobes, by a hollow Groove, which runs through its upper side from the Basis to the Apex. The first Portion of the Urethra lies in this Groove, adhering very closely to the Prostates which surround it.

537. THE Body of the Prostates lies on the Intestinum Rectum, and the Apex is under the internal Labium of the cartilaginous Arch of the Offa Pubis. The inner Substance is spongy, but very compact, and in each Lobe there are several Folliculi which open into the first Portion of the Urethra, toward the bottom of the Groove, as we shall see hereafter. The small Portion of the Urethra, between the Apex of the Prostates and the Bulb, perforates the Interosseous Ligament of the Offa Pubis described N° 183. This Portion is very short, its length being no more than what is sufficient to pass through the Hole in the Ligament, the backside of which consequently touches the Apex of the Prostates, and its fore side, the Bulb of the Urethra. This Portion might be called the Neck of the Urethra, and that which lies between the Body of the Bladder and the Prostates might be called the Neck of the Bladder.

Glans.

538. THE spongy Substance of the Urethra having reached the Extremity of the Corpora Cavernosa, forms a large Head, called the Glans, which crowns the three spongy Pillars, with this difference however, that it is a Continuation of the spongy Substance of the Urethra, and only adheres to the Extremity of the Corpora Cavernosa without any direct Communication.

539. IT is for this reason that if we blow into the spongy Substance of the Urethra, the Glans is presently inflated, and no Air passes into the Corpora Cavernosa; but when we blow into one of these Bodies, the Air passes immediately into the other, the Urethra and Glans remaining as they were.

540. THE Figure of the Glans is that of a rounded Cone, a little flattened at the lower part, and with an oblique prominent Basis, the Circumference of which is something greater than that of the Corpora Cavernosa.

541. THE spongy Substance of the Glans is thick and uniform next the Corpora Cavernosa, but next the Urethra, it is perforated by a Continuation of that Canal, and is there no thicker than the Urethra before the Formation of the Glans.

542. THEREFORE the Canal of the Urethra does not lie in the middle of the Glans, but continues its direct Course through the lower flat side of it, all the way to the Extremity, where it terminates by an oblong Orifice.

543. ALL the convex Surface of the Gland is covered by a fine villous Substance; and that again by a fine Membrane, resembling the red part of the Lips. The Circumference of the Basis of the Gland has a double row of small Papillæ, which may be reckoned sebaceous Glands, from which a thick Matter is discharged.

544. WE have several things to take notice of in the Cavity of the Urethra. At the bottom of the Cavity of the first Portion or that which lies within the Prostates, there is a small oblong Oval Eminence, pretty large on the back part, and terminating forward in a Point, called Caruncula or Verumontanum. The large Portion of it is commonly perforated by two Holes, sometimes only by one, and very seldom by three; and these are the excretory Orifices of the Vesiculæ Seminales, of which hereafter. Each Orifice has a small thin membranous Border, which may serve for Valves to the excretory Ducts of the Vesiculæ.

545. ON each side of the large Portion of the Caruncula, there are five or six Holes ranked in form of a Crescent round its lateral Parts; which are the Orifices of the excretory Ducts of the Prostates that come from the Folliculi already mentioned, and run in an oblique Course to the Orifices, in a kind of membranous Duplicature.

546. THE Vesiculæ Seminales are soft whitish knotted Bodies, about three or four Fingers breadth in length, one in breadth, and about three times as broad as thick, situated obliquely between the Rectum and lower part of the Bladder, in such a manner, as that their superiour Extremities are at a distance from each other, and their lower Extremities united between those of the Vasa Deferentia, of which they imitate both the Obliquity and the Incurvation.

547. THEY are irregularly round on the upper part, and their breadth decreases gradually from thence. By the Union of their lower Extremities, they form a kind of Fork, the Branches of which are broad, and bent like Rams Horns. These Extremities are very narrow, and form a small Neck, which runs behind the Bladder toward its Orifice, and continues its Course in the Groove of the Prostates, through the Substance of the contiguous Portion of the Urethra, till its Extremities pierce the Caruncula in the manner already said.

548. THE inner Substance of the Vesiculæ is plaited, and in a manner distinguished into several Capsulæ, by contorted Folds. Their external Surface is covered by a fine Membrane, which serves for a Border and Frænum to the Folds, and is a true Continuation of the cellular Substance of the Peritonæum. The Vesiculæ may easily be unfolded, and all their Contorsions streightened, and by this means they become much longer than in their natural State.

549. THEIR inner Surface is villous and glandular, and continually furnishes a particular Fluid, which exalts, refines, and perfects the Semen, which they receive from the Vasa Deferentia, and of which they are the Reservoirs for a certain time.

550. THE Passage of the Vasa Deferentia into the Vesiculæ, is very particular. I have already observed, that these Canals are incurvated behind the Bladder, and that their contracted Extremities unite at that place. They unite in an Angle, and run between the contiguous Extremities of the Vesiculæ; and this Union is so close, that the adhering Portions seem to form only one middle Septum, between two small Tubes, each of which is formed, partly by the Extremity of one Vas Deferens, and partly by that of the neighbouring Vesicula.

551. THIS lateral Union of the Extremities of the Vas Deferens, and Vesicula Seminalis on each side, forms likewise a kind of short Septum, which terminates in a Crescent, like a small semilunar Valve, and the Extremity of the Vas Deferens is narrower than that of the Vesicula. By this Mechanism, the Fluid contained in each Vas Deferens has liberty to enter the contiguous Vesicula, but that contained in the Vesicula cannot return into the other Canal.

552. IF we blow into one of the Vasa Deferentia, after having compressed the Urethra, the Air inflates the contiguous Vesicula Seminalis, and the Bladder of Urine, without passing into the Vesicula, or Canal of the other side, except we blow with too great Violence.

553. AFTERWARDS the two small Tubes, formed each by the Extremities of the Vas Deferens and Vesicula, run in between the Basis of the Prostates, and Canal of the Urethra; and perforating the sides of that Canal obliquely, they terminate in the Caruncula, in the manner already said.

*Lacunæ of
the Urethra.*

554. THE Inside of the Canal of the Urethra is lined by a fine Membrane, full of capillary Blood-Vessels; and its Surface is perforated by a great number of oblong Holes or small Lacunæ of different sizes, the largest lying near the Glands.

555. THESE Lacunæ, or Orifices of the excretory Ducts of the same number of small Glands, are dispersed through the Substance of the Urethra. Which Ducts run for some way in the spongy Substance, along the convex side of the internal Membrane of the Urethra, and open obliquely from behind, forward, into the great Canal. The Edges of the Lacunæ are semilunar, or like a Crescent, because of the Obliquity of their Opening.

*Anti-
Prostatae.*

556. A little way from the beginning of the cellular Substance of the Urethra, we meet with two Lacunæ more considerable than the rest, and their Ducts are very long. These Lacunæ and Ducts lead to two glandular Bodies, situated on the two convex sides of the spongy Substance of the Urethra near the Bulb. Each of them is about the size of a Cherry-stone, but they are oblong and flat, and covered intirely by the Muscles called Acceleratores, of which hereafter. These two Bodies are commonly called Prostatae inferiores; but if their Situation be carefully examined, they will be

be found to be higher than the true Prostates. There is a third Body of the same kind situated more anteriorly.

557. THE Cavity of the Urethra resembles nearly that of a small writing Pen. It is not every where round, and towards the Gland becomes broader and flatter on each side, especially in the Gland it self, where there is a kind of oval or navicular Fossula. *Orifice of the Urethra.*

558. THIS Canal terminates at the Extremity of the Glans by a narrow oblong Orifice or Fissure, which is much less than the rest of the Cavity. The Commissures of this small Fissure, are turned one toward the convex, the other toward the flat side of the Glans; and the Labia of the Fissure are its lateral Parts; and it seems to be surrounded by fleshy Fibres.

559. THE Integuments which cover all these Parts, are three or four in number. The first is the Skin with the Cuticula; the second is the common cellular Membrane, which in this place seldom contains any Fat; the third is termed Nervous; and the fourth is a particular cellular Membrane, which is not always to be found. *The common Integuments.*

560. THE first of these Integuments, the Skin, is a Continuation of that of the Pubis and Scrotum, and it adheres to the second all the way to the Basis of the Gland, where that second Integument ends. The rest of the Cutaneous Integument covers the Glans without adhesion, and terminates by an Opening. This Portion is named Præputium, and along the whole lower or back side, both of the whole Integument in general, and of the Præputium in particular, there runs a fine Suture, which is a Continuation of the Raphe of the Perinæum and Scrotum. *Præputium.*

561. THE inner Surface of the Præputium is lined with a fine Membrane from the Opening all the way behind the Basis of the Glans, and the same Membrane is folded from behind, forward, round the Glans, forming the proper Integument thereof, and covering very closely its whole villous Surface, as far as the Orifice of the Urethra, where it joins the Membrane, which lines the inside of that Canal.

562. THIS proper Membrane of the Glans, and internal Membrane of the Præputium, form conjointly along the flat part of the Glans, from its Basis to the Orifice of the Urethra, a membranous Duplicature, which like a Septum or Mediastinum divides this part into two lateral Portions, and limits the Motions of the Præputium; for which reason it is called Frænum Præputii.

563. THE Surface of the internal Membrane of the Præputium discharges a Fluid which prevents it from adhering to the Glans; and perhaps serves likewise to dilute that which is collected at the Basis of Glans, from the Glandulæ Sebaceæ, already mentioned.

564. THE second common Integument of these Parts, is nearly the same with what is every where found under the Skin, except that it is not filled with Fat, and that it is more fibrous than cellular, and a little loose. It accompanies the Skin to the Basis of the Glans, as has been already observed.

*Ligamentum
Suspensorium.*

565. THE third common Integument, improperly called Tunica Nervosa, is of a firm, elastic, ligamentary Substance, and its Fibres are sometimes of a yellowish Colour. It invests the Corpora Cavernosa and Urethra from the Glans to the Symphysis of the Ossa Pubis; and at some distance from these Bones, it forms on the superiour Groove of the Corpora Cavernosa, a close Duplicature; and by this Duplicature, a flat broad Ligament, which runs directly upward, and is inserted in the fore-mentioned Symphysis, as far as the tendinous Basis of the Musculi Pyramidales of the Abdomen.

566. THIS Ligament has been called Ligamentum Elasticum, because it yields and recovers it self; and Suspensorium, because it suspends these Parts, by means of its Insertion in the Symphysis. It sends off a Detachment or Ala toward each side, one Edge of which is fixed between the Musculus Triceps and the Corpus Cavernosum, and forms the ligamentary Expansion in which the Dartos is inserted, as has been already said. It seems likewise to send down another Elongation directly to the Perinæum and Anus.

567. THE fourth Integument of these Parts is the Tunica Cellulosa of M. Ruysch, which immediately surrounds the Corpora Cavernosa and Urethra, lying between these and the third Integument from which it seems to be distinguished only by the Closeness and Fineness of its Texture; and it is sometimes hardly perceivable.

The Muscles. 568. SEVERAL Muscles are inserted in the Parts, which we have described in this Paragraph. They may be reckoned to be ten in number, two for the Corpora Cavernosa, two for the Urethra, two common Muscles called Transversales, and four small ones for the Prostates.

569. THE first two Muscles are commonly termed Erectores, but might be more properly named Ischio-Cavernosi. The next two are called Acceleratores, but the name of Bulbo-Cavernosi would better agree to them. The four small Muscles, two of which are superiour, and two inferiour, may be called Prostatici. I observed in the beginning of the Description of the Muscles, that the Names taken from the supposed Uses are very equivocal.

570. THE Musculi Ischio-Cavernosi lie along the Roots of the Corpora Cavernosa; each of them being fixed by one Extremity very obliquely, in the internal Labium of the Ramus of the Os Ischium, from the Tuberosity upward. From thence it accompanies the Root of the Corpus Cavernosum, all the way to the Symphysis of the Ossa Pubis, and is fixed by its other Extremity, in the Corpora Cavernosa, near their Union; where the Fibres of both Muscles meet, and are reciprocally expanded over both Corpora. They lie a little lower, and more interiorly than the Roots of these Cavernous Bodies.

571. I have shown two other Musculi Accessorii, which I look'd upon as lateral Acceleratores, or as Acceleratores Accessorii; fixed lower, and more interiorly in the Os Ischium, than the former, which they accompany all the way to the Corpora Cavernosa, and then leaving them, they are inserted chiefly in the Urethra, near the Bifurcation of the Musculus Bulbo-Cavernosus.

572. THESE Bulbo-Cavernosi, commonly termed Acceleratores, form first of all, a Penniform Muscle, by means of a middle Tendon, fixed in the lower part of the interosseous Ligament of the Ossa Pubis, described N^o 184. and to the Union of the Musculi Transversales, with the Sphincters of the Anus. From which they pass in an expanded Form over the Bulb of the Urethra, covering that Bulb and the Urethra it self, and adhering in some measure to both, as high as the Origin of the Ligamentum Suspensorium, the middle Tendon answering to the Septum of the Bulb.

573. AFTERWARDS the two fleshy Planes separate, and run obliquely to the right and left Hands from behind, forward, and from below, upward; surrounding the Corpora Cavernosa, in the outer sides of which they are inserted. The middle Tendon adheres very strongly to the lower part of the Septum of the Bulb, in which, and in the Urethra it self, several of the Fibres of these Muscles are fixed.

574. THE Musculi Transversi, called also Triangulares, are two long, narrow, fleshy Fasciculi, inserted each, by one Extremity in the Root or Beginning of the Ramus of the Os Ischium; from whence they run transversely along the Edge of the Interosseous Ligament of the Ossa Pubis, as far as the Apex of the Prostates, where their other Extremities meet, and form commonly a kind of Digastric Muscle, the middle of which gives Insertion to the Muscles of the Urethra, and to the Cutaneous Sphincters of the Anus.

575. THE superiour Prostatici are two thin Planes fixed in the upper part of the inside of the small Rami of the Ossa Pubis, from whence they are spread over and inserted in the Prostates. Their Insertions in the Ossa Pubis are on one side of those of the Obturatores Interni.

576. THE Prostatici inferiores are small transverse Planes, each of which is fixed in the Symphysis, between the Ramus of the Os Pubis and Os Ischium, and from thence runs transversely, till it meets its fellow from the other side under the Prostates, to which they are both strongly connected, and they serve like a Girth to sustain these Glands. They may be considered as two small or internal Transversales, and the other two Transversales may be distinguished by the Names of great or external. They have likewise some Adhesions to the Point in which all these Muscles hitherto described, are united.

577. THE Arteries of these Parts come chiefly from the Iliacæ Internæ *Blood-Vessels* or Hypogastricæ, and the rest from the Iliacæ Externæ or Crurales. The principal Arteries are termed Pudicæ, of which one is external, the other internal.

578. THE Pudicæ externæ send a Branch to each side, which having passed out of the Pelvis by the side of the Os Sacrum, runs on the inside of the Tuberculum Ischii, to the Roots of the Corpora Cavernosa, along the inside of the Musculi Ischio-Cavernosi or Erectores. It sends Ramifications to the bulbous Head of the Urethra and to the Corpora Cavernosa; and together with the Glutæa, with which it communicates in its passage, it likewise supplies the Scrotum.

579. THE Pudicæ Internæ having furnished the Intestinum Rectum, Bladder, Vesiculæ Seminales and Prostates, communicates with the Hæmorrhoidales, passes under the Arch of the Offa Pubis, and partly enters the Corpora Cavernosa, and partly runs along their upper side, sending off small lateral Branches, which surround these Bodies, like irregular Half-Arches, and penetrate them by numerous Ramifications.

580. THE Crural Arteries send each likewise a Branch, which running behind the contiguous crural Vein, is distributed to the Integuments of the Penis, by the Name of Pudica externa, and communicates by lateral Ramifications with those of the Pudica interna. These Communications are not only between the internal and external Pudicæ of the same side, but also between those of both sides, which reciprocally communicate with each other.

581. THE Distribution of the Veins follows nearly that of the Arteries, but they have more Ramifications and Communications, as in other places. The principal Vein is that which passes directly under the Symphysis of the Offa Pubis between the two Arteries, and runs along the whole superiour Groove, formed by the Union of the Corpora Cavernosa. It is very large, often double, and very seldom triple; but the Trunks do not separate, while in the Groove, and it has a great number of Valves.

582. THIS great middle Vein is formed by the Union of the Hypogastric Branches, which after passing on the two inner sides of the Pelvis, meet about the middle of the Arch of the Offa Pubis. At this place we observe a venal Plexus, which covers the upper convex side of the first Portion of the Urethra, before it is surrounded by the spongy Substance.

583. THE spermatic Vessels, of which I have already described the Origin and Course all the way to where they go out of the Abdomen, having reached on each side, near the Testicle, are divided into two principal Fasciculi, one of which is larger than the other. The largest is the anteriour, and is distributed through the Testicle, by a prodigious number of very fine capillary Ramifications, which accompany all the Convolutions and Folds of the small Canals.

584. THE other Fasciculus is posteriour, and is distributed to the Epididymis in the same manner.

585. THE spermatic Artery is accompanied by a Ramus of the Epigastric Artery, which runs down on the side of it, as far as the Testicle, where they communicate reciprocally with each other. There is sometimes a small Ramus of the Hypogastric Artery, which accompanies the Vas Deferens to the Epididymis, and there communicates with the Arteria Spermatica.

Nerves.

586. THE Nerves of these Organs come from the Lumbares and Sacri, and they communicate with the Sympatheticus Maximus and Plexus Mesenterici. Near the Arch of the Os Pubis, they form together, on each side, a particular Rope, which passes under that Arch along the upper side of the neighbouring Corpus Cavernosum, near the Artery already mentioned.

587. IN their passage over the Corpora Cavernosa, they send off a great many Rami, which surround these Bodies on all sides, between the Skin and
ligamentary

ligamentary Integument ; being so disposed, as that the Arteries lie between them and the middle Vein. They must be examined presently after the Skin has been raised, because when the Ramifications are dried by the Air, they disappear.

588. There are two Nerves which accompany the spermatic Rope, whereof one comes from the Nervi Lumbares, near the antierour Spine of the Os Ilium, which is incurvated in its passage out of the Abdomen through the Muscles, and serves to distinguish the Cremaster. The other Nerve comes from the Plexus Renalis.

589. THERE is likewise one Nerve on each side, which being produced from the Union of the second, third and fourth Pairs of the Nervi Sacri, especially from the third ; goes out of the Abdomen above the Ligamentum Ischio-Sacrum, passes by the inside of the Tuberosity and small Branch of the Os Ischium, and is distributed to the Corpora Cavernosa, to the Muscles belonging to them, and to the neighbouring Parts.

§. 21. *The Parts of Generation in Females.*

590. THE Parts of Generation in Females, are several in number, some of them external, and some internal ; and they are all subordinate to one principal internal part, called the Uterus. The other internal parts are the Tubæ Falloppianæ, Ovaria, Vasa Spermatica, Ligamenta Lata, the Ropes or Bands called Ligamenta Rotunda, and the Canal of the Uterus. The external Parts are the Pubis, the Alæ, Nymphæ, Clitoris, Orifice of the Urethra, and Orifice of the Canal of the Uterus.

591. THE Uterus lies between the Bladder and Intestinum Rectum. It is a Body inwardly hollow, outwardly of a whitish Colour, of a pretty solid Substance, and except in time of Pregnancy, of the figure of a flat Flask, being in Adults about three Fingers breadth in length, one in thickness and two in breadth at one end, and scarcely one at the other. This Size varies according to the Age of the Subject. Uterus.

592. THE broadest Portion is termed the Fundus, and the narrowest, the Neck. Its Situation is oblique, the Fundus being turned backward and upward, and the Neck, forward and downward ; the broad sides lie next the Rectum and Bladder, and the narrow sides are lateral.

593. THE Cavity of the Uterus is flat, and resembles an oblong Triangle, the shortest side of which answers exactly to the Fundus, and the two longest sides lie one on the right hand, the other on the left, and they are all bent inward, or toward the Cavity formed by them.

594. OF the three Angles of this Cavity, the two which terminate the Fundus, are perforated each by a narrow Duct, which with difficulty admits a Hog's Bristle. The third Angle forms a flat Duct wider than the former, which perforates the Neck of the Uterus lengthwise, and terminates at the Extremity of that Neck, by a transverse Opening.

595. THIS Opening is termed, the internal Orifice of the Uterus ; and in the natural State, is narrower than the Duct of the Collum Uteri, so that

only a small Stilet can be passed through it. At the Edge of this Orifice, are several small Holes, answering to the same number of glandular Corpuscles, which discharge a viscid Lympha.

596. THE inner Surface of the Cavity of the Uterus, is lined by a very fine Membrane, which at the Fundus or broad Portion is smooth and even, but in the narrow Portion which leads to the Orifice, it is wrinkled in a particular manner.

597. THE Portion of this Membrane, which covers the Bottom of the Cavity, is perforated by a great number of considerable Holes, through which small Drops of Blood may be observed to pass, when the whole Uterus is compressed; and sometimes it appears to have very small Hairs or Villi. Both these Villi and Holes are observed to be more or less tinged with Blood, in those Women who die in the time of their Menfes.

598. IN the narrow part, which answers to the Collum, each side is divided into two lateral Parts, by a kind of prominent longitudinal Line, which is larger in the upper or antierour side, than in the lower or posterour.

599. ON each side of these two longitudinal Lines, there are Lines or Rugæ obliquely transverse, and disposed like Branches, the longitudinal Lines representing Trunks. Between and round these Rugæ, there are small Lacunæ, through which a mucilaginous Fluid is discharged that closes the Orifice of the Uterus. We observe likewise in the Interstices between the Rugæ, several transparent globular Corpuscles, which a modern Author took for a kind of Ova.

*Structure of
the Uterus.*

600. THE Substance of the Body of the Uterus is spongy and compact, with a copious Intertexture of Vessels. Its Thickness is nearly equal and uniform in the Sides and Edges, but the Fundus is thicker toward the middle, than toward the two Angles, where the thickness decreases gradually. The Edges are likewise much thinner near these Angles, than near the Extremity of the Neck.

601. THE Uterus is covered by a Portion of the Peritonæum, which serves it for a Coat, and is the Continuation of that which covers the Bladder and Intestinum Rectum, running up from the lower and posterour part of the Bladder, over the antierour part of the Uterus, and from thence over the Fundus, and down the backside, and afterwards going to the Rectum.

602. ON each lateral Part or Edge of the Uterus, this Portion of the Peritonæum, forms a broad Duplication, which is extended on each side, more or less directly to the neighbouring lateral parts of the Pelvis, forming a kind of membranous Septum, between the antierour and posterour Halves of the Cavity of the Pelvis; and it is afterwards continued in a loose manner, with the Peritonæum, on the sides of the Pelvis.

*Broad Ligaments of the
Uterus.*

603. THESE two broad Duplicatures have the name of Ligamenta Lata, and Vesperitilium Alæ. The upper Edge of each, is partly double, or folded, forming two small distinct Duplicatures, which I term the Pinions of the broad Ligaments. The antierour Pinion is more raised than the posterour, and they are both very loose.

604. THE Laminæ of all these Duplicatures are connected by a cellular Substance, in the same manner as the other Duplicatures of the Peritonæum, and they contain the Falloppian Tubes, the Ovaria, a part of the spermatic Vessels, and of those that go to the Body of the Uterus, the Ropes called the round Ligaments, the Nerves, &c.

605. THE Ovaria are two whitish oval, flat, oblong Bodies, situated *Ovaria.* on the sides of the Fundus Uteri, to which they are fixed by a kind of short round Ligament, and inclosed together with it, in the Duplicature of the posterioir Pinion of the Ligamenta Lata.

606. THEY are composed of a compact, spongy Substance, and of several little Balls, or transparent Vesiculæ, which are called Ova. The spongy Substance surrounds each of these Vesiculæ very closely, and seems likewise to furnish them with distinct spongy Coverings or Calices. These Vesiculæ are to be carefully distinguished from other preternatural ones, termed Hydatides.

607. THE Ligaments of the Ovaria, lie in the Edges of the posterioir Pinions of the Ligamenta Lata, much in the same manner as the umbilical Vein, in the anterior or umbilical Ligament of the Liver. They are round Ropes of a filamentary Texture, fixed by one Extremity to the Corner of the Fundus Uteri, a little above and behind the Level of that Fundus. They were formerly believed to be hollow, and look'd upon as Vasa Deferentia.

608. THE Falloppian Tubes are two flaccid, conical and vermiform Canals, situated more or less transversely on each side of the Uterus, between the Fundus and the lateral parts of the Pelvis, and included in the anterior Duplicatures or Pinions of the Ligamenta Lata. *Tubæ Falloppianæ.*

609. EACH of them is fixed by its narrow Extremitys in the Corner of the Fundus Uteri, into which it opens, tho' by so narrow a Duct, as hardly to admit a large Bristle. From thence their Diameter augments by degrees all the way to the other Extremity, where it is about one third part of an Inch. The Body of the Tubæ goes in a winding Course, and their large Extremity is bent toward the Ovaria.

610. THESE large Extremities are irregularly round, and terminate by a narrow Orifice, a little plaited and turned toward the Ovarium, where it presently expands in form of a membranous Fringe, full of Plaits and Incisures. These Fringes are called the broad Ends of the Falloppian Tubes.

611. THE breadth of the Fringe is not equal in all parts. Its Circumference is in a manner oval, and the longest Segment of the Fringe reaches to, and is fixed in the Ovarium. The Folds are disposed like Laminæ on the concave side.

612. THESE Tubes are composed of fleshy Fibres, whereof some are longitudinal, and some obliquely circular, with an Intertexture of another very fine Substance.

613. THE anterior Pinions of the Ligamentum Latum serve for a common or external Coat to both Tubæ, and also to connect them, in the same manner as the Mesentery, connects the Intestines. From thence

the Tubæ, and especially their Fringes come to be loose, and their Direction to be very imperfectly determined in the greatest part of the Figures.

614. THEIR Cavity is lined by a soft glandular Membrane, which is plaited longitudinally, almost like the inner Surface of the Aspera Arteria; and these Folds are stronger and broader near the great Extremities, than any where else. Their Substance seems to be spongy, and the Interstices between them are moisten'd more or less by a Fluid, which is continually discharged there.

Blood-
Vessels.

615. THE Blood-Vessels of these Parts are of different kinds, viz. the Hypogastric Arteries and Veins, the Ramifications of which, belong chiefly to the Body of the Uterus; the spermatic Vessels, and the two vascular Ropes, called Ligamenta Rotunda, which might be more properly termed the vascular Ropes of the Uterus or of the Ligamenta Lata.

616. THE Hypogastric Branches are arterial and venal Ramifications, arising from the Artery and Vein of the same Name, which having reached the lateral Edges of the Uterus, are distributed to all the parts thereof, both internal and external, forming a great number of Incurvations and particular Intertextures.

617. THE Arteries of one side communicate both upon the Uterus, and through its whole Substance, with those of the other side, and the arterial Ramifications of each side form numerous Anastomoses with each other. The Veins communicate together on each side in the same manner; and all these Blood-Vessels communicate likewise with the spermatic Vessels, with the vascular Ropes of the Ligamenta Lata, and with the Hæmorrhoidales.

618. THESE frequent Anastomoses may be demonstrated by injecting, or blowing into the Hypogastric Vessels, having first made proper Ligatures to prevent the Liquor or Air from running into other parts. The Extremities of these Arteries terminate and open into the Cavity of the Uterus, as has been already said; and there is this peculiar to the Veins, that they communicate with the Hæmorrhoidales, and consequently with the Vena Portæ.

619. THE spermatic Vessels, have nearly the same Origin in Females, as in Males, and likewise the same Course and Intertextures; but they never pass out of the Abdomen, being wholly distributed to the Ovaria and Tubes, and they communicate with the Hypogastrics, and with the vascular Ropes of the Ligamenta Lata. The Veins are very large in proportion to the Arteries, and these Vessels send out lateral Ramifications, which seem to communicate with the Mesaraicæ and Vena Portæ.

620. THE vascular Ropes, commonly called the round Ligaments, are two long small Fasciculi of Arteries and Veins, interwoven and connected together by a fine cellular Substance, and they run in the great Duplicature of the Ligamenta Lata, from each Corner of the Fundus Uteri, as far as the annular Openings of the abdominal Muscles.

621. IN this Course, each Rope thrusts outward or raises the anterior Lamina of the Duplicature, which consequently gives a kind of Coat to these vascular Fasciculi, and makes them appear like distinct Ropes, connected to this foreside of the Duplicatures.

622. THEY seem to arise from the Communication between the Vasa Spermatica and Hypogastrica, and might be reckoned a particular Continuation of the Spermatic Vessels. The disposition of their Adhesions to the Angles of the Fundus Uteri, with respect to that of the Tubes and Ligaments of the Ovaria which lie all near each other, is this: The Tubes lie highest, the Ligaments of the Ovaria most backward, and the vascular Ropes forward, and a little lower than the Ligaments of the Ovaria.

623. AFTERWARDS they run in a Course, nearly resembling that of the Spermatic Vessels in Males, pass out of the Abdomen, through the Openings of the abdominal Muscles, and are lost in the Fat of the upper and middle parts of the Groins. It may be conjectured, that these Vessels furnish the Lacunæ, of which hereafter. As they pass out of the Abdomen, they are accompanied by a Production of the cellular Portion of the Peritonæum, as the Spermatic Rope in Men, and by a Fasciculus of fleshy Fibres, representing a kind of Cremaster.

624. BESIDES all the Vessels hitherto mentioned, we observe Nerves and Lymphatics, to which we may add the Lactiferous Ducts that are seen in an advanced Pregnancy. The Nerves come from the Lumbares, Sacri and Sympathetici Maximi, in the same manner as in Males. The Lymphatic Vessels run chiefly in the Coats continued from the Peritonæum. I shall in another place explain the Lactiferous Ducts, and also the particular Fibres which seem to be interwoven in the Substance of the Uterus in pregnant Woman, the innermost of which being disposed in a vortical or turbinated manner, gave occasion to *M. Ruysch* to describe them particularly by the name of Musculus Uteri Orbicularis. Nerves,
Lymphatics, &c.

625. THE Pubis is that broad Eminence at the lower part of the Hypogastrium, between the two Inguina, on which Hairs grow at a certain age, called in *Latin* by the same name, and almost of the same kind with those found under the Axillæ. This Eminence is owing to a particular thickness of the Membrana Adiposa which covers the forepart of the Ossa Pubis, and some small Portions of the neighbouring Muscles. Pubis.

626. THE longitudinal Cavity which reaches from the middle and lower part of the Pubes, within an Inch of the Anus, was by the Ancients termed Sinus; and they called the lateral parts of that Cavity, Alæ which is a more proper name than that of Labia, commonly given to them. The places where the Alæ are joined above and below, are termed Commissures; and may likewise be called the Extremities or Angles of the Sinus. Sinus &
Alæ.

627. THE Alæ are more prominent, and thicker above than below, and lie nearer each other below than above. They are chiefly composed of the Skin, cellular Substance and Fat. The exteriour Skin is a Continuation of that of the Pubes and Inguina. It is more or less even, and furnished with a great number of Glandular Corpuscles, from which a whitish ceruminous Matter may be expressed; and after a certain age it is likewise covered in the same manner with the Pubes.

628.

628. THE inner side of the Alæ is something like the red Portion of the Lips of the Mouth ; and it is distinguished every where from the external side by a kind of Line, in the same manner as the red Portion of the Lips from the rest of the Skin ; being likewise thinner and smoother than the outward Skin. A great number of Pores are observable in it, and also numerous Glandular Corpuscles which furnish a Liquor more or less Sebaceous ; and these Corpuscles are larger near the Edges than in the other parts.

Lacunæ.

629. NEAR the inner Edge of the inner Surfaces of the Alæ, on each side of the Orifice of the Canal of the Uterus, we find a small Hole more visible than the rest. These two Holes are termed Lacunæ ; and they communicate by two small Ducts with the same number of Follicular Bodies lying in the Substance of the Alæ, and which may be looked upon as small Prostates answering to the Glandulæ Prostaticæ in Males. When compressed they discharge a viscid Liquor.

630. ABOVE the superiour Commissure, a thin flat Ligament runs down from each small Branch of the Ossa Pubis, which penetrates the Fat in the Substance of each Ala, and is lost therein insensibly near the Edge. These may be look'd upon as the Ligamenta Suspensoria of the Alæ. The inferiour Commissure of the Alæ is very thin or like a membranous Ligament, and together with the neighbouring parts of the inner Sides, it forms a Fossa, termed Navicularis or Scaphoides. The Space between the inferiour Commissure and Anus, termed Perinæum, is about a large Finger's breadth in length.

631. THE other external parts are situated in the Sinus, and hid by the Alæ. Directly under the superiour Commissure lies the Clitoris, with its Covering, called Præputium. A little lower is the Orifice of the Urethra ; and below that is the Orifice of the great Canal of the Uterus. The Circumference of this Orifice is bordered either by a membranous Circle, called Hymen, or by fleshy Portions, termed Carunculæ Myrtiformes. On each side of the Clitoris begins a very prominent Fold, like a Crista, which runs down obliquely on each side of the Orifice of the Urethra. These Folds are termed Nymphæ, and they might likewise be named Cristæ Clitoridis. On each side of the great Orifice lies the small Prostatic Hole already described.

Clitoris.

632. THE Clitoris appears at first sight like a small imperforated Glans. Its upper and lateral sides are covered by a kind of Præputium, formed by a particular Fold of a Portion of the inner side of the Alæ ; which appears to be Glandular, and to discharge a certain Moisture, and its inside is granulated.

633. BY dissection, we discover in the Clitoris a Trunk and two Branches, as in the Penis, made up of a spongy Substance, and of very elastic Coats, but without any Urethra. This Substance may be inflated either by Air or by anatomical Injections into the Artery, &c. The Trunk is divided into two lateral parts by a middle Septum, from the Bifurcation, to the Glans, where it is insensibly lost.

634. THE Bifurcation of the Trunk is on the Edge of the cartilaginous Arch of the *Ossa Pubis*; and the Branches which resemble the Roots of the *Corpora Cavernosa* are inserted in the inferior Rami of these Bones, and in those of the *Ossa Ischium*, where they terminate by degrees; but there is sometimes a membranous Tube on each side, which reaches to the Tuberosity of the *Ischium*.

635. THE Trunk of the Clitoris is sustained by a *Ligamentum Suspensorium* fixed in the Symphysis of the *Ossa Pubis*, and containing this Trunk in its Duplicature, nearly as in the other Sex.

636. FOUR Muscles or Fasciculi of fleshy Fibres are inserted in the Trunk of the Clitoris, two on each side. One of them runs down on the fore-side of the neighbouring *Corpus Cavernosum*, and is inserted by a tendinous or aponeurotic Portion, partly in the Extremity of the *Corpus Cavernosum*, and partly in the Tuberosity of the *Ischium*. These two Muscles are called *Erectores*, but the name of *Ischio-Cavernosi* would be more proper.

637. THE other Muscle on each side lies under the former, and runs down on the side of the Urethra and great Orifice of the Uterus, all the way to the Anus; increasing gradually in breadth in its passage, and terminating partly like that which is called *Accelerator* in Males.

638. THESE two Muscles surround very closely the lateral parts of the Urethra, and of the great Orifice. They expand very much as they descend, and are spread on the lower and lateral parts of the great Orifice; for which reason several Anatomists have looked upon them as muscular Sphincters. All these four Muscles, and especially the two latter are oftentimes almost covered with Fat.

639. THE Blood-Vessels of the Clitoris come chiefly from the *Hypogastricæ*; and the Nerves from the second and third Pairs of the *Nervi Sacri*, by means of which they communicate with the inferior *Mesenteric Plexus*, and with the great *Sympathetici*.

640. THE *Nymphæ*, *Cristæ Clitoridis*, or as they may likewise be termed, *Alæ Minores* five *Internæ*, are two prominent Folds of the inner Skin of the great or external *Alæ*, reaching from the *Præputium* of the Clitoris to the two sides of the great Orifice of the Uterus. They begin very narrow, and having increased in breadth in their Course downward, they are again contracted at their lower Extremity.

641. THEY are of a spongy Substance, intermixed with Glands, several of which may be perceived by the naked Eye. Their Situation is oblique, their upper Extremities lying near each other, and the lower at a much greater distance. In married Women they are more or less flaccid and decay'd.

642. By the Urethra in Females, we mean the urinary Duct, the Orifice of which is between the *Nymphæ* below the Glans of the Clitoris. The sides of this Orifice are a little prominent and wrinkled, and perforated by small *Lacunæ*, from which a viscid or mucilaginous Liquor may be squeezed. In time of Pregnancy, this Orifice is sometimes drawn a little inward.

643. THE Body of the Urethra is a spongy Duct of the same Structure as in Males, but much shorter, situated directly under the Trunk of the Clitoris, and above the great Canal of the Uterus, adhering to each of these Canals between which it lies, by membranous Filaments. It passes under the cartilaginous Arch of the Ossa Pubis, and terminates by an oblique Opening at the Neck of the Bladder; being bent a little downwards between its two Extremities.

644. THE internal Membrane of the Urethra is a little plaited, and perforated by small Holes, which communicate with Folliculi, lying hid in its Substance, as in Males. If we blow into one of these Holes, we observe a small Canal to be inflated, which runs from without inwards, and terminates in some places by a kind of Sacculus, by compressing which, a viscid Liquor is discharged.

645. THE Continuation of this Membrane, which Lines the Neck of the Bladder, forms likewise several Rugæ more or less equal, but that which lines the Cavity of the Bladder, is wrinkled in an irregular manner when the Bladder is empty.

*The Canal of
the Uterus.*

646. THE great Canal, formerly called the Neck of the Uterus, is situated below the Urethra, and above the Extremity of the Intestinum Rectum, a little obliquely, being more raised on the inner and back Part, than on the outer and fore part.

647. ITS inner or posteriour Extremity, joins the Extremity of the Body of the Uterus, and surrounds its Orifice much in the same manner as the Duodenum surrounds the Pylorus, or as the Ilium is surrounded by the Cæcum and Colon.

648. THE anteriour Extremity forms the great Orifice, which lies under that of the Urethra, and above the Fossula of the inferiour Commissure of the Alæ.

649. THE Body of the Canal is chiefly made up of a spongy Substance, interwoven with numerous Blood-Vessels, and it is commonly longer and narrower in Virgins, than in Married Women.

650. ITS inner or concave Surface, has several transverse Rugæ, and is covered by a particular Membrane. The Rugæ are formed by oblong narrow Eminences, incurvated like Portions of Arches, placed very near each other, and disposed in such a manner, as to divide the Cavity of the Canal, into an upper and lower side.

651. BY the Union of the Extremities of the upper and lower Rugæ, a kind of Raphe or Suture is formed on the right and left sides; and both Arches are sometimes intersected in the middle, and so form two Half-Arches; but in this there is some Variety.

652. IN general, these Arches are very considerable in young Persons; become gradually more superficial in married Women, and are quite lost in time of Delivery.

653. THE inner or posteriour Extremity of this great Canal, surrounds the Orifice of the Uterus, a little obliquely, in such a manner, as that the upper side of the Canal lies very near the Orifice, and the lower side, at a greater

greater distance from it, and this makes the Extremity of the Uterus appear to advance more into the Canal on the lower, than on the upper Part

654. THE exteriour or anteriour Extremity of the great Canal in Virgins, *Circulus* and especially before the first Eruption of the Menfes, is commonly bordered by a circular membranous Fold, of different Breadths, more or less *Membranosus*. smooth, and sometimes semilunar, which in some Subjects leaves but a very small Opening, in others a larger Opening, and in all, renders the external Orifice narrower than the rest of the Cavity. This Fold called Hymen, is formed by the Union of the internal Membrane of the great Canal, with that on the inside of the Alæ, and represents a membranous Circle of different breadths, and sometimes uneven.

655. THIS membranous Circle is commonly ruptured after the Consummation of Marriage; is quite lost in Delivery; and afterwards only some irregular Portions of it remain, which from their supposed resemblance to Myrtle Leaves, have been termed *Carunculæ Myrtiformes*. This Circle may likewise suffer some disorder by too great a flux of the Menfes, by Imprudence, Levity and other particular Accidents. *Caruncule.*

656. EACH side of the anteriour Portion of the great Canal is covered exteriorly by a thin broad cavernous and vascular Plexus, called the Plexus *Plexus Retiformis*. Retiformis of that Canal. These two Planes run down on each side of the Clitoris behind the Nymphæ, and likewise cover the Urethra like a Collar, before they are spread on the great Canal.

657. THIS Plexus is strictly united to the muscular Portions commonly taken for Accelerators or Constrictors, lying between these Portions and the lateral parts of the Urethra and of the great Canal.

658. THIS Plexus may be inflated by Air like a flaccid Spleen, or like the spongy Substance of the Clitoris, with which it seems to have some Communication; and on this Account the lateral Portions of this reticular Plexus have been named the internal Crura of the Clitoris. It is a kind of Rete Mirabile, composed of Vessels which come chiefly from the Hypogastricæ.

659. IT still remains to be observed, that on each side of the bottom of the Pelvis in both Sexes, opposite to the lower part of the Bladder, there is an aponeurotic or tendinous Ligament, which runs over the inner Surface of the Musculus Obturator Internus from before backward. The anteriour Extremity of this Ligament is fixed on one side of the middle Portion of the Symphysis of the Offa Pubis; and the posterioir Extremity, to the middle part of the Ligamentum Sacro-Sciaticum described in Sect. II.

660. A little above the Elongation, called the Neck of the Bladder, there is another ligamentary Expansion on each side of the Bladder; the forepart of which is narrow, and fixed to the anteriour Extremity of the Ligament already mentioned; and the broad posterioir part, to the side of the Bladder. These two lateral Expansions may be look'd upon as proper Ligaments of the Bladder, by which it is connected to the inner side of both Offa Pubis.

661. To the antierour Portion of each of these Ligaments of the Bladder is fixed a particular Fasciculus of fleshy Fibres, which run up obliquely on the foreside of the Bladder, on which those of each side meeting together, form a kind of muscular Intertexture, and unite with the most transverse Fibres of the Bladder.

662. THESE two muscular Fasciculi form a part, and perhaps the principal part of what is called the Sphincter of the Bladder; but to have a true Idea of them, they must be examined in Situ, without destroying any of their natural Connexions. When the Bladder is removed out of its place, as is done in the common Method of Dissection, these Fasciculi are cut, and thereby their Direction being lost, they appear transverse, and are taken by those who know no better, for Portions of an orbicular Sphincter.

663. IN Males, these two Fasciculi are partly fixed in the Prostates; but in Females they are very broad, and appear sometimes to be double on each side, one Plane lying above the other. They are to be look'd upon as true Muscles, fixed by small Tendons on the sides of the Symphysis of the Ossa Pubis.



S E C T. IX.

A Description of the Thorax.

§ 1. *Introduction.*

1. **I**N the Compendious View Sect. 7. I gave a general Idea of all the external and internal Parts which compose what Anatomists call the middle Venter, Breast or Thorax in the Human Body ; and I beg the Reader to turn to what was there said, to prevent the necessity of repeating it here.

2. THE whole extent of the Thorax in a living Subject, is commonly determined not only by the Sternum, Vertebræ of the Back and Ribs, but also by all that Space contained between the Articulations of the two Arms with the Scapulæ and Claviculæ ; and in this sense, the outside of the Thorax is broader above than below in a healthy Subject, who has a moderate share of Flesh on his Bones. *External Conformation of the Thorax.*

3. THIS breadth of the upper part of the Breast is owing to the Pectorales Majores and Latissimi Dorfi viewed directly forward or backward. But when we take a direct lateral view of the Breast, it appears narrower above than below, not only in an intire Subject, but even after every thing has been removed that cover the sides of the Thorax, and in the Skeleton itself.

4. THE common Integuments of the Thorax are the same with those of the Abdomen ; and the convex side of this part of the Body is likewise covered by several Muscles. Anteriorly, we find the Pectorales Majores and Minores, a large Portion of the Serrati Majores, the Subclavii, a Portion of the Scaleni and of the Obliqui Abdominis Externi. Posteriorly, we have all the Muscles which cover both sides of the Scapula, the Serrati Postici, and a part of the Sacro-Lumbares, Longissimi Dorfi, Vertebrales, &c. as in the History of the Muscles. Among all the external parts of the Thorax, only two are peculiar to it in the Human Body, I mean the two Eminences called Mammæ, which must therefore be described in this Section.

5. THE hard parts which form the sides of the Cavity of the Thorax, are the twelve Vertebræ of the Back, all the Ribs, and the Sternum. The soft Parts which compleat the sides, are the Membrane called Pleura, which lines the Cavity, and the Musculi Inter-Costales, Sterno-Costales and Diaphragma, already described among the Muscles. *Cavity of the Thorax.*

6. ALL these hard and soft Parts taken together represent a kind of Cage, in some measure of a conical Figure, flatted on the foreside, depressed on the backside, and in a manner divided into two Nooks by the

THE ANATOMY OF

Figure of the Vertebræ of the Back, and terminated below by a broad arched Basis inclined backward. The Intercoastal Muscles fill up the Interstices betwixt the Ribs, and so compleat the sides of the Cavity; the Basis is the Diaphragm, and the Pleura not only covers the whole inner Surface of the Cavity, but by forming the Mediastinum, divides it into two, one on the right Hand, the other on the left.

§ 2. *Mammæ.*

7. THE name of *Mammæ* or Breasts is given to two Eminences more or less round, situated in the Anterior and a little toward the lateral Parts of the Thorax, their Center or middle Part lying almost opposite to the bony Extremity of the sixth true Rib on each side. Their Size and Figure vary in the different Sexes and different Ages.

8. IN Children of both Sexes, and in Males of all Ages, they are commonly no more than Cutaneous Tubercles, or soft *Verrucæ* of a reddish Colour, called *Papillæ* or Nipples, each of them being surrounded by a small, thin and pretty broad Circle or Disk, more or less of a brownish Colour and an uneven Surface, termed *Areola*.

9. IN Females come to the Age of Puberty, which is sometimes sooner, sometimes later, a third part is joined to the two former, which is a convex Protuberance, more or less round, of about five or six Fingers in breadth; the *Papilla* and *Areola* being situated near the middle of its convex Surface. This is what is properly termed *Mamma*, and it may be termed the Body of the Breast, when compared with the other two Parts. It increases with Age, and is very large in Women with Child, and in those that give Suck. In old Age it decreases and becomes flabby, losing its natural Consistence and Solidity.

*Body of the
Mammæ.*

10. THE Body of the *Mammæ* is partly Glandular, and partly made up of Fat; or it is a Glandular Substance mixed with Portions of the *Membrana Adiposa*, the Cellulous *Pelliculæ* of which support a great many Blood-Vessels, Lymphatics, and Serous or Lactiferous Ducts, together with small Glandular *Molliculæ* which depend on the former; all of them being closely surrounded by two Membranes continued from the *Pelliculæ*.

11. THE innermost of these two Membranes, which is, in a manner, the Basis of the Body of the *Mamma*, is thick and almost flat, adhering to the *Musculus Pectoralis Major*. The second or external Membrane is thinner, forming a particular Integument for the Body of the *Mamma*, more or less convex, and adhering closely to the Skin.

12. THE *Corpus Adiposum* of the *Mamma* in particular, is a spongy Cluster, more or less interlarded with Fat, or a Collection of Membranous *Pelliculæ*, which by the particular disposition of their outer sides, form a kind of Membrane in shape of a Bag, in which all the rest of the *Corpus Adiposum* is contained. The anterior or outer Portion of this Bag, or that

that which touches the Skin is very thin; but that side next the Pectoralis Major, is thick.

13. THE Glandular Body contains a white Mass, which is meerly a Collection of Membranous Ducts, narrow at their Origin, broad in the Middle, and which contract again as they approach the Papilla, near which they form a kind of Circle of Communication. They are named Ductus Lactiferi. *Ductus Lactiferi.*

14. THE coloured Circle or Disk already mentioned is formed by the Skin, the inner Surface of which sustains a great number of small Glandular Molleculæ, of that kind which Morgagni calls Glandulæ Sebaceæ. They appear very plainly all over the Areola, even on the outside where they form little flat Heights or Eminences at different distances quite round the Circle. *Areola.*

15. THESE Tubercles are perforated by small Holes, through which a kind of sebaceous or cheesy Matter more or less liquid, may be squeezed out. Sometimes this is a serous Liquor, sometimes a milky Serum, and sometimes pure Milk, especially in Nurses; and I have seen both serous and milky Drops come out at the same time.

16. FROM thence I am inclined to think that these Holes communicate with the Lactiferous Ducts, and that the Tubercles are a kind of Auxiliary Papillæ added to the true ones. The different Matters or Liquors that may be squeezed from the same Glandular Body, gives also room to think, that the Holes in them communicate by their Extremities with several other smaller Holes.

17. THE Tubercle which lies in the Center of the Areola is termed Papilla. *Papilla.* It is of different Sizes in different Ages and Constitutions, and in the different Conditions of Females in particular. In Women with Child, or who give Suck, it is pretty large, and generally longer or higher than it is thick or broad; and when it happens to be short, it causes great uneasiness to the Child.

18. THE Texture of the Nipple is spongy, elastic, and liable to divers changes of Consistence, being sometimes harder, sometimes more flaccid. It seems to be made up chiefly of Ligamentary Fasciculi, the Extremities of which form the Basis and Apex of the Nipple. These Fasciculi appear to be gently folded or curled during their whole length, and if by drawing the Fibres out, these Folds be destroyed, they return again as soon as that Action ceases.

19. BETWEEN these spongy and elastic Fasciculi lie seven or eight particular Tubes at small distances from each other, and all in the same Direction. These Tubes end at the Basis of the Papilla in the irregular Circle of Communication of the Lactiferous Ducts, and at the Apex, in the same number of almost imperceptible Holes or Orifices; and as they are closely united to the elastic Fasciculi, they are folded in the same manner with them.

20. THE Body of the Papilla is covered by a thin Cutaneous Production, and by the Epidermis. Its outer Surface is uneven, being full of small Tubercles and Wrinkles, among which those near the Circumference of the Nipple, seem to have a transverse or annular Disposition, which however is not uniform,

21. THIS Disposition or Direction seems to be owing to the elastic Folds already mentioned; and from this simple Structure it is easy to explain how Infants in sucking the Nipple, and Women in drawing the Teats of Cows, bring out the Milk. For the Excretory Tubes being wrinkled in the same manner as the Fasciculi, do by these Wrinkles or Folds, as by so many Valves, hinder the Milk contained in the Ducts from flowing out; but when the Nipple is drawn and elongated, the Tubes lose their Folds, and the Passage becomes streight. Besides this, when they are drawn with a considerable Force, the whole Body of the Mamma is increased in length and contracted in breadth, and thereby the Milk is press'd into the open Tubes; and thus by barely pressing the Body of the Breast, the Milk may be forced toward the Nipple, and even through the Tubes.

Arteries,
Veins,
Nerves, &c.

22. THE Arteries and Veins distributed through the Mammæ, are Ramifications of the Arteriæ and Venæ Mammariæ, of which one kind comes from the Subclaviæ, and are named Mammariæ Internæ; the others from the Axillares, called Mammariæ Externæ.

23. THESE Vessels communicate with each other, with those near them, and with the Vasa Epigastrica, as was observed in the Description of the Arteries and Veins. The Nerves come chiefly from the Costales, and by means of these, communicate with the great Nervi Sympathetici.

Uses.

24. THE use of the Mammæ in the Nourishment of Children is known to all the World: But it is not certainly known what the Papillæ and Areolæ in Males can be designed for. Milk has been observed in them, in Children of both Sexes; and this happened to one of my own Brothers when he was about two Years of Age.

§ 3. *Pleura and Mediastinum.*

25. THE Pleura is a Membrane which adheres very closely to the inner Surface of the Ribs, Sternum, and Musculi Inter-Costales, Sub-Costales, and Sterno-Costales, and to the convex side of the Diaphragm. It is of a very firm Texture, and plentifully stored with Blood-Vessels and Nerves, in all which it resembles the Peritonæum; and likewise in that it is made up of an inner true Membranous Lamina, and a Cellular Substance on the outside, which is a Production or Continuation of the Lamina.

26. THE Cellular Portion goes quite round the inner Surface of the Thorax, but the Membranous Portion is disposed in a different manner. Each side of the Thorax has its particular Pleura, intirely distinct from the other, and making, as it were, two great Bladders, situated laterally with respect to each other in the great Cavity of the Breast; in such a man-

ner

ner as to form a double Septum or Partition running between the Vertebrae and the Sternum, their other sides adhering to the Ribs and Diaphragm.

27. THIS particular Duplicature of the two Pleurae is termed Mediastinum. The two Laminæ of which it is made up are closely united together near the Sternum and Vertebrae; but in the middle, and toward the lower part of the fore-side, they are separated by the Pericardium and Heart, as we shall see hereafter. A little more backward they are parted in a tubular Form by the Œsophagus, to which they serve as a Covering; and in the most posterior Part, a triangular Space is left between the Vertebrae and the two Pleurae from above downward, which is filled chiefly by the Aorta.

28. BEFORE the Heart, from the Pericardium to the Sternum, the two Laminæ adhere very closely, and there the Mediastinum is transparent, except for a small Space near the upper part, where the Thymus is situated; so that in this place there is naturally no Interstice or particular Cavity. The apparent Separation is owing intirely to the common Method of raising the Sternum, as was plainly demonstrated by *Bartholinus* my first Master in Anatomy, in his Treatise of the Diaphragm published at *Paris* in 1676. I shall have occasion to mention *Eustachius's* Tables, where the same Fault is said to be found, in another place.

29. THE Mediastinum does not commonly terminate along the middle of the inside of the Sternum, as the common Opinion has been. I demonstrated in the Year 1715. to the Royal Academy of Sciences, that from above downward, it inclines toward the left side; and that if before the Thorax is opened, a sharp Instrument be run through the middle of the Sternum, there will be almost the breadth of a Finger between the Instrument and the Mediastinum; provided that the Sternum remain in its natural Situation, and the Cartilages of the Ribs be cut at the distance of an Inch from it, on each side.

30. FROM all this we see not only that the Thorax is divided into two Cavities intirely separated from each other, by a middle Septum without any Communication; but also that by the Obliquity of this Partition, the right Cavity is greater than the left; and from hence we may judge of the uncertainty of Trepanning the Sternum, which the Ancients have recommended in some cases.

31. THE Cellular Portion of the Pleura connects the Membranous Portion to the Sternum, Ribs, and Muscles; to the Diaphragm, Pericardium, Thymus, and Vessels; and in a word, to whatever lies near the convex side of the Membranous Portions of the Pleura. It likewise insinuates itself between the Laminæ of the Duplicature of which the Mediastinum is formed, and unites them together. It even penetrates the Muscles, and communicates with the Cellular Substance in their Interstices, all the way to the Membrana Adiposa on the external convex side of the Thorax. In this the Pleura resembles the Peritonæum.

32. THE Surface of the Pleura turned to the Cavities of the Breast, is continually moistened by a Lymphatic Serosity which transudes through the Pores of the Membranous Portion. This Fluid is said to be secreted by imperceptible Glands; but the Existence of these Glands has not been hitherto demonstrated; as was likewise observed of the Glands of the Peritonæum.

*Arteries and
Veins.*

33. THE Arteries and Veins of the Pleura are chiefly Ramifications of the Intercostals; and these Ramifications are exceedingly numerous, and for the most part very small. The Mammariæ Internæ and Diaphragmaticæ likewise send Branches hither, which communicate very frequently with those that come from the Intercostals.

34. THE Mediastinum has particular Vessels called Arteriæ and Venæ Mediastinæ, which are commonly Branches of the Subclaviæ. The Mammariæ Internæ send likewise Ramifications to the forepart of it, the Diaphragmaticæ to the lower part, and the Inter-Costales and Œsophagææ to the backpart.

Nerves.

35. THE Nerves are Ramifications of the true Inter-Costales, called otherwise Costales and Dorfales. Near the Vertebrae they communicate with the great Sympathetic Nerves, improperly called Inter-Costales, and but very little with the middle Sympathetici or those of the eighth Pair.

Uses.

36. THE Pleura serves in general for an inner Integument to the Cavity of the Thorax. The Mediastinum cuts off all communication between the two Cavities, and hinders one Lung from pressing on the other when we lie on one side. It likewise forms Receptacles for the Heart, Pericardium, Œsophagus, &c. and is continued over the Lungs in the manner which shall be explained hereafter.

37. BEFORE we leave the Pleura, it must be observed that these Portions of it which adhere immediately to the Ribs, may be looked upon as the Periosteum of their inner sides. This Adhesion keeps the Pleura stretched, and hinders it from slipping or giving way. It likewise renders this Membrane extremely sensible of the least Separation caused by a coagulated Lympha or accumulated Blood; the Nervous Filaments being likewise in this case very much compressed in Inspiration, by the swelling of the Intercostal Muscles.

§ 4. *Thymus.*

38. THE Thymus is an oblong Glandular Body, round on the upper part, and divided below into two or three Lobes, of which that toward the left Hand is the longest. In the Fœtus it is of a pretty large Size, less in Children, and very little in aged Persons. In Children it is of a white Colour, sometimes mixed with red; but in an advanced Age its Colour is generally dark.

39. THE greatest part of the Thymus lies between the Duplication of the Superior and Anterior Portion of the Mediastinum, and the great Vessels

Vessels of the Heart, from whence it reaches a little higher than the Tops of the two Pleuræ, so that some part of it is out of the Cavity of the Thorax; and in the Fœtus and in Children, it lies as much without the Thorax as within it.

40. ITS particular inward Structure and Secretions are not as yet sufficiently known to determine its Uses, which however seem to be designed more for the Fœtus than for Adults. It has Vessels belonging to it called Arteriæ and Venæ Thymicæ.

§ 5. Cor.

41. THE Heart is a Muscular Body situated in the Cavity of the Thorax on the anterior part of the Diaphragm, between the two Laminæ of the Mediastinum. It is in some measure of a Conical Figure, flattened on the sides, round at Top, and oval at the Basis. Accordingly, we consider in the Heart the Basis, Apex, two Edges, and two sides, one of which is generally flat, the other more convex. *Situation in general and Conformation.*

42. BESIDES the Muscular Body which chiefly forms what we call the Heart, its Basis is accompanied by two Appendices called Auriculæ, and by large Blood-Vessels, of which hereafter; and all these are included in a Membranous Capsula, named Pericardium.

43. IT is hollow within, and divided by a Septum which runs between the Edges, into two Cavities called Ventriculi, one of which is thick and solid, the other thin and soft. This latter is generally termed the right Ventricle, the other, the left Ventricle, though in their natural Situation, the right Ventricle is placed more anteriorly than the left, as we shall see hereafter.

44. EACH Ventricle opens at the Basis by two Orifices, one of which answers to the Auricles, the other to the Mouth of a large Artery; and accordingly one of them may be termed the Auricular Orifice, the other the Arterial Orifice. The right Ventricle opens into the right Auricle, and into the Trunk of the Pulmonary Artery; the left, into the left Auricle, and into the great Trunk of the Aorta. At the Edges of these Orifices are found several moveable Pelliculæ, called Valves by Anatomists; of which some are turned inward toward the Cavity of the Ventricles, called Triglochines, or Tricuspides; others are turned toward the great Vessels, called Semilunares or Sigmoidales. The Valvulæ Tricuspides of the left Ventricle are likewise termed Mitrales.

45. THE inner Surface of the Ventricles is very uneven, many Eminences and Cavities being observable therein. The most considerable Eminences are thick fleshy Productions called Columnæ. To the Extremities of these Pillars are fastened several Tendinous Cords, the other ends of which are joined to the Valvulæ Tricuspides. There are likewise other small short Tendinous Ropes along both Edges of the Septum between the Ventricles. These small Cords lie in an obliquely transverse Situation, and form a kind of Network at different distances. *Ventriculi.*

46. THE

46. THE Cavities of the inner Surface of the Ventricles are small deep Fossulæ or Lacunæ placed very near each other, with small prominent Interstices between them. The greatest part of these Lacunæ are Orifices of the Venal Ducts to be described hereafter.

*Structure of
the Ventri-
cles.*

47. THE fleshy or muscular Fibres of which the Heart is made up, are disposed in a very singular manner, especially those of the right or anterior Ventricle; being either bent into Arches or folded into Angles.

48. THE Fibres which are folded into Angles are longer than those which are only bent into Arches. The middle of these Arches, and the Angles of the Folds, are turned toward the Apex of the Heart, and the Extremities of the Fibres, toward the Basis. These Fibres differ not only in length but in their Directions which are very oblique in all, but much more so, in the long or folded Fibres than in the short ones which are simply bent.

49. IT is commonly said, that this Obliquity represents this Figure 8, but the comparison is very false, and can only agree to some bad Figures drawn by Persons ignorant of the Laws of Perspective.

50. ALL these Fibres, regard being had to their different Obliquity and Length, are disposed in such a manner, as that the longest form partly the most external Strata on the convex side of the Heart, and partly the most internal on the concave side; the middle of the Arches and the Angles meeting obliquely and successively to form the Apex.

51. THE Fibres situated within these long ones, grow gradually shorter and streighter all the way to the Basis of the Heart, where they are very short and very little incurvated. By this Disposition, the sides of the Ventricles are very thin near the Apex of the Heart, and very thick toward the Basis.

52. EACH Ventricle is composed of its proper distinct Fibres, but the left Ventricle has many more than the right. Where the two Ventricles are joined, they form a Septum which belongs equally to both.

53. THERE is this likewise peculiar to the left Ventricle, that the Fibres which form the innermost Stratum of its concave side, form the outermost Stratum of the whole convex side of the Heart, which consequently is common to both Ventricles; so that by carefully unravelling all the Fibres of the Heart, we find it to be made up of two Bags contained in a third.

54. THE anterior or right Ventricle is larger than the posterior or left, as was well observed by the Ancients, and clearly demonstrated by *M. Helvetius*. They are both nearly of the same length in Men, and in some Subjects they end exteriorly in a kind of double Apex.

55. ALL the Fibres are not directed the same way, though they are all more or less oblique; for some end toward the right Hand, others toward the left; some forward, some backward, and others in the intermediate places; so that in unravelling them, we find that they cross each other gradually, sometimes according to the length of the Heart, and sometimes according to its breadth.

56. THE Tubes which cross each other transversely are much more numerous than those which cross Longitudinally; which ought to be taken notice of, that we may rectify the false Notions that have been entertained concerning the Motion of the Heart; namely, that it is performed by a contorsion or twisting like that of a Screw, or that the Heart is shortened in the time of Contraction, and lengthened in Dilatation.

57. THE Fibres which compose the inner or concave Surface of the Ventricles, do not all reach to the Basis; some of them running into the Cavity, and there forming the fleshy Columnæ, to which the loose floating Portion of the Tricuspidal Valves is fastened by Tendinous Ropes.

58. BESIDES these fleshy Pillars, the internal Fibres form a great many Eminences and Depressions, which not only render the inner Surface of the Ventricles uneven, but give it a great extent within a small compass. Some of these Depressions are the Orifices of the Venal Ducts found in the Substance of the Ventricles, which have been already mentioned. The Circumferences of the great Openings at the Basis of the Heart are Tendinous, and may be looked upon as the common Tendon of all the fleshy Fibres of which the Ventricles are composed.

59. THE Valves at the Orifices of the Ventricles are of two kinds; one *Valvulæ* kind allows the Blood to enter the Heart, and hinders it from going out the same way; the other kind allows the Blood to go out of the Heart, but hinders it from returning. The Valves of the first kind terminate the Auriculæ, and those of the second lie in the Openings of the great Arteries. The first are termed Semilunar or Sigmoidal Valves, the others Triglochines, Tricuspidal, or Mitral.

60. THE Tricuspidal Valves of the right Ventricle are fixed to its Auricular Orifice, and turned inward toward the Cavity of the Ventricle. They are three triangular Productions, very smooth and polished on that side which is turned towards the Auricle, and on the side next the Cavity of the Ventricle, they have several Membranous and Tendinous Expansions; and their Edges are notched or indented. The Valves of the Auricular Orifice of the left Ventricle are of the same Shape and Structure, but they are only two in number; and from some small resemblance to a Mitre, they have been named Mitrales.

61. THESE five Valves are very thin, and fastened by several Tendinous Ropes to the fleshy Columnæ of the Ventricles. The Cords of each Valve are fixed to two Pillars; and between these Valves there are other small ones of the same Figure. They may all be termed *Valvulæ Tricuspidæ*, *Auriculares*, or *Venosæ Cordis*.

62. THE Semilunar Valves are six in number, three belonging to each Ventricle, situated at the Mouths of the great Arteries; and they may be properly enough named *Valvulæ Arteriales*. Their concave sides are turned toward the Cavity of the Arteries, and their convex sides approach each other. In examining them with a Microscope, we find fleshy Fibres lying in the Duplication of the Membranes of which they are composed.

63. THEY are truly Semilunar or in form of a Crescent, on that side by which they adhere; but their loose Edges are of a different Figure, each of them representing two small Crescents, the two Extremities of which meet at the middle of this Edge, and there form a kind of small Papilla.

The Aorta in general.

64. THE great Artery that goes out from the left Ventricle, is termed Aorta. As it goes out, it turns a little toward the right Hand, and then bends obliquely backward to form what is called Aorta Descendens which I shall have occasion to mention again hereafter. From about the middle of the convex side of this Curvature, three great Branches arise, which furnish an infinite number of Ramifications to the Head and upper Extremities of the Body; as the descending Aorta does in the same manner to the Thorax, Abdomen, and lower Extremities.

The Arteria Pulmonaris in general.

65. THE Trunk of the Artery which goes out from the right Ventricle is called Arteria Pulmonaris. This Trunk, as it is naturally situated in the Thorax, runs first of all directly upward for a small Space, then divides laterally into two principal Branches, one for each Lung; that which goes to the right Lung being the longest, for a reason that shall be given hereafter.

Auricle.

66. THE Auricles are Muscular Bags situated at the Basis of the Heart, one towards the right Ventricle, the other towards the left, and joined together by an inner Septum and external communicating Fibres, much in the same manner with the Ventricles; one of them being named the right Auricle, the other the left. They are very uneven on the inside, but smother on the outside, and terminate in a narrow, flat, indented Edge, representing a Cock's Comb, or in some measure the Ear of a Dog; and for that reason a famous Anatomist of *Leyden* would fain have distinguished this Edge, by the particular name of Auricle, calling the rest, the Bag. They open into these Orifices of each Ventricle, which I name Auricular Orifices; and they are Tendinous at their opening, in the same manner as the Ventricles.

67. THE right Auricle is larger than the left, and it joins the right Ventricle by a common Tendinous Opening, as has been already observed. It has two other Openings united into one, and formed by two large Veins which meet and terminate there, almost in a direct Line, called Vena Cava Superior and Inferior. The notched Edge of this Auricle terminates obliquely in a kind of obtuse Point, which is a small particular Production of the great Bag, and is turned toward the middle of the Basis of the Heart.

68. THE whole inner Surface of the right Auricle is uneven, by reason of a great number of prominent Lines which run across the sides of it, and communicate with each other by smaller Lines, which lie obliquely in the Interstices between the former. The Lines of the first kind represent Trunks, and the others, small Branches in an opposite Direction to each other. In the Interstices between these Lines, the sides of the Auricle are very thin and almost transparent, seeming to be formed meerly by the external

ternal and internal Coats of the Auricle joined together, especially near the Point.

69. THE left Auricle is in the Human Body, a kind of Muscular Bag or Reservoir, of a pretty considerable thickness and unequally square, into which the four Veins open, called *Venæ Pulmonares*, and which has a distinct Appendix belonging to it, like a third small Auricle. This Bag is very even on both sides, for which reason, one might be led to call it the Trunk of the Pulmonary Veins, and its Appendix, the left Auricle. However, the Bag and Appendix have but one common Cavity; and therefore may still be both comprehended under the common name of the left Auricle. In Men, the small Portion may likewise be named the Appendix of the left Auricle, but in other Animals, the case is different.

70. THIS small Portion or Appendix of the left Auricle is of a different Structure from that of the Bag or large Portion. Exteriously, it resembles a small oblong Bag, bent different ways, and indented quite round the Edges. Interiorly, it is like the inside of the right Auricle. The whole common Cavity of the left Auricle is smaller in an adult Subject than that of the right; and the fleshy Fibres of this left Auricle cross each other obliquely, in Strata differently disposed.

71. BESIDES the great common Vessels, the Heart has Vessels peculiar to itself, called the Coronary Arteries and Veins, because they in some measure crown the Basis of the Heart. The Coronary Arteries, which are two in number, go out from the beginning of the Aorta, and afterwards spread themselves round the Basis of the Heart, to the Substance of which they send numerous Ramifications. *Arteriae & Venæ Coronarie.*

72. THE exterior course of the Veins is pretty much the same with that of the Arteries, but they end partly in the right Auricle, and partly in the right Ventricle. They likewise terminate in the left Ventricle, but in smaller numbers; and in both they end by certain Venal Ducts, which open into the Fossulæ or Lacunæ already taken notice of, in the uneven inner sides of the Ventricles. There are likewise Lacunæ of the same kind in the Auricles between the prominent Lines beforementioned; and in the great Bag of the left Auricle, we find likewise small Holes which seem to have the same use.

73. THERE are seldom more than two Arteries; of which one lies toward the right Hand, the other toward the left of the anterior third part of the Circumference of the Aorta. The right Coronary Artery runs in between the Basis and right Auricle, all the way to the flat side of the Heart, and so goes half way round. The left Artery has a like course between the Basis and left Auricle, and before it turns on the Basis, it sends off a capital Branch, which runs between the two Ventricles. Another principal Branch goes off from the Union of the two Arteries on the flat side of the Heart, which running to the Apex, there joins the other Branch.

74. THE Coronary Veins are distributed exteriorly, much in the same manner. Their Trunk opens principally into the right Auricle by a particular Orifice furnished with a Semilunar Valve. All the Coronary Veins

and

and their Ramifications communicate with each other, so that if we blow through a small Hole made in any of these Branches, having first compressed the Auricles and large Vessels, we observe that the Air swells all the Vessels, and the Ventricles likewise by passing through the Ductus Venosi.

*Particular
Situation of
the Heart.*

75. THE Heart lies almost transversely on the Diaphragm, the greatest part of it being in the left Cavity of the Thorax, and the Apex being turned toward the bony Extremity of the sixth true Rib. The Basis is toward the right Cavity, and both Auricles, especially the right, rest on the Diaphragm.

76. THE Origin or Basis of the Pulmonary Artery is in this natural Situation, the highest part of the Heart on the foreside, and the Trunk of this Artery lies in a perpendicular Plane, which may be conceived to pass between the Sternum and Spina Dorsi. Therefore some part of the Basis of the Heart is in the right Cavity of the Thorax; and the rest all the way to the Apex, is in the left Cavity; and it is for this reason that the Mediastinum is turned toward that side.

77. ACCORDING to this true natural Situation of the Heart, the Parts commonly said to be on the right side, are rather Anterior; and those on the left side, Posterior; and that side of the Heart which is thought to be the foreside, is naturally the upper side; and the backside consequently the lower side.

78. THE lower side is very flat, lying wholly on the Diaphragm, but the upper side is a little convex through its whole length, in the Direction of the Septum between the Ventricles. And it may be proper here to remark, that though commonly received terms of Art may still be retained, yet it is necessary to prevent their communicating false Ideas to those who have not had an opportunity of making observations themselves, or of being instructed by others.

Pericardium.

79. THE Heart with all the Parts belonging to it, is contained in a Membranous Capsula called Pericardium, which is in some measure of a Conical Figure, and much bigger than the Heart. It is not fixed to the Basis of the Heart, but round the large Veins above the Auricles, before they send off the Ramifications, and round the large Arteries, before their Divisions.

80. THE Pericardium is made up of three Laminæ, the middle and chief of which is composed of very fine Tendinous Filaments, closely interwoven and crossing each other in different Directions. The internal Lamina seems to be a continuation of the outer Coat of the Heart, Auricles and great Vessels. The Trunks of the Aorta and Pulmonary Artery have one common Coat which contains them both as in a Sheath, and is lined on the inside by a Cellular Substance, chiefly in that Space which lies between where the Trunks are turned to each other, and the sides of the Sheath. There is but a very small Portion of the inferior Vena Cava contained in the Pericardium.

81. It is the middle Lamina which chiefly forms the Pericardium ; and the Figure of this Bag is not simply Conical, its Apex or Point being very round, and the Basis having a particular Elongation which furrounds the great Vessels, as has been already said, as amply, as the other Portion furrounds the Heart.

82. THE Pericardium is closely connected to the Diaphragm, not at the Apex, but exactly at that place which answers to the flat or lower side of the Heart ; and it is a very difficult matter to separate it from the Diaphragm in Dissection. This adhering Portion is in some measure of a triangular Shape, answering to that of the lower side of the Heart ; and the rest of the Bag lies upon the Diaphragm, without any Adhesion.

83. THE External Lamina or common Covering, as it may be called more properly, is formed by the Duplication of the Mediastinum. It adheres to the proper Bag of the Pericardium by the Intervention of the Cellular Substance in that Duplication, but leaves it where the Pericardium adheres to the Diaphragm, on the upper Surface of which it is spread, as being a continuation of the Pleura.

84. THE Internal Lamina is perforated by an infinite number of very small Holes, through which a serous Fluid continually transudes, in the same manner as in the Peritonæum. This Fluid being gradually collected after Death, makes what is called Aqua Pericardii, which is found in considerable quantities, in opening dead Bodies while they remain fresh. Sometimes it is of a reddish Colour, which may be owing to a Transudation of Blood through the fine Membrane of the Auricles.

85. THE Heart and Parts belonging to it, are the principal Instruments *Uses in gene-
ral.* of the Circulation of the Blood. The two Ventricles ought to be considered as two Syringes so closely joined together as to make but one Body, and furnished with Suckers placed in contrary Directions to each other, so as that by drawing one of them, a Fluid is let in, and forced out again by the other.

86. THE Heart is made up of a Substance capable of Contraction and Dilatation. When the fleshy Fibres of the Ventricles are contracted, the two Cavities are lessened in an equal and direct manner, not by any Contortion or Twisting, as the false resemblance of the Fibres to a Figure of Eight, has made Anatomists imagine. For if we consider attentively in how many different Directions and in how many places, these Fibres cross each other, as has been already observed, we must see clearly that the whole Structure tends to make an even, direct and uniform Contraction, more according to the breadth or thickness, than according to the length of the Heart, because the number of Fibres situated transversely, or almost transversely, is much greater than the number of longitudinal Fibres.

87. THE fleshy Fibres thus contracted do the Office of Suckers, by pressing upon the Blood contained in the Ventricles, which Blood being thus forced toward the Basis of the Heart, presses the Tricuspidal Valves against each other, opens the Semilunares, and rushes with Impetuosity through.

through the Arteries and their Ramifications, as through so many elastic Tubes.

Systole.

88. THE Blood thus pushed on by the Contraction of the Ventricles, and afterwards pressed by the elastic Arteries, enters the Capillary Vessels, and is from thence forced to return by the Veins to the Auricles, which like Retirements, Porches, or Anti-chambers, receive and lodge the Blood returned by the Veins during the time of a new Contraction. This Contraction of the Heart is by Anatomists termed *Systole*.

Diastole.

89. THE Contraction or *Systole* of the Ventricles, ceases immediately, by the Relaxation of their fleshy Fibres, and in that time the Auricles which contain the Venal Blood, being contracted, force the Blood through the Tricuspidal Valves into the Ventricles, the Sides of which are thereby dilated and their Cavities enlarged. This Dilatation is termed *Diastole*.

Circulation.

90. IN this manner does the Heart by the alternate *Systole* and *Diastole* of its Ventricles and Auricles, push the Blood through the Arteries to all the parts of the Body, and receive it again by the Veins. This is called the Circulation of the Blood, which is carried on in three different manners.

91. THE first and most universal kind of Circulation is that by which almost all the Arteries of the Body are filled by the *Systole* of the Heart, and the greatest part of the Veins evacuated by the *Diastole*.

92. THE second kind of Circulation opposite to the first, is through the Coronary Vessels of the Heart, the Arteries of which are filled with Blood during the *Diastole* of the Ventricles, and the Veins emptied during the *Systole*.

93. THE third kind of Circulation is that of the left Ventricle of the Heart; through the Venal Ducts of which, a small quantity of Blood passes, without going through the Lungs, which is the course of all the remaining Mass of Blood.

94. BESIDES these three different kinds of Circulation, there are some peculiarities in the course of the Blood which may be looked upon as particular Circulations. Such is the passage of the Blood through the Liver, Spleen, Corpora Cavernosa of the Parts of Generation, and through the Cavernous Sinuses of the Dura Mater. I do not here examine the Circulation peculiar to the Foetus.

§ 6. *Pulmones.*

Situation in general and Figure.

95. THE Lungs are two large spongy Bodies of a reddish Colour in Children, greyish in adult Subjects, and bluish in old Age; filling the whole Cavity of the Thorax, one being seated in the right side, the other in the left, parted by the Mediastinum and Heart, and of a Figure answering to that of the Cavity which contains them; that is, convex next the Ribs, concave next the Diaphragm, and irregularly flattened and depressed next the Mediastinum and Heart.

96. WHEN the Lungs are viewed out of the Thorax, they represent in some measure an Ox's Foot, with the forepart turned to the Back, the backpart to the Sternum, and the lower part to the Diaphragm.

97. THEY are distinguished into the right and left Lung; and each of these into two or three Portions called Lobi, of which the right Lung has commonly three, or two and a half, and the left Lung two. The right Lung is generally larger than the left, answerably to that Cavity of the Breast, and to the Obliquity of the Mediastinum. *Division and Figure in particular.*

98. AT the lower Edge of the left Lung, there is an indented Notch or Sinus opposite to the Apex of the Heart, which is therefore never covered by that Lung even in the strongest Inspirations, and consequently the Apex of the Heart and Pericardium may always strike against the Ribs; the Lungs not surrounding the Heart in the manner commonly taught. This Sinus is expressed in Eustachius's Tables.

99. THE Substance of the Lungs is almost all spongy, being made up of an infinite number of Membranous Cells, and of different sorts of Vessels spread among the Cells, in innumerable Ramifications. *Structure.*

100. THIS whole Mass is covered by a Membrane continued from each Pleura, which is commonly said to be double; but what is looked upon as the inner Membrane is only an Expansion and Continuation of a Cellular Substance which shall be spoken to, after I have described the Vessels of this Viscus. *Coats.*

101. THE Vessels which compose part of the Substance of the Lungs are of three or four kinds; the Air-Vessels, Blood-Vessels and Lymphatics, to which we may add the Nerves. The Air-Vessels make the chief part, and are termed Bronchia. *Bronchia.*

102. THESE Bronchia are Conical Tubes, composed of an infinite number of Cartilaginous Fragments, like so many irregular Arches of Circles, connected together by a Ligamentary Elastic Membrane, and disposed in such a manner as that the lower easily insinuate themselves within those above them.

103. THEY are lined on the inside by a very fine Membrane, which continually discharges a Mucilaginous Fluid; and in the Substance of the Membrane are a great number of small Blood-Vessels, and on its convex side, many Longitudinal Lines which appear to be partly fleshy, and partly made up of an elastic Substance of another kind.

104. THE Bronchia are divided in all Directions into an infinite number of Ramifications, which diminish gradually in size; and as they become Capillary, change their Cartilaginous Structure into that of a Membrane. Besides these very small Extremities of this numerous Series of Ramifications, we find that all the subordinate Trunks from the greatest to the smallest, send out from all sides a vast number of short Capillary Tubes of the same kind.

105. EACH of these numerous Bronchial Tubes is widened at the Extremity, and thereby formed into a small Membranous Cell, commonly called a Vesicle. These Cells or Folliculi are closely connected together in Bundles; *Vesiculae Bronchiales.*

Bundles; each small Branch producing a Bundle proportionable to its extent and the number of its Ramifications.

Lobuli.

106. THESE small Vesicular or Cellulous Bundles are termed Lobules; and as the great Branches are divided into small Rami, so the great Lobules are divided into several small ones. The Cells or Vesicles of each Lobule have a free communication with each other, but the several Lobules do not communicate so readily.

Interlobular Substance.

107. THE Lobules appear distinctly, to be parted by another Cellulous Substance, which surrounds each of them in proportion to their extent, and fills up the Interstices between them. This Substance forms likewise a kind of irregular Membranous Cells, which are thinner, looser, and broader than the Bronchial Vesicles.

108. THIS Substance is dispersed through every part of the Lungs, forms cellulous or spongy Vaginæ which surround the Ramifications of the Bronchia and Blood-Vessels, and is afterwards spread over the outer Surface of each Lung, where it forms a kind of fine Cellular Coat, joined to the general Covering of that Viscus.

109. WHEN we blow into this Interlobular Substance, the Air compresses and flattens the Lobuli; and when we blow into the Bronchial Vesicles they presently swell, and if we continue to blow with force, the Air passes insensibly into the Interlobular Substance. We owe this Observation to *M. Helvetius*.

Vascular Texture.

110. ALL the Bronchial Cells are surrounded by a very fine Reticular Texture of the small Extremities of Arteries and Veins which communicate every way with each other. The greatest part of this admirable Structure is the discovery of the illustrious *Malpighi*.

Blood-Vessels.

111. THE Blood-Vessels of the Lungs are of two kinds; one common, called the Pulmonary Artery and Veins; the other proper, called the Bronchial Arteries and Veins.

112. THE Pulmonary Artery goes out from the right Ventricle of the Heart; and its Trunk having run almost directly upward as high as the Curvature of the Aorta, is divided into two lateral Branches, one going to the right Hand, called the right Pulmonary Artery, the other to the left, termed the left Pulmonary Artery. The right Artery passes under the Curvature of the Aorta, and is consequently longer than the left. They both run to the Lungs, and are dispersed through their whole Substance by Ramifications nearly like those of the Bronchia, and lying in the same Directions.

113. THE Pulmonary Veins having been distributed through the Lungs in the same manner, go out on each side, by two great Branches which open laterally into the Reservoir or Muscular Bag of the right Auricle.

114. THE Ramifications of these two kinds of Vessels in the Lungs, are surrounded every where by the Cellular Substance already mentioned, which likewise gives them a kind of Vagina; and the Rete Mirabile of *Malpighi*, described above, is formed by the Capillary Extremities of these Vessels. It must be observed, that the Ramifications of the Arteries are

more

more numerous and larger than those of the Veins, which in all other parts of the Body exceed the Arteries both in number and size.

115. BESIDES these capital Blood-Vessels, there are two others called *Bronchial* the Bronchial Artery and Vein. The Artery has become very famous of *Arteries and* late, by the Description given of it by *M. Ruysch*. The Vein was doubted *Veins* of for some time, but it exists as really as the Artery, and may be easily demonstrated.

116. THESE two Vessels are very small, appearing only like very fine Arteries and Veins coming from the Aorta, Vena Cava and their Branches, in the manner already said in the Description of the Arteries and Veins; and they seem to have no other use but that of nourishing the Lungs.

117. THE Varieties in the Origins of the Bronchial Arteries and Veins, especially of the Arteries, their Communications or Anastomoses with each other, and with the neighbouring Vessels, and above all, the immediate Anastomosis of the Bronchial Artery with the common Pulmonary Vein are of so great consequence in the practice of Physick, that it will be proper to repeat here what I have said about them elsewhere, that the attention of the Readers may not be diverted by being obliged to turn to another place of this Work.

118. THE Bronchial Arteries come sometimes from the anterior part of the Aorta Descendens Superior, sometimes from the first Intercoastal Artery and sometimes from one of the *Œsophagææ*. They go out sometimes separately, toward each Lung, sometimes by a small common Trunk which afterwards divides to the right and left, near the Bifurcation of the *Aspera Arteria* hereafter to be described, and follow Ramifications of the Bronchia.

119. THE left Bronchial Artery comes pretty frequently from the Aorta and the Right, from the superior Intercoastal on the same side, because of the Situation of the Aorta. There is likewise another which arises from the Aorta posteriorly near the Superior Intercoastal, and above the Anterior Bronchialis.

120. THE Bronchial Artery gives off a small Branch to the Auricle of the Heart on the same side, which communicates immediately with the Coronary Artery.

121. IN the Year 1719. I observed a very plain Anastomosis between some Branches of the left Pulmonary Vein, and of one of the *Arteriæ Œsophagææ*, which came from the first left Intercoastalis, together with a Bronchial Artery of the same side.

122. IN that or the following Year, I observed likewise an Anastomosis between the left Bronchial Artery and the Vena Azygos; and in the Month of April 1721, I saw an Anastomosis between a Branch of this Artery, and the Body of the just mentioned Vein.

123. SOMETIMES one Bronchial Artery gives Origin to several Superior Intercoastales; and sometimes several Bronchial Arteries send off separately the same number of Intercoastals.

124. THE Bronchial Veins, as well as Arteries, were known to *Galen*. These Veins are sometimes Branches of the *Arygos*, coming from the upper part of the Curvature or Arch. The left Vein is sometimes a Branch of the common Trunk of the *Intercostales* of the same side; and sometimes both Veins are Branches of the *Gutturialis*.

Nervi.

125. THE Lungs have a great many Nerves distributed through them by Filaments which accompany the Ramifications of the Bronchia and Blood-Vessels, and are spread on the Cells, Coats, and all the Membranous Parts of the Lungs. The *Nervi Sympathetici Medii* and *Majores*, commonly called the Nerves of the eighth Pair, or the *Intercostals*, form behind each Lung a particular Intertexture, called *Plexus Pulmonaris*, from whence nervous Filaments go out, which communicate with the *Plexus Cardiacus* and *Stomachicus*.

Vasa Lymphatica.

126. ON the Surface of the Human Lungs, between the external and cellular Coat, we observe something that looks like Lymphatic Vessels; but we ought to take care not to mistake for such Vessels, a transparent Reticular Substance observable on the Surface of the Lungs, after blowing strongly into the Lobuli; this appearance being intirely owing to the Air which passes through the Bronchial Vesicles into the Interlobular Cells, and which by separating a certain number of Lobuli, finds room to lodge between them. The true Lymphatic Vessels of the Lungs are most visible in Brutes; and in a Horse particularly, I have observed one of these Vessels to run along a great part of one Edge of the Lungs.

Ligaments.

127. UNDER the Root of each Lung, that is under that part formed by the subordinate Trunk of the Pulmonary Artery, by the Trunks of the Pulmonary Veins, and by the Trunk of the Bronchia, there is a pretty broad Membranous Ligament which ties the Posterior Edge of each Lung to the lateral parts of the *Vertebræ* of the Back, from that Root all the way to the Diaphragm.

Trachea Arteria.

128. THE Bronchia already described are Branches or Ramifications of a large Canal, partly Cartilaginous, and partly Membranous, called *Trachea* or *Aspera Arteria*. It is situated Anteriorly in the lower part of the Neck, from whence it runs down into the Thorax between the two *Pleuræ*, through the upper Space left between the Duplication of the *Mediastinum*, behind the *Thymus*.

129. HAVING reached as low as the Curvature of the Aorta, it divides into two lateral Parts, one toward the right Hand, the other toward the left, which enter the Lungs, and are distributed through them in the manner already said. These two Branches are called *Bronchia*, and that on the right side is shorter than that of the left, whereas the right Pulmonary Artery is the longest.

130. THE Trachea is made up of Segments of Circles or Cartilaginous Hoops, disposed in such a manner, as to form a Canal open on the back-part, the Cartilages not going quite round; but this Opening is filled by a soft Glandular Membrane, which compleats the circumference of the Canal.

131. EACH

131. EACH Circle is about the twelfth part of an Inch in breadth, and about a quarter of that Space in thickness. Their Extremities are round; and they are situated horizontally above each other, small Interstices being left between them, and the lower Edge of the superior Segments being turned toward the upper Edge of those next below them.

132. THEY are all connected by a very strong elastic Membranous Ligament fixed to their Edges. I have observed the first three Segments united into one bent alternately in two different places according to its breadth. Sometimes two are continuous in the same manner.

133. THE Canal of the Aspera Arteria is lined on the inside by a particular Membrane which appears to be partly Flethy or Muscular, and partly Ligamentary, perforated by an infinite number of small Holes more or less imperceptible, through which a Mucilaginous Fluid continually passes, to defend the inner Surface of the Trachea against the Acrimony of the Air which we breath.

134. THIS Fluid comes from small Glandular Bodies dispersed through the Substance of the Membrane, but especially from Glands something larger than the former, which lie on the outer or posterior Surface of that strong Membrane, by which the circumference of the Canal is compleated. The same Structure is observable in the Ramifications of the Trachea from the greatest to the smallest.

135. ALL the Vessels of which the Lungs are chiefly composed, that is, the Air-Vessels or Bronchia; and Blood-Vessels, that is, the Pulmonary and Bronchial Arteries and Veins, accompany each other through this whole Viscus.

136. THEY are disposed commonly in such a manner even to the last Ramifications, as that a subordinate Trunk or Branch of the Bronchia lies between the like Trunks or Branches of the Pulmonary Artery and Vein; the Bronchial Vessels being immediately joined to the Bronchia. In some places these three kinds of Vessels touch each other in such a manner as to leave a Triangular Space in the middle.

137. THE Bronchia are divided into a very great number of Ramifications; and the last Rami are the Pedicles or Footstalks of the small Lobuli. All the Lobuli are angular, oblong, broad, thin, &c. The Footstalks send out other smaller Membranous Pedicles, which are very short and terminate in the Bronchial Vesicles or Cells, of which they are continuations. The subordinate Trunks and Rami detach a great number of these Pedicles from their convex Surface.

138. WHEN we blow into the Lungs, the Bronchial Cells nearest their outer Surface, appear like small Portions of round Vesicles; and from this appearance, all the Bronchial Cells have got the name of Vesicles, though they are all Angular, except those which I have now mentioned.

139. WHEN we examine a Lung without blowing it up, we find that the Cartilaginous Segments of the Bronchia lie so near as to be ingaged in each other; and in drawing out any Portion of the Bronchia by the two Ends, these Segments are parted, and the whole Canal is increased in length;

but it contracts again by means of its elastic Membrane as soon as that force is taken off.

140. WHEN we open lengthwise any Portion of the Pulmonary Artery and Vein in the same Lung, we meet with a great number of transverse Rugæ which are destroyed when these Vessels are elongated. This is an Observation made by *M. Helvetius*.

141. BY virtue of this Structure, all the Ramifications both of the Bronchia and Pulmonary Arteries and Veins, have constantly the same Direction, whether the Lung be inflated or collapsed; and they contract in length without being either contorted or folded. In Expiration these Vessels are elongated, and shortened in Inspiration.

142. THESE three Vessels lie in a sort of Cellular Vagina which accompanies all their Ramifications, and is a continuation of the Interlobular Cells, or Cellular Substance in the Interstices of the Lobuli. The Pelliculæ which compose it are, however, disposed there, in a more regular manner, and more longitudinally than in other places, and thereby appear to form a true Vagina.

143. WHEN we blow through a Pipe introduced so far as to touch immediately a Trunk of the Blood-Vessels or Bronchia, the Air runs at first through all the Cells that lie nearest that Trunk or its Branches; but if we continue to blow, it insinuates itself through the whole Interlobular Substance.

*Bronchial
Glands.*

144. AT the Angle of the first Ramification of the Trachea Arteria, we find on both the fore and back sides, certain soft, roundish, glandular Bodies, of a bluish or blackish Colour, and of a Texture partly like that of the Thymus already described, and partly like that of the Glandula Thyroides, of which hereafter. There are other Glands of the same kind at the Origin of each Ramification of the Bronchia, but they decrease proportionably in number and size. They are fixed immediately to the Bronchia, and covered by the Interlobular Substance; and they seem to communicate by small Openings with the Cavity of the Bronchia.

145. THE Trachea has several Coats, as has been already observed. The outermost or common Covering surrounds that part of the Trachea which lies in the Thorax; but out of the Thorax, this first Coat is derived from the Aponeurotic Expansions of the Muscles of the Neck; and it is between this and the following Covering that the Glands already mentioned, are situated.

146. THE second is a proper Coat, being a continuation of the Cellular Covering of the Lungs; and the Pelliculæ thereof nearest the Cartilaginous Segments, serve them for an external Perichondrium. The third Membrane lies on the inside, adhering closely to the same Cartilages, and supplying to these, the place of an internal Perichondrium.

147. THE fourth Membrane is that which compleats the Circumference of the Cartilaginous Circles of the Trachea. It consists chiefly of two Laminae or Strata, partly Muscular and partly Tendinous; the external or posterior Lamina being made up of Longitudinal Fibres; and the internal
or

or anterior, of transverse Fibres. This Membrane is perforated by the small Ducts of the abovementioned Glands, which discharge a Fluid when pressed, and being examined through a Microscope they appear Vesicular or Folliculous, much like those of the Stomach.

148. THE Ligament between the Cartilaginous Circles are very strong and elastic; and each of them is confined to two Cartilages without communicating with any of the rest; being fixed to the Edges of these Cartilages much in the same manner as the Intercoastal Muscles are inserted in the Ribs.

149. As the Bronchia penetrate into the Substance of the Lungs, they gradually lose their Cartilages; but the Muscular Lines or Columnæ of *M. Morgagni* appear as much, and sometimes more than before. The two Planes abovementioned continue likewise to be visible; and we observe very distinctly, sometimes even without a Microscope, a great many small Holes in the Pedicles of the Lobuli, and Bronchial Vesicles or Cells, which open from within outwards.

150. RESPIRATION is performed by Organs of two kinds, one of which *Utes.* may be looked upon as active, the other as passive. The Lungs are of the second kind, and the first comprehends chiefly the Diaphragm and Intercoastal Muscles.

151. As soon as the Intercoastal Muscles begin to contract, the Arches of the Ribs are raised together with the Sternum, and placed at a greater distance from each other; by which means the Cavity of the Thorax is enlarged on the two lateral and anterior sides.

152. AT the same instant the Diaphragm is flatted or brought toward a Plane by two Motions, which are apparently contrary; that is, by the Contraction of the Diaphragm, and the Dilatation of the Ribs in which it is inserted. The external Surface of the Thorax being thus in a manner increased, and the Cavity of the Bronchia being at the same time and by the same means, less resisted or pressed upon; the Ambient Air yields to the external Pressure, and insinuates itself into all the places where the Pressure is diminished, that is, into the Aspera Arteria, and into all the Ramifications of the Bronchia all the way to the Vesicles. This is what is called Inspiration.

153. THIS Motion of Inspiration is instantaneous, and ceases in a moment by the Relaxation of the Intercoastal Muscles; the elastic Ligaments and Cartilages of the Ribs bringing them back at the same time, to their former Situation. This Motion by which the Ribs are depressed and brought nearer each other, is termed Expiration.

154. THE Pulmonary Arteries and Veins which accompany the Bronchia, through all their Ramifications, and surround the Vesicles, transmit the Blood through their narrow Capillary Extremities, and thereby change or modify it, at least in three different manners.

155. THE first Change or Modification which the Blood undergoes in the Lungs, is to have the Cohesions of its Parts broken, to be attenuated, pounded, and as it were, reduced to Powder. The second is, to be deprived

prived of a certain quantity of Serum, which transpires through the Lungs, and is what we commonly call the Breath. The third is to be in a manner reanimated by the Impression of the Air, whether the whole Body of the Air enters the Blood, whether the common Air is only the Vehicle of some finer Parts which are conveyed to it, or whether the Air only compresses and shakes the Blood, as it passes round the Bronchial Vesicles in the Reticular Capillary Extremities of the Vessels.

156. THE Cartilages of the Aspera Arteria and Bronchia serve in general to compose a Canal, the sides of which will not sink in or subside by Compression, but will nevertheless yield to certain Pressures and Impulses without breaking. As these Cartilages are not compleat Circles or Rings, and as their Circumferences are compleated by elastic Membranes, they allow of these Dilatations and Contractions which modulate the Voice; and as they are connected by elastic Ligaments of a considerable breadth, the alternate Elongation and Contraction of the Bronchia is facilitated in the Motions of Respiration.

157. I say nothing here of the Larynx, which is commonly looked upon as the upper part of the Aspera Arteria, but refer the Description of it to that of the Head, with which it has a particular Connexion in relation to the Tongue; and this I do the more willingly, because I have included in the same Treatise, all that relates to the Neck, as not furnishing Matter enough for a particular Section, though in the general Division of the Human Body, it may naturally enough be looked upon as a distinct part lying between the Head and the Thorax.

§ 7. *Œsophagus.*

Situation and Figure.

158. THE *Œsophagus* is a Canal partly Muscular and partly Membranous, situated behind the Trachea Arteria, and before the Vertebrae of the Back, from near the middle of the Neck, down to the lower part of the Thorax; from whence it passes into the Abdomen through a particular Hole of the small or inferior Muscle of the Diaphragm, and ends at the upper Orifice of the Stomach.

Structure and Coats.

159. IT is made up of several Coats almost in the same manner as the Stomach, of which it is the Continuation. The first Coat, while in the Thorax, is formed only by the Duplication of the posterior part of the Mediastinum, and is wanting above the Thorax and in the Neck, where the outer Coat of the *Œsophagus* is only a Continuation of the Cellular Substance belonging to the neighbouring parts.

160. THE second Coat is Muscular, being made up of several Strata of fleshy Fibres. The outermost are mostly longitudinal; but they are not all continued from one end of the Canal to the other. The following Strata are obliquely transverse, the next to these, more transverse, and the innermost are turned a little obliquely the contrary way. They cross each other irregularly in many places, but are neither Spiral nor Annular.

161. THE third is termed the Nervous Coat, and is like that of the Stomach and Intestines. It is differently folded or plaited according to its length, being much wider than the Muscular Coat; and it is surrounded by a whitish, soft, fine Filamentary Substance like a kind of Cotton, which when steep'd in Water, swells and grows thicker.

162. THE fourth or innermost Coat resembles in some measure that of the Intestines, except that instead of the Villi it has small and very short Papillæ. It is folded lengthwise like the third Coat; so that the Œsophagus when cut across, represents one Tube within another. Through the Pores of this Coat, a viscid Lympha is continually discharged.

163. THE Œsophagus from its very beginning, turns a little to the left Hand, and naturally runs along the left Extremities of the Cartilages of the Aspera Arteria. The Thyroide Gland and those which lie behind the middle of the Œsophagus shall be described in another place, and I refer the Pharynx as well as the Larynx to the Description of the Head, for a reason that shall be given there.

§ 5. *Ductus Thoracicus.*

164. THE Thoracic Duct is a thin transparent Canal, which runs up from the Receptaculum Chyli, along the Spina Dorfi, between the Vena Azygos and Aorta as high as the fifth Vertebra of the Back or higher. From thence it passes behind the Aorta toward the left Hand, and ascends behind the left Subclavian Vein, where it terminates in some Subjects, by a kind of Vesicula, in others by several Branches united together, and opens into the backside of the Subclavian Vein near the outside of the internal Jugular.

165. THIS Canal is plentifully furnished with Semilunar Valves turned upward. Its Opening into the Subclavian Vein in the Human Body, is, in the place of Valves, covered by several Pelliculæ so disposed as to permit the entrance of the Chyle into the Vein, and hinder the Blood from running into the Duct. It is sometimes double, one lying on each side, and sometimes it is accompanied by Appendices called Pampiniformes.

THE ANATOMY OF

S E C T. X.

A Description of the Head.

1. **I**N the Descriptions of the Abdomen and Thorax, I began by an account of the External Parts of these two Cavities of the Human Body; and afterwards I proceeded to the internal Parts; but I must observe a different order in describing the Head. I shall here explain first of all, the Contents of the Cranium or all that lies within that bony Cavity; and afterwards all that surrounds it on the outside; and it is very proper that the Reader should review what has been said concerning the Structure of the Cranium in both Treatises of the Bones, before he begins this Section.

2. THE Head being considered in general as one of the three principal Cavities of the Human Body, has this peculiar to it, that its outside is the Seat and Basis of several very complex particular Organs, whereas on the inside it contains only one, which is indeed the Organ of Organs, and the Primum Mobile of the whole Animal Œconomy; I mean the Brain, the Mechanism of which is still very little known; and the Structure of its different Parts, even of those which we are supposed to be most acquainted with, is very difficult to be demonstrated.

A R T. I.

The Brain and its Appendages.

3. **T**HE name of Brain is given to all that Mass which fills the Cavity of the Cranium, and which is immediately surrounded by two Membranes called Meninges by the Greeks, and Matres by other Ancients, because they were commonly of opinion that these Membranes were the Origin, and, as it were, the Mother of all the other Membranes of the Body.

4. THIS general Mass is divided into three particular Portions; the Cerebrum or Brain properly so called, the Cerebellum and Medulla Oblongata. To these three Parts contained within the Cranium, a fourth is added which fills the great Canal of the Spina Dorsi by the name of Medulla Spinalis, being a continuation of the Medulla Oblongata.

5. THE Meninges or Membranes are two in number, one of which is very strong, and lies contiguous to the Cranium; the other is very thin and immediately touches the Brain. The first is named Dura Mater; the second Pia Mater, which is again divided into two, the external Lamina being

being termed Arachnoides ; the internal retaining the common name of Pia Mater. I begin by these Meninges.

§ 1. *Dura Mater.*

6. THE Dura Mater incloses the Brain and all its Appendages. It lines the *Situation in* inside of the Cranium, and supplies the place of an internal Periosteum, *general.* being spread in all the Holes and Depressions, and covering all the Eminences in such a manner as to prevent their being hurtful to the Brain.

7. IN describing the Dura Mater we must take notice, 1. Of its Compo- *Division.* sition. 2. Its Adhesions to the Cranium. 3. Its Folds or Septa. 4. Its Productions, Vessels and Nerves.

8. THE Dura Mater is made up of two Laminæ, adhering very closely *Composition.* together ; the Fibres of both, crossing each other obliquely. By rubbing any part of this Membrane between the Fingers, we easily perceive the two Laminæ sliding a little upon each other. Their Texture is very close and strong, appearing to be partly Ligamentary and partly Tendinous.

9. THE Dura Mater sticks closely to the Cranium by a great number of *Adhesions.* Filaments of the external Lamina, which enter the Pores of the Bones chiefly at the Sutures both above and below ; and by penetrating these Joints, they communicate with the external Periosteum. These Filaments are for the most part, small Vessels, which being broken in separating the Dura Mater from the Skull, a great number of red Points appear on the external Surface of that Membrane.

10. IT adheres much more to the whole inner Surface of the Cranium in Children and young Persons than in those of an advanced Age, the Filaments becoming then very small, being compressed by the Contraction of the bony Pores ; and consequently they are more easily ruptured by any force applied to them.

11. THESE Adhesions are formed intirely by the external Lamina. The *Internal La-* internal Lamina is very smooth and polished on the inside, which is also *mina.* continually moistened by a fine Fluid discharged through its Pores, much in the same manner as in the Peritonæum and Pleura.

12. THE Folds of the Dura Mater are made by the internal Lamina ; *Folds and* and three of them form particular Septa ; one of which is superior, repre- *Septa.* senting a kind of Mediastinum between the two great Lobes of the Brain. The second is in a middle Situation, like a Diaphragm between the Cerebrum and Cerebellum ; the third is inferior between the Lobes of the Cerebellum. The superior Septum is Longitudinal in form of a Scythe, from whence it is termed the Falx of the Dura Mater ; and it may likewise be called Septum Sagittale, Verticale, or Mediastinum Cerebri. The middle Septum is transverse, and might be called the Floor of the Cerebrum, the Diaphragm of the Brain, or the Tent of the Cerebellum. The inferior Septum is very small, and runs down between the Lobes of the Cerebellum ; on which account it may be termed either simply Septum Cerebelli, or

THE ANATOMY OF

Septum Occipitale Minus; the middle Partition being looked upon as the Septum Occipitale Majus.

13. THE Superior or Vertical Septum called the Falx of the Dura Mater is a long and broad Fold or Duplicature of the internal Lamina, reaching from the Edge of the Crista Ossis Cribrosi, along the Sagittal Suture, to the middle of the transverse Septum; which it joins in such a manner, as that the lateral Laminæ of the Falx are continuous on each side, with the neighbouring Portions of the superior Lamina of the middle Septum.

14. It is broader where it joins the middle Septum than at the Os Ethmoides, and it is thicker at that Edge which adheres to the Cranium than at the other which lies loose and is very sharp, and from this resemblance to a Scythe it had the name of Falx.

15. THE transverse or middle Septum is fixed to the Os Occipitis along the Grooves of the lateral Sinuses, and those of the great Angles of the Apophyses Petrosæ all the way to the posterior Clinoid Apophyses of the Os Sphenoidale. By this Situation it forms a sort of Floor, Tent, or shallow Vault, on the forepart of which is a large Notch almost of an oval Figure.

16. THIS Septum divides the Cranium into two Cavities, one large or superior, and the other small or inferior, which communicate together by the great oval Notch. It is formed by a particular Fold and a very broad Membrane of the internal Lamina of the Dura Mater; and in the natural state it is very tense, because of its Union, or rather Continuity with the Falx.

17. THIS Union or Continuity of these two Septa, keeps them both very tense, so that the middle Septum is capable of sustaining a considerable Weight ^{without} sinking downward; and the Falx is able to resist lateral Pressures without giving way either to the right Hand or to the left.

18. WE may be convinced of this reciprocal Tension by first touching these two Septa in their natural state; and again, after they have been cut one after the other according to their breadth, or rather after having cut in this manner the Falx in one Subject and the transverse Septum in another; for as soon as the Falx is cut, the other will be perceived immediately to lose its Tension and Firmness; and the same thing will be observed in the Falx as soon as we cut the Septum Medium.

19. THE small Occipital Septum is both very short and narrow. It runs down from the middle of the transverse Septum, to the Edge of the great Occipital Hole, being fixed to the internal Spine of the Os Occipitis. It is formed by a Fold and Duplicature of the internal Lamina of the Dura Mater, in the same manner as the other two, and distinguishes the lower part of the Occipital Cavity of the Cranium into two lateral Parts. In some Subjects this Septum is double, answering to the double Spine of the Os Occipitis.

*Sphenoidal
Folds.*

20. BESIDES these large Folds, there are two small lateral ones, on each side of the Sella Sphenoidalis, each running from the posterior to the anterior Clinoid Apophysis on the same side. These two Folds, together

with

with the anterior and posterior parts of the Sella Sphenoidalis, form a small Fossula in which the Pituitary Gland is lodged. There are likewise two anterior Folds, at the Edges of the Sphenoidal or Superior Orbital Fissures, which augment the depth of the middle Fossulæ of the Basis Cranii. Thus we have seven Folds of the internal Lamina of this Membrane, three large and four small, which may be termed internal Productions or Processes of the Dura Mater.

21. THE Elongations of the Dura Mater are Productions of both Laminae which go beyond the general Circumference and pass out of the Cranium, through the Openings described in the Treatise of the Skeleton; and in this they differ from the Folds which are formed intirely by one Lamina and do not go out of the Skull. They may be named the external Productions of the Dura Mater. *Elongations.*

22. THE most considerable of these Elongations passes through the great Occipital Foramen, and runs down the common Canal of the Vertebrae in form of a Tube, lining the inside of that Canal and inclosing the Medulla Spinalis, by the name of the Dura Mater of that Medulla. The other Elongations accompany the Nerves out of the Cranium in form of Vaginae, which are more numerous than the Nervous Trunks reckoned in Pairs. For the Olfactory Nerves, there is the same number of distinct Vaginae as there are Holes in the Lamina Ethmoidalis; and some Nerves are accompanied by several Vaginae through one Hole, as those of the ninth Pair.

23. THERE are two particular Elongations which form the Periosteum of the Orbits, together with the Vaginae of the Optic Nerves. These Orbital Elongations go out by the Sphenoidal or Superior Orbital Fissures, and increasing in breadth in their Passage, line the whole Cavity of the Orbits, at the Edges of which they communicate with the Pericranium and Periosteum of the Face. They communicate likewise through the Sphenomaxillary or inferior Orbital Fissures with the Pericranium of the Temporal and Zygomatic Fossæ; and by these Communications we may explain the accidents which happen to these Parts, in Wounds of the Head.

24. THE Elongations of the Dura Mater which accompany the Blood-Vessels through the Foramina of the Cranium, unite with the Pericranium immediately afterwards. Such for instance, are the Elongations which line the Fossulæ of the Foramina Lacera or Jugularia, and the bony or carotid Canals of the Apophysis Petrosa, &c.

25. THE Vessels of the Dura Mater are Arteries, Veins and Sinuses. *Arteries.* The Arteries in general are distinguished into Anterior, Middle and Posterior, and come from the Carotides and Vertebrales on each side. The External Carotid sends a Branch through the Spinal Hole of the Os Sphenoidale, which is the middle Artery of the Dura Mater, and is called by way of Eminence, Arteria Duræ Matris. It is divided into a great number of Branches which are plentifully dispersed through the Substance of the external Lamina as high as the Falx, where these Ramifications communicate with their Fellows from the other side. The Impressions of this Artery are

seen on the inside of the Parietal Bones, the anterior and lower Angle of which, instead of a simple Impression, contains a Canal for the Passage of a Trunk or Branch of this Artery, on which account several accidents happen in Fractures of the Skull, as I demonstrated at the [Royal Garden above eight Years ago.

26. THE External Carotid sends another small Ramus through the Corner or small End of the Sphenoidal or Superior Orbital Fissure, where there is sometimes a little Notch on purpose, mentioned in the Description of the Skeleton. This Branch is the anterior Artery of the Dura Mater, and it gives off Ramifications in the same manner as the former with which it communicates, but its Ramifications are not so numerous. The Internal Carotid, as it enters the Cranium, gives off a small Branch to the substance of the Dura Mater.

27. THE two Vertebral Arteries enter by the great Occipital Foramen, and unite in one Trunk on the Anterior or Sphenoidal Apophysis of the Os Occipitis. Immediately afterwards, they enter the Substance of the Dura Mater on both sides, each of them by one or two Branches. These are the posterior Arteries of the Dura Mater; and they communicate by some Ramifications with the Middle or Spinal Artery abovementioned.

*Veins and
Sinuses.*

28. THE Dura Mater contains in its Duplication several particular Canals, into which the Venal Blood not only of that Membrane, but of the whole Brain, is carried. These Canals are termed Sinuses, and some of them are disposed in Pairs, others in uneven numbers, that is, some of them are placed alone, in a middle Situation; others are disposed laterally on each side of the Brain. The most ancient Anatomists reckoned only four; to which we can now add four times as many.

29. THESE Sinuses are in the Duplication of the Dura Mater; and their Cavities are lined on the inside by particular very fine Membranes. They may be enumerated in this manner.

THE great Sinus of the Falx or Superior Longitudinal Sinus, which was reckoned the first by the Ancients.

Two great lateral Sinuses, the second and third of the Ancients.

THE Sinus called Torcular Herophili, the fourth of the Ancients.

THE small Sinus of the Falx or inferior Longitudinal Sinus.

THE Posterior Occipital Sinus, which is sometimes double.

Two Inferior Occipital Sinuses which form a Portion of a Circle, and may likewise be called the Inferior Lateral Sinuses.

Six Sinus Petrofi, three on each side, one Anterior, one Middle or Angular, and one Inferior. The two Inferior, together with the Occipital Sinuses, complet a Circular Sinus round the great Foramen of the Os Occipitis.

THE Inferior Transverse Sinus.

THE Superior Transverse Sinus.

Two Circular Sinuses of the Sella Sphenoidalis; one superior and one inferior.

Two Sinus Cavernosi, one on each side.

Two Orbitary Sinuses, one on each side.

30. ALL these Sinuses communicate with each other, and with the great lateral Sinuses by which they discharge themselves into the internal Jugular Veins, which are only Continuations of these lateral Sinuses. They likewise unload themselves partly into the Vertebral Veins, which communicate with the small lateral or inferior Occipital Sinuses; and partly into the external Jugular Veins, by the Orbitary Sinuses which communicate with the Venæ Angulares, Frontales, Nales, Maxillares, &c. as the lateral Sinuses likewise communicate with the Venæ Occipitales, &c.

31. THUS the Blood which is carried to the Dura Mater, &c. by the external and internal Carotid, and by the Vertebral Arteries, is returned to the Heart by the external and internal Jugular and Vertebral Veins; so that when the passage of the Blood is obstructed in any particular place, it finds another way, by virtue of these Communications, though not with the same ease. This Observation is of consequence in relation not only to Obstructions, but to the different Situations of the Head.

32. THE great Sinus of the Falx reaches from the Connexion of the Ethmoidal Crista with the Os Frontis. along the upper Edge of the Falx, all the way to the posterior Edge of the transverse Septum, where it ends by a Bifurcation in the great lateral Sinuses. It is very narrow at its anterior Extremity, and from thence becomes gradually wider all the way to its posterior Extremity.

33. THE Cavity of this Sinus is not Cylindrical but triangular, having in a manner, three sides, one superior parallel to the Cranium and two lateral, inclined to the Plane of the Falx. The upper side is formed by the external Lamina of the Dura Mater, and through the middle of its breadth a kind of fine Raphe or Suture runs from one end to the other.

34. THE two lower or lateral sides are Productions of the internal Lamina, which having parted from the external, are inclined toward each other, and then unite; forming first the Sinus, and afterwards the Duplicature of the Falx. This Sinus is lined interiorly by a fine proper Membrane, which forms likewise a kind of Raphe or Suture along the bottom of the Sinus, that is along the union of the two lateral sides.

35. IN this Sinus we observe several Openings and several Ligamentary Fræna. The Openings are Orifices of Veins, the smallest of which belong to the Dura Mater, the largest to the Brain. The Veins of the Brain enter the Sinus, for the most part, obliquely from behind forward, after they have run about a Finger's breadth in the Duplicature of the Dura Mater.

36. IT has been thought that the Arteries of the Dura Mater discharged themselves immediately into the Sinuses, because Injections made by the Arteries or a Hog's Bristle thrust into them, have been found to pass into these Sinuses. But on a more close examination, it has been discovered that the Injections passed from the Arteries into the Veins, and from thence
into

into the Sinuses, through the small Orifices already mentioned; and that the Hog's Bristle pierced the sides of the Artery, which near the Sinuses are very thin.

37. THIS mistake gave rise to another, that the Dura Mater had no Veins; and what confirmed it was, that the Arteries of the Dura Mater cover the Veins so intirely, that the Edges of the Veins are hardly perceivable on either side of the Arteries. There are however some places where the Veins being broader than the Arteries, their two Edges are seen on each side of the Arteries like Capillary Vessels. These Veins are for the most part Branches of the Sinuses, and the small Trunks of some of them, open into the Head of the Vena Jugularis Interna. We may easily be satisfied that the Arteries on both sides of the Dura Mater communicate with each other above the Falx, either by injecting or blowing into them.

38. THE internal Fræna of this great Sinus appear to be Tendinous, and to be designed to prevent the too great Dilatation of the Sinus by the Blood. They vary, however, in different Subjects, and do not always reach from one side to the other. It has been pretended that Glands have been found there; but we ought to take care not to mistake for such, certain small Corpuseles which are the products of Diseases.

39. THE inferior Sinus of the Falx is situated in the lower Edge of its Duplicature, being very narrow, and as it were, flattened on both sides. It communicates immediately with the fourth Sinus of the Ancients; and in some Subjects, seems even to be a continuation thereof. It likewise communicates with the great or superior Sinus, by small Veins which go from one to the other, and with the Veins of the Cerebrum by the same means.

40. THE lateral Sinuses represent two large Branches of the superior longitudinal Sinus, one going to the right Hand the other to the left, along the great Circumference of the transverse Septum, all the way to the Basis of the Apophysis Petrosa of the Ossa Temporum. From thence they run down, having first taken a large turn and then a small one; and being strongly fixed in the lateral Grooves of the Basis Cranii, they follow the course thereof all the way to the Foramina Lacera and Fossulæ of the Jugular Veins.

41. THEY do not always arise by an equal and Symmetrical Bifurcation of the superior longitudinal Sinus; for in some Subjects, one of the lateral Sinuses appears to be a continuation of the Longitudinal, and the other, to be a Branch from it. This variety may happen on either side; and in a word, we sometimes find one of these Sinuses higher or lower, larger or smaller than the other.

42. THE Cavity of these lateral Sinuses is likewise triangular, and furnished with a proper Membrane and with Fræna; and it has also the small venal Openings which indeed are common to it, not only with the longitudinal Sinus, but with most part of the others. The posterior or outer
side

side of this Cavity, is formed by the external Lamina of the Dura Mater, and the other two by the internal Lamina.

43. As these two Sinuses go out by the posterior Portions of the Openings of the Basis Cranii, called Foramina Lacera, they are dilated into a kind of Bag, proportioned to the Fossulæ of the Venæ Jugulares, where they terminate in these Veins.

44. NEAR the Concourse of the superior longitudinal and lateral Sinuses, we observe an Opening (sometimes double) which is the Orifice of a Sinus situated along the Union of the Falx and transverse Septum. It does not always end directly at the lower part of the superior Sinus, but sometimes opens at the beginning of one of the lateral Sinuses, especially when the Bifurcation is not equal; and in this case it often terminates in that lateral Sinus, which appears like a Branch from the common Trunk of the superior and other lateral Sinus.

45. THIS Sinus has been named Torcular Herophili, from an ancient Author, who imagined that the Blood was in a manner, in a Press, at the Union of these four Sinuses. Its Diameter is but small, and it forms a kind of Bifurcation with the inferior longitudinal Sinus, and with a Vein of the Cerebrum which is sometimes double, called Vena Magna Galeni.

46. THE cavernous or lateral Sinuses of the Os Sphenoides are Reservoirs of a very particular kind, containing not only Blood, but considerable Vessels and Nerves, as we shall see hereafter; and likewise a spongy or cavernous Substance full of Blood, much like that of the Spleen or Corpus Cavernosum of the Urethra.

47. WE observe some Nervous Filaments which go to the Dura Mater, *Nerves and* from the Trunk of the fifth Pair, at the entry of the cavernous Sinus; *Glands.* and from the common Trunk of the eighth Pair and Nervus Accessorius or Spinalis, as they pass through the Foramen Lacerum. The small Tubercles sometimes found on the lateral sides of the longitudinal Sinus of the Falx, deserve still to be examined before we can determine any thing about them. The whole inside of the Dura Mater is moistened in the same manner as the Peritonæum and Pleura.

48. THE prominent Fibres intersecting each other in different manners, which appear on the inside of the Dura Mater, especially near the Falx and transverse Septum, and which have been taken for a kind of fleshy Fibres, seem to be only Ligamentary and Elastic. The universal Adhesion of this Membrane to the Cranium, prove that it can have no particular Motion, and consequently that such fleshy or muscular Fibres would be altogether useless. This Adhesion was plainly demonstrated by *Vesalius, Riolan, &c.* long before *Roonbuisen*.

§ 2. Pia Mater.

49. THIS Membrane surrounds the whole Mass of the Brain more particularly than the Dura Mater. It adheres very closely to the Brain, and *Situation in general.*

is connected to the Dura Mater only by the Veins which open into the Sinuses, as has been already said.

Structure.

50. THE Pia Mater is made up of two very fine Laminæ, the outermost of which covers pretty uniformly, all the convex Surface of the Brain, and lines in the same manner all the concave or inner Surface of the Dura Mater. The internal Lamina forms a great number of Plicæ, Duplicatures and Septa, which insinuate themselves into all the Folds and Circumvolutions, and between the different Strata of the Cerebrum and Cerebellum.

51. THE two Laminæ of the Pia Mater are not so closely united as those of the Dura Mater, being connected only by a cellulous Substance, which accompanies them through their whole extent, except at some places of the Basis of the Cerebrum, &c. where the internal Lamina continuing its Insertions, the external remains uniformly stretched over the prominent Parts, the Interstices of which are intirely separated from the other Lamina without any cellular Substance between them. These separate Portions of the external Lamina have made it be looked upon as a third Membrane of the Brain distinct from the Pia Mater; and it has been named Membrana Arachnoides from its resemblance to a Cobweb in delicacy of Texture.

52. IN each of these Laminæ of the Pia Mater, we discover another kind of fine Duplication which contains Vessels, as I have demonstrated in my private Courses; but these small Vessels are hardly perceivable without the help of an Injection, or of a great Inflammation. The cellular Substance does not only accompany the two Laminæ through their whole common extent, in the manner already said, but also the internal Lamina in particular through all its Duplicatures and Septa. This we discover by blowing through a small Pipe cautiously introduced between the two Laminæ, so as not to offend any of the Parts near it, in the manner which I demonstrated publicly in the Year 1726. in the Dissections which I performed my self at the Physick Schools, after the example of the great Riolan.

§ 3. *Cerebrum.*

*Situation
and Figure.*

53. THE Cerebrum properly so called, is a kind of Medullary Mass, of a moderate Consistence, and of a greyish Colour on the outer Surface, filling all the superior Portion of the Cavity of the Cranium, or that Portion which lies above the transverse Septum. The upper part of the Cerebrum is of an oval Figure like half an Egg cut lengthwise, or rather like two Quarters of an Egg cut lengthwise, and parted a little from each other. It is flatter on the lower part, each lateral half of which is divided into three Eminences called Lobes, one anterior, one middle, and one posterior.

Substance.

44. THE Substance of the Cerebrum is of two kinds distinguished by two different Colours; one part of it which is softest, being of a greyish or Ash-Colour; the other which is more solid, being very white. The
Ash-

Ash-coloured Substance lies chiefly on the outer part of the Cerebrum like a kind of Cortex, from whence it has been named Substantia Corticalis or Cinerea. The white Substance occupies the inner part, and is named Substantia Medullaris, or simply Substantia Alba.

55. THE Cerebrum is divided into two lateral Portions, separated by the Falx, or great longitudinal Septum of the Dura Mater. They are generally termed Hemispheres, but they are more like Quarters of an oblong Spheroide. Each of these Portions is divided into two Extremities, one anterior and one posterior, which are termed the Lobes of the Cerebrum, between which there is a large inferior Protuberance which goes by the same name; so that in each Hemisphere there are three Lobes, one anterior, one middle and one posterior. *Division and Lobes.*

56. THE anterior Lobes lie upon these Parts of the Os Frontis which contribute to the Formation of the Orbits and of the Frontal Sinuses, commonly called the anterior Fossæ of the Basis Cranii. The posterior Lobes lie on the transverse Septum; and the middle Lobes, in the middle or lateral Fossæ of the Basis Cranii.

57. EACH lateral Portion of the Cerebrum has three sides, one superior, which is convex, one inferior, which is uneven, and one lateral, which is flat, and turned to the Falx. Through the whole Surface of these three sides we see Inequalities or Windings like the Circumvolutions of Intestines, formed by waving Streaks or Furrows very deep and narrow, into which the Septa or Duplicatures of the Pia Mater insinuate themselves, and thereby separate these Circumvolutions from each other. *Sides and Inequalities.*

58. NEAR the Surface of the Cerebrum, these Circumvolutions are at some distance from each other, representing Serpentine Ridges; and in the Interstices between them, the superficial Veins of the Cerebrum are lodged, between the two Laminæ of the Pia Mater, from whence they pass into the Duplicature of the Dura Mater, and so open into the Sinuses.

59. THESE Circumvolutions are fixed through their whole depth to the Septa or Duplicatures of the Pia Mater, by an infinite number of very fine vascular Filaments, as may be seen by pulling the Circumvolutions a little asunder with the Fingers.

60. WHEN they are cut transversely, we observe that the Substantia Alba lies in the middle of each Circumvolution, so that there is the same number of internal Medullary Circumvolutions as of external Cortical ones; the first representing white Laminæ invested by others of an Ash-colour; but the cortical Substance is in many places thicker than the medullary.

61. THE anterior and middle Lobes of the Cerebrum on each side are parted by a deep narrow Sulcus, which ascends obliquely backward, from the Temporal Ala of the Os Sphenoides to near the middle of the Os Parietale; and the two sides of this Division have each their particular Ridges and Circumvolutions, which gives a very great extent to the cortical Substance. This Sulcus is termed Fissura Magna Silvii, or simply Fissura Cerebri. *Figure.*

Corpus Callosum.

62. HAVING cut off the Falx from the Crista Galli, and turned it backward; if we separate gently the two lateral Parts or Hemispheres of the Cerebrum, we see a longitudinal Portion of a white convex Body, which is named Corpus Callosum. It is a middle Portion of the medullary Substance, which under the inferior Sinus of the Falx, and also a little toward each side, is parted from the Mass of the Cerebrum, to which it is simply contiguous from one end of that Sinus to the other, so that at this place, the Edge of the inside of each Hemisphere, only lies on the Corpus Callosum, much in the same manner as the anterior and posterior Lobes lie on the Dura Mater. Both Extremities of this medullary Body terminate by a small Edge bent transversely downward.

63. THE Surface of the Corpus Callosum is covered by the Pia Mater, which runs in between the lateral Portions of this Body, and the lower Edge of each Hemisphere. Along the middle of its Surface from one end to the other, there is a kind of Raphe formed by a particular Intertexture of Fibres which cross each other; for though these Fibres appear to be transverse, yet they are really a little oblique, and those that come from the right side intersect those that come from the left. This Raphe is made more perceivable by two small medullary Cords which accompany it on each side, and adhere closely to the transverse Fibres.

Medullary Arch and Centrum Ovale.

64. THE Corpus Callosum becomes afterwards continuous on each side, with the medullary Substance, which through all the remaining part of its extent, is intirely united with the cortical Substance, and together with the Corpus Callosum forms a medullary Arch or Vault of an oblong or oval Figure. To perceive this, the whole cortical Substance, together with the medullary Laminæ mixed with it, must be cautiously and dexterously cut off in the same Direction with the Convexity of the Cerebrum. After which we will observe a medullary Convexity much smaller than that which is common to the whole Cerebrum, but of the same form; so that it appears like a medullary Nucleus of the Cerebrum, especially when we consider it together with the medullary Substance of the inferior Part or Basis of the Cerebrum. And from thence *M. Vieussens* took occasion to name this Nucleus the Centrum Ovale.

Ventriculi Laterales.

65. UNDER this Arch are two lateral Cavities, much longer than they are broad, and very shallow, separated by a transparent medullary Septum, of which hereafter. These Cavities are generally named the anterior superior Ventricles of the Cerebrum, to distinguish them from two other smaller Cavities which are situated more backward, as we shall see presently; but the name of lateral or great Ventricles given them by *Steno*, is more proper than either of the other two.

66. THE lateral Ventricles are broad, and rounded at these Extremities which lie next the transparent Septum. They go from before backward, contracting in breadth, and separating from each other gradually in their progress. Afterwards they bend downward, and return obliquely from behind forward in a course, like the turning of a Ram's Horn, and terminate

nate almost under their superior Extremities, only a little more backward and outward.

67. AT the place where they begin to bend in order to run downward and then backward, there is on each side a particular Elongation which runs from before backward, and terminates in a triangular pointed Cavity turned a little inward, the two Points resembling Horns. These Ventricles are every where lined with a thin Membrane.

68. THE transparent Partition or Septum Lucidum, as it is commonly called, lies directly under the Raphe or Suture of the Corpus Callosum, of which it is a Continuation, and a kind of Duplication. It is made up of two medullary Laminæ, more or less separated from each other by a narrow medullary Cavity, sometimes filled with a serous Substance. This Cavity in some Subjects, reaches a great way backward; and I am apt to think, communicates with the third Ventricle, of which hereafter.

69. THE Septum Lucidum is united by its lower part, to the anterior Portion of that particular medullary Body, called improperly the Fornix with three Pillars, because of some resemblance it is thought to bear to the Arches of ancient Vaults. It is in reality nothing but the Corpus Callosum, the lower side of which is like a hollow Cieling with three Angles, one anterior and two posterior; and three Edges, two lateral and one posterior. The lateral Edges are terminated each by a large semi-cylindrical Border, like two Arches, which uniting at the anterior Angle, form by their Union what is called the anterior Pillar of the Fornix; and as they run backward separately toward the two posterior Angles, they have then the name of the posterior Pillars.

70. THE anterior Pillar being double is larger than either of the posterior; and the Marks of this Duplicity always remain. Immediately below the Basis of this Pillar, we observe a large, white, short, medullary Rope stretched transversely between the two Hemispheres, and commonly called the anterior Commissure of the Cerebrum. It is to this Pillar that the Septum Lucidum adheres; but it has no total Adhesion below, and therefore the two lateral Ventricles communicate with each other. The posterior Pillars are bent downward, and continued through the lower Portions of the Ventricles all the way to their Extremities, resembling a Ram's Horn, which is a name that has been given to them. They diminish gradually in thickness during this course, and at their outsides they have each a small, thin, flat, collateral Border, to which the name of Corpora Fimbriata is owing.

71. THE inferior Surface of the triangular Cieling which lies between these Arches, is full of transverse, prominent, medullary Lines; for which reason the Ancients called it Psaloides and Lyra, comparing it to a stringed Instrument, something like what is now called a Dulcimer.

72. THE Fornix being cut off and inverted, or quite removed, we see first of all a vascular Web, called Plexus Choroides, and several Eminences more or less covered by the Expansion of that Plexus. There are four Pairs of Eminences which follow each other very regularly, two large and

two small. The first two great Eminences are named Corpora Striata; and the second, Thalami Nervorum Opticorum. The four small Eminences are closely united together; the anterior being called Nates, and the posterior, Testes; but it would be better to call them simply, anterior and posterior Tubercles. Immediately before these Tubercles there is a single Eminence called Glandula Pinealis.

*Corpora
Striata.*

73. THE Corpora Striata got that name, because in scraping them with the Knife we meet with a great number of white and ash-coloured Lines alternately disposed, which are only the transverse Section of the medullary and cortical Laminæ, mixed together in a vertical Position in the Basis of the Cerebrum, as appears evidently by Incisions made from above downward. These two Eminences are of a greyish Colour on the Surface, oblong, roundish, pyriform, and larger on the fore than on the backpart, where they are narrow and bent.

74. THEY lie in the bottom of the superior Cavity of the lateral Ventricles, which they resemble in some measure in Shape, their anterior Parts being near the Septum Lucidum, from which they separate gradually as they run backward and diminish in size. They are in reality the convex Bottoms of the Ventricles, and it is at the lower part of the Interstice between the largest Portions of them, that we observe the great transverse Cord, named the Anterior Commissure of the Cerebrum, which I mentioned already in describing the anterior Pillar of the Fornix Callosus. This Cord communicates more particularly with the Bottom of the Corpora Striata, by a turn toward each side.

*Thalami
Nervorum
Opticorum.*

75. THE Thalami Nervorum Opticorum are so named, because these Nerves arise chiefly from them. They are two large Eminences placed by the side of each other, between the posterior Portions or Extremities of the Corpora Striata. Their Figure is Semi-spheroidal and a little Oval; and they are of a whitish Colour on the Surface; but their inner Substance is partly greyish and partly white, so that in cutting them, we see Streaks of different Colours like those of the Corpora Striata.

76. THESE two Eminences are closely joined together, and at their convex part, they are so far united as really to become one Body, the whitish outer Substance being continued uniformly over them both. This Substance is very thin, and falls to pieces only by the Weight of the lateral Parts of the Brain when taken out of the Cranium. Therefore to learn the Structure of these Eminences, they must be examined in Situ, and even there they must be handled very gently.

77. IMMEDIATELY within this whitish common Substance, these two Eminences are closely contiguous till about the middle of their thickness; and from thence they separate insensibly toward the bottom, where by the Space left between them a particular Canal is formed, named the third Ventricle, one Extremity of which opens forward, the other backward, as we shall see hereafter. Some Anatomists have mistaken the superficial Connexion of these Eminences for the Pons Varolii.

78. AT the bottom, these two Eminences are elongated downward toward both sides, into two thick, round, whitish Cords, which separate from each other like Horns, by a large Curvature, and afterwards by a small Curvature turned forward in an opposite Direction to the former, and representing the Tip of an Horn, they approach each other again. The Size of these Ropes diminishes gradually from their Origin to their anterior Reunion. I shall have occasion to mention them in another place in speaking of the Optic Nerves.

79. THE Tubercles are four in number, two anterior and two posterior; *Tubercula.* adhering together as if they made but one Body situated behind the Union of the Thalami Nervorum Opticorum. They are transversely oblong; the anterior being a little more rounded, and broader or larger from before backward, than the posterior. Their Surface is white and their inner Substance greyish. The names of Nates and Testes given to these Tubercles, are very impertinent, there being no resemblance between them and the things from whence these names are taken. I should like to call them *Tubercula Quadrigemina*; that term being used by Anatomists on another like occasion, to express four small Muscles lying near each other, and inserted round the great Trochanter of the Os Femoris.

80. DIRECTLY under the place where the Tubercles of one side are united to those of the other side, lies a small middle Canal, which communicates by its anterior Opening with the third Ventricle, under the Thalami Nervorum Opticorum, and by its posterior Opening, with the fourth Ventricle, which belongs to the Cerebellum, as we shall afterwards see. *Canalis Medius.*

81. WHERE the convex Parts of the two anterior Tubercles join these posterior convex parts of the Thalami Nervorum Opticorum, an Interstice or Opening is left between these four Convexities which communicates with the third Ventricle, and with the small middle Canal. Instead of the ridiculous name of Anus which has been given to this Opening, it may be called *Foramen Commune Posterius.* to distinguish it from another which shall be mentioned hereafter, by the name of *Foramen Commune Anterius.*

82. THE Glandula Pinealis is a small soft greyish Body, about the size of an ordinary Pea, irregularly round, and sometimes of the Figure of a Pine-Apple, situated behind the Thalami Nervorum Opticorum, above the *Tubercula Quadrigemina.* It is fixed like a small Button to the lower part of the Thalami by two very white medullary Pedunculi, which at the Gland are very near each other, but separate almost transversely toward the Thalami. *Glandula Pinealis.*

83. It seems to be mostly of a cortical Substance, except near the Footstalks where it is something medullary. The Footstalks are sometimes double, as if they belonged to the two anterior Tubercles. This Body adheres very close to the Plexus Choroides by which it is covered, as we shall see hereafter; and it therefore requires some Dexterity to separate it from the Glandula, without altering its Situation or breaking the Pedunculi. This Gland has been often found to contain Gravel. Below the

the Glandula Pinealis there is a medullary transverse Cord, called the Posterior Commissure of the Hemispheres of the Cerebrum.

Infundibulum.

84. BETWEEN the Basis of the anterior Pillar of the Fornix, and the anterior part of the Union of the Optic Thalami, lies a Cavity or Fossula named Infundibulum. It runs down towards the Basis of the Cerebrum, contracting gradually, and terminates in a streight Course, by a small membranous Canal, in a softish Body situated in the Sella Sphenoidalis, named Glandula Pituitaria. The Infundibulum opens above, immediately before the Optic Thalami, by an oval Hole named Foramen Commune Anterius, and consequently communicates with the lateral Ventricles.

The third Ventricle.

85. AT the lower part of the Thalami Nervorum Opticorum directly under their Union, lies a particular natural Canal, called the third Ventricle of the Cerebrum. I call it a natural Canal, that we may not mistake for it, an accidental Fissure which lies between the Thalami in Cerebra taken out of the Cranium, as I have already said.

86. THIS Canal opens forward into the Infundibulum under the Foramen Commune Anterius, by which it likewise communicates with the lateral Ventricles. It opens backward under the Foramen Commune Posterius, between the Thalami and Tubercula Quadrigemina, opposite to the small middle Canal which goes to the Cerebellum.

Plexus Choroides.

87. THE Plexus Choroides is a very fine vascular Texture, consisting of a great number of arterial and venal Ramifications, partly collected in two loose Fasculi, which lie one in each lateral Ventricle, and partly expanded over the neighbouring Parts, and covering in a particular manner the Thalami Nervorum Opticorum, Glandula Pinealis, Tubercula Quadrigemina, and the other adjacent Parts both of the Cerebrum and Cerebellum, to all which it adheres.

88. IN each lateral Portion of this Plexus we observe a venal Trunk, the Ramifications of which are spread through the whole extent of the two Portions. Near the Glandula Pinealis, these two Trunks approach each other, and uniting behind that Gland, they open into the Torcular or fourth Sinus of the Dura Mater. When we blow into one of these Trunks toward the Plexus, the Air passes into all its Ramifications; and in some Subjects, these two Veins form one Trunk which opens into the Sinus.

89. THE ventricular or loose Portions of the Plexus, often appear to contain a great number of Tubercles like Glands, which in the natural state are extremely small, but grow bigger in Diseases. To be able to examine them, as we ought, the loose Portions must be made to swim in clear Water, and be there carefully expanded. Then by the help of a Microscope we will see these Tubercles in the natural state, like small Folliculi or little Bags more or less flatted.

90. BESIDES this vascular Web or Plexus of the Septum Lucidum; the sides of the Fornix, of the Eminences, Ventricles, Canals and Infundibulum, are all covered by a very fine Membrane, in which by Injections or Inflammations, we discover a great number of very fine Vessels. This Membrane is in a manner, a continuation of the Plexus, and that seems to be

be a detachment from the Pia Mater. By the same means we likewise discover an extremely thin Membrane on the insides of the Duplicature of the Septum, though in some Subjects, these sides touch each other.

91. THE Pituitary Gland is a small spongy Body lodged in the Sella *Glandula*
Sphenoidalis between the sphenoidal Folds of the Dura Mater. It is of a *Pituitaria.*
singular kind of Substance, which seems to be neither Medullary nor Glandular. On the outside it is partly greyish, and partly reddish, and white within. It is transversely oval or oblong, and on the lower part in some Subjects it is divided by a small Notch into two Lobes, like a Kidney Bean. It is covered by the Pia Mater as by a Bag, the Opening of which is the Extremity of the Infundibulum, and it is surrounded by the small circular Sinuses which communicate with the Sinus Cavernosi.

§ 4. Cerebellum.

92. THE Cerebellum is contained under the transverse Septum of the Dura Mater. It is broader laterally than on the fore or backsides, flatted *Situation and*
on the upper side, and gently inclined both ways, answerable to the Septum which serves it as a kind of Tent or Cieling. On the lower side it is rounder, and on the backside it is divided into two Lobes, separated by the Occipital Septum of the Dura Mater. *Figure.*

93. It is made up like the Cerebrum, of two Substances, but it has no *Structure.*
Circumvolutions on its Surface. Its Sulci are pretty deep, and disposed in such a manner as to form thin flat Strata, more or less horizontal, between which the internal Lamina of the Pia Mater insinuates itself by a number of Septa equal to that of the Strata.

94. UNDER the transverse Septum, it is covered by a vascular Texture, which communicates with the Plexus Choroides. It has two middle Eminences called Appendices Vermiformes, one anterior and superior which is turned forward, the other posterior and inferior which goes backward. There are likewise two lateral Appendices, both turned outward. They are termed Vermiformes from their resemblance to a large Portion of an Earthworm.

95. BESIDES the Division of the Cerebellum into lateral Portions or into two Lobes, each of these Lobes seems to be likewise subdivided into three Protuberances, one anterior, one middle or lateral, and one posterior; but they are not in all Subjects equally distinguished either by their Convexity or Limits; but they may always be distinguished by the Direction of their Strata, those of the middle and anterior Protuberance being less transverse than in the posterior.

96. WHEN we separate the two lateral Portions or Lobes, having first made a pretty deep Incision; we discover first of all the posterior Portion of the Medulla Oblongata, of which hereafter; and in the posterior Surface of this Portion, from the Tubercula Quadrigemina, all the way to the posterior Notch in the Body of the Cerebellum, and a little below that *Fourth Ventricle.*

that Notch ; we observe an oblong Cavity which terminates backward like the Point of a writing Pen. This Cavity is what is called the fourth Ventricle.

97. AT the beginning of this Cavity, immediately behind the small common Canal which lies under the Tubercles, we meet with a thin medullary Lamina, which is looked upon as a Valve between that Canal and the fourth Ventricle. A little behind this Lamina, the Cavity grows wider towards both Hands, and then contracts again to its first size. It is lined interiorly by a thin Membrane, and seems oftentimes to be distinguished into two lateral Parts, by a kind of small Groove, from the Valvular Lamina to the Point of the Calamus Scriptorius.

98. THIS Membrane is a Continuation of that which lines the small Canal, the third Ventricle, Infundibulum, and the two great Ventricles. To be able to see the fourth Ventricle in its natural state, in which it is narrowest, it must be laid open while the Cerebellum remains in the Cranium, and in order to that, the Os Occipitis must be sawed very low down.

99. ON each side of this Ventricle the medullary Substance forms a Trunk which expands itself in form of Laminæ through the cortical Strata. We discover these medullary Laminæ according to their breadth, by cutting the Cerebellum in Slices almost parallel to the Basis of the Cerebrum ; but if we cut one Lobe of the Cerebellum vertically from above downward, the medullary Substance will appear to be dispersed in Ramifications through the cortical Substance. These Ramifications have been named Arbor Vitæ, and the two Trunks from whence these different Laminæ arise, are called Pedunculi Cerebelli.

100. WE cannot go on with the description of the other middle parts of the Basis of the Cerebellum, before that of the middle parts of the Basis of the Cerebrum, because these two kinds of parts are united, and jointly form the Medulla Oblongata. I shall only add here that the Strata of both Substances of the Cerebellum are not always of the same extent in the same Portions or Protuberances of each Lobe. This appears meerly by viewing the convex or outer Surface of the Cerebellum ; for there we see at different distances, some cortical Strata shorter than others, and likewise that the Extremities of the short Strata diminish gradually in thickness till they are quite lost between two long ones.

101. IF we make a small Hole in the external Lamina of the Pia Mater over one of the Lobes of the Cerebellum, without touching the inner Lamina, and then blow into the cellular Substance by which these two Laminæ are connected, through a small Pipe introduced into the Hole ; the Air will gradually swell that Substance, and separate the Strata more or less equally from each other, through their whole extent, and we will see at the same time the disposition of all the membranous Septa or Duplicatures of the internal Lamina of the Pia Mater, with the numerous distribution of the fine Blood-Vessels which run upon it, especially after a lucky Injection, or in an inflammatory state of these Membranes.

§ 5. *Medulla Oblongata.*

102. THE Medulla Oblongata is a medullary Substance situated from before backward in the middle part of the Bases of the Cerebrum and Cerebellum without any Discontinuation, between the lateral parts of both these Bases; and therefore it may be looked upon as one middle medullary Basis common to both Cerebrum and Cerebellum, by the reciprocal Continuity of their medullary Substances, through the great Notch in the transverse Septum of the Dura Mater; which common Basis lies immediately on that Portion of the Dura Mater which lines the Basis of the Cranium. The Medulla Oblongata is therefore justly esteemed to be a third general part of the whole Mass of the Brain, or as the common Production or united Elongation of the whole medullary Substance of the Cerebrum and Cerebellum.

103. IT is extremely difficult, if not altogether impossible, to examine or demonstrate it as we ought, in its natural Situation; but we are obliged to do both on a Brain inverted; and in this instance, the Direction I gave in the Description of the Skeleton N^o 186, 187. concerning the method of examining and demonstrating the Basis Cranii, cannot have place. However to prevent false Ideas either in viewing our selves, or in shewing to others, the Medulla Oblongata thus inverted, it is very necessary often to call to mind that all that appears superior in that Situation, is inferior in the natural state.

104. THE lower side of the Medulla Oblongata in an inverted Situation, presents to our view several parts which are in general either medullary Productions, Trunks of Nerves, or Trunks of Blood-Vessels.

105. THE chief medullary Productions are these: The large or anterior Branches of the Medulla Oblongata; which have likewise been named Crura Anteriora, Femora and Brachia Medullæ Oblongatæ, and Pedunculi Cerebri: The transverse Protuberance called likewise *Processus Annularis* or *Pons Varolii*: The small or posterior Branches called *Pedunculi Cerebelli* or *Crura Posteriora Medullæ Oblongatæ*: The Extremity or Cauda of the Medulla Oblongata, with two Pairs of Tubercles, one of which is named *Corpora Olivaria*, the other *Corpora Pyramidalia*; and to all these Productions we must add a Production of the Infundibulum and two medullary Papillæ.

106. THE great Branches of the Medulla Oblongata are two very considerable medullary Fasciculi, the anterior Extremities of which are separated, and the posterior united, so that taken both together, they represent a *Roman V*. These Fasciculi are flat, much broader before than behind; their Surfaces being composed of several longitudinal and distinctly prominent medullary Fibres. Their anterior Extremities seem to be lost at the lower part of the *Corpora Striata*; and it is for that reason that they are looked upon as the Pedunculi of the Cerebrum.

107. THE transverse, annular, or rather semi-annular Protuberance is a medullary Production, which seems at first sight to surround the posterior Extremities of the great Branches; but the medullary Substance of this Protuberance is in reality intimately mixed with that of the two former. *Varolius* an ancient *Italian* Author, viewing those Parts in an inverted Situation, compared the two Branches to two Rivers, and the Protuberance to a Bridge over them both, and from thence it has the name of Pons Varolii. Its Surface is transversely streaked, and it is divided into two lateral Parts, by a very narrow, longitudinal Depression, which does not penetrate into its Substance.

108. THE small Branches of the Medulla Oblongata are lateral Productions of the transverse Protuberance, which by their Roots seem to encompass that medullary Portion in which the fourth Ventricle or Calamus Scriptorius is formed. They form in the Lobes of the Cerebellum on each side, these medullary Expansions, a vertical Section of which, shews the white Ramifications, commonly called Arbor Vitæ; and they may be justly enough stiled Pedunculi Cerebelli.

109. THE Extremity is no more than the Medulla Oblongata contracted in its Passage backward to the anterior Edge of the great Foramen of the Os Occipitis, where it terminates in the Medulla Spinalis; and in this part of it several things are to be taken notice of. We see first of all, four Eminences, two named Corpora Olivaria, and the other two Corpora Pyramidalia. Immediately afterwards, it is divided into two lateral Portions by two narrow Grooves, one on the upper side, the other on the lower. They both run into the Substance of the Medulla, as between two Cylinders, flatted on that side by which they are joined together.

110. WHEN we separate these Ridges with the Fingers, we observe a crucial Intertexture of several small medullary Cords which go obliquely from the Substance of one lateral Portion into the Substance of the other. *M. Petit* Member of the Royal Academy of Sciences and Doctor of Physick, is the Author of this discovery, by which we are enabled to explain several Phænomena both in Physiology and Pathology, of which in another place.

111. THE Corpora Olivaria and Pyramidalia are whitish Eminences situated longitudinally near each other on the lower side of the Extremity or Cauda, immediately behind the transverse or annular Protuberances. The Corpora Olivaria are in the middle, so that the Interstice between them, which is only a kind of superficial Groove, answers to the inferior Groove of the following Portion.

112. THE Corpora Pyramidalia are two lateral Eminences depending on the Olivaria. *Willis* gave the name of Pyramidalia to what I have called Olivaria, after the late *M. Duverney* in his Treatise of the Organ of Hearing. These four Eminences are situated on the lower half of the Medulla; which Observation I here repeat to make it be remembered that in all the Figures and Demonstrations, these Parts are represented as superior,

rior, which in their natural Situation are inferior. Thus these Eminences are under the fourth Ventricle, and under the Pedunculi Cerebelli.

113. THE Tubercula Mammillaria which are situated very near the Production of the Infundibulum, have been taken for Glands, probably because of their greyish inner Substance, which however does not seem to be any ways different from that of several other Eminences of the Medulla Oblongata. And for that reason I choose rather to call them from their Figure Tubercula Mammillaria, than Papillæ Medullares.

114. THESE Tubercles seem to have some immediate relation to the Roots or Bases of the anterior Pillar of the Fornix; so that they might be named, as *M. Santorini* has done, the Bulbs of these Roots, though they appear to be likewise partly a Continuation of other Portions of the cortical and medullary Substance, of a particular Texture.

115. THE Beak or Tube of the Infundibulum is a very thin Production from the sides of that Cavity; and it is strengthened by a particular Coat given to it by the Pia Mater. It is bent a little from behind forward, toward the Glandula Pinealis, and afterwards expands again round this Gland.

116. THE Membrana Arachnoides or external Lamina of the Pia Mater appears to be very distinctly separated from the internal Lamina, in the Interstices between all these Eminences on the lower side of the Medulla Oblongata, without any visible cellular Substance between them. The internal Lamina adheres much more to the Surface of these Interstices than to that of the Eminences. The external Lamina is as it were buoy'd up by the Eminences, and equally stretched between their most prominent Parts, to which it sticks very close; and in this respect, the Roots or great Cornua of the Optic Nerves may be joined to these Eminences.

117. WE must observe in general concerning the Eminences of the Medulla Oblongata, that those which are medullary on their Outsides or Surfaces, are interiorly either intirely Cortical, or partly Cortical, and partly Medullary, or formed by a singular Mixture of these two Substances, which still remains to be unfolded, as well as many other particularities observable in examining the internal Structure of the Brain.

118. FROM this common Portion of the Cerebrum and Cerebellum, arise almost all the Nerves which go out of the Cranium through the different Foramina by which its Basis is perforated. It likewise produces the Medulla Spinalis, which is no more than a common Elongation of the Cerebrum and Cerebellum, and of their different Substances; and therefore the Medulla Oblongata may justly be said to be the first Origin or primitive Source of all the Nerves, which go out through the Spina Dorfi, and consequently of all the Nerves of the Human Body.

§ 6. *Medulla Spinalis.*

119. The Medulla Spinalis is only an Elongation of the Extremity of the Medulla Oblongata; and it has its name from its being contained in the bony Canal of the Spina Dorſi. It is conſequently a Continuation or common Appendix of the Cerebrum and Cerebellum, as well becauſe of the two Subſtances of which it is compoſed, as becauſe of the Membranes by which it is inveſted.

120. IN the Deſcription of the Freſh Bones N^o 316, 317, 318, 319. I mentioned a Ligamentary Tube which lines the inner Surface of this bony Canal from the great Occipital Foramen, to the Os Sacrum, repreſenting a very long flexible Funnel. I likewiſe mentioned the yellowiſh and very elaſtic Ligaments that lie in the great poſterior Notches of all the Vertebrae, and adhere very cloſely to the Ligamentary Tube.

121. THE Dura Mater, after it has lined the whole internal Surface of the Cranium, goes out by the great Occipital Foramen, and forms a kind of Funnel, in its Progreſs downward thro' the bony Canal of the Vertebrae. As it goes out at the Occipital Hole, it joins the beginning of the Ligamentary Funnel already mentioned, and adheres very ſtrongly to it. That Portion of the Pericranium which terminates exteriorly at the Edge of the great Foramen, joins the Funnel likewiſe; which by all theſe Acceſſions becomes very ſtrong and capable of reſiſting the greateſt Violences.

122. THIS Adheſion of the Dura Mater to the Ligamentary Funnel, is gradually diſcontinued below the firſt Vertebra, and from thence the Dura Mater forms a ſeparate Tube, which runs down in the bony Canal all the way to the Os Sacrum, the Capacity of it anſwering to that of the Canal; but it does not adhere cloſely to the Sides as it does to that of the Cranium. It is ſurrounded by a ſlimy Subſtance, which near the lower end of the Canal, reſembles Fat.

123. THE Spinal Marrow is made up of a cortical and medullary Subſtance, as the Cerebrum and Cerebellum, but with this difference, that the Aſh-coloured Subſtance lies within the other; and in a tranſverſe Section of this Medulla the inner Subſtance appears to be of the Figure of an Horſe-ſhoe or of the Os Hyoides; the convex ſide being turned forward, and the Extremities or Cauda backward.

124. THE Body of the Medulla Spinalis runs down all the way to the firſt Vertebra of the Loins, where it terminates in a Point. The ſize of it is proportionable to that of the bony Canal, ſo that it is larger in the Vertebrae of the Neck than in thoſe of the Back. It is a little flattened on the fore and backſides; ſo that we may diſtinguiſh in it two ſides, one Anterior, the other Poſterior, and two Edges. It is likewiſe in a manner divided into two lateral Halves by a Groove, which runs along the middle of each ſide, being a Continuation of thoſe in the Extremity of the Medulla Oblongata.

125. EACH lateral Portion sends off from both the fore and backsides, between the Grooves and the Edges, at different distances, flat Fasciculi of Nervous Filaments turned toward the nearest Edge. The anterior and posterior Fasciculi having got a little beyond the Edge of the Medulla, unite in Pairs, and form on each side a kind of Knots, called Ganglions by Anatomists, each of which produces a nervous Trunk. These Ganglions are made up of a Mixture of cortical and medullary Substance, accompanied by a great number of small Blood-Vessels.

126. THE Dura Mater which invests the Medulla sends out on each side, the same number of Vaginæ, as there are Ganglions and Nervous Trunks. These Vaginæ are Productions of the external Lamina, the internal Lamina which is very smooth and polished on the inside, being perforated by two small Holes very near each other, where each Vagina goes off, through which Holes the Extremities of each anterior and posterior Fasciculus are transmitted; and immediately after their Passage through the internal Lamina, they unite.

127. THE Triangular Spaces left between the anterior and posterior Fasciculi and Edge of the Medulla, are filled from one Extremity to the other by an indented Ligament, very thin and shining, having the same number of Indentations as there are Pairs of Fasciculi. It is fixed at different Distances to the Edge of the Medulla, from whence it sends Filaments to the internal Lamina of the Dura Mater, by which the anterior Fasciculi are distinguished from the posterior.

128. THE Membrana Arachnoides is here very distinct from the internal Lamina of the Pia Mater; so that by blowing through a Hole made in the Arachnoides, it will swell from one end to the other, like a transparent Gut. The internal Lamina, called in this place simply the Pia Mater, adheres very closely to the Medulla Spinalis, and sends many Productions and Septa through its Substance. When we blow through a Hole made in the Pia Mater, through the Substance of one lateral Portion of the Medulla, the Air penetrates through the whole, and the Pia Mater which covers the other lateral Portion, is separated from it.

129. THE Membrana Arachnoides adheres more closely to the Pia Mater at the lower than at the upper part, being in a manner suspended by the indented Ligament which runs along both Edges of the Medulla, and is fixed by a Filament to the internal Lamina of the Dura Mater in each Interstice between the Nervous Fasciculi, as has been already said. It also gives off Elongations in the same manner as the Dura Mater to each Nervous Trunk or Rope, as we shall see hereafter.

§ 7. *The Nerves of both Medullæ, from their Origin to their going out of the Cranium.*

130. I observed in the beginning of the Description of the Nerves, that they arise either from the Medulla Oblongata or Spinalis; that they go out in Fasciculi disposed in Pairs; that ten Pairs are reckoned to belong to the Medulla Oblongata, of which nine go out through the Foramina of

the Cranium, and the tenth arises from the Extremity of this Medulla as it passes through the great Occipital Hole; and lastly, that about thirty Pairs were reckoned to belong to the Medulla Spinalis, of which seven pass through the lateral Notches of the Vertebrae Cervicis, twelve through those of the Back, five through those of the Loins, and five or six through the anterior Holes of the Os Sacrum, and one at the sides of the Os Coccygis.

131. MY design is here principally to mention some particular Observations about the Nerves, while they remain within the Cranium, the rest of their Course through the whole Body being already sufficiently described; and I beg the Reader first of all to review the Idea I gave in that Description, of the general Division and original Disposition of all the Nerves which come either from the Medulla Oblongata or Spinalis.

*Nerves of
the Medulla
Oblongata.*

132. THE first Pair of Nerves that arise from the Medulla Oblongata are the Olfactory, anciently called Processus Mamillares. These are two very flat and soft medullary Ropes, each arising first by medullary Fibres from the outside of the lower part of the Corpora Striata, between the anterior and middle Lobe on each side of the Cerebrum, and afterwards by another Filament more internally, and by a third which is more posterior and very long. They run under the anterior Lobes of the Cerebrum, being lodged in two superficial Grooves in the Basis of these Lobes, and lying immediately on the Dura Mater, from the Clinoid Apophyses to the Os Ethmoides.

133. THEY are first of all considerably incurvated from without inwards or toward each other, and having reached near the backside of the Os Ethmoides, they run for a small Space, parallel to and at some distance from each other. Backward they are very thin, but they gradually increase in bulk in their course forward, toward each side of the Crista of the Ethmoidal Bone, where they terminate in elongated Papillae, the Substance of which appears to be softer and less white than that of the Ropes.

134. THESE Papillae lie on the two sides of the Lamina Cribrosa, and send down a nervous Filament into each Hole of that Lamina. At the same place, the Dura Mater sends off the same number of Vaginae which invest and accompany the nervous Filaments and their Ramifications on the internal parts of the Nose.

135. I have already related the Origin of the second Pair or Optic Nerves, from the Eminences called Thalami Nervorum Opticorum; and I have described their great Curvature, and traced them all the way to their Reunion, which happens immediately before the superior part of the Glandula Pituitaria, and consequently before the Beak or Production of the Infundibulum. The internal Carotids run upon the outsides of these Nerves, immediately after their Union, and before they pass through the Foramina Optica.

136. BESIDES their Origin from the Optic Thalami, these Nerves have likewise a kind of Communication with the Tubercula Quadrigemina Anteriora by very fine Filaments, one Extremity of which is lost in the Tubercles,

bercles, the other in the Roots of the great Arches or Bodies of the Optic Nerves. The internal Structure of these Nerves seem to change at their entrance into the Optic Holes, as we shall see in another place.

137. THE Union of these Nerves by the small Curvatures of their Cornua, is very difficult to be unfolded in Human Bodies. This Union is commonly found to be very close, but in some Subjects, it seems to be no more than a strong Adhesion, in others, to be partly made by an Interfection or Crossing of Fibres. They have been found quite separate; and in other Subjects one of them has been observed to be very much altered both in Size and Colour through its whole Passage, the other remaining in its natural state.

138. THE third Pair called *Nervi Motores Oculi Communes, Oculares Communes, and Oculo-Musculares*, arise from the Union of the anterior Edge of the great transverse Protuberance, with the two great Branches of the Medulla Oblongata. They pierce the Dura Mater behind the lateral Parts of the posterior Apophysis of the Sella Sphenoidalis, and pass afterwards each in the neighbouring Sinus Cavernosi, by the side of the carotid Artery, and all the way to the broad Portion of the superior Orbital Fissure, where they are divided in the manner already said in describing the Nerves.

139. THE fourth Pair called *Nervi Trochleares, Musculares Obliqui Superiores*, and most commonly *Pathetici*, are very small and tender, and in proportion, very long. They arise each behind the Tubercula Quadrigemina, and from the lateral part of the Valviform Expansion at the entry of the fourth Ventricle. From thence they take their course forward all the way to the Edge of the anterior Extremities of the Transverse Sinus, where on each side they enter the Duplication of the Dura Mater, and advancing into the Sinus Cavernosi, they accompany the third Pair to the superior Orbital Fissure.

140. THE fifth Pair called *Nervi Innominati, or Trigemini*, are at first large Trunks arising chiefly from the lateral and posterior Parts of the great transverse Protuberance, and a little from the Corpora Olivaria and Pyramidalia. They run down obliquely forward on the Extremity of the upper or anterior side of the Apophysis Petrosa, very near the side of the Sella Sphenoidalis, where they enter the Duplication of the Dura Mater and Sinus Cavernosi.

141. AT their entry into the Sinus, they form a kind of flat irregular Ganglion, from which some Filaments are sent off to the Dura Mater; and immediately afterward, each of them is divided into three great Branches, one Superior or Anterior, one Middle, and one Inferior or Posterior. The first Branch which may be termed *Ocularis* or *Ophthalmicus*, accompanies the Nerves of the third and fourth Pairs, to the superior Orbital Fissure. The second called *Maxillaris Superior*, goes out by the superior maxillary Hole; and the third named *Maxillaris Inferior*, by the inferior maxillary Hole. As the great Trunk of this Nerve runs down, it perforates the Membrana Arachnoides, which at this place forms a kind of Ceiling.

142. THE sixth Pair named *Motores Oculorum Externi*, *Oculares* or *Ophthalmici Externi*, and *Oculo-Musculares Externi*, are small Nerves, but still not so small as the fourth Pair; and I have sometimes found them double. They arise partly from the oblong inferior Eminences, immediately behind the transverse Protuberance, and partly from this Protuberance; and passing immediately under it, they pierce the Dura Mater behind the Occipital Symphysis of the Sphenoidal Bone.

143. THEY run on each side in the Duplicature of the Dura Mater to the Cavernous Sinus; and having entered that Sinus, each of them accompanies the first Branch of the fifth Pair to the Superior Orbital Fissure. In this Course they communicate with the first Branch just mentioned, and are increased on the forepart by a Filament or two, which arise from the great Sympathetic Nerve, and run up with the Carotid.

144. THE seventh Pair, named *Auditorii*, arise from the lateral and posterior Part of the transverse Protuberance, near the Pedunculi of the Cerebellum, by two Cords, one small and solid, the other large and soft, which from thence is called *Portio Mollis*, and the first, *Portio Dura*, or as I have named it, *Nervus Sympatheticus Minimus*. The two Nerves on each side accompany each other very closely, all the way to the internal Foramen Auditorum.

145. THE eighth Pair, named *Par Vagum*, *Nervi Vagi*, or *Sympathetici Medii*, arise from the posterior Extremities of the large Branches or *Crura* of the Medulla Oblongata, from the transverse Protuberance, and from the anterior Part of the inferior oblong Eminences behind the transverse Protuberances; by numerous Filaments, which altogether make a broad Band on each side, which runs toward the Foramen Lacerum, where it pierces the Dura Mater, and goes out through the anterior Part of that Hole, having been first joined by a nervous Portion that runs up from the Medulla Spinalis through the great Occipital Foramen, by the name of *Nervus Accessorius Octavi Paris*, or *Nervus Spinalis*. This additional Nerve goes out with that of the eighth Pair through the Foramen Lacerum, lying behind it, but distinguished from it by a Membranous Septum.

146. THE ninth Pair called *Nervi Hypoglossi Externi*, *Hypoglossi Majores*, and commonly *Gustatorii*, arise each from the lateral part of the Extremity of the Medulla Oblongata, between the oblong inferior Eminences, by several Filaments, which uniting together, form commonly two small Ropes on each side, which pierce the Dura Mater separately, and presently afterwards form one Rope, which goes out of the Cranium through the anterior Condylloide Hole.

147. THE tenth Pair, called *Nervi Sub-Occipitales*, arise under the ninth Pair, chiefly from the anterior and a little from the lateral Part of the Extremity of the Medulla Oblongata, opposite to the posterior Part of the Condylloide Apophysis of the Occipital Bone, by a single Plane or Fasciculus of small Filaments which pierce the Dura Mater directly from within

within outward, at the same place where the Vertebral Arteries perforate it from without inwards.

148. THE Nerves formed by the lateral Union of the anterior and posterior Filaments of the Medulla Spinalis, go out of the bony Canal of the Spina Dorsi, toward each side, through the intervertebral Holes, through the anterior Holes of the Os Sacrum, and the lateral Notches of the Os Coccygis; and from thence they have the general name of *Nervi Vertebrales*. They are divided in the same manner as the *Vertebrae*, into seven Pair of Cervical Nerves, twelve Pair of Dorsal, five Pair of Lumbar, and five or six Pair of *Nervi Sacri*. *Nerves of the Medulla Spinalis.*

149. I observed in the particular Description of the Nerves, that I begin the Enumeration of the Vertebral Nerves by those which go out between the first and second Vertebra; and that the Situation of the Dorsal or Costal Nerves which are true Intercostals, determined me to this Disposition, the first Pair of these Nerves passing between the first and second true Ribs.

150. As the Spinal Marrow which furnishes all these Nerves, seldom goes lower than the first or second Vertebra of the Loins, as I have already said, the Situation of the Fasciculi of Nervous Filaments must be different from that of the Holes through which they pass; and several of these Fasciculi both anterior and posterior must be longer than the rest. This we find from experience to be the case in the following manner.

151. THE Fasciculi of nervous Filaments of the Medulla Spinalis, which produce the Cervical Nerves, run more or less transversely toward each side from their Origin to their Passage through the Intervertebral Holes. The Fasciculi which form the Dorsal Nerves, run a little obliquely downward from their Origin to the Intervertebral Holes; and those which form the Lumbar Nerves, run down more and more longitudinally from the Medulla to the Holes by which they go out.

152. THEREFORE the Cervical Fasciculi are very short in the Spinal Canal; the Dorsal Fasciculi are longer, and the Fasciculi from the Loins and Os Sacrum very long. It must likewise be observed that the Fasciculi of the four lowest Pairs of the Cervical Nerves, and first Pair of the Dorsal Nerves are broader and more compounded than the following, because the Brachial Nerves are a Continuation of these. The Filaments belonging to the Lumbar Nerves and those of the Os Sacrum, are likewise very broad, and made up of numerous Filaments, as being the Roots of the large Nerves which go to the lower Extremities. The Dorsal Filaments are very small.

153. THE Cervical and Lumbar Fasciculi are not only broader and made up of more Filaments than the Dorsal, but also situated much closer to each other, the Lumbar Fasciculi being still more so than the Cervical, whereas in the Dorsal a considerable Interstice is left between the Fasciculi.

154. THESE Lumbar Fasciculi from their Origin to the Extremity of the Os Sacrum, form through the whole Canal of the Lumbar Vertebrae

and of the Os Sacrum, a large Bundle of Nervous Ropes called by Anatomists, *Cauda Equina*, because of some resemblance which it bears to a Horse's Tail, especially when taken out of the Canal and extended in clear Water.

155. **THOUGH** the *Medulla Spinalis* ends at the first Vertebra of the Loins, the Vagina of the *Dura Mater* by which it is invested, is continued through the rest of the bony Canal all the way to the Extremity of the Os Sacrum, and involves the great Bundle or *Cauda Equina*, the Cords of which pierce it on each side nearly opposite to the places where they pass through the Intervertebral Holes, and the anterior Holes of the Os Sacrum, almost in the same manner as was said above, in describing the general formation of the Vertebral Nerves.

156. **THIS** Vagina of the *Dura Mater* being separated from the Canal of the Vertebrae, and the lateral Elongations which serve for particular Vaginae to the Cords, being cut off, it presently shrinks up and contracts in the same manner as all the other elastic Parts of the Human Body; for instance, as an Artery does when cut transversely soon after Death. Therefore its true length must be taken while it is in Situ, and likewise the true Situation of the lateral Elongations.

157. **FROM** all this a Conclusion may be drawn of great importance, not only in Anatomical and Philosophical Inquiries, but also for understanding local Diseases, Wounds, &c. which is, that when we have occasion to consider any particular Nerves near the Vertebrae of the Back or Loins, or near the Os Sacrum, we must remember that in the *Spina Dorsi* the Origin of these Nerves is not even with their Passage out of the Spine; but proportionably higher. If, for instance, we inquire about any of the lowest *Nervi Sacri* near the Os Coccygis, we must not stop at the Extremity of the Os Sacrum, but trace its Origin as high as the last Vertebra of the Back, or first of the Loins.

158. **THE** Membrane *Arachnoides* accompanies the original Fasciculi separately, to their Passage through the lateral Elongations of the *Dura Mater*, forming a kind of Duplication, Breaks, or Discontinuations between the Cords which run in the Vagina of the *Dura Mater*. The internal Lamina of the *Pia Mater*, or the *Pia Mater* simply, as it is here reckoned, adheres very closely both to the Fasciculi and Filaments of which they are composed.

159. **AMONG** the original Productions of the Nerves of the *Medulla Spinalis*, we ought still to reckon the formation of the *Nervi Accessorii* of the eighth Pair, or of those that I call *Sympathetici Medii*. They arise from the lateral Parts of this *Medulla* by several Filaments, about the third or fourth Vertebrae of the Neck, and sometimes lower. And, if my Memory does not fail me, I once traced them to the middle of the Back. They run up on each side between the anterior and posterior Ranks of the Nervous Fasciculi, increasing gradually in Size by the Accession of new Filaments from the posterior Fasciculi.

160. HAVING reached above the first Vertebra of the Neck, they have a kind of Adhesion or Communication with the neighbouring Ganglions of the Nervi Sub-Occipitales, or those of the tenth Pair. Above this Adhesion they receive two Filaments each, from the backside of the Medulla, and afterwards continue their course towards the great Occipital Foramen. As they enter the Cranium, they communicate with the Nerves of the ninth and tenth Pairs; and at the Foramen Lacerum, they join those of the eighth Pair, with which they return out of the Cranium.

161. IN the posterior Part of the Medulla Spinalis, near its lower Extremity, there is in some Subjects a longitudinal Depression in which several transverse Fibres are situated, which though I have not examined any further, I thought it proper to mention this Observation, as I found it in my Anatomical Common-Place Book.

§ 8. *Blood-Vessels of the Brain and Medulla Spinalis.*

162. THE Arteries which supply the Cerebrum, Cerebellum and Medulla Oblongata, come partly from the Carotids which enter the Cranium through the Canals in the Apophyses Petrosæ of the Ossa Temporum, and partly from the Vertebrales which enter by the great Occipital Foramen, and send off the Arteriæ Spinales into the Canal of the Spine for the Medulla lodged there. Arteries.

163. ALL these Arteries are divided into several Branches which send out a great number of Ramifications distributed through both Substances of the Brain, and through the whole Extent of the Pia Mater. The Dura Mater both of the Cerebrum and Cerebellum has Arteries peculiar to it, which have been already described.

164. THE Internal Carotid on each side enters the Cranium by the great Canalis Petrosus, in an angular or winding Course, as was observed in the Description of the Skeleton. The inner Surface of this Canal is lined by a Production common to the Dura Mater and Inferior Pericranium; to which the Artery adheres only by a loose Filamentary Substance, in which the Plexiform Filaments run, that belong to the great Sympathetic Nerve, commonly called the Intercostal.

165. HAVING passed through the bony Canal, it immediately bends upward toward a Notch in the Sphenoidal Bone, and through that Notch it enters the Cranium. Immediately after this, it penetrates the Cavernous Sinus on the side of the Sella Sphenoidalis, where having formed a third Curvature, it goes out from it, from below, upwards, and is bent a fourth time round the anterior Clinoid Apophysis, from before backward. By this Course it is in a manner bathed in the Blood of the Cavernous Sinus, together with the third, fourth, fifth and sixth Pairs of Nerves.

166. AFTER this fourth Curvature the internal Carotid having now reached the side of the Infundibulum, and consequently being very near its Fellow, these two Arteries communicate sometimes by a very short transverse arterial Production. At this place each of them divides into two

principal Branches, one Anterior, the other Posterior ; and sometimes into three, in which case there is a middle Branch between the two former.

167. THE Anterior Branch runs first of all, forward under the Basis of the Cerebrum, separating a little from the same Branch of the other Carotid. They approach each other again under the Interstice between the two Olfactory Nerves, communicating by a very short Anastomosis, and sending small Twigs to that Pair of Nerves. They afterwards separate, being each divided into two or three Rami.

168. THE first Ramus of the anterior Branch goes to the anterior Lobe of the Cerebrum. The second, which is sometimes double, is inverted on the Corpus Callosum to which it gives Ramifications, as also to the Falx of the Dura Mater and middle Lobe of the Cerebrum. The third, which is sometimes a distinct Branch, sometimes only, an additional Ramus to the second, goes to the posterior Lobe of the Cerebrum. This third Ramus is sometimes so considerable as to deserve to be reckoned the middle Branch of the three principal ones.

169. THE Posterior Branch communicates first of all with the Vertebral Artery of the same side, and then is divided into several Rami on the superficial Circumvolutions of the Cerebrum, and between these Circumvolutions all the way to their bottom. The anterior and middle Branches when there are three, distributes the same kind of Ramifications to the Circumvolutions and to their Interstices.

170. ALL these different Ramifications run in the Duplicature of the Pia Mater, from which they receive a kind of additional Coats, and the Capillaries being distributed upon it in a reticular manner, do afterwards penetrate the cortical and medullary Substance, in which last they terminate insensibly.

171. THE Vertebral Arteries enter through the great Occipital Foramen, having first pierced on each side the Elongations of the Dura Mater at the same place where the Sub-Occipital Nerves, or those of the tenth Pair, pierce it, as they go out ; the Arteries in this place lying above the Nerves.

172. AT their entry into the Cranium they send each several Ramifications to the Cauda of the Medulla Oblongata, and to the Corpora Olivaria and Pyramidalia, which Ramifications are distributed on the sides of the fourth Ventricle, produce the Plexus Choroides, are spread on the whole Surface of the Cerebellum, insinuate themselves between the Strata, always invested by the Duplicature of the Pia Mater, and are at length lost in both Substances of the Cerebellum.

173. AFTERWARDS the two Vertebral Arteries turn toward each other, for the most part immediately under the posterior Edge of the great transverse or semi-annular Protuberance of the Medulla Oblongata, where they unite and form one common Trunk. This Trunk passes directly from behind forward, under the middle of the great Protuberance, and partly in the middle Groove of the convex Surface of that Protuberance, at the anterior Edge of which it terminates.

174. IN

174. IN its passage through the Groove, this Trunk sends off several small Branches on each side, which surround transversely the lateral Portions of the Protuberance, being partly lodged in the small lateral Grooves of these Portions. These lateral Branches are afterwards distributed to the neighbouring Parts of the Cerebrum, Cerebellum and Medulla Oblongata.

175. THIS common or middle Trunk of the Vertebral Arteries having reached the Edge of the great Protuberance, is divided again into two small Branches, each of which soon communicates with the Trunk of the internal Carotid on the same side. Instead of this Bifurcation, the two last or most anterior lateral Branches, send each sometimes a small Branch forward, which form the Anastomoses with the internal Carotids.

176. THE principal Arteries of the Medulla Spinalis, called commonly *Arteriæ Spinales*, are two in number, one Anterior and one Posterior, lodged in the Grooves by which the Medulla is divided into lateral Portions on both sides. They arise from the Vertebral Arteries, a little above the great Occipital Foramen, where these Arteries send each a small Ramus downward, as soon as they enter the Cranium; and having got under the Extremity of the Medulla Oblongata, they send off two other Branches backward.

177. THE first two Branches uniting soon after their Origin, form the *Arteria Spinalis Anterior*, which runs down within the Canal of the *Vertebræ* along the anterior Groove of the Medulla. The other two small Branches are inverted on the sides of the Medulla Oblongata, and from thence running backward, they unite much in the same manner with the first two, and form the *Arteria Spinalis Posterior*, which runs down along the posterior Groove of the Medulla Spinalis.

178. THE two Spinal Arteries in their course downward along the Medulla, send off on each side lateral Ramifications, by which they frequently communicate with each other; and likewise with the Vertebral Arteries of the Neck, with the Intercostals, and sometimes they are in a manner split for a little way and then unite again.

179. THE Veins of the Cerebrum and Cerebellum, &c. may in general be looked upon as Branches not only of the longitudinal Sinus of the Dura Mater, and of the two great lateral Sinuses, but also of all the inferior Sinuses of that Membrane; in all which Sinuses the Veins terminate by different Trunks in the manner already said in the Description of the great superior Sinus. Their principal Ramifications accompany all the cortical Circumvolutions of the Cerebrum, and Directions of the Strata of the Cerebellum, running always in the Duplication of the Pia Mater. The Veins of the Plexus Choroides in general are of the number of these already mentioned.

180. THE Veins of the Medulla Spinalis are Branches partly of the superior Extremities of the two Vertebral Veins, partly of the two Venal Ropes termed *Sinus Venosi*, which run down both ways laterally on the anterior convex side of the Production of the Dura Mater, and form at different

different Distances reciprocal Communications, by semi-annular Arches, as by so many subordinate Sinuses. The two longitudinal Sinuses communicate likewise in their Passage with the Vertebral Veins, in the same manner as the neighbouring Arteries.

§ 9. *Uses of the Brain, and of its Appendages in general.*

181. WE are obliged to the great *Malpighi* for the first and best Instructions concerning the manner of examining the Structure of the Brain, especially that of the two Substances of which it is made up, and for putting us in a condition to be able to conjecture something about its Uses. The Experiments and Observations of that illustrious and faithful Searcher into Nature, having been repeated by several excellent Philosophers, and confirmed by comparative Anatomy, leave us no room to doubt but that the Brain is a Secretory Organ, or as it is called by Anatomists, a Gland.

182. IT is to no purpose to dispute about Words, when we are agreed as to the things themselves. Anatomists have for many Years past understood by the word Gland, an Organ fitted to separate some particular Fluid from the Mass of Blood, as universally as they mean by the word Muscle, all sorts of fleshy Fibres capable of Contraction; and this last Term might be cavilled at and rejected as justly as the other.

183. THE whole Matter of Secretions must be owned to be very obscure; but it is to be hoped that the Brain and Liver will sometime or other lead us so far into the knowledge of it, as at least to be able to distinguish Truth from Falshood.

184. THE greyish or ash Colour of the cortical Substance is not the effect of a particular mixture of Red and White; at least we have no Experiment to prove it. The Blood indeed gives this Substance a slight reddish cast; but the ash Colour which seems to be the Characteristic of the Structure of these Secretory Organs, is not owing to that.

185. WE learn from *M. Ruysch's* Anatomical Injections that the cortical Substance is chiefly composed of Vessels; that by making these Vessels swim in a clear pellucid Liquor, their Extremities represent an infinite number of fine Brushes or vascular Tufts, and that his Injection fills even the smallest Filaments of these Tufts. He tells us likewise, that in these last Filaments the Structure is altered; and that by the Mechanism of this change, the Functions attributed to Glands may be performed.

186. BUT still these Injections and Preparations do not unravel the Mystery; neither is the Existence of these Pencils or Tufts sufficiently demonstrated; for they are only the last Extremities of the small Arteries macerated in Water, or some other Liquor, after being injected; and then artfully separated from the other essential Parts of the Organ.

187. IN the first place they are separated from the Venal Extremities which must answer to these Tufts, in what manner soever that be brought about. Secondly, they are separated from the membranous Filaments of the Pia Mater, which in the natural state tie these arterial Extremities to each

each other, and give them a different Disposition from that of Tufts or Pencils. Thirdly, By this Preparation, the arterial Extremities are separated from their Connexions with the medullary Substance; which both Experiments and comparative Anatomy shew to be fibrous.

188. IT is no ways surprising that these Capillary Extremities thus stript should float loosely and freely when moved in a Fluid, and that they should put on the appearance of Pencils or Tufts, being in this state only the truncated Extremities of small Vessels. When we consider these Circumstances attentively, we find our selves obliged to return to the small Glandular Bodies and Folliculi, &c. of *Malpighi*, of which in another place; and at the same time we must acknowledge that *Ruyfch*'s fine Injections have discovered these minute Bodies to be of a vascular Substance, the Structure of which we are still ignorant of.

189. IN a word, *Malpighi* has discovered the glandular Tubercles and Folliculi without destroying their natural Connexions. *Ruyfch* has discovered a considerable part of their Structure by destroying their Connexions. We are therefore very much beholden to both these illustrious Anatomists, and it is only by joining their Observations to each other, that we can ever be able to form an Idea of the Secretory Organs, which will answer all the Phænomena concerning the different Secretions in the Human Body.

190. THE infinite number of these small Secretory Clusters, strain or filter the Mass of Blood carried to them by the numerous Ramifications already mentioned, and separate from it, an excessively fine Fluid; the remaining Blood being conveyed back by the same number of Venal Extremities, into the Sinuses of the Dura Mater, and from thence into the Jugular and Vertebral Veins.

191. THIS subtle Fluid commonly called Animal Spirit, Nervous Juice or Liquor of the Nerves, is continually forced into the medullary Fibres of the white Portion of the Cerebrum, Cerebellum, Medulla Oblongata, and Medulla Spinalis; and by the Intervention of these Fibres supplies and fills the Nerves, which are a continuation of them.

192. ALL the Nervous Ropes, as they pass through the Foramina of the Cranium and Vertebrae are accompanied by particular Elongations of the Pia and Dura Mater. Those of the Dura Mater serve them for Vaginae in their passage through the bony Openings. Those of the Pia Mater not only accompany and invest each nervous Rope, but also form internal Septa between all the Filaments of which each Rope consists. It is known from many Experiments, that the Nerves are the primitive or original Organs of all Muscular Motion and of all Animal Sensation; and that these two Functions depend in general on the Brain; but we are ignorant of the nature of this Dependance, and of the particular Uses of the Medullary Fibres, of the Nervous Fluid, and of the Membranous Productions which accompany the Fibres and Nerves.

193. NEITHER is there any thing certain in what has been said concerning the Design or particular Uses of the superficial conformation of the Cerebrum

Cerebrum and Cerebellum, or of the different Configuration of their Turnings, Circumvolutions, Eminences, Depressions, Expansions, and various Folds. It may be affirmed in general, that by this Structure the extent of the Secretory Organ of the Nervous Fluid is increased very considerably, and the particular Functions of each Nervous Rope distinguished, and likewise their general and reciprocal correspondence, both in regard to the Exquifiteness of the Organs of Sensation, and the Activity of the Organs of Motion.

194. THE Falx of the Dura Mater hinders one Portion of the Cerebrum from pressing on the other, when we lie on one side. The transverse Septum serves for a Tent to the Cerebellum, and defends it from a mortal Compression which it must otherwise be liable to from the Cerebrum, especially when we walk or jump.

195. THE Septum and Productions of the Pia Mater connect and strengthen all the Circumvolutions, Divisions and Ridges of the Cerebrum, Cerebellum, &c. and sustain in a general and almost incomprehensible manner all the Branches and Ramifications of the Blood-Vessels, all the medullary Filaments, and all the Elongations and Ropes that depend on these.

§ 10. *A Dissertation on the Anatomy of the Brain by M. Steno, read in the Assembly held at M. Thevenot's House in the Year 1668.*

GENTLEMEN,

INSTEAD of promising that I shall satisfy your curiosity in what relates to the Anatomy of the Brain, I begin by publicly and frankly owning that I know nothing of the matter. I wish I were the only Person under a necessity of talking in this manner, because I might in time become acquainted with what others know; and it would be a great blessing to Mankind if this most delicate Part, and which is liable to so many dangerous Diseases, were as well understood as the generality of Anatomists and Philosophers imagine it to be. In this, few imitate the Sincerity of *Silvius* who never talks positively concerning the Brain, though he has been at more pains about it, than any Man that I know. The number of those who think every thing easy is infinitely the greatest; and they give us the History of the Brain and Disposition of its Parts with the same confidence and assurance, as if they had been present at the Formation of this surprising Machine, and had been let into all the Designs of the Great Architect. Though the number of these positive Gentlemen be very great, and though I cannot pretend to answer for the Sentiments of all the rest, I am nevertheless very much convinced that they who search for solid Knowledge, will find nothing satisfactory in all that has been written about the Brain. It is very certain that it is the principal Organ of the Soul, and the Instrument by which it works very wonderful Effects. The Soul which imagines it can penetrate into every thing without it; and that nothing in the World

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can set bounds to its Knowledge, is nevertheless utterly at a loss to describe its own Habitation, and is no where more to seek than at home. We need only view a Dissection of that large Mass, the Brain, to have Ground to bewail our Ignorance. On the very Surface you see varieties which deserve your admiration; but when you would look into its inner Substance you are utterly in the dark, being able to say nothing more than that there are two Substances, one greyish the other white, which last is continuous with the Nerves distributed all over the Body; that the greyish Substance serves in some places for a Cortex to the White, and that in other places it separates the white Filaments from each other.

If we are asked what these Substances are, in what manner the Nerves are joined in the white Substance, or how far their Extremities penetrate into it; all we can do is to own our ignorance, except we be resolved to increase the number of those who prefer the applause of the Publick to sincerity and truth. For, to say that the white Substance is only an uniform Body like Wax, without any Art concealed in it, would be to think too meanly of this great Master-piece of Nature. We are sure that wherever there are Fibres in the Body, they always observe a certain regular order more or less complex in proportion to the Functions for which they are appointed. If this Substance is every where Fibrous, as it appears in many places to be, you must own that these Fibres are disposed in the most artful manner; since all the diversity of our Sensations and Motions depends upon them. We admire the contrivance of the Fibres of every Muscle, and ought still more to admire their disposition in the Brain, where an infinite number of them contained in a very small Space, do each execute their particular Offices without confusion or disorder.

THE Ventricles or Cavities of the Brain are no less unknown than its Substance. They who place the Animal Spirits there, think they are as much in the right as they who make them the Receptacles of the Excrements; but they are both equally puzzled, when they are desired to explain the Origin of these Spirits and Excrements. These may come from the Vessels found in these Cavities as well as from the Substance of the Brain; and it is equally difficult to determine how they get out.

AMONG those who place the Animal Spirits in the Ventricles, some make them pass from the anterior to the posterior Ventricles, there to meet with the Entries of the Nerves, while others affirm that these Entries are in the anterior Ventricles. Some imagine that the Excrements of the Brain are contained in the Ventricles, because they think they see something like Excrements there; but they own that there is as ready a Passage for them from the Brain down to the Medulla, as into the Infundibulum; and supposing they go into the Infundibulum, they may be carried from thence into the Sinuses of the Dura Mater, and there is some reason to believe that they may have an immediate Passage into the Eyes, Nares and Mouth.

WE are still more uncertain about what relates to the Animal Spirits. Are they Blood, or a particular Substance separated from the Chyle by

the Glands of the Mesentery? Or may they not be derived from a Lymphatic Serum? Some compare them to Spirit of Wine, and it may be doubted whether they are not the Matter of Light. Our common Dissections cannot clear up any of these difficulties.

THE true manner of dissecting the Brain is as little known as its Substance. I need not mention the method of cutting it into Slices, because it is owned by every Body that nothing can be learned that way. The second method of unfolding all the Plicæ is something more artful; but it only shews us the outer Surface of what we want to know, and even that, very imperfectly.

THE third Method of unfolding the Plicæ, and separating the two Substances goes no further than the Surface of the Medulla. These three Methods have been differently combined; and they may be still more diversified according as they are executed longitudinally, transversely, &c.

As for my own part, it is my Opinion that the true method of Dissection would be to trace the nervous Filaments through the Substance of the Brain, to see which way they pass, and where they end; but this Method is accompanied with so many Difficulties, that I know not whether we may hope ever to see it executed without a particular manner of preparing. The Substance of the Brain is so soft, and the Fibres so tender, that they can hardly be touched without breaking. Since therefore Anatomy has not hitherto arrived to that degree of perfection as to make the true Dissection of the Brain, let us without flattering our selves any longer, freely acknowledge our Ignorance, that we may not first deceive our selves, and others afterwards, by promising to shew them the true Structure of this Organ.

I should tire your patience instead of entertaining you, were I to mention particularly all the disputes that have arisen about the Brain: Books are but too full of them; and therefore I shall only relate the principal Mistakes that still subsist among Anatomists, and which may be corrected by Anatomy; and they may be reduced to these Heads. Some pretend to shew Parts in the Brain as separate, which are only a Continuation of the same Substance; and others would persuade us that these Parts touch each other without any Connexion, though they are visibly joined together by Filaments or Vessels. Some situate the Parts in the manner which is most agreeable to the Systems they have framed, without considering that they are quite otherwise situated by nature. They shew you the Pia Mater, for instance, in places where it never was; and do not see the Dura Mater in places where it is very visible; and in case of need, they will make the very Substance of the Brain pass for a Membrane.

I have too good an Opinion of Men of Learning in general, to believe that they do this with a Design to deceive others; but the Principles which they have established, and the Method of Dissection to which they have accustomed themselves, oblige them to it. All Anatomists would demonstrate the Parts the same way, if they made use of the same Method; and therefore we ought not to be surpris'd if their Systems are very ill founded.

THE Ancients were so far prepossessed about the Ventricles as to take the Anterior for the Seat of common Sense, the Posterior for the Seat of Memory, that the Judgment which they said was lodged in the middle, might more easily reflect on the Ideas which came from either Ventricles. I would only ask those who are still of the same Opinion, to give us the reason why we should believe them, for there is nothing satisfactory in all that has been hitherto said in favour of it; and as that fine arched Cavity of the third Ventricle where they placed the Throne of Judgment does not so much as exist, we may easily see what Judgment is to be pronounced on the rest of this System.

Willis is the Author of a very singular Hypothesis. He lodges common Sense in the Corpora Striata, the Imagination in the Corpus Callosum, and the Memory in the cortical Substance: But without being at pains to enter into the detail of his whole Hypothesis, we need only make the following Remarks upon it. He describes the Corpus Striatum, as having two sorts of Striæ, one ascending the other descending; and yet if you separate the cortical from the white Substance, you will perceive that these Striæ are all of the same Nature, that is, that they are part of the Substance of the Corpus Callosum which runs toward the Medulla Spinalis, parted into different Lamellæ by the Intervention of the ash-coloured Substance.

How can he then be sure that these three Operations are performed in the three Bodies which he pitches upon? Who is able to tell us whether the nervous Fibres begin in the Corpora Striata, or if they pass through the Corpus Callosum all the way to the cortical Substance? We know so little of the true Structure of the Corpus Callosum, that a Man of a tolerable Genius may say about it, whatever he pleases.

M. Descartes knew too well how imperfect an History we have of the Human Body, to attempt an Exposition of its true Structure; and accordingly in his *Traëtatus de Homine*, his Design is only to explain a Machine capable of performing all the Functions done by Man. Some of his Friends have indeed expressed themselves on this Subject differently from him; but it is evident from the beginning of that Work, that he intended no more than what I have said; and in this sense, it may justly be said that *M. Descartes* has gone beyond all the other Philosophers. He is the only Person who has explained mechanically all the human Actions, and especially those of the Brain. The other Philosophers describe to us the Human Body itself. *M. Descartes* speaks only of a Machine, but in such a manner, as to convince us of the insufficiency of all that had been said before him, and to teach us a Method of inquiring into the uses of the Parts with the same evidence with which he demonstrates the Parts of his Machine called a Man, which none had done before him.

We must not therefore condemn *M. Descartes*, though his System of the Brain should not be found altogether agreeable to experience; his excellent Genius which shines no where more than in his *Traëtatus de Homine*, casts a Veil over the Mistakes of his Hypotheses, especially since even *Vesalius* himself and other Anatomists of the first rank, are not altogether free from

such Mistakes. And since we can forgive these great Men their Errors, who passed the greatest part of their lives in dissecting, why should not *Descartes* meet with the same Indulgence, who has happily imployed his time in other Speculations?

THE respect which I and all the World owe to such superior Geniuses, would have inclined me to continue only to admire this Treatise as containing the Description of a fine Machine invented by the Author, if I had not met with several Persons who would make us believe that it is a faithful relation of the most secret Springs of the real Human Body. Since these Persons are not convinced by *Silvius's* repeated Demonstrations that *M. Descartes's* Descriptions do not agree with what appears in dissecting the Human Body, I find my self obliged to point out some Parts of his System, without relating the whole, in which they must see, if they have a mind to be instructed, the vast difference there is between *Descartes's* imaginary Machine, and the real Machine of the Human Body.

THE Glandula Pinealis has lately been the Subject of the greatest Disputes touching the Anatomy of the Brain; but before I enter upon that Matter, or endeavour to determine the place where it lies, I must first give *Descartes's* own Opinion in his own words, contained in the following Passages, to which I have added several others taken from the same Treatise, at the end of this Discourse.

“ THE Surface of the Glandula Pinealis has a relation to the inner Surface of the Brain.

“ IN the Concavity of the Brain, the Pores are directly opposite to those of the small Gland.

“ THE Spirits run from all sides of the Gland into the Concavities of the Brain.

“ THE Gland may perform its Functions, though it be inclined sometimes to one side, sometimes to the other.

“ THE small Tubes on the Surface of the Concavities are always turned to the Gland, and may easily be turned toward the different Points of this Gland.

FROM all these Passages, it is certain that he believed the Glandula Pinealis to lie intirely in the Cavities of the Brain. And though in some other places, he says, that it is situated at the entry of these Cavities, yet we are not to think that this is contrary to what he advances in the Passages here quoted; for as it is but a very small Body, it may lie either at the entry, or in any other place of the Cavities, and yet still be within them, which he declares to be his Opinion in many other places.

WE are now to examine whether this Opinion be not contrary to experience. It is very certain that the Basis of this Gland reaches immediately from the Passage of the third Ventricle to the fourth; but the posterior Part, that is, one half of the Gland, may evidently be perceived to be altogether without the Cavities, by only removing the Cerebellum, and one or both of the Tubercles of the third Pair, with Dexterity and Care; upon

upon which the posterior part of the Gland will be brought into view, and yet no Passage will appear, by which the Air or any other Fluid can pass into the Ventricles.

To prove that the anterior Part of the Gland is not in the lateral Cavities, we need only look upon them, after they have been opened either in *Silvius's* way, or in that of the Ancients; for the Substance of the Brain will always be found to lie between these lateral Cavities and the Gland. The same thing may be demonstrated without cutting the Substance of the Brain, by separating from its Basis, the Part which contains these Cavities; for the Gland will then appear to be so far out of the Cavities, that it can have no manner of relation to them, being hindered by the Insertions by which this Part is fixed to the Basis. The Ancients knew very well that the Fornix is not continuous with the Basis of the Brain, but that it forms a third Cavity on its under side, and by forcing in Air through the Fissure between the Tubercles of the second Pair, we raise the Fornix, and thus by breaking the Filaments which connect it to the Basis, a large Cavity is formed; from whence some have imagined that when the Spirits swell the Cavities, the Fornix rises, and that all sides of the Surface of the Gland are turned toward the Cavities.

I say, some have imagined this, because though the Fornix be raised in the manner already said, only the anterior Surface of the Gland can be turned towards the lateral Cavities; but no preparation whatever can turn the posterior Surface toward the posterior Ventricles. But if the Brain has suffered no Violence, either in opening the Cranium, forcing in Air, or by any other Method, the Cavity of this third Ventricle will be found very narrow at the middle, and to contain nothing but the great Vein which forms the fourth Sinus and the Glandular Bodies, which accompany this Vein.

I own that behind this Fissure, and immediately below its posterior Opening, there is a Cavity lined on the fore and lateral Parts by that part of the Plexus Choroides which runs up toward the fourth Sinus, and at the backpart, closed by the Glandula Pinealis, the anterior Portion of which is perfectly continuous; and when the Fornix is removed, this Cavity remains intire under the first, in the Shape of a kind of inverted Horn.

WHAT *Descartes* says, that the Glandula Pinealis may perform its Functions, though it inclines sometimes to one side, sometimes to another, Experience shews to be groundless; because it is so hedged in between all the Parts of the Brain, and so fixed to them on all sides, that it cannot be moved in the least without Violence, and without breaking the Fibres by which it is connected. It is easy to shew likewise that *M. Descartes* has not represented it in its true Situation, which is neither perpendicular, as he represents it, nor inclined forward, as other very great Anatomists believe; but its Point is always turned toward the Cerebellum, and makes nearly half a right Angle with the Basis.

THE supposed Connexion of this Gland with the Brain by means of Arteries, is likewise groundless; for the whole Basis of the Gland adheres

to the Brain, or rather the Substance of the Gland is continuous with that of the Brain, though the contrary be affirmed by *Descartes*.

THE Hypothesis of Arteries meeting round the Gland, and from thence running up to the great Euripus, as it is called, is of great moment in *Descartes's* System, because the separation and motion of the Spirits depend upon it. But if we can believe our Eyes, this is no more than a Collection of Veins from the Corpus Callosum, from the interior Substance of the Brain, from the Plexus Choroides, from different places of the Basis of the Brain and from the Gland itself; the Office of which Veins is to carry back the Blood from the Brain to the Heart, and not to bring it from the Heart to the Brain. Some have thought that *M. Descartes* designed to carry the Nerves to the Gland, but he never had any such intention.

SUCH of *M. Descartes's* Friends who look upon his Man only as a Machine, will be so good as to believe that I do not here speak against his Machine, the contrivance of which I have always admired; but as for those who pretend to demonstrate that *M. Descartes's* Man is made like other Men; Anatomical Observations may easily convince them that this is a fruitless attempt. And if they should plead the same Experience on their side, we may readily answer that there is nothing more common than not to perceive the mistakes we commit in dissecting the Brain, as will evidently appear in the Sequel of this Dissertation.

I designed to have mentioned the other Systems of the Brain by which the Animal Actions have been accounted for, and the Origin and Composition of the Fluids contained in the Brain, been explained; but I considered afterwards, that this undertaking requires more application and leisure than my Journey will allow me.

DISSECTIONS or Preparations being liable to so many mistakes, and Anatomists having hitherto too readily formed Systems, and moulded these soft Parts in the manner that was most agreeable to each, we cannot be surprised to find so little exactness in their Figures. But this want of accuracy in the Figures is not owing to bad Dissections only. The ignorance of Drawers has contributed very much, and the difficulty of expressing the several Eminences and Depressions of the Parts, and of understanding what the Anatomists chiefly insist upon, furnishes them with a never failing excuse. The best Figures of the Brain are those of *Willis*; but even these contain a great number of important Mistakes, and they want many things to perfect them. In the third Figure he represents the Superior or Pineal Gland like a round Ball; and consequently according to this Figure, the Apex of that Gland cannot be said to be turned either forward or backward. Besides, we see here nothing of the Substance of the Brain on the fore-side of the Gland, and which goes from one side to the other; all which the Figure would make us believe to be annihilated. Behind the Gland, a Space appears on the Basis of the Brain between the two Tubercles of the third Pair, which in the natural state, has a quite different appearance. The thin Expansion of the white Substance of the Cerebrum, which is continued to the middle of the Cerebellum, where it is very thick,

is quite wanting; as also the Origin of the Nervi Pathetici which go out from this Expansion. He likewise represents the second Pair of Tubercles as distinct, which commonly adhere to each other. The underside of the Fornix appears to be uniform, which is of an uneven and very elegant Structure. When we cut the Corpus Striatum transversely, we see Radii very different from what they are exhibited in *Willis's* eighth Figure. The white Radii appear there to be continuous with the forepart of the Corpus Striatum, which nevertheless is of an Ash-coloured Substance, and as it runs in between the white Radii, does not appear in that method of Dissecting, to adhere to any other Body whatever.

IN the third Figure the Infundibulum has no resemblance to Nature. The Nervi Motores Oculorum are straight, and not oblique as they ought to be; neither do we see the true Origin of the Filaments of which these Nerves are composed, from the Basis of the Brain. The Pons Varolii might have been better and more distinctly expressed; and the anterior Roots of the Fornix are not separated as in the seventh and eighth Figures, but touch each other at the upper part, and form an acute Angle. The Line marked G. G. G. in the seventh Figure appears to be a continued Line, though the part between the Roots of the Fornix which is represented, has no Connexion with the Extremities; and in the same Figure the Glandula Pinealis is connected to the Substance of the Brain by two Funiculi. I need say nothing of the Figures of *Vesalius*, *Casseri*, &c. for since these which are the latest and best, are so very imperfect, we may easily imagine how little regard is to be paid to the others.

I have seen but three Figures of *Varolius* which express in a wretched manner, the best Observations that have ever been published on the Brain. I do not know whether the Figures of the first Edition at *Padua* in 1573, may not be better than those which I have seen published at *Frankfort* in 1591, and again in *Baubin's* Anatomy. Among *Bartholinus's* Figures, there are three which represent the Brain dissected after *Silvius's* Method, but the Author himself owns that they are faulty. But to pass over many other Mistakes in all these Figures, there is not one amongst them which represents truly the Situation of the Glandula Pinealis; the Duct of the third Ventricle; the Plexus Choroides; the Ramifications of the Veins contained in the lateral Cavities; the Distribution of the Arteries; the concurrence of the Veins which form the fourth Sinus; or the numerous glandular Bodies lodged there.

FROM all this you see how the Brain has been hitherto dissected, how little Knowledge has been gained from these Methods of Dissection, and how falsely the Figures represent the Parts which they are designed for. It is easy to conclude from hence how little regard is to be paid to the Systems built on these bad Foundations, in framing of which the Authors, by an unaccountable sort of Misfortune common to this with all other Arts, have employed obscure Terms, Metaphors and Comparisons, all of them so ill chosen as to be equally puzzling to those who have made some progress in this Science, and those who begin to learn it. Besides, the greatest
number

number of these Terms are so low and so unworthy of the most noble part of the Body of Man, that I am at a loss whether I ought most to wonder at the bad turn of thought of those who first made use of them, or at the Indolence of their Successors who continue still to retain them. What necessity could there be to imploy the words Nates, Testes, Anus, Vulva and Penis, which in their common Signification have no relation at all to the Parts expressed by them in the Anatomy of the Brain? And accordingly what one Author calls Nates, another calls Testes, &c.

THE third Ventricle is a very equivocal Term. The Ancients understood by this word, a Cavity under the Fornix which they believed to be separated from the Basis of the Brain, and they have represented it with three Legs, that it might support the Brain which lies upon it. *M. Silvius* calls the third Ventricle a Canal found in the Substance of the Basis of the Brain, between the Infundibulum and the Passage which goes under the two posterior Pairs of the Tubercles of the Brain, towards the fourth Ventricle. Some Anatomists having separated the Bodies of this second Pair of Tubercles, take the Space between them, which is owing to their manner of Dissection, for the third Ventricle, which is consequently sometimes the Fissure above and sometimes the Canal below; and some will have it to be the Space between the Fissure and Canal, which is likewise owing to the Rupture of the Parts already mentioned. We have therefore three third Ventricles, the second of which alone is the true one; the first and third arising intirely from the Methods of preparing the Parts. To these a fourth third Ventricle might be added, if the small Fissure under the Fornix could be looked upon as a Passage between the two anterior Ventricles and the fourth. But it is so small and so full of the Vessels and Glands of the Plexus Choroides, that I doubt very much whether there can be any Communication that way, between the anterior and posterior Ventricles, especially since *Silvius's* third Ventricle is sufficient for that purpose, and likewise answers the Design so perfectly well, that whatever goes from the lateral to the posterior Ventricle, must first of all fill the Infundibulum and this Canal.

Two Glands are reckoned to belong to the Brain, though we know not if either of them resembles Glands in any thing more than in the Figure, and even that, when well examined, will be found to be different from what it is in the rest. The Superior or Pineal Gland is not like a Pine-Apple, either in Brutes or in Man; and it is not known whether the inferior or pituitary Gland acts in any respect on the Pituita.

THE Plexus Choroides represents a vascular Texture, in which the Veins are seen very distinct from the Arteries, and the Distribution of each may be traced separately. The name of Fornix gives the Idea of an arched or vaulted Part, which however is not to be found, when looked for in a proper manner. The Corpus Callosum in the common signification means the white Substance of the Brain which comes into view when the two lateral Parts are separated; but as it intirely resembles the rest of the Substance

stance of the Brain, there can be no reason for giving a particular name to one part of this Substance.

THERE are but two ways of coming at the knowledge of a Machine, either to be taught the whole Contrivance by the Maker, or to take it quite to pieces, and to examine each Piece by itself, and as it stands in relation to the rest. These are the only true ways of learning the Contrivance of any Machine; but the generality of Inquirers have thought that they had better guess at it, than be at pains to examine it thoroughly. They have satisfied themselves with observing its Motions, and on these Observations they have built Systems which they believed to be true, because by their help, they imagined they could explain all the Effects which they knew. They never considered that the same thing may be explained in different manners; and that the Senses alone are capable of informing us whether our Ideas be conformable to Nature. As the Brain is a Machine, we must not flatter our selves that we can discover the Contrivance of it by any other means than are made use of for knowing other Machines; and we have no way left but to take it to pieces, and to consider what every part is capable of in a separated and in an united state. In this search, we may truly say that few Anatomists have discovered any great degree of Curiosity. Chymistry has in all Ages found both private Men and Princes very ready to erect Laboratories; but few have pursued Anatomy with equal Ardour. This neglect is not owing to Princes, among whom, many have had curiosity enough for such an important part of Knowledge, to build magnificent anatomical Theatres, which they have often honoured with their presence. But the Dissecters being always willing to appear compleat Masters of this Science, never have had the sincerity to own that any thing still remained to be known, and to conceal their ignorance, have contented themselves with demonstrating what is to be found in the Writings of the Ancients.

ANATOMISTS might have reason to blame me, if I did not shew by a farther explanation that they are not so much in the wrong as I seem to insinuate, by saying, that they do not apply themselves sufficiently to Anatomical Inquiries. They that study Anatomy are generally either Physicians or Surgeons, who being both obliged to visit their Patients, have too little time left for Study, after they have attained to a tolerable degree of Reputation. But they ought not to undertake the Cure of a Body, the make of which they do not know, that is, they ought not to endeavour to rectify a Machine till they are previously acquainted with its Nature. Others who do not visit sick Persons, and have no other Business but that of teaching Anatomy in publick Schools, do not look upon themselves as more obliged to pursue Anatomical Inquiries than the practising Physicians and Surgeons. The Design of their Profession is to teach to those who are to practise Physick and Surgery, the Descriptions left us by the Ancients, of the Structure of the Human Body; and when they have clearly demonstrated all that is contained in the Works of the Ancients, and their Hearers have as distinctly understood them, they both imagine that they

THE ANATOMY OF

have done their Duty. The Bounds of these different Professions of teaching and practising have been so very ill settled, that the true knowledge of the Human Machine, though the most necessary Branch, is neglected, as belonging neither to the Anatomist, Physician, nor Surgeon.

To make the necessary Inquiries for the discovery of Truth, a Man's whole time must be taken up; and Professors of Anatomy, who are obliged to make publick Demonstrations, which imploy a great deal of time and labour, cannot be proper for this Study, for the reasons already given, and for the following, which are no less evident.

1. THERE is so much Time and Application required to examine each Part as it ought, that every thing else must be laid aside, and we must mind nothing but that. Physicians and Surgeons cannot comply with this because of their Practice; nor Professors, because of their publick Demonstrations. Whole Years may sometimes be necessary to discover what may afterwards be demonstrated to others in the space of an Hour. I do not question but that *Pecquet* was a great while in carrying the Chyle from the Mesentery to the Subclavian Vein; and perhaps I should not be believed, were I to mention what difficulties I found, before I could shew the true Insertion of *Pecquet's* Duct, of which *Bilsius* had given us a Figure; whereas at present they may be both prepared and demonstrated in half an Hour.

2. THOUGH Anatomists open a thousand Bodies in the Schools, it is by meer accident if they ever discover any thing new. They are obliged to demonstrate the Parts as described by the Ancients, and in doing this it is necessary they should follow a certain Method; whereas Inquiries admit of no settled Method, but must be pursued in every manner that can be thought of. In the Schools every thing must be removed that lies in the way of the Part which they want to shew; but in particular Searches no Part must be cut off till we have first examined it; and if any such thing were attempted in publick Dissections, the Demonstrator would be looked upon as ignorant; and the Spectators would be often in the right to complain of loss of time, because he would not always be sure to find what he proposed to shew them. It is evident from these Considerations that Professors have not hitherto been obliged to make Inquiries in Anatomy, and even that it is impossible for them to do it, were they ever so willing; so that it is not their fault that greater Progress has not been made in that Science.

ANATOMY in general has, we see, been managed hitherto with very little success; and the Inquiries into the Brain have succeeded less than any others, because they have not been made with that care and diligence which the difficulty of the Subject requires. Let us now consider the true Method, and examine if any Person has hitherto found it out.

Bilsius applied himself to Anatomy, without having studied the Writings of the Ancients, and I make no question but that he would have made a greater Progress, if after having learned all that is good in these Writings, he had imployed his time and application in making new discoveries. We must own that the Works of our Predecessors contain very fine Experiments,

ments, which we might still have been ignorant of, if they had not handed them down. And they have sometimes told us Truths, which their Successors, for want of sufficient application, have not been able to see. It must, however, be owned, that all that both Ancients and Moderns have told us about the Brain is so uncertain, that the Books which contain the Anatomy of this Organ may be said to be chiefly a Collection of Doubts, Disputes and Controversies; but still a great advantage may be made of their Labour, and even of their Mistakes. I here speak of the Authors who have dissected, for as for those who only copy the Works of others, the best that can be said of them is, that it may sometimes be proper to read their Books by way of Diversion. But they would have deserved a great deal more commendation, and been more useful to those who dissect, if they had given us only an exact relation of all that Anatomists have wrote about the Brain; if they had explained, according to the laws of a true Analysis, all the different ways of accounting for the Animal Actions mechanically; or if they had made an exact List of all the Propositions found in these Writings, distinguishing those which are founded on Facts and Experience, from those which contain Reasonings and Conclusions drawn from the former. None of these Methods have hitherto been pursued by the Compilers, and therefore we must confine our selves mostly to the original Authors.

THE first thing to be considered is the History of the Parts; and in this we ought precisely to determine what is true and certain, that we may be able to distinguish that, from what is false or uncertain. Neither is it sufficient that we our selves are satisfied about any thing; the evidence of our Demonstrations ought to be so clear as to oblige every body else to assent to them, for otherwise the number of Disputes would rather increase than diminish. Every Anatomist who dissects the Brain demonstrates from experience what he advances. This soft and pliable Substance so readily yields to every motion of his Hand, that the Parts are imperceptibly formed in the same manner as he had conceived them before Dissection; while the Spectator who often sees two contrary Experiments made on the same Part, is either puzzled very much to know which he ought to embrace, or obliged to reject both to make himself easy. Therefore to prevent this inconveniency, it is absolutely necessary to carry Dissections the length of a convincing certainty, which, though very difficult, is very far from being impossible. For I would not have you imagine from what I have said, that I believe there is nothing certain in Anatomy; or that all who follow that Study, make the Parts appear as they have a mind, without any danger of being discovered. You may indeed justly doubt, if Parts which are shewn you separated, were ever united; but it would be impossible to shew them united together, if they were not naturally so. To clear up any doubt that might arise on this Subject; and to be certain whether the Parts which are shewn you were naturally joined or not, you need only examine them in their natural state, without using any kind of violence, but allow those whom you have a mind to convince, to do all that is in their power

to shew that they are united. We may come at the same degree of certainty in other Circumstances, and particularly when we inquire into the Situation of Parts, provided we touch nothing without having first examined it, and set down every moment what we touch. In order to this we must not only be very attentive to the Part which we examine, but also reflect on all that we did before we reached it, to see if these Operations may have changed it from its natural state in any respect. For by often handling more exterior Parts, we may easily affect those that lie within them, and when these come in sight, we are apt to imagine that they are naturally such as they then appear, without considering how far we may have altered their Situation and Connexion with other Parts. The most famous Anatomical Dispute which this Age has produced may serve for an example of what I say. They who deny the Continuation of the Glandula Pinealis with the Substance of the Brain, and the Adhesion of the Fornix to the Basis of the Brain, would not talk so positively concerning a matter of fact, if they did not believe it to be proved by incontestable Experiments and Observations. But in making these Experiments they must necessarily have forgot the changes which happen in separating the exterior Parts, and that they destroy all the Connexions by which the Dura Mater adheres to the Cranium; and I have often observed that in raising the superior Part of the Cranium, the middle of the Dura Mater continued still to adhere to it, even after I had opened it sufficiently, to thrust in three Fingers between the separated Parts of the Cranium. Now, how can the Dura Mater be thus raised without making the interior Parts to which it is fixed suffer violence. The Glandula Pinealis adheres to the fourth Sinus, which is connected with the Falx, so that the Dura Mater cannot be raised at that place without affecting the Gland. This Falx receives likewise all the Veins which pass between the Fornix and the Basis of the Brain, and by which these two Parts are connected. There is a pretty strong Connexion between the upper part of the Brain and the Dura Mater, and when that Membrane is raised, the Brain must follow it; and the fourth Sinus being carried upward, breaks the Connexion between the Fornix and the Basis. I have many times been deceived about this when I first began to dissect the Brain, and I used to wonder why these Connexions were not always sensible. But observing afterwards in Horses, Sheep, Cats, &c. where that part of the Dura Mater which separates the Cerebrum from the Cerebellum is ossified, that I destroyed a great many of the inner Parts in extracting this Bone; I began to perceive the cause of this mistake, and that it was not an easy matter to separate the Cranium as it ought. The common way is to divide the Cranium by a circular Section, to remove the upper Segment, but if this Segment were again divided by a Section perpendicular to the former, it would be much more easily removed without doing any Violence to the Brain; for Scissars, Saws and Forceps cannot be handled without shaking and disordering the Parts. A small circular Saw might be contrived which would not shake the Parts very much, especially if it were turned upon a proper Axis placed between two pointed Pillars. This Saw might likewise be

employed for several other purposes in separating the Cranium; but if any Liquor could be discovered to dissolve or soften the Bones in a small space of time, this would be by far the best way of separating the Cranium.

It is not sufficient to be continually attentive, we must likewise make use of different Methods of Dissection, which are so many different proofs of the truth of our Operations, in order to satisfy our selves and to convince others.

THIS will appear a very strange Doctrine to those who believe that there are stated Laws for the Dissection of every Part, and that the Anatomical Administrations taught us by the Ancients, ought to be inviolably observed without any change or addition. I own that the Ancients might have given us unalterable Rules for the Dissection of each Part, had they been sufficiently acquainted with them themselves; but as they certainly knew less about many Parts than we do, they were at least as unfit as we are, to prescribe Rules which can never be fixed or constant till more Discoveries have been made. It will here be objected that some method must be followed in dissecting the Parts already known. This I readily grant, and also that the Method of the Ancients is to be made use of till a better is found out; but I would not have that Method looked upon as perfect or unalterable. The principal reason why a great many Anatomists have remained in their mistakes, and why they have gone no greater a length than the Ancients in Dissection, is because they believe that every thing has been already taken notice of, and that there is nothing left for the Moderns to do; and as they have looked upon the Ancient Laws as inviolable Rules in Dissection, they spent their whole lives in demonstrating the same Parts in the same manner; whereas Anatomy ought to be confined by no Rules, every new Dissection requiring a different Method. The advantage of proceeding in this manner is, that if we miss of new Discoveries, we at least are put in a condition to find out any mistakes that may have happened in former Dissections, especially in controverted Points, in which the Spectators ought to have the liberty of prescribing the Rules of Dissection.

THIS method of Dissection makes indeed but a very small Shew, and a Man cannot well display his Learning at the same time that he acknowledges his Ignorance; but as for my own part I much rather choose to own what I do not know, than to impose upon my Hearers, ancient Opinions, which will some time or other be demonstrated to be false. We have seen great Anatomists exposed to this Mortification; and we still see many who believe that more regard will be paid to their stiffness and positiveness in Opinion than to ocular Demonstration. I wish these Gentlemen much joy of their self-conceit; while I endeavour to follow the Laws of Philosophy by which we are taught to search after Truth in so cautious a manner, as never to believe we have found it, till it brings demonstration along with it.

I cannot prove to you the necessity of often changing the Methods of Dissection better than by the two following Examples. It is a confirmed Experiment

Experiment that by blowing into the beginning of the Fissure under the Fornix, the Fornix is separated from the Basis, and a considerable Cavity left between them; and the same thing happens when we separate the Cranium with violence, as I have already said. This is so evident, that both the Dissector and the Spectators are fully convinced of it; but if any Person should still be in doubt, there is no other way to clear it up but to endeavour to demonstrate this Cavity in another manner. For if it be natural, we must always find it the same, in whatever manner we look for it; but if by any other Method you find that it is wanting, and that the Parts between which it ought to lie, are connected together without leaving any void Space between them, you ought from that moment to be convinced of the falsity of the former Demonstration, and that it was the force of the Air to which the appearance of a Cavity was owing.

If the Brain is dissected according to the Method of *Varolius* or *Willis*, after having taken it out of the Cranium, you will commonly see the second Pair of Tubercles separated at the middle of that white Substance which lies before the Glandula Pinealis, and which is very often broken. When we make the Dissection, leaving the Brain in the Cranium, we see both the Tubercles and the white Substance intire, and then we see plainly that the cause of the first mistake was owing to the Weight of the lateral Parts which break those in the middle.

HAVING made a true and exact Plan of the Parts of the Brain; having discovered the Mistakes and the Causes of these Mistakes; and having settled the true Method of demonstrating these Parts, with all the necessary Precautions; the next Step is to express by good Figures all that we have discovered; for we had better be without Figures than not have them true and faithful. When we cannot have recourse to the Originals, the Representation serves to keep us in mind of them; and many Persons never have an opportunity of seeing the Parts in any other way, their aversion for Blood, hindering them from satisfying their curiosity by examining dead Bodies; and therefore if the Figures are not true, they give false Ideas to those who would learn Anatomy by their help, and puzzle others who make use of them only to refresh their Memory.

WE ought therefore to leave nothing undone to procure exact Figures; in order to which a good Drawer is as necessary as a good Anatomist. We must likewise apply our selves very particularly to see in what manner we ought to dissect and dispose the Parts so as to exhibit all that is to be seen in the Brain, there being difficulties peculiar to this Organ. The other Parts require only a preparation to compleat the Figures we design; whereas the Brain, never so well prepared, subsides before the Figure can be taken; and we must have several fresh Subjects before one Figure can be finished. To this perhaps it is owing that no Anatomical Figures are so imperfect as those of the Brain.

I have hitherto said nothing of the Uses of the Parts nor of the Animal Actions, as they are called, because it is impossible to explain the Movements of a Machine, till we know the contrivance of its Parts. A rea-
sonable

sonable Man must in his own mind laugh at these positive Anatomists, who having made a long Harangue about the use of Parts, the Structure of which is altogether unknown to them, give this as the only reason of all they advance that God and Nature do nothing in vain. They deceive themselves in the application of this general Maxim; and the Part which they rashly judge to have been made by God for one end, is afterwards discovered to have been made for another. We had therefore much better own our Ignorance, be more reserved in our Decisions, and not undertake upon such slight conjectures to explain matters which are in their own nature so difficult.

ALL that I have hitherto mentioned is but a very small part of what ought to be done, in order to acquire the knowledge of the Brain. We ought moreover to examine the Heads of all Animals, and in all the different states of each Animal. In the Fœtus of Animals, we see how the Brain is gradually formed; and what could not be seen in a sound healthy Brain, may perhaps be discovered in one that is diseased.

IN living Animals we ought to consider every thing that may cause the least alteration in the Actions of the Brain, whether the Causes be external as from Liquors, Wounds, Medicines, &c. or internal, as a great number of Diseases reckoned up by Physicians. There is likewise this advantage attending the Dissection of the Brains of Animals, that we may manage them as we please. We may learn to trepan or to perform any other Surgical Operation upon them; we may examine whether the Brain has any Motion in these Operations, and whether the application of any Medicines to the Dura Mater, or to the Substance or Ventricles of the Brain, may not produce some particular Effects.

WE might likewise make different Trials without opening the Cranium, by applying Medicines exteriorly, by mixing them with the Food, and by Injections into the Vessels, in order to discover what disturbs the Animal Actions, and what is most proper to restore them when disordered.

THE Brain is different in different Animals; and this is another reason why we should examine them all. The Brains of Birds and Fishes are not at all like that of Man; and even in Animals where there is the greatest likeness to the Human Brain, I have always found a very great Variety. Whatever this difference be, it may always afford us some new light, and teach us what it is absolutely necessary we should know. In some Animals, the Fibres are more easily seen than in Men; and the Parts which in the Human Brain are mixed and joined together, are sometimes distinct and separate, in Animals; and we often meet with the Substance more or less solid, and the Size and Situation different.

I need not insist any longer on this Subject, because I believe we are all convinced that we are indebted to the Dissection of Animals for almost all the new Discoveries of this Age; and that there are many Parts which would never have been found in the Human Brain, if they had not first been observed in Animals.

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WHAT I have hitherto said concerning the insufficiency of all the Systems of the Brain, concerning the want of a true Method in dissecting it, concerning the infinite number of Inquiries that ought to be made about it in Man and in Brutes, in all their different states, concerning the barrenness of all the Writers on this Subject, and concerning [the precautions that must be used in handling these tender Parts, ought certainly to undeceive those who satisfy themselves with what they find in the Books of the Ancients. We must always remain in ignorance if we sit down with what the Ancients have taught us, and if Men capable of making such Inquiries do not contribute their Labour, Industry and Study, in order to arrive at the knowledge of Truth, which is the principal aim of all who search for it sincerely.

The Passages from Descartes referred to in this Dissertation are these.

Page 11. FOR we must know that the other Vessels which bring the Blood from the Heart, having been divided into an infinite number of small Branches disposed in a reticular manner, and which are spread like a thin Web in all the Cavities of the Brain, are collected round a certain small Gland situated almost in the middle of the Substance of the Brain at the entry of the Cavities, and have in this place a great number of small Holes, through which the most subtle Parts of the Blood which they contain, may be conveyed to the Gland, because they are too small to allow the grosser Parts to pass. These Arteries do not terminate here, but several of them being united into one, run up in a straight course to that great Vessel, which like an Euripus supplies all the exterior Surface of the Brain.

Page 12. THE Gland is to be looked upon as a rich Source from which the finest and most agitated Parts of the Blood run on all Hands into the Cavities of the Brain.

Page 63. IMAGINE the Surface which is turned toward the Cavities to be a piece of close Network or Plexus; all the Meshes of which are so many small Holes through which the Animal Spirits may pass; and being turned toward the Gland from which all these Spirits proceed, they can easily be directed toward all the different Points of this Gland.

Page 65. THE Spirits do not stop any where, but in proportion as they enter the Cavities of the Brain by the Holes of the small Gland; they run directly toward those of the small Tubes which are over against them.

Page 72. IN explaining how Figures are marked in the Spirits on the Surface of the Gland, he determines plainly enough the relation which he supposes to be between the inner Surface of the Brain and that of the Gland.

Page 77. It ought likewise to be considered that the Gland is composed of a soft Matter, and that it is not all united to the Substance of Brain, but only connected to small Arteries (the Coats of which are very loose and

and pliable) and supported in its Situation by the force of the Blood in these Arteries; so that a very small matter may incline it to either side, and by so doing, dispose the Spirits which it contains, to run towards one part of the Brain rather than to another. If the Spirits were of equal force the Gland would always be kept in an immovable erect Posture in the Center of the Head.

Page 77. As the Spirits flow out more readily from one part of the Brain than from another, they may have force enough to turn the small Tubes in the inner Surface of the Brain into which they run, towards the place from whence they flow out, if they do not find them in that Direction.

§ 11. *Pericranium.*

196. BESIDES the external Integuments of the Head, the Skin, Hair, and cellular Substance, there is an Aponeurotic Expansion which covers the Head like a Cap, and is spread round the Neck and on the Shoulders like a Riding-Hood; and for this reason I give it in general the name of Hood, and I call the upper Portion of it, the Aponeurotic Cap.

197. THIS Aponeurosis is very strong on the Head, and it appears to be made up at least of two Strata of Fibres crossing each other. As it is spread on the Neck it becomes gradually thinner, and ends insensibly on the Clavicles. It sends out a Production on each side, from above downward, and from without inward, which having passed over the superior Extremity of the Musculus Sterno-Mastoidæus, runs behind that Muscle toward the transverse Apophyses of the Vertebrae of the Neck, where it communicates with the Ligamenta Intertransversalia.

198. THE external Surface of all the Bones of the Head, as well as of all the other Bones of the Human Body, except the Teeth, is covered by a particular Membrane, of which that Portion which particularly invests the Cranium is named Pericranium, and that which invests the Bones of the Face is simply termed Periosteum.

199. THE Pericranium is made up of two Laminæ closely united together. The internal Lamina which has by some been taken for a particular Periosteum, covers immediately all the bony Parts of this Region; and the external Lamina has been looked upon as a Membrane distinct from the internal, and named Pericranium particularly.

200. THE external Lamina of the Pericranium parts from the other, at the semi-circular or semi-oval Plane mentioned in the Description of the Skeleton N^o 182. and becomes a very strong Aponeurotic or Ligamentary Tent which covers the Temporal Muscle, and is afterwards fixed in the external angular Apophysis of the Os Frontis, in the posterior Edge of the superior Apophysis of the Os Malæ, and in the superior Edge of all the Zygomatic Arch, as far as the Root or Basis of the Mastoide Apophysis.

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201. IN the Interstice between the two Laminæ at this place, lies a large Portion of the Musculus Temporalis, being inserted in each Lamina in the manner already said in the Description of the Muscles. The rest which does not give Insertion to this Muscle, that is, between the lower Portion of the Muscle and Zygomatic Arch, is filled by a cellular and fatty Substance. At this place, the Aponeurotic Hood is seen to join the external Lamina of the Pericranium, and they both communicate with particular Aponeurotic Expansions of the neighbouring Muscles, the Sterno-Mastoidæus, Masseter, Zygomaticus, &c.

A R T. II.

The Eye.§ 1. *The Eye in general.*

*Situation
and Composition.*

202. **T**HE Eyes are commonly two in number, situated at the lower part of the Forehead, one at each side of the Root of the Nose; and they are made up of hard and soft Parts. The hard Parts are the Bones of the Cranium and Face, which form two Pyramidal or Conical Cavities, like Funnels, to which we give the name of Orbits. The soft Parts are of several kinds.

203. **T**HE principal and most essential soft Part in each Organ is the Globe or Ball of the Eye; the others are partly external and partly internal. The external Parts are the Supercilia or Eye-Brows, the Palpebræ or Eye-Lids, the Caruncula Lacrymalis, and the Puncta Lacrymalia; and the internal Parts are the Muscles, Fat, Lacrymal Gland, Nerves and Blood-Vessels.

The Orbits.

204. **S**EVEN Bones are concerned in the Composition of each Orbit, viz. the Os Frontis, Os Sphenoidale, Os Ethmoides, Os Maxillare, Os Malæ, Os Unguis, and Os Palati. In each Orbit we are to consider the Edge, Sides and Bottom. The Edge is formed by the Os Frontis, Os Maxillare, and Os Malæ; the Bottom by the Os Sphenoides and Os Palati; and all these Bones except the Os Palati, contribute to form the Sides. The Bottom is perforated by the Foramen Opticum of the Os Sphenoides; and the external side near this Foramen, by two orbital Fissures, one superior, called Sphenoidalis, the other inferior, called Spheno-Maxillaris, as has been already said in the Description of the Skeleton.

205. **A**LL the Cavity of the Orbit is lined by a Membrane, which is an Elongation or Production of the Dura Mater; and it comes partly through the Foramen Opticum of the Os Sphenoides, and partly through the Sphenoidal or superior Orbital Fissure. This Membrane, which may be looked upon as the Periosteum of the Orbit, communicates with the Periosteum of the Basis Cranii, by the inferior Orbital Fissure, and with the Periosteum

teum of the Face at the Edge of the Orbit. At the upper part of the Edge of the Orbits, the two Periosteæ form a kind of broad Ligament, and a narrow one at the lower part of this Edge, which I shall call Ligaments of the Palpebræ.

206. THE particular Situation of the Orbits represents nearly two Funnels, placed laterally at a small distance from each other, in such a manner as that their Apices are almost joined, their nearest sides almost parallel, and the other sides turned obliquely backward; and for this reason, the middle of the great Circumference or Edge of each Orbit, is at a much greater distance from the Septum Narium, than the Bottom or Apex; and the Edge or great Circumference is very oblique, the temporal or external Angle of the Orbit lying more backward than the Nasal or internal Angle.

§ 2. *The Globe or Ball of the Eye.*

207. THE Globe of the Eye being the most essential of all the soft Parts *Composition.* belonging to the Organ of Sight; and being likewise a Part which we are obliged to mention as often as we speak of the other soft Parts, must be first described. It is made up of several proper Parts, some of which being more or less solid, represent a kind of Shell formed by the Union of several Membranous Strata called the Coats of the Globe of the Eye; and the other Parts being more or less Fluid, and contained in particular Membranous Capsulæ, or in the Interstices between the Coats, are termed the Humours of the Globe of the Eye. These Capsulæ are likewise termed Coats.

208. THE Coats of the Globe of the Eye are of three kinds. Some form chiefly the Shell of the Globe; some are additional, being fixed only to a part of the Globe, and some are capsular, which contain the Humours. The Coats which form the Shell are three in number. The External, to which the Convexity of the Globe is owing, is termed Tunica Sclerotica or Cornea; the middle Coat is named Choroides, and the third or innermost, Retina. The additional Coats are two, one called Tendinosa or Albuginea, which forms the White of the Eye, and the other, Conjunctiva. The Capsular Tunicae are likewise two, the Vitrea and Crystallina.

209. THE Globe of the Eye thus formed, sends out backward a pretty large Pedicle, which is the Continuation of the Optic Nerve. It is situated about the middle of the Orbit in the manner which we shall afterwards see; and it is tied to it by the Optic Nerve, by six Muscles, by the Tunica Conjunctiva and by the Palpebræ. The backpart of the Globe, the Optic Nerve and Muscles, are surrounded by a soft fatty Substance, which fills the rest of the Bottom of the Orbit.

210. THE Humors are three in number, the Aqueous, Vitreous and Crystalline. The first may properly enough be called an Humor, and is contained in a Space formed in the Interstices of the anterior Portion of

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the Coats. The second or Vitreous Humor is contained in a particular Membranous Capsula, and fills above three Fourths of the Shell or Cavity of the Globe of the Eye. It has been named Vitreous from its supposed resemblance to melted Glass, but it is really more like the White of a new laid Egg.

211. THE Crystalline Humor is so called from its resemblance to Crystal, and is often named simply the Crystalline. It is rather a Gummy Mass than an Humor, of a lenticular Form, more convex on the back than on the fore-side, and contained in a fine Membrane called Membrana or Capsula Crystallina. What I have here said is sufficient to give a general Idea of the three Humors of the Globe of the Eye.

§ 3. *The Coats of the Eye in particular.*

*Tunica Scler-
otica.*

212. THE most external, thickest and strongest Coat of the Eye is the Sclerotica or Cornea, and it invests all the other Parts of which the Globe is composed. It is divided into two Portions, one called Cornea Opaca, the other Cornea Lucida, which is only a small Segment of a Sphere, situated anteriorly.

213. THE Cornea Opaca is made up of several Strata closely connected together, and is of an hard compact Texture resembling Parchment. About the middle of its posterior convex Portion where it sustains the Optic Nerve, it is in a manner perforated, and thicker than any where else, its thickness diminishing gradually toward the opposite side, and its Substance is penetrated obliquely in several places by small Blood-Vessels. The Course of the Nervous Filaments through this Coat is very singular; they enter the convex side at some distance from the Optic Nerve, and running from thence through its Substance, they pierce the concave side near the Cornea Lucida.

214. THE Cornea Lucida called likewise simply Cornea, the opaque Portion being named Sclerotica, is made up in the like manner of several Strata or Laminæ closely united, and appears to be a Continuation of the opaque Portion or Sclerotica, though of a different Texture. When macerated in cold Water, it swells.

215. THIS Portion is something more convex than the Cornea Opaca, so that it represents the Segment of a small Sphere added to the Segment of a greater; but this difference is not equally great in all Persons. The Circumference of the convex side is not circular as that of the concave side, but transversely oval; for the superior and inferior Portions of the Circumference terminate obliquely; but this Obliquity is more apparent in Oxen and Sheep than in Man.

216. THE Cornea Lucida is perforated by a great number of imperceptible Pores, through which a very fine Fluid is continually discharged, which soon afterwards evaporates; but we discover it evidently by pressing the Eye soon after Death, having first wiped it very clean, for we then see a gradual Collection of a very subtle Liquor, which forms itself into little

Drops;

Drops ; and this Experiment may be several times repeated on the same Subject. It is this Dew that forms a kind of Pellicle on the Eyes of dying Persons, which sometimes cracks soon after, as is observed in the Memoirs of the Academy for 1721.

217. THE second Coat of the Globe of the Eye is the Choroides which is of a blackish Colour, more or less inclined to red, and adheres by means of a great number of small Vessels, to the Cornea Opaca from the Insertion of the Optic Nerve all the way to the Union of the two Corneæ, where it leaves the Circumference of the Globe and forms a perforated Septum, by which the small Segment of the Globe is separated from the greater. This Portion goes commonly by the particular name of Uvea, which was formerly given to the whole second Coat ; and as it is of different Colours in several Subjects, it has likewise got the name of Iris, which term, however, agrees more precisely to the coloured Surface of this Portion, and would even be very improper for this Surface in Persons where it is uniformly brown, black, or blackish. *Tunica Choroides.*

218. THE external Lamina of the Choroides is stronger than the internal, and both appear blackish because of their Transparency. At a very small distance from the Union of the two Corneæ, this Lamina is most closely united to the Cornea Opaca. Round this Adhesion it changes Colour and forms a whitish Ring of the same breadth with the Adhesion ; and near the Edge of the Sclerotica this Ring is stronger and of a different Texture from what it is any where else. It adheres so closely to the Sclerotica, that if we blow through a small Hole made therein without touching the Choroides, the Air will penetrate every where between the two Coats, but cannot destroy this Adhesion, or pass to the Cornea Lucida. This Adhesion has been improperly named Ligamentum Ciliare. On the inner Surface of this Lamina we discover a great number of flat Lines in a vortical Disposition, which are the Vessels named by *Steno* Vasa Vorticosa, or Vortices Vasculosi, of which hereafter.

219. THE internal Lamina of the Choroides is thinner than the external ; and its Surface, together with the corresponding Surface of the other Lamina, is covered by a blackish Substance with some mixture of red, which easily separates when touched, and immediately tinges the Water in which the Choroides is dipt. The Origin of this Substance has not as yet been discovered ; but after a nice Anatomical Injection, I have observed a great number of vascular Stars on the inner Surface of this Lamina. In *M. Ruysche's* Works, it is termed Membrana Ruyschiana.

220. THE anterior Portion or perforated Septum of the Choroides has the name of Uvea, and the Hole near the Center of this Septum is called Pupilla. The anterior Lamina of the same Septum is termed Iris, and the radiated Plicæ of the posterior Lamina, Processus Ciliares. Between the two Laminæ of the Uvea we find two very thin Planes of Fibres which appear to be fleshy, the Fibres of one Plane being Orbicular, and lying round the Circumference of the Pupilla, and those of the other being *Uvea, Iris, Pupilla and Processus Ciliares.*

ing radiated, one Extremity of which is fixed to the orbicular Plane, the other to the great Edge of the Uvea.

221. THE Plicæ or Processus Ciliares are small radiated and prominent Duplicatures of the posterior Lamina of the Uvea, and their Circumference answers partly to that of the white Ring of the external Lamina. They are oblong thin Plates; their posterior Extremities, or those next the Choroides being very fine and pointed; the others, or those next the Pupilla, broad, prominent, and ending in acute Angles. In the Duplication of each Ciliary Fold we find a fine reticular Texture of Vessels; and some pretend to have seen fleshy Fibres in the same place, lying in small Grooves of the Membrana Vitrea, as we shall see hereafter.

222. THE Space between the Cornea Lucida and Uvea, contains the greatest part of the Aqueous Humour, and communicates by the Pupilla with a very narrow Space behind the Uvea, or between that and the Crystalline. These two Spaces have been termed the two Chambers of the Aqueous Humour, one anterior, the other posterior, as I shall observe in describing this Humour in particular.

Retina.

223. THE third Coat of the Eye is of a very different Texture from that of the other two Coats. It is white, soft and tender, and, in a manner, medullary, or like a kind of Paste spread upon a fine reticular Web. It appears to be thicker than the Choroides, and reaches from the Insertion of the Optic Nerve, to the Extremities of the Ciliary Radii, being equally fixed to the Choroides through its whole extent. At the Place which answers to the Insertion of the Optic Nerve, we observe a small Depression, in which lies a sort of medullary Button terminating in a Point; and from this Depression Blood-Vessels go out, which are ramified on all sides through the Substance of the Retina.

224. IT is commonly said that the Retina is a Production or Expansion of the medullary Substance of the Optic Nerve; the Sclerotica, of the Dura Mater, and the Choroides, of the Pia Mater, which accompanies this Nerve. But this Opinion is not agreeable to what we observe in examining the Optic Nerve, and its Insertion in the Globe of the Eye. If we take a very sharp Instrument and divide this Nerve through its whole length, between where it enters the Orbit and where it enters the Globe, into two equal lateral Parts, and then continue this Section through the Middle or Center of its Insertion, the following Phænomena will appear.

225. THAT the Nerve contracts a little at its Insertion into the Globe; that its outer Covering is a true Continuation of the Dura Mater; that this Vagina is very different from the Sclerotica both in Thickness and Texture, the Sclerotica being thicker than the Vagina, and of another Structure; that the Vagina from the Pia Mater forms through the whole medullary Substance of the Nerve, several very fine cellular Septa, and that where it enters the Globe of the Eye, the Pia Mater does not directly answer to the Choroides.

226. Lastly,

226. Lastly, That as the medullary Substance of the Nerve enters the Globe it is very much contracted, and seems to terminate only in the small Tubercle or Button already mentioned, and that the Retina is too thick to be taken for an Expansion of the medullary Substance at this place.

227. THE Insertion of the Optic Nerve in the Globe of the Eye is most commonly, not directly opposite to the Pupilla, so that the distance between these two Parts is not the same when measured on all Parts of the Globe. The greatest distance is ofteneft on the side next the Temples, and the smallest, next the Nose. I have observed an inequality of the same kind in the breadth of the Uvea, which in many Subjects is less near the Nose than near the Temples; so that the Center of the Pupilla is not the same with that of the great Circumference of the Iris; and I have seen the same difference in the breadth of the Corona Ciliaris.

§ 4. *The Humours of the Eye and their Capsulæ.*

228. THE Vitreous Humour is a clear and very Liquid Gelatinous Fluid contained in a fine transparent Capsula, called Tunica Vitrea, together with which it forms a Mass nearly of the Consistence of the White of an Egg. It fills the greatest part of the Globe of the Eye, that is, almost all that Space which answers to the extent of the Retina, except a small Portion behind the Uvea, where it forms a Fossula, in which the CrySTALLINE is lodged. This Humour being dexterously taken out of the Globe, preserves its Consistence for some time in the Capsula, almost like the White of an Egg, and then runs off by little and little, till it quite disappears. *The Vitreous Humour.*

229. THE Tunica Vitrea is composed exteriorly of two Laminæ very closely connected, which quite surround the Mass of Humour, and are immediately applied to the Retina all the way to the great Circumference of the Corona Ciliaris; but from thence to the circular Edge of the Fossula of the CrySTALLINE, this Coat is full of radiated Sulci which contain the Processus Ciliares of the Uvea. At the Edge of the Fossula, the two Laminæ separate and form a particular Capsula which belongs to the CrySTALLINE, as we shall see hereafter.

230. THE internal Lamina of the Tunica Vitrea gives off through the whole Substance of this Humour, a great number of cellular Elongations, or Septa so extremely fine, as not at all to be visible in the natural state, the whole Mass appearing then to be uniform and equally transparent through its whole Substance; but they are discovered by putting the whole soon after it is taken out of the Body into some acescent, and gently coagulating Liquor.

231. THE radiated Sulci of the Tunica Vitrea which may be termed Sulci Ciliares, are perfectly black, when the Coat is taken out of the Body. This proceeds from the black Substance with which the Laminæ or Processus Ciliares are naturally covered, as well as all the rest of the Choroides, and which remains in the bottom of the Sulci, after the Laminæ have been

taken out. We observe very fine Vessels in this Humour, which shall be spoken to hereafter.

The Crystalline Humour. 232. THE Crystalline is a small Lenticular Body of a pretty firm Consistence, and transparent like Crystal. It is contained in a transparent Membranous Capsula, and lodged in the anterior Fossula of the Vitreous Humour, as has been already said. It is very improperly called an Humour, because it may be handled and moulded into different Shapes by the Fingers, and sometimes almost dissolved by different reiterated Compressions, especially when taken out of the Capsula.

233. THE Figure of the Crystalline is lenticular, but its posterior side is more convex than the anterior, the Convexity of both sides being very rarely equal. The internal Structure of this Mass has not been hitherto sufficiently discovered, to be described with certainty, especially in Man, where I could never find that contorted Disposition of Crystalline Tubes which some pretend to have seen in the Eyes of large Animals.

234. THE Colour and Consistence of the Crystalline varies in different Ages, as was discovered by *M. Petit* the Physician, and demonstrated by him in the Academy of Sciences from a great number of Human Eyes; and his Observations are inserted in the Memoirs for 1726. Till the Age of thirty, it is very transparent, and almost without any Colour. It afterwards becomes yellowish, and that yellowness gradually increases. The Consistence varies almost in the same manner, being of an uniform softness till the Age of twenty, and afterwards growing gradually more solid in the middle of the Mass; but in this there are Varieties explained in the Memoirs for 1727.

235. THE Crystalline Capsula or Coat is formed by a Duplicature of the Tunica Vitrea, as I have already said. The external Lamina covers the anterior side of the Crystalline Mass; the internal Lamina covers the backside, and likewise the Fossula Vitrea in which the Crystalline is lodged. The anterior Portion of the Crystalline Capsula is thicker than the posterior, and in a manner, elastic; and both its Thickness and Elasticity may be discovered in Dissection, without any other Artifice.

236. THE anterior Portion swells when macerated in Water, and then appears to be made up of two Pelliculæ, united by a fine spongy Substance. I demonstrated this Duplicature very plainly in the Eye of an Horse by the Knife alone, and I even carried the Separation of the two Laminæ as far as the Vitreous Coat. Having made a small Hole in the middle of the Capsula, and blown into it through a Pipe, some part of the Air remained between the Edge of the Crystalline Mass and that of the Capsula in form of a transparent Circle. This Experiment was made with an Ox's Eye above ten Years ago.

237. IN examining the Human Eye, I have found that the Retina having reached the great Circumference of the Corona Ciliaris becomes very thin, and is continued between the Laminæ or Processus Ciliares of the Uvea, and the Ciliary Sulci of the Tunica Vitrea, all the way to the Circumference of the Crystalline. It is perhaps this Continuation which makes

makes the *Processus Ciliares* to be covered by a whitish Pellicle, and likewise increases the Thickness of the anterior Portion of the *Capsula Crystallina*.

238. THE Aqueous Humour is a very Limpid Fluid resembling a kind of Lympha or Serum with a very small degree of Viscidity; and it has no particular Capsula like the Crystalline and Vitreous Humours. It fills the Space between the *Cornea Lucida* and *Uvea*, that between the *Uvea* and the Crystalline, and the Hole of the Pupilla. These two Spaces are called the Chambers of the Aqueous Humour, and they are distinguished into the Anterior and Posterior.

239. THESE two Chambers are not of the same extent. The Anterior, which is visible to every body between the *Cornea Lucida* and *Uvea*, is the largest; the other between the *Uvea* and Crystalline is very narrow, especially near the Pupilla, where the *Uvea* almost touches the Crystalline. This Proportion between the two Chambers has been sufficiently proved, contrary to the Opinion of many ancient Writers, by *M. Heister*, *Morgagni*, and several Members of the Royal Academy; but none has treated these Matters at so great a length as *M. Petit* the Physician, as appears by the printed Memoirs of that Society.

§ 5. *The Tunica Albuginea and Muscles of the Globe of the Eye.*

240. THE Tunica Albuginea, called commonly the White of the Eye, and which appears on all the anterior convex side of the Globe, from the *Cornea Lucida* to the beginning of the posterior side, is formed chiefly by the Tendinous Expansion of four Muscles, in the manner presently to be described. This Expansion adheres very close to the Sclerotica, and makes it appear very white and shining, whereas the rest of it is of a dull whitish Colour. It is very thin near the Edge of the Cornea, in which it seems to be lost, terminating very uniformly.

241. THERE are commonly six Muscles inserted in the Globe of the Human Eye, and they are divided, on account of their Direction, into four Recti and two Obliqui. The Recti are again divided from their Situation, into Superior, Inferior, Internal and External; and from their Functions, into a Levator, Depressor, Adductor and Abductor. The two oblique Muscles are denominated from their Situation and Size, one being named Obliquus Superior, or Major; the other Obliquus Inferior, or Minor. The Obliquus Major is likewise called Trochlearis, because it passes through a small Cartilaginous Ring, as over a Trochlea or Pulley.

242. THE Musculi Recti do not altogether answer to that name, for in their natural Situation they do not all lie in a streight Direction, as they are commonly represented in an Eye taken out of the Body. To understand this, we ought to have a just Idea of the Situation of the Globe in the Orbit, and at the same time to remember the Obliquity of the Orbits, as already explained. The Globe is naturally placed in such a manner, as that during the Inaction or Equilibrium of all the Muscles, the Pupilla is turned

directly forward; the inner Edge of the Orbit is opposite to the middle of the inside of the Globe; the outer Edge of the Orbit, because of its Obliquity, is behind the middle of the outside of the Globe; and lastly, the greatest Circumference of the Convexity of the Globe between the Pupilla and the Optic Nerve, runs directly inwards and outwards, upwards and downwards.

243. IN this Situation, the internal Rectus alone is in a streight Direction, the other three being oblique; and the external Rectus is the longest, the internal, the shortest, and the superior and inferior, of the same middle length between the two former. The external Rectus is likewise bent round the outer convex side of the Globe; the superior and inferior are also incurvated, but in a less degree, whereas the whole Internus is almost streight: Notwithstanding all this I shall still continue to give them all, the common name of Musculi Oculi Recti.

244. THESE Muscles are fixed by their posterior Extremities at the bottom of the Orbit near the Foramen Opticum, in the Elongation of the Dura Mater, by short narrow Tendons, in the same order in which I have already named them. From thence they run wholly fleshy, toward the great Circumference of the Convexity of the Globe between the Optic Nerve and Cornea Lucida, where they are expanded into flat broad Tendons which touch each other, and afterwards unite. These Tendons are fixed first of all by a particular Insertion, in the Circumference just mentioned, and afterwards continue their Adhesion all the way to the Cornea, forming the Tunica Albuginea, as has been already said.

245. THE superior oblique Muscle is fixed to the bottom of the Orbit, by a narrow Tendon, in the same manner as the Recti, between the Rectus Superior and Internus. From thence it runs on the Orbit opposite to the Interstice between these two Muscles, toward the internal angular Apophysis of the Os Frontis, where it terminates in a thin Tendon, which having passed through a kind of Ring as over a Pulley, runs afterwards in a Vagina obliquely backward under the Rectus Superior, that is, between that Muscle and the Globe; and increasing in breadth it is inserted posteriorly and laterally in the Globe, near the Rectus Externus.

246. THE Ring through which this Muscle passes, is partly Cartilaginous and partly Ligamentary. The Cartilaginous Portion is flat, of a considerable breadth, and like half a Ring. The Ligamentary Portion adheres strongly to the two Ends of the Cartilage, and is fixed in the small Fossula which lies in the Orbit, on the angular Apophysis of the Os Frontis. By means of this Ligament, the Ring is in some measure moveable, and yields to the Motions of the Muscle. To the anterior Edge of the Ring, a Ligamentary Vagina is fixed which invests the Tendon all the way to its Insertion in the Globe.

247. THE Obliquus Inferior is situated obliquely at the lower side of the Orbit, under the Rectus Inferior, which consequently lies between this Muscle and the Globe. It is fixed by one Extremity a little Tendinous, to the Root of the Nasal Apophysis of the Os Maxillare, near the Edge of the

the Orbit between the Opening of the Ductus Nasalis, and the Inferior Orbital Fissure.

248. FROM thence it passes obliquely, and a little transversely backward, under the Rectus Inferior, and is fixed in the posterior lateral part of the Globe by a flat Tendon, opposite to, and at a small distance from the Tendon of the Obliquus Superior, so that these two Muscles do in some measure surround the outer posterior part of the Globe.

249. THE Rectus Superior moves the anterior Portion of the Globe upward when we lift up the Eyes; the Rectus Inferior carries this Portion downward; the Internus, toward the Nose; and the Externus, toward the Temples. *Uses of these Muscles.*

250. WHEN two neighbouring Recti act at the same time, they carry the anterior Portion of the Globe obliquely toward that side which answers to the distance between these two Muscles; and when all the four Muscles act successively, they turn the Globe of the Eye round, which is what is called Rolling the Eyes.

251. IT is to be observed, that all these Motions of the Globe of the Eye are made round its Center, so that in moving the anterior Portion all the other Parts are likewise in Motion. Thus when the Pupilla is turned toward the Nose or upward; the Insertion of the Optic Nerve is at the same time turned toward the Temple, or downward.

252. THE use of the oblique Muscles is chiefly to counterbalance the Action of the Recti, and to support the Globe in all the Motions already mentioned. This is evident from their Insertions which are in a contrary Direction to those of the Recti, their fixed Points with relation to the Motions of the Globe being placed forward, and those of the Recti, backward, at the bottom of the Orbit. The soft Fat which lies behind the Globe is altogether insufficient to support it; neither is the Optic Nerve more fit for this purpose; for I have shewn that this Nerve follows all the Motions of the Globe which would be impossible, were not the Fat very pliable, and without resistance. And to this we must add, that the Optic Nerve at its Insertion in the Globe has a particular Curvature, which allows it to be elongated, and consequently prevents it from suffering any Violence in the different Motions of the Eyes.

235. THE Obliquity of these two Muscles does not hinder them from doing the Office of a Fulcrum, because this is not a Fulcrum distinct from the Part moved, or on which the Globe of the Eye slides like the Head of one Bone in the articular Cavity of another, but being fixed to the Part, it easily accommodates itself to all the degrees of Motion thereof. Had these Muscles lain in a straight Direction they would have incommoded the Recti, but their Obliquity may be said to be in some measure rectified by the inner Surface of the Orbit, and by the Rectus Externus.

254. THE inner Surface of the Orbit serves for a kind of collateral Fulcrum, which hinders the Globe from falling too far inward; as the joint Action of the two Obliqui prevents it in part from falling too far outward. The Rectus Externus by being bent on the Globe not only hinders

it from being carried outward, but also prevents the indirect Motions of the Obliqui from thrusting it out of the Orbit toward the Temples. The other uses attributed to these Muscles seem to me to be without Foundation, from the consideration of their Insertions, and of the Structure of the Parts with which they are concerned; both which Reasons are explained in the Memoirs of the Academy for 1721.

§ 6. *The Supercilia, and Musculi Frontales, Occipitales and Superciliares.*

Supercilia.

255. THE Supercilia or Eye-Brows are the two hairy Arches situated at the lower part of the Forehead, between the top of the Nose and Temples in the same Direction with the bony Arches which form the superior Edges of the Orbits. The Skin in which they are fixed does not seem to be much thicker than that of the rest of the Forehead; but the Membrana Adiposa is thicker than on the neighbouring Parts. The Extremity of the Eye-Brows next the Nose is called the Head, as being larger than the other Extremity, which is named their Tail. Their Colour is different in different Persons, and often in the same Person, different from that of the Hair on the Head; neither is the Size of them always alike. The Hairs of which they consist are strong and pretty stiff, and they lie obliquely, their Roots being turned to the Nose, and their Points to the Temples.

256. THE Supercilia have Motions common to them with those of the Skin of the Forehead, and of the hairy Scalp. By these Motions the Eye-Brows are lifted up, the Skin of the Forehead is wrinkled more or less regularly and transversely; and the Hair and almost the whole Scalp is moved, but not in the same degree in all Persons; for some by this Motion alone can move their Hat, and even throw it off from their Head. The Eye-Brows have likewise particular Motions which contract the Skin above the Nose; and all these different Motions are performed by the following Muscles.

*Musculi
Frontales.*

257. THE Frontal Muscles are two thin, broad, fleshy Planes of unequal lengths, lying immediately behind the Skin and Membrana Adiposa on the anterior Parts of the Forehead, which Parts they cover from the Root of the Nose, and through about two thirds of the Arch of the Eye-Brows on each side, all the way to the lateral Parts of the Hair on the Forehead. At the Root of the Nose they touch each other as if they were but one Muscle, and at this place their Fibres are short and longitudinal, or vertical.

258. THE next Fibres on each side become gradually longer and more oblique, the most anterior being always the shortest and straightest; and the lateral, the longest and turned most obliquely toward the Temples at their upper Extremities. By this Disposition an angular Interstice is formed between the place where the two Muscles join, and the Hair on the middle of the Forehead; but this Disposition is not the same in all Subjects, no more than the Wrinkles, and Bounds of the Hair on the Forehead.

259. THESE Muscles are fixed by the inferior Extremities of their fleshy Fibres immediately in the Skin, running through the Membrana Adiposa. They cover the Musculi Superciliares, and adhere closely to them by a kind of Intertexture. By the same Fibres they seem to be inserted in the angular Apophyses of the Os Frontis, and to be blended a little with the Muscles of the Palpebræ and Nose. The upper Extremities of their fleshy Fibres are fixed in the external or convex Surface of the Pericranium. Each of their lateral Portions covers a Portion of the Temporal Muscle on the same side, and adheres very closely to it. The superior and inferior Insertions are graduated.

260. THE Occipital Muscles are two small, thin, broad, and very short fleshy Planes, situated on the lateral Parts of the Occiput at some distance from each other. They are inserted by the inferior Extremities of their fleshy Fibres in the superior transverse Line of the Os Occipitis, and also a little above it. From thence they run up obliquely from behind forward, and are fixed in the inner or concave Surface of the Pericranium. *Musculi Occipitales.*

261. THE breadth of these Muscles reaches from the posterior middle part of the Occiput, toward the Mastoide Apophysis, and they diminish unequally in length as they approach these Apophyses. From this inequality in length each of them appears as if it were double in some Subjects; and in others they are so thin and pale, that they seem to be wanting. They are sometimes covered by an Aponeurotic Expansion of the Trapezii.

262. THE Occipital and Frontal Muscles appear to be true Digastrici, both in regard to their Insertions in the Pericranium, and in regard to their Action. Their Insertions in the Pericranium are opposite, one being on the outside, the other on the inside; so that this Membrane or Aponeurosis may be considered as a middle Tendon of four single Muscles, that is, which have their fleshy Fibres fixed only to one side of their Tendons. The fixed Insertions of the Occipitales at the lower part of the Occiput, and the moveable Insertions of the Frontales in the Skin of the Forehead and of the Supercilia, being well considered, together with their reciprocal Insertions in the same Aponeurosis, seem to be a very convincing proof that they are Digastric Muscles.

263. THESE four Muscles seem always to act in concert, the Occipitales being only Auxiliaries or Assistants to the Frontales, the Office of which is to raise the Supercilia, by wrinkling the Skin of the Forehead; these Wrinkles following the Direction of the Eye-Brows pretty regularly in some Subjects, and very irregularly in others.

264. To be convinced of the Co-operation of these four Muscles, we need only hold the Hand on the Occipitales, while we raise the Eye-Brows and wrinkle the Forehead several times; and we will perceive the Occipitales to move each time, though not in the same degree in all Subjects. In some Persons the Occipitales seem to be relaxed, while the Frontales being in Contraction, move the whole Scalp and Pericranium forward, and then contract to bring them back to their natural Situation.

265. THE

Musculi Superciliares.

265. THE Musculi Superciliares are fleshy Fasciculi situated behind the Supercilia, and behind the inferior Portion of the Musculi Frontales, from the Root of the Nose to above one half of each Superciliary Arch. They are strongly inserted partly in the Synarthrosis of the Ossa Nasi with the Os Frontis, where they come very near the proper Muscles of the Nose, and partly in a small neighbouring Portion of the Orbit. From thence they first run up a little, and afterwards more or less in the Direction of the Eye-Brows. They are made up of several small Fasciculi of oblique Fibres, all fixed by one end in the manner already said, and by the other partly in the lower Extremity of the Muscles by which they are covered, and partly in the Skin of the Supercilia. This last Portion is easily confounded with a Portion of the Musculus Orbicularis Palpebrarum.

266. THE Action of these Muscles is to depress the Eye-Brows, to bring them close together, and to contract the Skin of the Forehead immediately above the Nose, into longitudinal and oblique Wrinkles, and the Skin which covers the Root of the Nose into irregular transverse Wrinkles. This Action, as well as that of the Frontales, and of the Muscles of the Nose and Lips, is not always arbitrary, but sometimes mechanical and involuntary. These Muscles may perhaps likewise serve to keep the Musculi Frontales in Equilibrio during their inaction, they being moveable by both Extremities.

§ 7. *The Palpebræ and Membrana Conjunctiva.*

Palpebræ.

267. THE Palpebræ are a kind of Veils or Curtains placed transversely above and below the anterior Portion of the Globe of the Eye; and accordingly there are two Eye-Lids to each Eye, one superior, the other inferior. The Superior is the largest and most moveable in Man; the Inferior the smallest and least moveable. They both unite at each side of the Globe, and the places of their Union are termed Angles, one large and internal which is next the Nose, the other small or external which is next the Temples.

Structure of the Palpebræ.

268. THE Palpebræ are made up of common and proper Parts. The common Parts are the Skin, Epidermis, and Membrana Adiposa. The proper Parts are the Muscles, the Tarfi, the Puncta or Foramina Lacrymalia, the Membrana Conjunctiva, the Glandula Lacrymalis, and the particular Ligaments which sustain the Tarfi. The Tarfi and their Ligaments are in some measure the Basis of all these Parts.

Tarfi.

269. THE Tarfi are thin Cartilages forming the principal Part of the Edge of each Palpebra; and they are broader at the Middle than at the Extremities. Those of the superior Palpebræ are something less than half an Inch in breadth; but in the lower Palpebræ they are not above the sixth part of an Inch; and their Extremities next the Temples are more slender than those next the Nose.

270. THESE Cartilages are suited to the Borders and Curvature of the Eye-Lids. The lower Edge of the superior Cartilage and the upper Edge of

of the inferior, terminate equally, and both may be termed the Ciliary Edges. The opposite Edge of the upper Tarsus is something semi-circular between its two Extremities ; but that of the inferior Tarsus is more uniform, and both are thinner than the Ciliary Edges. Their inner sides or those next the Globe are grooved by several small transverse Channels, of which hereafter ; and the Extremities of both Cartilages are connected by a kind of small Ligaments.

271. THE broad Ligaments of the Tarfi are membranous Elongations formed by the Union of the Periosteum of the Orbits and Pericranium along both Edges of each Orbit. The superior Ligament is broader than the inferior, and fixed to the superior Edge of the upper Cartilage, as the inferior is to the lower Edge of the lower Cartilage, so that these Ligaments and the Tarfi taken alone or without the other Parts, represent Palpebræ. This discovery I first communicated in my private Courses.

*Ligamenta
Tarsorum
Lata.*

272. THE Membrana Conjunctiva is generally described among the Coats of the Globe of the Eye ; and I also mentioned it there, but have referred the Description of it to that of the Palpebræ. It is a thin Membrane, one Portion of which lines the inner Surface of the Palpebræ, that is, of the Tarfi and their broad Ligaments. At the Edge of the Orbit it has a Fold, and is continued from hence on the anterior half of the Globe of the Eye, adhering to the Tunica Albuginea ; so that the Palpebræ and the Forepart of the Globe of the Eye are covered by one and the same Membrane, which does not appear to be a Continuation of the Pericranium, but has some Connexion with the broad Ligaments of the Tarfi.

*Membrana
Conjunctiva.*

273. THE name of Conjunctiva is commonly given only to that part which covers the Globe, the other being called simply the internal Membrane of the Palpebræ ; but we may very well name the one Membrana Oculi Conjunctiva, and the other Membrana Palpebrarum Conjunctiva. That of the Palpebræ is a very fine Membrane adhering very close and full of small capillary Blood-Vessels. It is perforated by numerous imperceptible Pores through which a kind of Serum is continually discharged ; and it has several very evident Folds which shall be spoken to hereafter.

274. THE Conjunctiva of the Eye adheres by the Intervention of a cellular Substance, and is consequently loose, and as it were, moveable ; and it may be taken hold of and separated in several places from the Tendinous Coat. It is of a whitish Colour, and being transparent, the Albuginea makes it appear perfectly white ; these two Coats together forming what is called the White of the Eye. The greatest part of the numerous Vessels which run upon it contain naturally only the serous part of the Blood, and consequently are not discoverable, except by Anatomical Injections, Inflammations, Obstructions, &c. With the Point of a good Knife we continue the Separation of this Membrane over the Cornea Lucida.

275. THE Lacrymal Gland is white, and of the number of those called Conglomerate Glands. It lies under that Depression observable in the Arch

Glandula Lacrymalis.

of

of the Orbit near the Temples, mentioned in the Description of the Skeleton N^o 199. and laterally above the Globe of the Eye. It is a little flattened, and divided as it were into two Lobes, one of which lies toward the Insertion of the Musculus Rectus Superior; the other toward the Rectus Externus. It adheres very closely to the Fat which surrounds the Muscles, and posterior Convexity of the Eye, and it was formerly named Glandula Innominata.

276. FROM this Gland several small Ducts go out, which run down almost parallel to each other, through the Substance of the Tunica Interna or Conjunctiva of the superior Palpebra, and afterwards pierce it inwardly near the superior Edge of the Tarsus. These Ducts are very difficult to be found; but the best way to discover them is to let the superior Palpebra lie for a little while in cold Water, and then without wiping it, to blow on several places of the Surface of the Membrane, through a small Tube held very near, but so as not to touch it, that the Air may fill some of the Orifices of the Ducts and so discover them.

Cilia.

277. THE Borders of each Palpebra taken all together are formed by the Edge of the Tarsus, and by the Union of the internal Membrane, with the Skin and Epidermis. This Border is flat and of some sensible breadth from within about a Quarter of an Inch of the internal Angle all the way to the external Angle, near which the Breadth diminishes. This Breadth is owing only to the thickness of the Palpebræ, which at this place have their Edges oblique or slanting, in such a manner as when the two Palpebræ touch each other slightly, a triangular Space or Canal is formed between them and the Globe of the Eye.

278. THE flat Edge of each Palpebra is adorned with a Row of Hairs called Cilia, or the Eye-Lashes. Those belonging to the superior Palpebra are bent upward, and longer than those of the lower Palpebra which are bent downward. These Rows are placed next the Skin, and are not single, but irregularly double or triple. The Hairs are longer near the middle of the Palpebræ than toward the Extremities, and for about a Quarter of an Inch from the inner Angle, they are quite wanting.

*Glandulae
Ciliares.*

279. ALONG the same Border of the Palpebræ near the internal Membrane, or toward the Eye, we see a row of small Holes which may be named Foramina, or Puncta Ciliaria. They are the Orifices of the same number of small oblong Glands which lie in the Sulci, Channels, or Grooves on the inner Surface of the Tarsus. These little Glands are of whitish Colour, and when examined through a single Microscope, they appear like Bunches of Grapes, those of each Bunch communicating together. And when they are squeezed between two Nails, a sebaceous Matter like soft Wax, is discharged through the Puncta Ciliaria.

Puncta Lacrymalia.

280. NEAR the great or internal Angle of the Palpebræ, the flat Portion of their Edges terminates in another which is rounder and thinner. By the Union of these two Edges an Angle is formed, which is not perfectly pointed like a true Angle, but rounded, and yet it ought not to be termed an obtuse Angle, because that expression in the Mathematical Stile means something

something different. For the same reason the name of great Angle is improper; and we had better call it the Internal or Nasal Angle.

281. AT this place, the Extremity of the flat Portion is distinguished from the round Portion by a small Protuberance or Papilla, which is obliquely perforated by a small Hole in the Edge of each Palpebra. These two small Holes are very visible, and often more so in living than in dead Bodies, and they are commonly named *Puncta Lacrymalia*, being the Orifices of two small Ducts which open beyond the Angle of the Eye into a particular Reservoir, termed *Sacculus Lacrymalis*, which shall be described in the Article of the Nose.

282. THE *Puncta Lacrymalia* are opposite to each other, and so they meet when the Eye is shut. Round the Orifice of each of these Points, we observe a whitish Circle which seems to be a Cartilaginous Appendix of the Tarsus, and which keeps the Orifice always open. These two oblique Circles are so disposed, that when the Eye is but slightly shut they touch each other only toward the Skin, and not toward the Globe of the Eye. The fine Membrane which covers these Circles, and passes thro' the *Puncta* into the Ducts, seems sometimes to run into Gathers when it is touched with a Stilet. This Observation was first made by the late *M. Saint Yves a Parisian Oculist*.

283. THE *Caruncula Lacrymalis* is a small reddish, granulated, oblong Body, situated precisely between the internal Angle of the Palpebræ and Globe of the Eye, but it is not fleshy as its name would insinuate. The Substance of it seems to be wholly glandular; and it appears through a single Microscope, in the same manner as the other Conglomerate Glands. We discover upon it a great number of fine Hairs covered by an oily yellowish Matter; and on the Globe of the Eye, near this glandular Body, we see a semilunar Fold formed by the Conjunctiva, the concave side of which is turned to the Uvea, and the convex side to the Nose. This Fold appears most when the Eye is turned toward the Nose.

§ 8. *The Muscles of the Palpebræ.*

284. THE Muscles of the Palpebræ are commonly reckoned to be two, one peculiar to the upper Eye-Lid, named *Levator Palpebræ Superioris*; the other common to both, called *Musculus Orbicularis Palpebrarum*, which has been subdivided in different manners, as we shall see presently.

285. THE *Levator Palpebræ Superioris* is a very thin Muscle situated in the Orbit above and along the *Rectus Superior Oculi*. It is fixed to the bottom of the Orbit, by a small narrow Tendon, near the *Foramen Opticum*, between the posterior Insertions of the *Rectus Superior*, and *Obliquus Superior*. From thence its fleshy Fibres run forward on the *Rectus*, increasing gradually in breadth, and terminate by a very broad Aponeurosis, in the Tarsus of the superior Palpebra.

*Orbicularis
Palpebra-
rum.*

286. BY the *Musculus Palpebrarum Obliquus* we understand all that extent of fleshy Fibres which by a thin Stratum surrounds the Edge of each Orbit, and from thence, without any interruption, covers the two Palpebræ all the way to the Cilia. The Fibres which run upon the Edge of the Orbit are nearly orbicular; but most of those which cover the Palpebræ are transversely oval.

287. ALMOST all of them have a common Tendon situated transversely between the internal Angle of the Eye, and the Nasal Apophysis of the *Os Maxillare*. This is a slender Ligamentary Tendon, strongest where it is fixed in the Bone, and diminishing gradually as it approaches the Angle of the Palpebræ, where it terminates at the Union of the Points, or at the Extremities of the two Tarfi. The fleshy Fibres are fixed to it anteriorly, so that at first sight it appears to be no more than a *Linea Alba*.

288. FROM thence one Portion of the Fibres is turned upward, the other, downward, and both meet again at the external Angle, being united by a particular kind of Intertexture, very difficult to be explained. When having inverted this Portion of the Muscle, we examine its posterior Surface, we observe a small thin Tendinous Rope which runs through the fleshy Fibres, and divides them all the way from the Union of the two Tarfi, to the Temporal Edge of the Orbit, where it disappears; the Fibres which lie beyond it appearing to continue the main Circuit of the Muscle.

289. I divide this Muscle into four Portions, whereof the first is that which surrounds the Orbit, and which does not appear to be interrupted toward the Temples; the upper part of it lying between the Supercilia, and the lower part of the *Musculi Frontales*. The second Portion is that which lies between the upper Edge of the Orbit and the Globe of the Eye, and which covers the inferior Edge of the Orbit below, some of its Fibres being fixed to both Edges of the Orbit. *Riolan* divided this into two semicircular Portions, one superior, the other inferior; the first lying between the *Musculus Superciliaris* and the lower part of the *Musculus Frontalis*, to both which it adheres very much.

290. THE third Portion seems to belong more particularly to the Palpebræ, and the greatest part of it is spent in the Palpebra Superior. The Fibres of this Portion meet at the two Angles of the Eye, where they appear to make very acute Inflexions without any Discontinuation; but when examined on the other side next the Globe of the Eye, they have in some Subjects appeared to me to be distinguished into superior and inferior. The greatest part of these Fibres form a transversely oval Circumference, the shortest Diameter of which is longer when the Eyes are open than when shut.

291. THE fourth Portion is an Appendix to the third, from which it differs chiefly in this, that its Fibres do not reach to the Angles, and form only small Arches, the Extremities of which terminate in each Palpebra. This Portion is really divided into two, one for the Edge of the upper Eyelid,

Eyelid, the other for that of the lower. *Riolan* names this Portion, *Musculus Ciliaris*.

292. ALL these different Portions of the Orbicular Muscle adhere to the Skin, which covers it from the upper part of the Nose to the Temples, and from the Supercilium to the upper part of the Cheek. When they contract, several Wrinkles are formed in the Skin, which vary according to the different Direction of the Fibres; those under the lower Palpebra are very numerous, and run down very obliquely from before backward.

293. THE Skin of the superior Palpebra is folded archwise, almost in a parallel Direction to that of the semioval Fibres, the Plicæ intersecting the Levator; whereas the other Folds only intersect the Orbicularis. The radiated and oblique Plicæ seldom appear in young Persons, except when the first and second Portions of the Orbicularis are in Action; but in aged Persons the marks thereof are visible at all times.

294. IN Man, the superior Palpebra has much more Motion than the inferior. The small simple Motions called Twinkling, which frequently happen, though not equally often in all Subjects, are performed in the upper Palpebra, by the alternate Contraction of the Levator and Superior Palpebral Portion of the *Musculus Orbicularis*; and in the lower Palpebra at the same time or alternately, by the Inferior Palpebral Portion of the Orbicularis; but as there is but a small number of Fibres in this Portion, these Motions are but very inconsiderable in this Eyelid.

295. THESE slight Motions, especially those of the upper Palpebra, are not very easy to be explained according to the true Structure of the Part. The Motions which wrinkle the Palpebræ, and which are commonly performed to keep one Eye very close shut, while we look stedfastly with the other, are explicable by the simple Contraction of all the Portions of the Orbicularis. These Motions likewise depress the Supercilia, which consequently may be moved in three different manners, upwards by the *Musculi Frontales*, downward by the *Orbiculares*, and forward by the *Superciliares*. I shall take another occasion to explain the Difficulties here mentioned.

§ 9. *The Vessels of the Eye and of its Appendages.*

296. THE external Carotid Artery by means of the *Arteria Maxillaris Externa*, and the Temporal and Frontal Arteries give several Ramifications to the Integuments which surround the Eye, and to all the Portions of the *Musculus Orbicularis*; and these Ramifications communicate with those which are distributed to the *Membrana Conjunctiva Palpebrarum*, and to the Caruncula.

297. THE same external Carotid, by means of the *Arteria Maxillaris Interna*, sends a considerable Branch into the Orbit through the inferior Orbital or Spheno-Maxillary Fissure; which is distributed to the Periosteum of the Orbit, to the Muscles of the Globe of the Eye, to the Levator Palpebræ Superioris, to the Fat, *Glandula Lacrymalis*, *Membrana Conjunctiva*

junctiva both of the Eye and Palpebræ, the Caruncula, &c. It communicates with the internal Carotid, and sends a small Artery to the Ethmoidal Cells of the Nose, through the small, internal, posterior orbitary Hole.

298. THE internal carotid Artery having entered the Cranium, sends off small Rami which accompany the Optic Nerve, and those which pass through the Fissura Spheno-Maxillaris. One of these small arterial Branches runs into the Substance of the Optic Nerve, and produces on the Retina, the small Arteries which appear very plainly on the inner sides of that Membrane. The rest join the Ramifications of the external Carotid already mentioned, and having penetrated into the Substance of the Tunica Sclerotica on the backside, and run for a little way through that Substance, they perforate this Coat inwardly in five or six places, at an equal distance from the Optic Nerve and the Pupilla.

299. AFTERWARDS they perforate the external Lamina of the Choroides in the same number of places, and form between that and the internal Lamina, the Vasa Vorticosa of *Steno*, and the Vascular Stellæ mentioned in the Description of this internal Lamina. Some small vascular Filaments from these Ramifications, are likewise observed to adhere very closely to the Tunica Vitrea; and before they form the Vasa Vorticosa, they send small Arteries in a direct course to the Circumference of the Uvea, where they form a vascular Circle, which sends out Capillaries as far as the Membrana Crystallina, which are very easily injected in new born Children.

300. THE Veins of all these Parts, answer nearly to the Arteries. The internal Veins unload themselves, partly into the internal Jugular Vein, by the Sinus Orbitarii, Cavernosi, and Petrosi, and partly into the external Jugular Vein by the Vena Angularis, or Maxillaris Externa, the Maxillaris Interna, Temporalis, &c.

301. BESIDES the Capillary Vessels, easily distinguishable by the red Colour of the Blood, there are great numbers of those which admit nothing but the serous and lymphatic Parts of the Blood, and consequently do not appear in the natural state. They become visible in some places by Inflammations and Injections, as on the Membrana Conjunctiva of the Eye; but these contrivances do not discover them every where in aged Persons. In a Fœtus and in new born Children a fine Injection has succeeded so well as to discover the Vessels of the Membrana Crystallina and Vitrea; and in a Fœtus of about six Months, the injected Liquor seemed to me to have penetrated a part of the Crystalline and Vitreous Humour.

§ 10. *The Nerves of the Eye and of its Appendages.*

302. I shall in this Paragraph repeat and illustrate what has been already said in the Description of the Nerves, concerning those of the Eye. Besides the Optic Nerve already described, the Globe of the Eye receives several small ones, which run on each side along and about the Optic Nerve, from its entry into the Orbit to its Insertion in the Globe. These Filaments come chiefly

chiefly from a small Lenticular Ganglion, formed by very short Rami of the Orbital or Ophthalmic Branch of the fifth Pair, and by a Branch of the third Pair, or Motores Oculi.

303. THESE nervous Filaments of the Lenticular Ganglion having reached the Globe of the Eye, are divided into five or six Fasciculi, which having surrounded the Optic Nerve, and penetrated and perforated the Cornea Opaca or Sclerotica, run at distances more or less equal, between the Sclerotica and Choroides towards the Uvea. There, each of them is divided into several short Filaments, which terminate in the Substance of the Uvea. These small Nerves which run from behind forward between the Sclerotica and the Choroides, have formerly been taken for particular Ligaments, by very great Anatomists.

304. THE Nerves which go to the other Parts belonging to the Eye, come from the third, fourth, fifth and first two Branches of the fifth Pair of Nerves of the Medulla Oblongata, and likewise from the Portio Dura of the seventh Pair. The third, fourth and fifth Pairs give Nerves to the Muscles of the Globe of the Eye. The two Branches of the fifth Pair, and the Portio Dura of the seventh, give Nerves not only to the other parts which surround the Globe, but also to the Musculi Frontales and internal Parts of the Nose.

305. THE Trunk of the third Pair or Motores Oculi, having entered the Orbit through the superior orbital or sphenoidal Fissure, produces four Branches. The first runs upward and divides into two, one for the Musculus Rectus Superior, and the other for the Levator Palpebræ Superioris. The Trunk continuing its course, gives off the second short Branch to the Rectus Inferior. The third Branch is long and goes to the Obliquus Inferior, contributing likewise to the formation of the Lenticular Ganglion already mentioned. The fourth Branch is large and supplies the Rectus Internus.

306. THE first Branch of the fifth Pair, commonly termed Nervus Ophthalmicus, divides into three Rami, as it enters the Orbit; and sometimes only into two, one of which is afterwards subdivided. Of these three Branches one is superior, which I term Nervus Superciliaris; one internal, termed Nasalis, and one external, to which the name of Temporalis agrees better than that of Lacrymalis, which may occasion a mistake.

307. THE Superior or Superciliary Ramus runs along the whole Periosteum of the Orbit, and having passed through the superciliary Notch or Foramen of the Os Frontis, is distributed to the Musculus Frontalis, Superciliaris, and superior Portion of the Orbicularis Palpebrarum; and it communicates with a small Branch of the Portio Dura of the seventh Pair.

308. THE Internal or Nasal Branch passes under the Ramification of the Nerve of the third Pair, and running toward the Nose, is distributed thereto, and to the neighbouring parts of the Orbicularis, the Caruncula, &c. This Branch sends off a Filament, which passing through the internal, anterior, orbital Hole, enters the Cranium, and presently returns again through one of the Ethmoidal Holes, to the internal Parts

of the Nose. I have sometimes observed this Nasal Ramus to communicate with the Ramus Superciliaris by a particular Arch, before it enters the Orbitary Hole.

309. THE External or Temporal Ramus, which is sometimes a Subdivision of the Superciliaris, is distributed to the Glandula Lacrymalis, and sends off a Filament which pierces the Orbitary Apophysis of the Os Malæ.

310. THE second Branch of the fifth Pair, called Nervus Maxillaris Superior, sends off a Ramus through the bony Canal of the lower part of the Orbit, which going out at the anterior inferior orbitary Hole, is distributed to the neighbouring Portion of the Musculus Orbicularis, and communicates with a Ramus of the Portio Dura. I shall here say nothing of the other Distributions of this Branch of the Maxillaris Superior.

311. THE Portio Dura of the seventh Pair or Auditory Nerve, which I call Nervus Sympatheticus Minor, gives Branches to the superior, inferior, and external lateral parts of the Orbicularis Palpebrarum, one of which communicates with the Nervus Superciliaris, and another with the Sub-Orbitarius, as I observed in the Description of the Nerves.

§ 11. *The Uses of the Eye and of its Appendages in general.*

312. EVERY Body knows that the Eye is the Organ of Vision. The transparent parts of the Globe modify the Rays of Light, by different Refractions; the Retina and Choroides receive the different Impressions of these Rays; and the Optic Nerve carries these Impressions to the Brain. When Objects are at a great distance or obscure, the Pupilla is dilated; and it is contracted when Objects are near, or placed in a great Light. The Muscles of the Globe of the Eye and of the Palpebræ perform the Motions already described.

313. THE Glandula Lacrymalis continually moistens the forepart of the Globe of the Eye; and the Lacrymal Serum is equally spread over that Globe by the Motions of the superior Palpebra, the inner Surface of which is in a small measure Villous. The Union of the two Palpebræ directs this Serum towards the Puncta Lacrymalia; and the unctuous Matter discharged through the Foramina Ciliaria hinders it from running out between the Palpebræ. The large Size and viscid Surface of the Caruncula prevents it from running beyond the Puncta, and thus forces it into them.

314. THE Supercilia may hinder Sweat from falling on the Eyes. The superior Cilia which are longer than the inferior may have the same Use, and they both serve to prevent Dust, Insects, &c. from entering the Eyes when they are only a little open.

A R T. III.

The Nose.

315. **T**HE Parts of which the Nose is made up, may be divided two different ways, viz. from their Situation, into internal and external Parts; and from their Structure, into hard and soft Parts. *Division.*

316. THE external Parts are the Root of the Nose, the Arch, the Back, or Spine of the Nose, the Sides of the Nose or of the Arch, the Tip of the Nose, the Alæ, the external Nares, and the Part under the Septum.

317. THE internal Parts are the internal Nares, the Septum Narium, the Circumvolutions, the Conchæ Superiores, the Conchæ Inferiores, the posterior Openings of the internal Nares, the Sinus Frontales, Sinus Maxillares, Sinus Sphenoidales, the Ductus Lacrymales, and Ductus Palatini.

318. THE firm or hard Parts are mostly bony, and the rest, Cartilaginous, viz. the Os Frontis, Os Ethmoides, Os Sphenoides, Offa Maxillaria, Offa Nasi, Offa Unguis, Offa Palati, Vomer, Conchæ Inferiores, and the Cartilages. To these we may add the Periosteum and Perichondrium, as Parts belonging to the Bones and Cartilages.

319. THE soft Parts are the Integuments, Muscles, Sacculus Lacrymalis, Membrana Pituitaria, Vessels, Nerves, and Hairs of the Nares. The bony Parts have been all explained in the Description of the Skeleton; and therefore I need only in this place set down the Distribution and Disposition thereof, for the formation of some of the principal Parts. The Septum is formed by the descending Lamina of the Os Ethmoides, and by the Vomer; and it is placed in the Groove framed by the Cristæ of the Offa Maxillaria, and rising Edges of the Offa Palati described in Sect. I. No 279, 316. The Back of the Nose is formed by the Offa Nasi, and the Sides, by the superior Apophyses of the Offa Maxillaria.

320. THE internal Nares, or the two Cavities of the Nose, comprehend the whole Space between the external Nares and posterior Openings, immediately above the Arch of the Palate, from whence these Cavities reach upward as far as the Lamina Cribrosa of the Os Ethmoides, where they communicate forward, with the Sinus Frontales, and backward, with the Sinus Sphenoidales. Laterally, these Cavities are bounded on the inside by the Septum Narium, and on the outside or that next the Cheeks, by the Conchæ, between which they communicate with the Sinus Maxillaris.

321. THE particular Situation of these Cavities deserves our attention. The bottom of them runs directly backward, so that a straight and pretty large Stilet, may easily be passed from the external Nares, under the great Apophysis of the Occipital Bone. The Openings of the Maxillary Sinuses, are nearly opposite to the upper Edge of the Offa Malarum. The Openings of the Frontal Sinuses are more or less opposite to, and between the

the Pulleys or Rings of the Musculi Trochleares; and by these Marks, the Situation of all the other Parts may be determined.

322. THE inferior Portion of the external Nose, is composed of several Cartilages, which are commonly five in number, and of a pretty regular Figure. The rest are only additional, smaller, more irregular, and the number of them more uncertain. Of the five ordinary Cartilages one is situated in the middle, the other four laterally. The middle Cartilage is the most considerable, and supports the rest, being connected immediately to the bony Parts; but the other four are connected to the middle Cartilage, and to each other, by means of Ligaments.

323. THE principal Cartilage of the Nose consists of three Parts, one middle and two lateral. The middle Portion is a broad Cartilaginous Lamina, joined by a kind of Symphysis, to the anterior Edge of the middle Lamina of the Os Ethmoides, to the anterior Edge of the Vomer, and to the anterior part of the Groove formed by the Ossa Maxillaria, as far as the Nasal Spines of these Bones. This Lamina compleats the Septum Narium, and indeed, forms the principal part thereof.

324. THE lateral Portions are oblique and narrow, suited to the corresponding parts of the bony Arch. Where they join the middle Lamina, a superficial Groove is observable, which makes them sometimes appear like two distinct Pieces, separated from the Lamina, though they are really continuous. This shallow Groove terminates below by a small Crista.

325. THE lateral Cartilages are two, on each side of the inferior part of the Lamina, one anterior, the other posterior. The two anterior Cartilages are very much bent forward, and form what is called the Tip of the Nose; the Space between their incurvated Extremities being commonly filled with a kind of fatty Substance. The two posterior Cartilages form the Alæ of the Nares, being pretty broad and of an irregular Figure.

326. THE Spaces left between some Portions of the anterior and posterior Cartilages, those between the posterior Cartilages and the neighbouring parts of the Ossa Maxillaria; and lastly, those between these four lateral Cartilages and the principal Lamina, vary in different Subjects, and are filled by small additional Cartilages, the Number, Size and Figure of which are as variable as the Interstices in which they lie.

327. THE Sub-Septum or Portion under the Septum Narium, is a Pillar of Fat applied to the inferior Edge of the Cartilaginous Partition, in form of a soft, moveable Appendix. The thickness of the Alæ Narium, and especially that of their lower Edges, is not owing to the Cartilages which are very thin, but to the same kind of solid Fat with which these Cartilages are covered. The great Cartilage is immovable by reason of its firm Connexion to the bony parts of the Nose; but the lateral Cartilages are moveable, because of their Ligamentary Connexions, and they are moved in different manners by the Muscles belonging to them.

328. THE external Nose is covered by the common Integuments, the Skin, Epidermis and Fat. These which cover the Tip of the Nose and Alæ

Alæ Narium are a great number of glandular Bodies, called Glandulæ Sebaceæ by *M. Morgagni*, the Contents of which may easily be squeezed out by the Fingers. All these bony and cartilaginous Parts have likewise the common Periosteum or Perichondrium.

329. Six Muscles are commonly reckoned to belong to the Nose; two *Muscles of Recti*, called also Pyramidales or Triangulares; two Obliqui or Laterales, *the Nose.* and two Transversi or Myrtiformes. In very Muscular Bodies there are likewise some supernumerary Muscles or small Accessorii. The Nose may also be moved in some measure by the Muscles of the Lips, which in many Cases become Assistants to the proper Muscles of this Organ.

330. THE Musculus Pyramidalis or Anterior on each side, is inserted by one Extremity, in the Synarthrosis of the Os Frontis and Ossa Nasi, where its fleshy Fibres mix with those of the Musculi Frontales and Superciliares. It is very flat, and runs down on the side of the Nose, increasing gradually in breadth, and terminating by an Aponeurosis, which represents the Basis of a Pyramid, and is inserted in the moveable Cartilage which forms the Ala of the Nares.

331. THE oblique or lateral Muscle is a thin, fleshy Plane, lying on the side of the former, and in some Subjects, appearing to form one broad Muscle with it. This is probably the reason why the anterior Muscle has been termed Triangularis. The lateral Muscle is fixed by its upper Extremity to the Apophysis Nasalis of the Os Maxillare, below its Articulation with the Os Frontis, and sometimes a little lower than the middle of the inner Edge of the Orbit. From thence it runs toward the Ala Narium, and is inserted in the moveable Cartilage, near the Os Maxillare, being covered laterally by a Portion of the neighbouring Muscle of the upper Lip, with which, in some Subjects, it appears to be confounded.

332. THE transverse or inferior Muscle, called also Myrtiformis, is inserted by one end in the Os Maxillare, near the lower Edge of the Orbit, much about the place which answers to the Extremity of the Socket of the Dens Caninus on the same side. From thence it runs almost transversely upward, and is fixed in the lateral Cartilages of the Nose, over which, in some Subjects, it seems to run to the Alæ of the great Cartilage, and to be inserted there.

333. THE first two Pairs of these Muscles, raise and dilate the Alæ of the Nares, when they act; and at the same time, raise the upper Lip, by reason of their Connexion with the Muscles of that Part. They likewise wrinkle the Skin on the sides of the Nose.

334. THE Membrana Pituitaria is that which lines the whole internal *Membrana Nares*, the cellular Convolutions, the Conchæ, the sides of the Septum *Pituitaria.* Narium, and by an uninterrupted Continuation, the inner Surface of the Sinus Frontales and Maxillares, and of the Ductus Lacrymales, Palatini and Sphenoidales. It is likewise continued down from the Nares to the Pharynx, Septum Palati, &c. as we shall shew hereafter.

335. IT is termed Pituitaria, because through the greatest part of its large extent, it serves to separate from the arterial Blood, a Mucilaginous

Lympha, called Pituita by the Ancients, which in the natural state is pretty liquid; but it is subject to very great changes, becoming sometimes glutinous or snotty, sometimes limpid, &c.; neither is it separated in equal quantities through the whole Membrane.

336. WHEN we carefully examine this Membrane, it appears to be of a different Structure in different Parts. Near the Edge of the external Nares it is very thin, appearing to be the Skin and Epidermis in a degenerated state. All the other Parts of it in general, are spongy and of different thicknesses. The thickest parts are those on the Septum Narium, on the whole lower Portion of the internal Nares, and on the Conchæ; and if we make a small Hole in it, at any of these places, and then blow through a Pipe, we discover a very large cellular Substance. In the Sinuses it appears to be of a more slender Texture.

337. ON the side next the Periosteum and Perichondrium, it is plentifully stored with small Glands, the Excretory Ducts of which are very long near the Septum Narium, and their Orifices very visible; and by applying a Pipe to any of these Orifices, the Ducts may be blown up almost through their whole extent; but in order to this, the Parts must first be very well cleaned and washed in lukewarm Water.

338. IN these places especially, we likewise discover a very fine villous Substance, when the Parts are examined in clear Water in the manner which I have described in another place, and which I have used in my public Courses, for above twenty Years past. *Riolan* made use of this Method in examining small Fœtuses.

Sinus.

339. THE Frontal, Maxillary and Sphenoidal Sinuses open into the internal Nares, but in different manners. The Frontal Sinuses open from above downward, answering to the Infundibula of the Os Ethmoides, described in the History of the Skeleton. The Sphenoidales open forwards opposite to the posterior Orifices of the Nares, and the Maxillares open a little higher, between the two Conchæ. Therefore the Sinus Frontales discharge themselves most readily when we stand or sit; and the Sphenoidales, when the Head is inclined forward.

340. THE Sinus Maxillares cannot be emptied wholly, or both at the same time in any one Situation. Their Opening, which in some Subjects is single, in others double, &c. lies exactly between the two Conchæ, about the middle of their depth; so that when the Head is held straight, or inclined forward or backward, they can only be half emptied; but when we lie on one side, the Sinus of the opposite side may be wholly emptied, the other remaining full.

341. IT is proper here to observe the whole extent of the Maxillary Sinus. Below, there is but a very thin Partition between it and the Dentes Molares, the Roots of which, do in some Subjects, perforate that Septum. Above, there is only a very thin transparent Lamina between the Orbit and the Sinus. Backward, above the Tuberosity of the Os Maxillare, the sides of the Sinus are very thin, especially at the place which lies before the Root of the Apophysis Pterygoides, through which the inferior

Maxillary

Maxillary Nerve sends down a Ramus to the Foramen Palatinum Posterius, commonly called Gustatorium. Inward, or toward the Conchæ Narium, the bony part of the Sinus is likewise very thin.

342. THE Lacrymal Sacculus is an oblong membranous Bag into which *Sacculus Lacrymalis*, the serous Fluid is discharged from the Eye through the Puncta Lacrymalia, already described, and from which the same Fluid passes to the lower part of the internal Nares. It is situated in a bony Groove and Canal, formed partly by the Apophysis Nasalis of the Os Maxillare and Os Unguis, partly by the same Os Maxillare and lower part of the Os Unguis, and partly by this lower Portion of the Os Unguis, and a small superior Portion of the Concha Narium Inferior. This Groove and Canal are the bony Lacrymal Duct, about which, I would advise Beginners to consult what was said in the Description of the Skeleton.

343. I have an Observation or two to add in this place concerning the Situation of this bony Duct. It runs down for a little way obliquely backward, toward the lower and lateral part of the internal Nares on each side, where its lower Extremity opens on one side of the Sinus Maxillaris under the inferior Concha, nearly at the place from which a perpendicular Line would fall in the Interstice between the second and third Dentes Molares. The upper part of this Duct is only an half Canal or Groove; the lower is a compleat Canal narrower than the former.

344. THE Sacculus Lacrymalis may be divided into a superior or orbitary Portion, and an inferior or nasal Portion. The orbitary Portion fills the whole bony Groove, being situated immediately behind the middle Tendon of the Musculus Orbicularis. About one fourth of its length is above this Tendon, and the rest below. The Nasal Portion lies in the bony Canal of the Nose, being narrower and shorter than the former.

345. THE orbitary Portion is disposed at its upper Extremity, much in the manner of an Intestinum Cæcum, and at the lower Extremity is continued with the Portio Nasalis. Towards the internal Angle of the Eye, behind the Tendon of the orbicular Muscle, it is perforated by a small short Canal formed by the Union of the Lacrymal Ducts.

346. THE Nasal Portion having reached the lower part of the bony Duct under the inferior Concha, terminates in a small flat membranous Bag, the bottom of which is perforated by a round Opening, as I have always found it upon a careful Examination, but which at first sight appears oblong.

347. I used to attribute this difference to the force which I was obliged to use in separating the Concha Inferior, in order to see this Opening, which I have often found more backward than the middle of the Bag at the Extremity of this Portion; and therefore when I would either see or shew this Opening in its natural state, I do not separate the inferior Concha, but cut it gently with a sharp Knife, or with Scissars. If a transverse Line be drawn between the lower part of the Nose and Os Malæ, and another Line be drawn directly upward, opposite to the third Dens Molaris

or opposite to the second and third, these two Lines will intersect each other nearly at the lower Extremitie of this Sacculus.

348. I have sometimes found the upper Extremitie of this Bag divided into an anterior and posterior part, by a kind of Valvula Connivens lying in the anterior Portion, a little lower than the Tendon of the Musculus Orbicularis. The small common Canal of the two Lacrymal Ducts opens in the posterior Portion, and consequently behind the Valve.

349. THE Substance of this Sacculus is something spongy or cellulous, and pretty thick, being strongly united by its convex side to the Periosteum of the bony Canal, which may be very distinctly shewn. This Substance seems to be made up of two Laminæ, joined together by a spongy Membrane, the outermost of which is that which I have mentioned; the other appears to be glandulous, and is in some Subjects loose and pliable, which I look upon as a Disease.

Ductus Incisorii.

350. THE Ductus Incisorii, or Naso-Palatini of *Steno*, are two Canals which go from the bottom of the internal Nares cross the Arch of the Palate, and open behind the first or largest Dentes Incisorii. Their two Orifices may be distinctly seen in the Skeleton at the lower part of the Nasal Fossæ, on the anterior and lateral sides of the Cristæ Maxillares; and we may likewise perceive their oblique Passage through the Maxillary Bones, and lastly their inferior Orifices in a small Cavity or Fossula, called Foramen Palatinum Anterius. In fresh Subjects they are not so apparent, especially in Human Subjects, for in Sheep and Oxen they are easily discoverable.

351. *Santorini* in his Anatomical Observations has described those of the Human Body in a very pretty manner, and has given us his method of discovering them, which is nearly the same with that which I have always made use of in my private Courses, to shew at one view all the external parts which belong to the Nose, as may be seen in the Works published by my Scholars, especially Strangers. I say his Method is *nearly* the same with mine, because instead of dividing the Head into two equal lateral parts, I always direct the Saw a little toward one side, to preserve the Septum Narium intire, as well as that of the Sinus Frontales, Sinus Sphenoidales, and Ductus Incisorii; and on the other side, to preserve the Conchæ and Cells of the Os Ethmoides. For this purpose I use a very fine Saw made of the Spring of a Watch.

352. By this Method I shew on that side from which all the Septa have been sawed off, the intire Conchæ, their convex sides, the particular thickness of the Membrana Pituitaria on their lower Edges, the Orifice or Orifices of the Sinus Maxillaris, the Situation of the Orifice of the Sinus Sphenoidalis, the communicating Ducts that go between the Sinus Frontales and the Ethmoidal Cells, and Interstices between the two Conchæ, and the Structure of the posterior Openings of the Nares. I can shew likewise at the same time the Orifice of the *Eustachian* Tube behind the posterior Opening of the Nares, and the Communication of the Nose with the Mouth.

353. ON the same side, I afterwards separate gradually with a very sharp Knife, or with narrow sharp pointed Scissars, the Superior or Ethmoidal Concha, without doing any Violence to the neighbouring parts; and then I can shew on the parts covered by that Concha, a little oblong or oval Fossula which runs down obliquely from before backward; at the posterior and lower Extremity of which, there is an Orifice of about a Quarter of an Inch in Diameter, which opens into the Maxillary Sinus; and another at the anterior or superior Extremity which opens into the Frontal Sinus.

354. IMMEDIATELY behind this Fossula, there are two Openings, one into the Sinus Frontales, the other into the Ethmoidal Cellulæ of the Os Frontis. I shew likewise in the posterior part of the Os Ethmoides, at least two Openings, by which the Cells of that Bone communicate with each other. All this is very different from what we see in the Skeleton, or even when these parts are deprived of their Membranes, &c. neither is the Structure always the same in fresh Subjects; for in some I have observed, a little before and above the Opening of the Maxillary Sinus, two small Grooves, which united in their passage to the Frontal Sinuses, the uppermost Groove being a little contorted.

355. IN the next place I remove the Concha Inferior or Maxillaris in the same manner and with the same precautions; and then I observe, at the distance of about a quarter of an Inch from the anterior Extremity of this Concha, a small Opening, the Diameter of which is not above the twelfth part of an Inch, and it is turned obliquely backward. It seems to be the Extremity of a Duct of the same Diameter, but when it is slit with sharp pointed Scissars, we discover a flat oval Cavity, the Diameter of which is a quarter of an Inch in length, and lies in the same Direction with the Septum Narium.

356. THIS oval Cavity is the lower Extremity of the Sacculus Lacrymalis, which consequently is only contracted between this inferior Cavity and the orbitary Portion. Within this narrow or contracted Portion we see likewise the Opening of a blind Duct, which runs obliquely backward and upward for about a quarter of an Inch; but I do not know precisely where it terminates, nor for what it is designed.

357. THE Arteries of all these Parts come from the external Carotid. *Arteries and* Those of the external parts of the Nose are chiefly Branches and Rami of *Veins.* the Arteria Maxillaris Externa or Angularis, and of the Temporalis; and the Arteries of the internal parts are Branches and Ramifications of the Maxillaris Interna. The Veins are almost in the same manner, Branches and Ramifications of the external Jugular, and they communicate with the orbitary Sinus, and by that means, with the Sinuses of the Dura Mater, and with the internal Jugulars.

358. THE principal Nerves belonging to the Nose are Filaments of the *Nerves.* Nervi Olfactorii, which run down through the Holes of the transverse Lamina of the Os Ethmoides, and are distributed to the common Membrane of the internal Nares, especially to the villous Portions thereof. The inner

inner Ramus of the orbitary or ophthalmic Nerve sends a Filament through the internal anterior orbitary Hole into the Cranium, which comes out again in company with one of the Filaments of the Olfactory Nerve thro' the Ethmoidal Lamina.

359. THIS internal Ramus advances afterwards toward the Os Unguis, and is distributed partly to the Sacculus Lacrymalis, partly to the upper Portion of the Musculus Pyramidalis, and of the Integuments of the Nose. The Sub-orbitary Nerve which is a Branch of the Maxillaris Superior, having passed through the inferior orbitary Hole, sends Filaments to the lateral external parts of the Nose. Another Ramus of the superior Maxillary Nerve goes to the posterior Opening of the Nares, being spent on the Conchæ, and other internal parts of the Nose.

Uses.

360. THE Nose is the Organ of Smelling, by means of the villous Portion of the internal Membrane, to which the Olfactory Nerves are chiefly distributed. It is likewise of use in Respiration, and the Mucilaginous Fluid spread over the whole Pituitary Membrane, prevents the Air from drying that Membrane, and so rendering it incapable of being affected. The Nose serves likewise to regulate and modify the Voice, and to this the Sinuses likewise contribute. The Sacculus Lacrymalis receives the Serum from the Eyes, and discharges it upon the Palate from whence the greatest part of it runs to the Pharynx.

A R T. IV.

The Ear.

The Ear in general.

361. EVERY one knows that the Ears are two in number, that they are situated in the lateral parts of the Head, and that they are the Organs of Hearing. Anatomists commonly divide or distinguish the Ear into external and internal. By the external Ear they mean all that lies without the external Orifice of the Meatus Auditorius in the Os Temporis; and by the internal Ear, all that lies within the Cavities of that Bone, and also the Parts that bear any relation thereto.

362. THE greatest part of the external Ear consists of a large Cartilage very artificially framed, which is the Basis of all the other parts of which this Portion of the Ear is made up. The internal Ear consists chiefly of several bony pieces, partly formed in the Substance of the Ossa Temporum, and especially in that Portion of it, called Apophysis Petrosa, and partly separated from, but contained in a particular Cavity of that Bone. All these bony Pieces have been explained in the Description of the Skeleton, to which I must therefore refer, desiring those who have a mind to understand what I am now to say about the other parts of this Organ, carefully to revise the Explication there given.

363. THE external Ear taken all together resembles in some degree the *The external Ear.* Shell of a Muscle, with its broad end turned upward, the small end downward, the convex side next the Head, and the concave side outward. Two Portions are distinguished in the external Ear taken all together, one large and solid, called in Latin Pinna, which is the Superior, and by much the greatest part; the other small and soft called the Lobe, which makes the lower part. We may likewise consider two sides in the outward Ear, one turned obliquely forward and irregularly concave, the other turned obliquely backward, and unequally convex; for all Ears which have not been disordered by binding the Head too tight in Childhood, are naturally bent forward.

364. THE foreside is divided into Eminences and Cavities. The Eminences are four in number, called Helix, Anthelix, Tragus, and Antitragus. The Helix is the large folded Border or Circumference of the great Portion of the Ear. The Anthelix is the large oblong Eminence or Rising surrounded by the Helix. The Tragus is the small anterior Protuberance below the anterior Extremity of the Helix, which in an advanced Age is covered with Hairs. The Antitragus is the posterior Tubercle, below the inferior Extremity of the Anthelix.

365. THE Cavities on the foreside are four in number, the Hollow of the Helix, the Depression at the superior Extremity of the Anthelix, called Fossa Navicularis, the Concha or great double Cavity that lies under the Rising termed Anthelix, the upper bottom of which is distinguished from the lower by a Continuation of the Helix in form of a transverse Crista; and lastly, the Meatus of the external Ear situated at the lower part of the bottom of the Concha.

366. THE backside of the external Ear shews only one considerable Eminence which is a Portion of the convex side of the Concha, the other Portion being hid by the Adhesion of the Ear to the Os Temporis. This Adhesion hinders us likewise from seeing the Hollow answering to the Crista, by which the Cavity of the Concha is divided.

367. I have already said that the external Ear consists chiefly of a Cartilage, which is the Basis of all the other Parts. These other Parts are Ligaments, Muscles, Integuments, Sebaceous and Ceruminous Glands, Arteries, Veins and Nerves; but I do not reckon among them a large Gland, called by the Greeks Parotis, because it lies very near the Ear; the Description of which must be referred to that of the Salivary Glands, of which it is the most considerable.

368. THE Cartilage of the outward Ear is nearly of the same Extent and Figure with the large solid Portion thereof, already mentioned; but it is not of the same thickness, being covered by Integuments on both sides. In the Lobe or soft lower Portion of the Ear, this Cartilage is wanting. On the backside, it shews all the Eminences and Cavities on the foreside in an opposite Situation with respect to each other, except the Fold of the great Circumference; and it consists only of one piece from that Circumference all the way to the Meatus Externus, except at the two Extremities

ties of the folded part of the Helix, where there are two small separate Portions connected to the great Cartilage only by the Integuments.

369. THE cartilaginous Portion of the external Meatus Auditorius does not make a compleat Circle; but rather a short Tube, in one side of which there is a Break, and which terminates in an oblique Border fixed to the Edge of the bony Canal by several small Inequalities, as by a kind of Ingrailing; and from this Obliquity it is, that the cartilaginous Border terminates downward in a kind of Apex or Point. The lateral Break in this Cartilage is between the upper and backpart of its Circumference; and on each side thereof the Cartilaginous Edges are rounded. There are likewise two or three other small Incisures in this Circumference, which in regard to the Meatus, represent obliquely transverse Fissures. The anterior Fissure is in a manner Quadrangular; neither are the intermediate parts always opposite to each other, for the uppermost is a little further from the Os Temporis than the posterior.

370. THE external Ear is fixed to the Cranium, not only by the Cartilaginous Portion of the Meatus already mentioned, but also by Ligaments which are two in number, one anterior, the other posterior. The anterior Ligament is fixed by one Extremity to the Root of the Apophysis Zygomatica of the Os Temporis, at the anterior and a little toward the superior part of the Meatus Ossæus, close to the Corner of the Glenoid Cavity; and by the other Extremity, to the anterior and superior part of the Cartilaginous Meatus.

371. THE posterior Ligament is fixed by one end to the Root of the Mastoid Apophysis, and by the other, to the posterior part of the Convexity of the Concha, so that it is opposite to the anterior Ligament. There is likewise a kind of superior Ligament, which seems to be only a Continuation of the Aponeurosis of the Frontal and Occipital Muscles.

372. OF the Muscles of the external Ear, some go between the Cartilages and the Os Temporis, others are confined to the Cartilages alone. Both kinds vary in different Subjects, and are sometimes so very thin, as to look more like Ligaments than Muscles. The Muscles of the first kind are generally three in number, one Superior, one Posterior, and one Anterior, and they are all very thin. The superior Muscle is fixed in the Convexity of the Fossa Navicularis, and of the superior Portion of the Concha; from whence it runs up to the squamous Portion of the Os Temporis, expanding in a radiated manner, though not in the same degrees in all Subjects, and is inserted principally in the Ligamentary Aponeurosis, which covers the posterior Portion of the Temporal Muscle.

373. THE anterior Muscle is small, more or less inverted, and like an Appendix to the superior. It is fixed by one Extremity above the Root of the Zygomatic Apophysis, and by the other, in the anterior part of the Convexity of the Concha.

374. THE posterior Muscle is almost transverse, and of a considerable breadth, being fixed by one end to the posterior part of the Convexity of the Concha, and by the other, in the Root of the Mastoid Apophysis.

It

It covers the posterior Ligament, but the division of it into several Portions mentioned by some Authors, seems to be merely artificial, that is, owing to Dissection.

375. THE small Muscles which are confined to the Cartilages are only small Strata of Fibres found on both sides of the Cartilages. In many Subjects they are of so pale a Colour, as not to look at all like Muscular Fibres. Of this number are those which *Valsalva* discovered in the different Cavities on the backside of the Cartilage, and those found by *Santorini* on the Tragus, and along the convex part of the anterior Portion of the Helix.

376. THE Skin of the external Ear is in general, a Continuation of that which covers the neighbouring parts of the Temporal Region. The Skin on the foreside of the Ear is accompanied by a very small quantity of cellular Substance, and therefore we find all the Eminences and Cavities of that side distinctly mark'd upon it, as far as the bottom of the external Meatus Auditorius. In what I have said of the Skin the Epidermis is likewise comprehended.

377. THE backside is covered by the Skin continued from the foreside; but as the Folds are there very close, it only passes over them, except that Portion of the Concha which surrounds the Entry of the Meatus Auditorius, and which is joined to the Os Temporis by means of the cellular Substance. The Hollow of that common Fold which lies between the Anthelix and Concha does not appear on the backside, for as it is filled with cellular Substance, the Skin passes over it.

378. THE Lobe of the Ear, or that soft Portion which lies under the Tragus, Antitragus, and Meatus Auditorius, is made up of nothing but Skin and cellular Substance. The Meatus Auditorius is partly Bony and partly Cartilaginous. The bony Portion is the longest, and forms the bottom of the Canal, as may be seen in the Description of the Skeleton. The cartilaginous Portion is the shortest, and in Adults, forms the external Opening or Orifice of the Canal, as has been already said.

379. THESE two Portions joined endwise to each other, form a Canal of about three Quarters of an Inch in length, of different Wideness in its different Parts, and a little contorted. It is lined on the inside by the Skin and cellular Membrane, through its whole length; and thus these Integuments make up for the Breaks in the Cartilaginous Portion, and form a kind of Cutaneous Tube in the other Portion. The cellular Membrane is confounded with the Perichondrium and Periosteum of the Meatus.

380. THE Skin which covers both sides of the Cartilage contains a great number of small Glands, which continually discharge an oily whitish Humour collected chiefly near the Adhesions of the Ear to the Head, and under the Fold of the Helix; and these Glands are of the sebaceous kind. The Skin which lines the Meatus Auditorius contains another kind of Glands, of a yellowish Colour, and which may be plainly seen on the convex side of the cutaneous Tube already mentioned.

381. THESE Glands are disposed in such a manner as to leave reticular Spaces between them, and they penetrate a little way into the Substance of the Skin. They are called *Glandulæ Ceruminosæ*, because they discharge that Matter which is named Cerumen, or the Wax of the Ear. The inner Surface of the cutaneous Tube is full of fine Hairs, between which lie the Orifices of the Ceruminous Glands. The first place in which we meet with these Glands is on that part of the convex side of the Cutaneous Tube, which supplies the Breaks of the Cartilaginous Meatus.

382. THE Arteries of the external Ear come anteriorly from the *Arteria Temporalis*, and posteriorly from the *Occipitalis*, which is a Branch of the external Carotid. It is proper to observe here that the Occipital Artery communicates with the *Vertebralis*, and thereby with the internal Carotid. The Veins are Rami of the *Jugularis Externa*; and the Occipital Vein, one of these Rami, communicates not only with the *Vena Vertebralis*, but with the neighbouring lateral Sinus of the *Dura Mater*.

383. THE Portio Dura of the Auditory Nerve having passed out of the Cranium through the Foramen Stylo-Mastoidæum in the manner that shall be afterwards described, gives off a Ramus which runs up behind the Ear, to the backside of which it sends several Filaments; and the Trunk of this Ramus sends likewise Filaments to the Meatus and foreside of the Ear. The second vertebral Pair sends also a Ramus to the Ear, the Ramifications of which communicate with those of the other Ramus from the Portio Dura.

The internal Ear.

384. I must here begin by repeating the Advice which I gave above, to read over and retain what has been said about the bony part of the Organ of Hearing in the Description of the Skeleton from N^o 260 to 267. and from N^o 392 to 444. It would be too long to repeat all these particulars in this place, but it is absolutely necessary to have a compleat Idea of all the bony Parts, if we would understand the Description of the other parts of the Ear, to which I am now to proceed.

385. THESE Parts are chiefly the *Membrana Tympani*, the *Périorsteum* of the Barrel, *Officula Auditus*, Labyrinth, and of all its Cavities, the *Membrana Mastoidæa Interna*, the Muscles of the *Officula*, the parts which compleat the formation of the *Eustachian Tube*, the Arteries, Veins and Nerves. I find my self however, under a necessity of beginning by the *Tuba Eustachiana* for two Reasons: First, because the bony parts of that Tube are but of very small use for the Knowledge of its whole Structure and Composition; and Secondly, because we are obliged to mention it in describing the Muscles.

386. I spoke of the *Eustachian Tube* in the Description of the Skeleton, by the name of *Ductus Auris Palatinus*; and I took notice that in France it goes generally by the name of the Aqueduct, which, however, must not be confounded with the *Aqueductus Falloppii*. In N^o 402 of Sect. 1. I observed, that it is a Canal or Duct which goes from the Tympanum to the posterior Openings of the Nares, or Nasal Fossæ, and toward the Arch of the Palate; that it is dug in the *Apophysis Petrosa*, along the carotid.

carotid Canal, and that it is lengthened out by the Spinal Apophysis of the Os Sphenoidale.

387. IN its natural state, this Duct reaches from the Cavity of the Barrel, to the Root or superior part of the internal Ala of the Apophysis Pterygoides; and through this whole course it is made up of two Portions, one intirely Bony, and the other partly Bony, partly Cartilaginous, and partly Membranous. That Beginners may not here be misled, it is very necessary to remember the Advice which I gave in the Description of the Skeleton N^o 186, &c. that in examining the lower parts of the Basis Cranii, the Skull ought to be raised up, and viewed from below upwards, &c.

388. THE bony Portion lies through its whole length immediately above the Fissure of the Glenoide or Articular Cavity of the Os Temporis, and terminates at the meeting of the Spinal Apophysis of the Os Sphenoidale, with the Apophysis Petrofa of the Os Temporis, that is, between that Spinal Apophysis, and the inferior Orifice of the carotid Canal.

389. THE other or mixed Portion reaches in the same Direction from this place, to the internal Ala of the Apophysis Pterygoides, or to the posterior and outer Edge of the Nares. But to form a more exact Idea of it, it will be proper to consider it as divided into four Parts, two Superior and two Inferior.

390. THE two upper Parts, or Quarters are bony, and of these, the innermost is formed by the side of the Apophysis Petrofa, the outermost, by the side of the Apophysis Spinalis of the Os Sphenoides, so that the upper half of this Portion of the Tube is bony. Of the two inferior Parts, the internal is Cartilaginous, and the external Membranous, so that the lower half of this Portion of the Tube is partly Cartilaginous next the Os Sphenoidale, and partly Membranous next the Apophysis Petrofa.

391. THE *Eustachian* Tube thus formed, is very narrow in the bony part next the Ear. The other Portion grows gradually wider, especially near the posterior Nares, where the inner Cartilaginous Side terminates by a prominent Edge, and the outer Side joins that of the neighbouring Nostril. The Cavity of the Tube is lined by a Membrane like that of the internal Nares, of which it appears to be a Continuation; and on the prominent Edge, this Membrane is considerably increased in thickness, representing a kind of half Pad.

392. THE Situation of the two Tubes is oblique, their posterior Extremities at the Ears being at a greater distance than the anterior at the Nares, and the convex sides of the prominent Edges are turned toward each other. The Openings of the Tubes are oval at this place, as is likewise their whole Cavity, especially that of the mixed Portion.

393. THE Membrana Tympani is a thin, transparent, flattish Pellicle, the Edge of which is round, and strongly fixed in the Orbicular Groove which divides the bony Meatus of the external Ear from the Tympanum or Barrel. This Membrane is very much stretched or very tense, and yet not perfectly flat; for on the side next the Meatus Externus it has a small Hol-

lowness which is pointed in the middle, and on the side next the Tympanum it is gently convex, and also pointed in the middle.

394. THIS Membrane is situated obliquely, the upper part of its Circumference being turned outward, and the lower part inward, suitably to the Direction of the bony Groove already mentioned. It is made up of several very fine Laminæ, closely united together. The external Lamina is in some measure a Production of the Skin and Cuticula of the external Meatus; for they may be pulled at the same time like the Finger of a Glove. The internal Lamina is a Continuation of the Periosteum of the Tympanum, and when the Membrane, has been first macerated in Water, each of these Laminæ may be subdivided into several others, which I have sometimes made to amount in all, to six. In very young Children this Membrane is covered on the outside by a thick mucilaginous Web.

395. THE Depression in the middle of the Membrana Tympani is caused by the Adhesion of the little Bone called Malleus, the Handle of which is closely joined to the inside of the Membrane from the upper part of the Circumference all the way to the Center to which the end of the Handle is fixed. This Handle seems to lie in a very fine membranous Duplitecture, by means of which it is tied to the Membrana Tympani, and which serves it for a Periosteum.

396. THE Periosteum of the Tympanum or Barrel of the Ear produces that of the small Bones, and it may be made visible by means of Anatomical Injections, which discover capillary Vessels very distinctly ramified on the Surface of the Ossicula, as has been shewn in my Private Courses. It is likewise continued over the two Fenestræ, and enters the *Eustachian* Tube, where it is lost in the inner Membrane of that Duct.

397. THE Cellulæ Mastoidæi are very irregular Cavities in the Substance of the Mastoide Apophysis, which communicate with each other, and have a common Opening towards the inside, and a little above the posterior Edge of the Orbicular Groove. These Cells are lined by a fine Membrane, which is partly a Continuation of the Periosteum of the Tympanum, and partly seems to be of a Glandular Structure like a kind of the Membrana Pituitaria. The Mastoide Opening is opposite to the small Opening of the *Eustachian* Tube, but a little higher.

398. THE Ligaments of the Ossicula come next in order, to understand which, I suppose the Reader acquainted with what I said concerning these small Bones in the Description of the Skeleton N^o 407, &c. The Incus is tied by a strong short Ligament fixed in the Point of the short Leg, to the Edge of the Mastoide Opening. Between the Incus and Malleus we find a small thin Cartilage. The Malleus is connected through the whole length of its Handle to the inside of the Membrana Tympani, in the manner already said. I need only add here, that by help of a Microscope we discover round the Point of the Handle, in the Substance of the Membrane, a small Orbicular Plane of a whitish Colour, a little inclined to Red.

399. THE

399. THE Malleus has three Muscles, one external, one anterior, and one internal; and the Stapes has one Muscle. The external or superior Muscle of the Malleus, attributed to *Casserius*, and mentioned by *Fabricius ab Aquapendente*, is a thin Fasciculus of fleshy Fibres lying along the upper part of the bony Meatus Auditorius, between the Periosteum and the other Integuments. The outer part of it is pretty broad, and it contracts by degrees as it advances towards the upper Part or Break of the Orbicular Groove of the Tympanum, into which it enters by a small Tendon, above the Membrana Tympani, and is inserted in the Neck of the Malleus, near the small Eminence or short Apophysis of the Handle. This Muscle is sometimes so pale as hardly to be distinguished.

400. THE anterior Muscle of the Malleus, called by *M. Duvernay* the External, is fleshy, long and thin. It runs along the outside of the *Eustachian* Tube, to which it adheres very closely thro' its whole length. Its anterior Extremity is fixed in that side of the Tube just before the Sphenoidal Spine; and the posterior Extremity ends in a long thin Tendon, which runs in the Articular or Glenoide Fissure of the Os Temporis, through a small oblique Notch in which Fissure, it enters the Tympanum, and is inserted in the long thin Apophysis of the Malleus. It is partly accompanied by a Nerve, which forms what is called the Chorda Tympani, as we shall see hereafter.

401. THE internal Muscle of the Malleus is very fleshy and distinct. It lies along the inside of the *Eustachian* Tube, partly on the Cartilaginous, and partly on the Bony Portion, being fixed by one Extremity in the Apophysis Petrosa. Afterwards it runs along the Cavity of the bony half Canal of the Tympanum, within which Cavity it is invested by a Portion of a Membranous or Ligamentary Vagina, which being fixed to the Edges of the half Canal, forms an intire Tube therewith, and this Vagina must be cut open before we can see the Muscle.

402. AT the Extremity of this bony half Canal, where we observe the Cavity shaped like the Mouth of a Spoon, mentioned in the Description of the Skeleton N^o 399. this Muscle ends in a Tendon, which is bent round the transverse bony or ligamentary Ridge in the last named Cavity, as over a Pulley, and is inserted in the Neck of the Malleus above the small Apophysis, advancing likewise as far as the Handle. The Extremities of the anterior and internal Muscles sometimes meet, and there they cover the mixed Portion of the *Eustachian* Tube.

403. THE Muscle of the Stapes is short and thick, and lies concealed within the small bony Pyramid at the bottom of the Tympanum. The Cavity which it fills, touches very nearly the bony Canal of the Portio Dura of the Auditory Nerve; and it terminates in a small Tendon which goes out of the Cavity through the small Hole in the Apex of the Pyramid. As it goes through the Hole it turns forward, and is inserted in the Neck of the Stapes on the side of the longest and most crooked Leg of that Bone.

404. THE three parts of the Labyrinth, that is, the Vestibulum, semicircular Canals, and Cochlea, are lined by a fine Periosteum, which is continued over all the sides of their Cavities, and shuts the two Feneſtræ of the Tympanum.

405. IN all the Subjects which I ever examined, I have found the semicircular Canals simply lined by a Periosteum adhering to their inner Surfaces, without any particular membranous Bands. The two half Canals of the Cochlea are lined in this manner: The Periosteum of the two sides of the bony Spiral Lamina, advances beyond the Edge of that Lamina, and forms a membranous Duplicature, which extending to the opposite side compleats the Spiral Septum.

406. THIS Septum separates the two half Canals from the Basis to the Apex, but there it leaves a small Opening, by which the small Extremities of the half Canals communicate with each other. The large Extremity of the external half Canal ends by an oblique Turn, in the Feneſtra Rotunda, which is shut by a Continuation of the Periosteum of that Canal. The large Extremity of the other half Canal opens into the Vestibulum; and these two Extremities are intirely separated by a Continuation of the Periosteum.

407. ALL the Periosteum of the internal Ear, especially that of the Officula and Tympanum, is in Children no more than a Mucilage; and in them likewise the Membrana Tympani is thick, opaque, and covered with a whitish slimy Matter.

408. THROUGH the whole extent of the Periosteum of the internal Ear, especially on that of the Officula, semicircular Canals, and half Canals of the Cochlea, we discover a vast number of Blood-Vessels, not only by Anatomical Injections, but in Inflammations, and even without the help of a Microscope; for I have often shewn them to the naked Eye in the semicircular Canals and half Canals of the Cochlea. The Arteries come partly from the internal Carotid, and partly from the Arteria Basilaris, which is a Continuation of the Vertebralis, the small capillary Ramifications of which may be observed to accompany the Auditory Nerve through the internal Foramen Auditorium.

409. THE Portio Mollis of the Auditory Nerve ends by its Trunk, at the great Fossula of the internal Auditory Hole, from whence the Filaments pass through several small Holes in the Basis of the Cochlea, partly to the Periosteum of the semicircular Canals, and partly to the internal Periosteum of the half Canals of the Cochlea.

410. THE Portio Dura, which I name Nervus Sympatheticus Minor, runs first of all into the small Fossula of the Foramen Auditorium Interum, then passes through the whole bony Duct, called Aqueductus Falloppii, and comes out again through the Stylo-Mastoide Hole of the Os Temporis. In this course it communicates with the Dura Mater on the upper or anterior side of the Apophysis Petroſa, at the place where the bony Duct is interrupted, as was mentioned in the Description of the Skeleton N^o 264, 443.

411. HAVING

411. HAVING reached behind the small Pyramid in the bottom of the Tympanum, this Nerve sends a small Filament to the Muscle of the Stapes; and a little before it goes out by the Stylo-Mastoide Hole, it gives off another more considerable Filament, which enters the Tympanum from behind forward, passes between the long Leg of the Incus and Handle of the Malleus, and afterwards runs cross the whole breadth of the Tympanum a little obliquely, and goes out at the same place at which the Tendon of the anterior Muscle of the Malleus enters.

412. THIS small Nerve is generally called Chorda Tympani, because in its passage through the Tympanum it has been compared to the Cord of a Drum. Having left the Cavity of the internal Ear, it advances toward one side of the Basis of the Tongue, where having joined the small Nervus Lingualis, it is considered as a kind of Recurrent; but the remaining part of its course must be referred to the Description of the Tongue.

413. THE Portio Dura of the Auditory Nerve having passed through the Foramen Stylo-Mastoidæum, is distributed in the manner already mentioned in the Description of the Nerves; and we ought very carefully to observe its different communications with the Branches and Rami of the Nerves of the fifth Pair, with the Sympatheticus Medius or eighth Pair, with the second Pair of cervical Nerves, and with the Nervi Sub-Occipitales, or tenth Pair of the Medulla Oblongata, &c.

414. THE Ear is the Organ of which we can most distinctly unfold the Structure, and demonstrate the greatest number of Parts, that is, of small Machines of which it is made up. We know likewise in general that it is the Organ of Hearing; but when we endeavour to discover the Uses of each of these Parts, that is, how each contributes to the great design of the whole, after having thoroughly examined them, we must be obliged to own that the greatest part of what the most able Philosophers have said upon this Subject, is without any real foundation.

415. It is certain that the Cavity of the external Ear collects Sounds or Noise, and centers it towards the bottom of the Concha, all the way to the external Meatus Auditorius. This we learn from Experience, by enlarging this Cavity with the Hand. It may likewise be affirmed with certainty, that in proportion as the Membrana Tympani is more or less stretched, Sounds become more or less sensible. This Experience teaches us; for when this Membrane is wetted by any Liquor, our Hearing is imperfect, but is restored again when the Membrane is dry. By the Muscles of the Officula, we can demonstrate that this Membrane is capable of being stretched and relaxed, as occasion requires; but the prosecution of this curious Subject must be referred to another Treatise.

ART. V.

The Mouth.

Introduction. 416. **T**HE word Mouth may have two significations: for first, it means the transverse Slit between the Nose and Chin, formed by the Lips, and secondly, it expresses the internal Cavity, of which this transverse Slit is the external Opening. For this reason the Mouth may be distinguished into external and internal, and the Parts of which it consists may likewise come under the same two general Heads. The bony Parts are the *Ossa Maxillaria*, *Ossa Palati*, *Maxilla Inferior*, and the Teeth: To these we may add the *Os Hyoides*, and the upper *Vertebræ* of the Neck.

417. THE external Parts of the Mouth are the two Lips, one upper, the other, under, the Borders or red parts of the Lips, the Corners or Commissures of the Lips, the Fossula of the upper Lip, the Basis of the under Lip, the Chin, the Basis of the Chin, the Skin, Beard, and even the Cheeks, as being the lateral parts of the Mouth in general, and of the Lips in particular.

418. THE internal parts of the Mouth are the Gums, Palate, Septum Palati, Uvula, Amygdalæ, the Tongue, the Membrane which lines the whole Cavity of the Mouth, the Salival Ducts and Glands, and the bottom of the Mouth. We might likewise reckon among the internal parts of the Mouth, all the Muscles that have any relation to it, as those of the Lips, of the Tongue, of the Uvula, of the Septum Palati, &c. and to these might be added the Muscles of the Lower Jaw, and of the *Os Hyoides*, which have been already described.

419. IN the Compendious View of the Parts of the Human Body, I made a general Enumeration of all those that belong to the Neck, of which there is a very considerable number, but the greatest part of them has been already described among the Bones, Muscles, Arteries, Veins and Nerves; and of those that remain, very few belong to the Description of the Thorax.

420. THE Parts of the Neck still undescribed are only the Larynx, Pharynx, Glandulæ Thyroideæ, and the Musculus Cutaneus, which really belongs to the Head; and therefore instead of making a particular Section for so small a number of Parts, I chose to bring them in, under the Description of the Head, especially since the Larynx and Pharynx have so near a relation to the internal parts of the Mouth, that I find myself under a necessity of describing them, before I proceed to the Mouth in particular.

§ 1. *The Larynx.*

421. THE Larynx forms the Protuberance in the upper and anterior part of the Neck, called commonly Pomum Adami. Anatomists term it the Head of the Trachea Arteria, which I explained particularly in the Description of the Thorax N^o 127, &c. and it is larger and more prominent in Men than in Women.

422. IT is chiefly made up of five Cartilages, the names of which are these: Cartilago Thyroides, which is the anterior and largest; Cricoides, the inferior, and Basis of the rest; two Arytenoides, the posterior and smallest; and the Epiglottis, which is above all the rest. These Cartilages are connected together by Ligaments, and they have likewise Muscles, Glands, Membranes, &c. belonging to them.

423. THE Cartilago Thyroidæa is large and broad, and folded in such a manner as to have a longitudinal Convexity on the fore-side, and two lateral Portions which may be termed Alæ. The upper part of its anterior middle Portion is formed into an angular Notch; the upper Edge of each Ala makes an Arch, and together with the middle Notch, these two Edges resemble the upper part of an Ace of Hearts in playing Cards. *Cartilago Thyroides.*

424. THE lower Edge of each Ala is more even, and the posterior Edges of both are very smooth, being lengthened out both above and below by Apophyses, which I name the Cornua of the Thyroide Cartilage. The superior Apophyses are longer than the inferior, and the Extremities of all the four are rounded like small Heads, which in the inferior Apophyses, have a shining Surface on the inside, resembling an articular Eminence.

425. ON the outside of each Ala near the Edge, is a prominent oblique Line which runs from behind forward. The upper Extremity of this Line is near the superior Apophysis or Cornu, and both that and the lower Extremity end in a small Tuberosity, the lowest being often the most considerable. These Tuberosities serve for the Insertion of Muscles and Ligaments. The inside of the Alæ and the convex side of the anterior Portion are very uniform; and this Cartilage ossifies gradually in old Age.

426. THE Cricoid Cartilage resembles a kind of thick, irregular Ring, very broad on one side and narrow on the other; or it may be compared to a small Portion of a thick Tube, cut horizontally at one end, and very obliquely at the other. I distinguish it into a Basis and Top, into an anterior, posterior, and two lateral sides. The Basis is almost horizontal, when we stand, and to this the Aspera Arteria is connected, so that the Cricoides may be looked upon as the upper Extremity of the Trachea. *Cartilago Cricoides.*

427. THE posterior Portion of the Cricoides is larger than the rest, and its posterior or convex side is divided by a longitudinal Eminence, or prominent Line into two distinct Surfaces, for the Insertion of Muscles. The Top is gently sloped above this prominent Line, and terminates on each side by a kind of obtuse Angle, formed between it and the oblique Edge

of each lateral Portion of this Cartilage. At the upper part of each of these Angles, there is a very smooth articular Surface, gently convex.

428. THE whole posterior side is distinguished into two lateral Portions by two prominent Lines, each of which runs down almost in a straight Direction from the articular Surface at the Top, a little below the middle of this side, where it terminates in another articular Line a little concave; and near these four articular Surfaces there are small Tubercles. The two superior Surfaces are for the Articulation of the Cartilagine Arytenoidææ, as we shall see presently; and the two inferior, for the Articulation of the inferior Cornua or Appendices of the Cartilago Thyroides.

*Cartilagine
nes Aryte-
noides.*

429. THE Cartilagine Arytenoidææ are two small, equal, similar Cartilages, which joined together, resemble the Spout of an Ewer, and they are situated on the Top of the Cricoides. In each, we may consider the Basis, Cornu, two sides, one posterior and concave, the other anterior and convex, and two Edges, one internal, the other external, which is very oblique. The Bases are broad and thick, and have each a concave articular Surface, by which they are joined to the Cricoides.

430. THE Cornua are bent backward, and a little toward each other. In some Subjects they are very loose, appearing like true Appendices, and easily separable from the rest, as I demonstrated in my private Courses about eight Years ago. Between their inner Edges they form a kind of Fissure, and their outer oblique Edges terminate each by a thick prominent Angle.

Epiglottis.

431. THE Epiglottis is an Elastic Cartilage, nearly of the Figure of a Purslane Leaf, narrow and thick at the lower part, thin and slightly rounded at the upper part, gently convex on the fore side, and concave on the back side. It is situated above the anterior or convex Portion of the Cartilago Thyroides; and its lower Extremity is tied by a short, pretty broad and very strong Ligament to the middle Notch in the upper Edge of that Cartilage. It is perforated by a great number of Holes, something like those in the Leaves of the Hypericum or St. John's-Wort, which are hid by the Membranes that cover its two sides.

*Ligaments of
the Larynx.*

432. THE Cartilago Thyroides is connected to the Cricoides by several short strong Ligaments, round the Articulations of the two inferior Cornua with the lateral articular Surfaces of the Cricoides. The Apices of the superior Cornua are fixed to the posterior Extremities of the great Cornua of the Os Hyoides, by slender round Ligaments, about a Quarter of an Inch in length.

433. In the middle of each of these Ligaments, we often meet with a small Cartilage of an oval Figure, and much thicker than the Ligaments. The Thyroides is likewise connected to the Os Hyoides by a short broad strong Ligament, one end of which is inserted in the superior Notch of the Cartilage, and the other in the lower Edge of the Basis of the Bone. It has also two Ligaments at the middle of the concave side which belong to the Arytenoidææ.

4.

434. THE Cricoides is tied to the lower part of the Thyroides by a strong Ligament; and by the Ligaments already mentioned, to the inferior Cornua of that Cartilage. Its Basis is fixed to the first Cartilaginous Ring of the Trachea Arteria, by a Ligament exactly like those by which the other Rings are connected together; and the membranous or posterior Portion of the Trachea is likewise fixed to the posterior part of the Basis of the Cricoides.

435. THE Cartilagines Arytenoidææ are connected to the Cricoides by *Glottis*. Ligaments, which surround their Articulations with the Top of that Cartilage. Anteriorly the Basis of each Arytenoides is fixed to one end of a Ligamentary Cord, which by its other end is inserted about the middle of the concave side of the anterior Portion of the Thyroides. At their Insertions in the Thyroides, these two Ligaments touch each other, but a small Space is left between them, where they are fixed in the two Arytenoides; and they seem likewise to have a small Adhesion to the Top of the Cricoides. This is what is called the Glottis.

436. UNDER these two Ligamentary Cords there are two others which run likewise from behind, forward. The Interstice between the superior and inferior Cords on each side form a transverse Fissure, which is the Opening of a small membranous Bag, the bottom of which is turned outward, that is, toward the Ala of the Thyroides. These two Sacculi are the Ventricles mentioned by the Ancients, and restored by *M. Morgagni*, who has given an excellent Description of them. They are chiefly formed by a Continuation of the internal Membrane of the Larynx, and the inner Surface of their bottom appears sometimes to be Glandulous.

437. ON the anterior Surface of the Arytenoide Cartilages, there is a small Depression between the Basis and the convex upper part. This Depression is filled by a Glandulous Body, which not only covers the anterior Surface of each Arytenoides, but is likewise extended forward from the Basis over the posterior Extremity of the neighbouring Ligamentary Cord. They are larger and more sensible in some Subjects than in others; and they are covered by the Membrane which lines the neighbouring Parts. These Glands were discovered by *M. Morgagni*.

438. I have already described the Ligaments which connect the Epiglottis to the Notch of the Thyroides, and to the Basis of the Os Hyoides. These two Ligaments, and a third which ties the Basis of the Os Hyoides to the Notch of the Thyroides, form a triangular Space filled with a cellular or fatty Substance, and with small Glands.

439. THE Epiglottis has likewise two lateral Ligaments, by which it is connected to the Arytenoides, all the way to their Points or Cornua. It has also a membranous Ligament, which running along the middle of its anterior or concave side, ties it to the Root or Basis of the Tongue. This Ligament is only a Duplicature of the Membrane which covers the Epiglottis, continued to the neighbouring Parts. Lastly, there are two lateral membranous Ligaments belonging to it, fixed near the Glandulous Bodies called Amygdalæ.

440. THE Epiglottis is not only perforated by the regular Holes already mentioned, but has likewise a great number of small irregular Scissures and Breaks, which are so many different Lacunæ situated between its two Membranes, and filled with small Glands, the Excretory Orifices of which are chiefly on the backside of this Cartilage.

*Muscles of
the Larynx.*

441. THE Larynx gives Insertion to a great number of Muscles, which may be divided into common, proper and collateral. The common Muscles, according to the general Acceptation of that Term, are all those that move the whole Body of the Larynx, one Extremity of them being inserted in other Parts; and these are reckoned to be four in number, two for each side, viz.

Sterno-Thyroidæi,
Thyro-Hyoidæi, or Hyo-Thyroidæi.

442. THE proper Muscles are those inserted wholly in the Larynx, and which move the Cartilages separately. These have been divided in various manners, but may be all reduced to the following Pairs.

Crico-Thyro-Hyoidæi.
Crico-Arytenoidæi Laterales.
Crico-Arytenoidæi Posteriores.
Thyro-Arytenoidæi.
Arytenoidæi.
Thyro-Epiglottici.
Aryteno-Epiglottici.
Hyo-Epiglottici.

443. BY the collateral Muscles, I understand those which are inserted by one Portion in the Larynx, without appearing to contribute any thing to the Motions of it. Of this kind are the Thyro-Pharyngæi, Crico-Pharyngæi, &c. of which hereafter.

444. THE Larynx may likewise be moved by Muscles, which are not immediately inserted in it, but altogether in other Parts. Such are the Mylo-Hyoidæi, Genio-Hyoidæi, Stylo-Hyoidæi, Omo-Hyoidæi, Sterno-Hyoidæi, and especially the Digastrici of the lower Jaw, by reason of their particular Adhesion to the Os Hyoides. It is likewise probable that those Muscles of the Pharynx which are inserted in the Basis Cranii, may in certain circumstances, move the Larynx in some small degree.

Sterno-Thyroidæi.

445. THE Sterno-Thyroidæi are two long, flat, narrow, thin Muscles, like Ribbons, broader above than below, and situated along that part of the Neck which lies between the Thyroide Cartilage and the Sternum. They are covered by the Sterno-Hyoidæi, and they cover the Thyroide Glands, passing immediately before them.

446. EACH Muscle is fixed by its lower Extremity, partly in the superior Portion of the inner or backside of the Sternum, partly in the Ligament.

gament and neighbouring Portion of the Clavicula, and partly in the Cartilaginous Portion of the first Rib. Sometimes it runs a great way down on the first Bone of the Sternum, and crosses the Muscle on the other side. From thence it runs up on the Aspera Arteria, close by its Fellow, passes before the Thyroide Glands, over the Cricoide Cartilage, and is inserted by its upper Extremity, in the lower part of the lateral side of the Thyroide Cartilage, and partly along that whole side. I have found this Muscle double, one distinct Portion of it being inserted in the Basis, and the other laterally.

447. THE Thyro-Hyoidæi, or Hyo-Thyroidæi are two flat, thin Muscles, lying close by each other, between and above the former. Each of them is inserted by its upper Extremity, partly in the Basis, and partly in the neighbouring part of the great Cornu of the Os Hyoides; and by its lower Extremity, in the lower part of the lateral side of the Thyroide Cartilage, immediately above the superior Extremity of the Sterno-Thyroidæus; and both this superior Extremity of the last named Muscle, and the lower Extremity of the Thyro-Hyoidæus are, at their place of Union, confounded a little with the Thyro-Pharyngæus Inferior, of which hereafter.

448. THE Crico-Thyroidæi are two small Muscles, situated obliquely at the lower part of the Thyroide Cartilage. They are inserted by their lower Extremities in the anterior Portion of the Cricoide Cartilage, near each other, and by their superior Extremities, laterally in the lower Edge of the Thyroide Cartilage at a distance from each other. By this oblique Situation, they represent a Roman V.

449. EACH of these small Muscles is in a manner double, its upper Extremity inserted in the Thyroide Cartilage, being in some Subjects very broad and divided into two Portions, one anterior, the other more lateral and more oblique. They may likewise be easily separated into two distinct Muscles, whereof one may be called Crico-Thyroidæus Anterior sive Internus; the other Lateralis sive Externus.

450. THE two Musculi Crico-Arytenoidæi Posteriores are situated posteriorly at the large or back Portion of the Cricoides, filling almost the two longitudinal Surfaces of that Portion, and distinguished by the prominent Line between these two Surfaces, already mentioned. Each of them runs up obliquely, and is inserted by its upper Extremity, in the posterior part of the Basis of the Arytenoide Cartilage of the same side, near the Angle of that Basis.

451. THE two Crico-Arytenoidæi Laterales are small, and situated more laterally than the former. Each Muscle is fixed by one end to the side of the broad part of the Cricoides, and by the other, to the lower part of the side of the neighbouring Arytenoides.

452. THE two Thyro-Arytenoidæi are very broad, each Muscle being situated laterally between the Thyroides and Cricoides. It is fixed by a broad Insertion in the inside of the Ala of the Thyroide Cartilage; and the Fibres contracting from thence, run from before backward, and from

below upward, towards the neighbouring Arytenoide Cartilage, in which they are inserted, from the Glottis to the Angle of the Basis. In some Subjects, these Muscles cover almost both sides of the Glottis.

Arytenoidæi. 453. THE Arytenoidæi are small Muscles lying on the posterior concave sides of the Arytenoide Cartilages. Dr. *James Douglas* in the first Edition of his Treatise of the Muscles, divided them into two kinds, one of which he called Arytenoidæi Majores, the other Arytenoidæi Minores; and it must be owned that there is some variety in different Subjects. I shall here confine my self to what I have most frequently and most distinctly observed, and that is, that there are two crucial Arytenoidæi and one transverse.

454. THE crucial Muscles run each obliquely from the Basis of one Arytenoide Cartilage, to the middle and upper part of the other, the left Muscle covering the right, as is observed by *M. Morgagni* in his first Adversaria.

455. I look upon these Muscles as Superior Crico-Arytenoidæi, because I have always found them partly inserted in the upper neighbouring Portion of the Cricoides. The Arytenoidæus Transversalis is inserted more or less directly by both Extremities, in the two Arytenoide Cartilages; and this I look upon as the true Musculus Arytenoidæus.

Thyro-Epiglottici.

456. THE two Thyro-Epiglottici cross the Thyro-Arytenoidæi, being inserted in the inner lateral part of the Thyroides, and laterally in the Epiglottis.

Aryteno-Epiglottici.

457. THE Aryteno-Epiglottici are small fleshy Fasciculi, each of which is fixed by one Extremity in the Head of one of the Arytenoide Cartilages, and by the other in the nearest Edge of the Epiglottis.

Hyo-Epiglottici.

458. I never had an opportunity of examining the Hyo-Epiglottici in very muscular Subjects, and therefore I am not sure that the Fibres which go from the convex side of the Basis of the Os Hyoides, to the convex side of the Epiglottis, are really fleshy.

Uses.

459. THE Larynx serves particularly to admit and let out the Matter of Respiration; and the Solidity of the Pieces of which it is composed hinders not only external Objects, but also any hard thing which we swallow, from disordering this Passage. The Glottis being a narrow Slit, modifies the Air which we breathe, and as it is very easily dilated and contracted, it forms the different Tones of the Voice, chiefly by means of the different Muscles inserted in the Cartilagine Arytenoidææ, to which the other Muscles of the Larynx, both Proper and Common, are Assistants.

460. THE whole Larynx is likewise of use in Deglutition, as has been already observed, by means of its Connexion with the Os Hyoides, to which the Digastric Muscles of the Lower Jaw adhere; which Muscles raise the Larynx together with the Os Hyoides every time we swallow. I have already said something on this Subject in the Description of the Muscles No 1130, 1131, 1132. and shall further explain it after the Description of the Pharynx and Tongue.

461. THE Facility of varying and changing the Tone of the Voice, depends on the Flexibility of the Cartilages of the Larynx, and decreases in proportion as we advance in Age; because these Cartilages gradually harden and ossify, though not equally soon in all Persons; and this change happens not only to the Cartilago Thyroides, but also to the Cricoides and Arytenoides.

462. THE Musculi Sterno-Thyroidæi serve in general to pull down the Thyroide Cartilage, and the whole Larynx along with it. They may likewise assist the Sterno-Hyoidæi in its Actions explained Sect. 3. N° 1149. and compress the Thyroide Gland, of which hereafter. The Thyro-Hyoidæi may, as occasion requires, either draw up the Larynx toward the Os Hyoides, or draw that Bone downward toward the Cartilago Thyroides.

463. IT is difficult to determine the use of the Crico-Thyroidæi from their Situation. They may either pull the Cricoides obliquely backward, or the Thyroides obliquely forward; and by this Action the inferior Cornua of the Thyroides, and small articular Surfaces of the Cricoides, must slide upon each other.

464. BOTH the lateral and posterior Crico-Arytenoidæi, may separate the Arytenoide Cartilages, and thereby open or dilate the Glottis, but they do not both perform this Action in the same manner. The lateral Muscles separate these Cartilages obliquely forward, and at the same time loosen or relax the sides of the Glottis; but the posterior Muscles separate them obliquely backward, and at the same time stretch or extend the sides of the Glottis; and when both Muscles act equally, they separate the Cartilages directly.

465. THE Thyro-Arytenoidæi acting together, draw both the Arytenoide Cartilages forward, and consequently loosen the Glottis, and render it capable of the smallest Quaverings of the Voice. They may likewise probably compress the lateral Sinuses or Ventracles of the Larynx, and also the Arytenoide Glands.

466. THE Arytenoidæi bring the Arytenoide Cartilages close together, and press them against each other; and when the Cartilages are in this Situation, they may at the same time be inclined either forward by the Thyro-Arytenoidæi, or backward by the Crico-Arytenoidæi Posteriores. By this means the Glottis, when shut, may be either relaxed or tense, and in this last case, it is intirely shut, as when we hold in our Breath in straining; but of this more in another place.

467. THE general use of the Epiglottis is to cover the Glottis like a Penthouse, and thereby hinder any thing from falling into it when we eat or drink; and for this purpose it is depressed in the manner that shall be shewn hereafter. It serves likewise to hinder the Air which we inspire, from rushing directly upon the Glottis, but by splitting it, as it were, obliges it to enter by the sides, or in an oblique course. The Muscles of the Epiglottis do not appear to be absolutely necessary for that Cartilage; for in Deglutition, it may be sufficiently depressed by the Basis
of

of the Tongue; and it may raise itself again by its own Elasticity. The Thyro-Epiglottici and Aryteno-Epiglottici may serve to shut any lateral Openings that might remain when the Epiglottis is depressed by the Basis of the Tongue; and the Hyo-Epiglottici may pull it a little forward in strong Respirations, as in Sighing, Yawning, &c.

§ 2. *The Pharynx.*

468. THE Pharynx is a muscular and glandular Bag, the outer Surface of which is closely joined to the inner Surface of all that Space which is at the bottom of the Mouth, behind the posterior Nares, Uvula, and Larynx, and which reaches from the great or anterior Apophysis of the Os Occipitis all the way to the Œsophagus, which is the Continuation of the Pharynx. This Space is bounded posteriorly by the Muscles which cover the Bodies of the first Vertebrae of the Neck, and laterally by the superior Portions of both the internal Jugular Veins, and of both the internal Carotid Arteries, by the Spinal Apophyses of the Os Sphenoides, by the Extremities of the Apophyses Petrosæ, by the Os Sphenoides, immediately above the internal Alæ of the Apophyses Pterygoides, and by the neighbouring Portion of both Pterygoide Muscles.

469. FROM these Limits and Adhesions of the Pharynx we may pretty nearly determine its Figure. It may be compared to the wide part of a covered Funnel of which the Œsophagus is the narrow Part or Tube; or it may be called the broad end of the Œsophagus, that and the Pharynx taken together, being compared to a Trumpet. The Pharynx may be divided into three Parts, one Superior, which is the Arch of the Pharynx, one Middle, which is the Body or great Cavity, and one Inferior, which is the Bottom, narrow Portion, or Sphincter. We are likewise to observe in it three Openings, that of the Arch, toward the Nares, that of the Body, toward the Mouth, and that of the Bottom toward the Œsophagus.

470. THE Arch is the broadest part of the Pharynx, and ends on each side in an Angle or Point, toward the Jugular Fossulæ of the Basis Cranii. Afterwards the great Cavity contracts a little toward the sides, all its other Dimensions continuing the same; and behind the Larynx it is again enlarged on each side, a very small Space being left between it and the Cricoide Cartilage. The Extremity of the lower Portion is very narrow, and joins the Basis of the Cartilage just named.

471. THE Pharynx is made up partly of several distinct fleshy Portions, which are looked upon as so many different Muscles so disposed as to form a large Cavity, and partly of a Membrane which lines the inner Surface of this whole Cavity, and is a Continuation of that of the Nares and Palate.

472. THIS Membrane is wholly Glandular, and it is thicker on the superior and middle Portions of the Pharynx, than on the Bottom or lower Portion. Immediately above the first Vertebra, it forms several Longitudinal

dinal Rugæ very thick, deep and short, and we generally find therein, a collection of Mucus in dead Bodies. In the great Cavity there are no Rugæ, the Membrane adhering both there and in the upper part, very closely to the Muscles. At the lower part where it is thinnest, it covers likewise the posterior part of the Larynx, and is very loose, and formed into irregular Folds. It runs in a little on each side between the Edges of the Pharynx.

473. THOUGH almost all the muscular or fleshy Portions of which the Pharynx is composed, concur in the formation of one continued Bag or Receptacle, they are nevertheless very distinguishable from each other, not only by their different Insertions, from which they have been denominated, but also by the different Directions of their Fibres. The greatest part of them may be looked upon as Digastric Muscles, the middle Tendons of which lie backward in one longitudinal Line, which in some Subjects appears plainly like a Linea Alba.

474. THESE Muscles may be reduced to three general Classes, with regard to their Insertions. The first Class is of those which are inserted in the Basis Cranii, viz.

Cephalo-Pharyngæi.
Petro-Pharyngæi.
Spheno-Pharyngæi, five Spheno-Salpingo-Pharyngæi.
Pterygo-Pharyngæi.
Stylo-Pharyngæi.

THE second Class comprehends those which are inserted toward the Mouth, viz.

Perystaphilo-Pharyngæi.
Glossopharyngæi.
Hyperopharyngæi.
Genio-Pharyngæi.

THE third Class includes those inserted in the lateral parts of the Larynx, viz.

Syndesmo-Pharyngæi.
Thyro-Pharyngæi.
Crico-Pharyngæi.
Œsophagæus.
Adeno-Pharyngæus.

475. THE Cephalo-Pharyngæi are inserted in the lower side of the Apophysis Basilaris, or great Apophysis of the Os Occipitis, about the middle of the posterior part. From thence they separate laterally, and

sometimes join the Stylo-Pharyngæi. The Linea Alba of the Pharynx begins by the middle Adhesion of these Muscles.

476. THE Petro-Pharyngæi are inserted in the lower part of the Extremity of the Apophysis Petrosa; the Spheno-Pharyngæi, partly in the Os Sphenoides, directly above the internal Ala of the Apophysis Pterygoides, and partly in the neighbouring cartilaginous Portion of the *Eustachian* Tube; and the Pterygo-Pharyngæi, in the Edge of the same Ala of the Apophysis Pterygoides. These three Muscles on each side run obliquely backward, covering each other by some Fibres, and meet at the Linea Alba. Their use may be to draw the middle Portion or great Cavity of the Pharynx, upward.

477. THE Stylo-Pharyngæi are inserted interiorly by one Extremity in the Apophysis, or Epiphysis Styloides. From thence each Muscle runs down obliquely along the lateral part of the Pharynx, covering and crossing the other Muscles. It extends gradually in breadth as it descends, and forms two principal Portions, one Superior which is narrow, and one Inferior which is broad. The narrow Portion is spread among the muscular Fibres above the Thyroide Cartilage, and the broad Portion is inserted in the side of that Cartilage; and thus the Stylo-Pharyngæus is partly a true Stylo-Thyroidæus. These Muscles may draw the Pharynx laterally upward, especially by their Thyroide Portions; but the Use commonly assigned to them of dilating the Pharynx, seems conformable neither to their Situation, nor to their Direction.

478. THE Peristaphylo-Pharyngæi are two small Muscles inserted between the Uvula and lower Extremity of the internal Ala of the Apophysis Pterygoides, and run obliquely backward on the sides of the Pharynx. It is difficult to find them in very lean or young Subjects, and they seem to be the same which *M. Santorini* calls Hypero-Pharyngæi, or Palato-Pharyngæi. The Glosso-Pharyngæi are Fibres which run along the lateral Edges of the Tongue, from which they are parted backward, and run down on the sides of the Pharynx under the Stylo-Pharyngæi.

479. THE Hyo-Pharyngæi in general are those on each side which are inserted in the Os Hyoides; and they may be reckoned three Pairs, the Basio-Pharyngæi, Kerato-Pharyngæi Minores, and Kerato-Pharyngæi Majores; these Denominations being taken from their Insertions in the Basis, and in the small and great Cornua of the Os Hyoides.

480. I have never been able to see distinctly the Mylo-Pharyngæi of Dr. *James Douglas*; all that I have hitherto found is a muscular Portion really distinct from the Genio-Glossus, inserted in the side of the Pharynx, and for that reason I call it Genio-Pharyngæus, as being joined to the Genio-Glossus all the way to the Chin.

481. THE Syndesmo-Pharyngæi of Dr. *Douglas* are Fasciculi of muscular Fibres very distinctly inserted by one end along the Ligaments by which the superior Cornua of the Cartilago Thyroides are connected to the Extremities of the great Cornua of the Os Hyoides. From thence they run backward and meet at the Linea Alba. To be able to see them distinct

from the other Muscles, the Pharynx must be filled with Cotton to give it a proper Convexity, and to support its Sides, which otherwise collapse, and sink inward, and thus prevent our seeing the Direction and Distinction of several of the Muscles belonging to it.

482. THE Thyro-Pharyngæi are very broad, and each Muscle is inserted along the outside of the Ala of the Cartilago Thyroides, between the Edge of that Cartilage and the oblique Line in which the Thyro-Hyoidæi are fixed; and they are a little confounded with the Crico-Hyoidæi. From thence they run up obliquely backward, and meeting under the Linea Alba, they sometimes appear to be but one Muscle without any middle Tendon. Sometimes they have appeared to me to be distinguished into Superior and Inferior, because their upper Portion ran upward and backward, and their lower Portion more transversely.

483. THE Crico-Pharyngæi are inserted each in the lower part of the side of the Cricoidæ Cartilage. They seem to be Appendices of the Thyro-Pharyngæi, shewing no other marks of Distinction but these Insertions, and a small difference in Direction, because as they run backward they descend a little. For this reason I have sometimes looked upon these two Muscles to be one, and have called it Thyro-Crico-Pharyngæus.

484. THE lowest of these muscular Fibres make a compleat Circle backward, between the two sides of the Basis of the Cartilago Cricoides. This Circle is the beginning of the Œsophagus, and has been thought by some, to form a distinct Muscle, called Œsophagæus. I have found another Fasciculus of Fibres detached from the Thyro-Pharyngæus, and inserted laterally in the Thyroide Gland, for which reason I call it Musculus Thyro-Adenoidæus.

485. THE particular uses of all these Muscles are very difficult to be determined. It is certain that those of the middle and lower Portions of the Pharynx serve chiefly for Deglutition. Those of the upper Portion, and some of those of the middle Portion may, among other Functions, be useful in modifying the Voice, according to the opinion of *M. Santorini*.

§ 3. *The Palate, Uvula, &c.*

486. THE Palate is that Arch or Cavity of the Mouth, surrounded anteriorly by the Alveolar Edge and Teeth of the upper Jaw, and reaching from thence to the great Opening of the Pharynx. This Arch is partly solid and immovable, and partly soft and moveable. The solid Portion is that which is bounded by the Teeth, being formed by the two Offa Maxillaria, and two Offa Palati. The soft Portion lies behind the other, and runs backward like a Veil fixed to the Edge of the Offa Palati, being formed partly by the common Membrane of the whole Arch, and partly by several muscular Fasciculi, &c.

487. THE Membrane that covers all this Cavity is like that which lines the superior and middle Portions of the Pharynx. It is very thick set

with small Glands, the Orifices of which are not so sensible as in the Pharynx, and especially in the Rugæ of the superior Portion thereof, where *M. Heister* observed a considerable Orifice, and a Canal proportioned to that Orifice which he could easily inflate with Air. This is certainly the best way of beginning these kinds of Inquiries, especially if the Pipe be held at first only very near the part, without endeavouring to force it in. To immerge the Parts in clear Water in the manner already mentioned, is likewise a very good way to discover small Orifices, by the help of a Microscope. Small Ducts of the same kind with what I have now mentioned, may be supposed to lie along the middle Line or Raphe of the Arch of the Palate, and along the Alveolar Edge, because of some small Tubercles or Points which appear there.

488. THIS Membrane, together with that of the posterior Nares, forms by an uninterrupted continuation, the anterior and posterior Surface of the soft Portion, or Septum Palati; so that the muscular Fasciculi of this Portion lie in the Duplication of a Glandulous Membrane. The Muscles composed of these Fasciculi shall be presently described.

489. THE Septum which may likewise be termed Velum, or Valvula Palati, terminates below by a loose floating Edge, representing an Arch situated transversely above the Basis or Root of the Tongue. The highest Portion or Top of this Arch sustains a small, soft, and irregularly conical glandulous Body, fixed by its Basis to the Arch, and its Apex hanging down without adhering to any thing, which is called Uvula.

490. ON each side of the Uvula there are two muscular half Arches, called Columnæ Septi Palati. They are all joined to the Uvula by their upper Extremities, and disposed in such a manner, as that the lower Extremities of the two which lie on the same side, are at a little distance from each other, and so as that one half Arch is anterior, the other posterior, an oblong triangular Space being left between them, the Apex of which is turned toward the Basis of the Uvula.

491. THE two half Arches on one side, by joining the like half Arches on the other side, form the intire Arch of the Edge of the Septum. The posterior half Arches run by their upper Extremities, more directly toward the Uvula than the anterior. The anterior half Arches have a continuation with the sides of the Basis of the Tongue, and the posterior, with the sides of the Pharynx. At the lower part of the Space left between the lateral half Arches on the same side, two Glands are situated termed Amygdalæ, which shall be described hereafter, together with the glandular Structure of the Uvula, among the other Glands of the Mouth.

492. THE half Arches are chiefly made up of several flat fleshy Portions, almost in the same manner with the Body of the Septum. The Membrane which covers them is thinner than the other parts of it towards the Palate, Pharynx and Tongue. Each Portion is a distinct Muscle, the greatest part of which terminate by one Extremity in the Substance of the Septum and of the half Arches, and by the other Extremity in parts different from these.

493. As Anatomists used formerly to ascribe all these Muscles, as far as they knew them, to the Uvula, without any regard to the Septum, they termed them in general either Ptery-Staphylini, or Peri-Staphylini. The last part of these two compound Words expresses the Uvula; the first part of the first Word is an abridgment of Pterygoides, and expresses the Insertion of these Muscles, but the first part of the second Word signifies no more than round, or about, &c.

494. I should be very glad to make use of the term Peri-Staphylinus as a general denomination for the Muscles belonging to the Septum, and then to add the other terms, of which these names have been made up by modern Writers. But lest I should be thought to affect a Language different from the common, I shall retain the ordinary names, only desiring the Reader to take notice that by the term Staphylini I do not mean precisely the Uvula, but only the parts round it. If we could be allowed to frame names of Greek and Latin words compounded together, we might for example, say Glosso-Palatinus, instead of Glosso-Staphylinus. I shall call the Muscles that go to the Uvula, simply Staphylini, or Epistaphylini, because that part resembles a small Bunch of Grapes, according to the Signification of the Greek word. From what has been said, I name these Muscles in the following manner.

Glosso-Staphylini.

Pharyngo-Staphylini.

Thyro-Staphylini.

Pterygo-Staphylini.

Spheno-Salpingo-Staphylini, called commonly Peri-Staphylini Externi.

Pterygo-Staphylini Superiores.

Pterygo-Staphylini Inferiores.

Pterygo-Salpingo-Staphylini, called commonly Ptery-Staphylini Interni.

Staphylini five Epistaphylini.

495. THE Glosso-Staphylini are two small Muscles, fixed each in the lower and lateral part of the Basis of the Tongue; from whence they run up obliquely backward, along the anterior half Arches of the Septum Palati, and terminate insensibly on each side near the Uvula, some of their Fibres being spread through the Septum. The thickness of the anterior half Arches is chiefly owing to these two Muscles.

496. THE Pharyngo-Staphylini are likewise two small Muscles, each of them being fixed by one Extremity to the lateral part of the Musculi Thyro-Pharyngæi, as if they were Portions detached from these Muscles. From thence they run up obliquely forward along the two posterior half Arches of the Septum, and terminate in the Septum above the Uvula; where they meet together, and seem to form an intire Arch by the Union of their Fibres. The thickness of the two posterior half Arches is owing to these Muscles.

497. THE

497. THE Thyro-Staphylini are two small Muscles, which accompany the Pharyngo-Staphylini very closely, through their whole course, except that their posterior Extremities are fixed in the Thyroide Cartilages near the other Muscles. They likewise contribute to the thickness of the posterior half Arches, and are inserted in the Septum in the same manner with the former. These two Pairs of Muscles may be made one Pair, and may be called Thyro-Pharyngo-Staphylini.

498. THE Spheno-Salpingo-Staphylini are each fixed by one Extremity, partly to the Sphenoidal side of the bony Portion of the *Eustachian* Tube, partly to the nearest soft Portion of the same Tube. From thence it runs toward the external Ala of the Apophysis Pterygoides, into which one Portion of this Muscle is inserted. The other Portion runs to the end of the Ala, and turns round to the forked Extremity thereof as over a Pulley, and is afterwards inserted in the Septum Palati near the Uvula.

499. I look upon these two Portions as two distinct Muscles, one of which ending in the Ala, seems only to serve for the Dilatation of the Tuba *Eustachiana*. The other Portion is a true Spheno-Staphylinus, and as it has likewise an Insertion in the Tube, it may be termed Spheno-Salpingo-Staphylinus, or Staphylinus Externus. This is the Muscle commonly called Peri-Staphylinus Externus.

500. THE Pterygo-Staphylinus Superior is only the external Portion of the Muscle last described; and this name may likewise be given it, because it has a small Insertion in the upper part of the Apophysis Pterygoides, besides that in the Sphenoidal part of the bony Portion of the Tube. The Pterygo-Staphylinus Inferior on each side, is a small Muscle inserted by one Extremity in the Uncus Pterygoidæus, and by the other in the Septum near the Uvula. This Observation we owe to *M. Heister*.

501. THE Petro-Salpingo-Staphylini, or Salpingo-Staphylini Interni are those which are commonly called Peri-Staphylini Interni. Each Muscle is fixed by one Extremity, partly to the inner side of the bony Portion of the *Eustachian* Tube, or that next the Apophysis Petrofa, partly along the Cartilaginous Portion of the same Tube. From thence it passes a little way under the soft membranous part, and toward what I called the half Pad of the Tube, and then turning toward the Septum, is fixed in the Edge, and partly in the upper side thereof.

502. THE Staphylini, or Epistaphylini are two small fleshy Ropes, closely united together, as if they made but one Muscle, but in some Subjects they are distinguished by a very fine white Line. They are fixed by one Extremity in the common point of the posterior Edges of the Ossa Palati, and from thence run downward and backward along the middle of the Septum, and likewise along the middle of almost the whole Uvula. These Muscles have been termed *Azygos Morgagnii* from the Discoverer, but he considered them as one Muscle. The Pterygo-Staphylini Inferiores are of the same kind, and might be termed Staphylini, or Epistaphylini Laterales, and these last, Medii.

503. THE Septum Palati serves to conduct the Lacrymal Lympha, and that which is continually collected on the Arch of the Palate, into the Pharynx. It serves for a Valve to hinder what we swallow, and especially what we drink, from returning by the Nares. The uses of the different Muscles of the Septum are not as yet sufficiently known, nor the different Motions of which it is capable, as may be observed by looking for some time into an healthy Person's Mouth opened wide. I shall endeavour to explain these things at greater length in another place.

§ 4. *The Tongue.*

504. EVERY one knows that the Tongue is a soft fleshy Body, which fills all that part of the Cavity of the Mouth that is surrounded by the Alveolar Border and Teeth of the lower Jaw, and extends still further back. All this Space is therefore in a manner the Mould and Measure of the length and breadth of the Tongue, as well as of its Thickness and Figure.

505. THE Tongue is divided into the Basis and Point; the upper and under sides; and the lateral Portions or Edges. The Basis is the posterior and thickest part; the Point, the anterior and thinnest part. The upper side is not quite flat, but a little convex, and divided into two lateral Halves, by a shallow depressed Line, called *Linea Linguae Mediana*. The Edges are thinner than the other parts, and a little rounded as well as the Point. The lower side reaches only from the middle of the length of the Tongue to the Point.

506. THE Tongue is principally composed of very soft fleshy Fibres, intermixed with a particular medullary Substance, and disposed in various manners. Many of these Fibres are confined to the Tongue without going any farther, the rest form separate Muscles which go out from it in different ways, and are inserted in other parts. All the upper side of the Tongue is covered by a thick Membrane of a Papillary Texture, upon which lies another very fine Membrane like a kind of Epidermis, which is likewise continued over the lower side, but without Papillæ.

507. THREE sorts of Papillæ may be distinguished in the upper side of the Tongue; *Capitatae*, *Semi-Lenticulares* and *Villosæ*. Those of the first kind are the largest, resembling little Mushrooms with short Stems, or Buttons without a Neck. They lie on the Basis of the Tongue in small superficial Fossulæ.

508. THEY resemble small conglomerate Glands seated on a very narrow Basis, and each of them has sometimes a small Depression in the middle of their upper or convex side. They occupy the whole Surface of the Basis of the Tongue, and they are situated near each other in such a manner as that the most Anterior form an Angle. They are Glandular Papillæ or small salival or mucilaginous Glands, of the same kind with those that are to be described hereafter.

509. WE oftentimes observe about the middle of this part of the Tongue a particular Hole of different Depths, the inner Surface of which is intirely Glandular, and filled with small Papillæ, like those of the first kind. It is called Foramen Cæcum *Morgagnii*, as being first described by that Author. Since that time *M. Vaterus* has discovered a kind of Salival Ducts belonging to it; and *M. Heister* found two of these Ducts very distinctly, the Orifices of which were in the bottom of the Foramen Cæcum near each other. He observed the Ducts to run backward, divaricating a little from each other, and that one of them terminated in a small oblong Vesicle situated on the side of the small Cornu of the Os Hyoides.

510. THE Papillæ of the second kind or Semilenticulares, are small orbicular Eminences, only a little convex, their circular Edge not being separate from the Surface of the Tongue. When we examine them in a sound Tongue with a good Microscope, we find their convex sides full of small Holes or Pores, like the End of a Thimble.

511. THEY lie chiefly in the middle and anterior Portions of the Tongue, and are sometimes most visible on the Edges, where they appear to be very smooth and polished even to the naked Eye, and sometimes in living Subjects. They soon loose their consistence after Death, so that by rubbing them several times, they may be drawn out in form of small soft Pyramids inclined to one side.

512. THE Papillæ of the third kind or Villosæ are the smallest and most numerous. They fill the whole Surface of the upper side of the Tongue, and even the Interstices between the other Papillæ. They would be more properly named Papillæ Conicæ than Villosæ, from the Figure which they appear to have when examined through a Microscope in clear Water. They are naturally softish, but they become extremely flaccid after Death; so that by handling them they may be made short and thick, whereas they are naturally long and small.

513. THE fleshy Fibres of which the Tongue is composed, and which go no further than the Tongue, may be termed Musculi Linguae Interiores, or the Intrinsick Muscles, and they are the same which *Spigelius* named Musculi Linguales. The Fibres these Muscles consist of, are of three general kinds, Longitudinal, Transverse, and Vertical; and each of these Situations admits of different degrees of Obliquity. The longitudinal Fibres point to the Basis and Apex of the Tongue, and seem partly to be Expansions of the Musculi Stylo-Glossi, Hyo-Glossi, and Genio-Glossi, of which hereafter. The vertical Fibres seem likewise to be in part produced by the same Genio-Glossi, and the transverse, by the Mylo-Glossi.

514. BESIDES these mixed Productions, there is a distinct Plane of longitudinal Fibres, which run near the Surface of the upper side of the Tongue, and a distinct transverse Plane under them. All these Fibres are partly interwoven, one Portion of them terminating at the two Edges of the Tongue, and the other at the Basis and Point, without going to any other part; and they lie immediately above those that belong to the Genio-Glossi. To discover all these different Fibres, and their different degrees

of Direction, we need only cut the Tongue longitudinally, after it has been boiled, or long macerated in strong Vinegar.

515. THE Extrinsic Muscles, or Musculi Exteriores, are those which by one Extremity make a part of the Body of the Tongue, and are fixed by the other in some part without the Tongue. Of these we commonly reckon four Pairs:

Mylo-Glossi.

Stylo-Glossi.

Hyo-Glossi.

Genio-Glossi.

516. THE Muscles which move the Os Hyoides, already described in Sect. 3. belong likewise to the Tongue, and are the principal Directors of its Motions. The names of these Muscles may be remember'd to be as follow:

Mylo-Hyoidæi.

Genio-Hyoidæi.

Stylo-Hyoidæi.

Omo-Hyoidæi.

Sterno-Hyoidæi.

517. THE Mylo-Glossi are small fleshy Planes situated transversely, one on each side, between the Ramus of the Lower Jaw, and the Basis of the Tongue. Their Insertion in the Jaw is immediately above the posterior half of the Mylo-Hyoidæus, between the prominent oblique Line on the inside of the Bone, and the Dentes Molares. From thence they run toward the Basis of the Tongue, and are lost there on one side of the Glossopharyngæi. These Muscles are often wanting.

518. THE Stylo-Glossi are two long small Muscles which run down from the Styloide Apophyses or Epiphyses, and form two Portions of the lateral parts of the Tongue. Each Muscle is fixed in the outside of the Apophysis Styloides by a long Tendon, being the uppermost of the three Muscles fixed in that Apophysis, which at *Paris*, go by the name of *Riolan's* Nosegay. The Stylo-Hyoidæus is the lowest, and the Stylo-Pharyngæus is in the middle, but more backward.

519. As it runs down almost opposite to the inside of the Angle of the Lower Jaw, it sends off a pretty broad and short lateral Aponeurotic Ligament, which being fixed in that Angle, serves for a Frænum, or Ligamentum Susensorium to the Muscle in this part of its Course. From thence it passes on to the side of the Basis of the Tongue, where it first of all adheres closely to the lateral Portion of the Hyoglossus, and then forms together with that Muscle, a large Portion of the side of the Tongue.

THE ANATOMY OF

520. THE Hyo-Glossi are each inserted in three parts of the Os Hyoides that lie near each other; in the Basis, in the Root of the great Cornu, and in the Symphysis between these two; and on this account the Hyo-Glossus has been divided by some into two or three distinct Muscles called Basio-Glossus, Cerato-Glossus, and Chondro-Glossus. In some Subjects they may easily be separated, the three Portions being simply contiguous to each other; but it is needless to burden the Memory with so many useless names, and therefore I describe them all as one Muscle, by the name of Hyo-Glossus.

521. IT is situated on the inside, and a little lower than the Stylo-Glossus, with which it forms the lateral part of the Tongue. The Portion inserted in the Basis of the Os Hyoides lies more anteriorly, and is larger than the other two; that which is inserted in the Symphysis is the least, and that inserted in the great Cornu, the most posterior. This Muscle is partly sustained by the Mylo-Hyoidæus, as by a Girth; and the anterior Portion is distinguished from the rest by the passage of the Nerves of the fifth Pair, and of the Arteries which accompany them.

522. THE Genio-Glossi are situated close to each other on the lower side of the Tongue. Each Muscle is inserted in the inner or backside of the Symphysis of the Lower Jaw, immediately above the Genio-Hyoidæus. From thence it runs backward toward the Os Hyoides, to which the lowest Fibres are connected by a Ligamentary Membrane; and in this course its Fibres are spread through the Substance of the Tongue in a very singular manner.

523. OF these Fibres, some run directly toward the Os Hyoides, all the way to the Basis of the Tongue; some are inflected forward, and go to the Point of the Tongue; and the rest are distributed in a radiated manner, forward, upward, and backward in the Substance of the Tongue; and the middle Fibres expand laterally toward the Edges of the Tongue.

524. THE two Genio-Glossi run close to each other, as if they formed but one Mass; but they are evidently divided by a very thin cellular Membrane, or middle Septum, which penetrates a good way between the two lateral, or right and left Halves of the Tongue, lying in the same Plane with the Linea Mediana of the upper side of the Tongue.

525. WHEN we separate these two Muscles from the Chin, they presently contract so much, that their anterior Extremities which lay under the Point of the Tongue, are as far back as the middle of it. It is in this preternatural Situation that we see these Muscles represented in Figures given by very great Anatomists, and drawn and engraved by very good Artists, in which Figures the whole Beauty of their true Mechanism is lost.

526. THESE two Muscles by their posterior streight Fibres which go to the Basis, can draw the Tongue out of the Mouth, and bring it back again by their anterior bent Fibres which go to the Point. They can either successively, or all at once, make the Tongue longitudinally hollow

or like a Groove; and they can at the same time contract it, by the lateral Expansion of their middle Fibres. I pass over many other Motions which these Muscles are capable of performing, from whence I formerly used in my private Courses to call them *Musculi Polychrestii*.

527. WHEN either of the *Stylo-Glossi* acts, it turns the Tongue toward the Cheek, and forces the Aliment between the upper and lower Molares. When they act jointly with the lateral Portions of the superior fleshy Plane of the Tongue, they turn the Tongue obliquely upward to the Teeth of the upper Jaw, and near the Cheeks, as when we bring down any part of the Food that may have stuck there, after Mastication. When they act jointly with the lateral Portions of the *Hyo-Glossi*, they turn the Tongue downward between the lower Teeth and the Cheek.

528. WHEN all the parts of the *Hyo-Glossi* act together, they shorten the Tongue. They likewise turn the Point of the Tongue between the Teeth and the under Lip, and make it pass over that Lip. The superior fleshy Plane of the Body of the Tongue, bends it upward toward the Palate, and makes it pass along or lick the upper Lip. The *Mylo-Glossi* serve as a *Frænum* to one side of the Basis, while the Point is turned to the other side. The *Ligamenta Suspensoria* of the *Stylo-Glossi* may answer the same purpose, and even supply the want of the *Mylo-Glossi*.

529. BESIDES the Membranes of the Tongue already described, it is customary to mention another, called *Membrana Reticularis*, which is commonly demonstrated from the boiled Tongues of Oxen or Sheep; and some pretend to have shewed it in the Human Tongue, which I own I have never been able to do. It is now a long time since I shewed that what they take from the Tongues of Oxen and Sheep is not a true Membrane, but a kind of clear mucilaginous Substance, which lies between the papillary and external Membranes, and which by boiling, becomes white, and acquires Solidity enough to be taken out in large Portions, and that the Holes found in it are owing to the small pyramidal *Papillæ*.

530. THE Tongue is fixed in the Mouth, not only by Muscles, but also by Ligaments, which are for the most part Membranous. The principal Ligament is that called the *Frænum*, which is the prominent Fold that appears first under the Tongue, when we raise it, with the Mouth opened, and is no more than a Continuation or loose Duplicature of that Membrane, which covers the inferior Cavity of the Mouth. It covers the Curvature of the anterior Portion of the *Genio-Glossi* from the Point of the Tongue, almost as high as the middle Interstice between the lower *Dentes Incisorii*.

531. THE other Ligaments of the Tongue are the small membranous Fold which runs along the middle of the convex side of the *Epiglottis* to the Basis of the Tongue; and the membranous Folds which cover the inferior half Arches of the *Septum Palati*. These three Folds are Continuations of the Membrane which covers the neighbouring parts. The Aponeurotic Ligaments of the *Stylo-Glossus* may be looked upon as true lateral Liga-

ments of the Tongue ; and they adhere a little to the lower part of the *Musculus Pterygoidæus Internus*, or Anterior.

532. THE principal Blood-Vessels of the Tongue are those that appear so plainly on its lower Surface, on each side of the *Frænum* ; and they consist of one Artery and one Vein, which accompany each other, and are called *Arteriæ & Venæ Sublinguales* or *Raninæ*. The Veins lie next the *Frænum*, and the Arteries on the other side of the Veins. The Arteries are Rami of the second internal or anterior Branch of the external Carotid on each side, and communicate with the first external or posterior Branch of the same Carotid, &c. The Veins are commonly Rami of a Branch of the external anterior Jugular Vein, described among the other Veins, Sect. 5. N^o 79.

533. WE observe four nervous Ropes to go very distinctly to the Basis of the Tongue, and to continue their course through its whole Substance all the way to the Point. Two of these Ropes are Rami of the inferior maxillary Nerves, or of the third Branch of the fifth Pair from the *Medulla Oblongata*. The other two are the Nerves of the ninth Pair. The two first I have already named *Linguales* or *Hypo-Glossi Minores*, and the other two *Linguales* or *Hypo-Glossi Majores*. The Majores are inferior and internal, the Minores, superior and external, or lateral. The small Portion or first Branch of the *Nervus Sympatheticus Medius*, or of the eighth Pair, sends likewise a Nerve to each side of the Tongue.

534. THE great Lingual Nerve on each side runs forward between the *Musculus Mylo-Hyoidæus* and *Hyo-Glossus*, under the *Genio-Glossus*, and is distributed to the fleshy Fibres all the way to the Point of the Tongue, communicating [by several small Filaments with the *Lingualis Minor*, and with the Nerve from the eighth Pair. For the other Distributions of it, I refer to the Description of the Nerves.

535. THE small Lingual Nerve on each side goes off from the *Maxillaris Inferior*, sometimes at and sometimes before its passage between the *Pterygoide Muscles*. Afterwards separating more and more from the Trunk, it passes under the lateral part of the Tongue, over the Sublingual Gland, of which hereafter. It supplies the nearest parts of the Tongue as it passes, and then entering its Substance, terminates at the Point, having sent a great number of Filaments to the Papillary Membrane. It communicates, as has been said, with the *Lingualis Major*, and with the Nerve from the eighth Pair.

536. THIS Lingual Nerve, a little after it leaves the *Maxillaris Inferior*, is accompanied by a small distinct Nerve, which runs upward and backward toward the Articulation of the Lower Jaw, in company with the lateral Muscle of the Malleus, passes through the Tympanum between the Handle of the Malleus and the long Leg of the Incus, by the name of *Chorda Tympani*, and afterwards perforating the backside of the Tympanum, unites with the *Portio Dura* of the Auditory Nerve, as has been already said in the Description of the Ear.

537. THIS small Nervous Rope has been looked upon by Anatomists as a kind of small Recurrent of the Nervus Lingualis; but as in some Subjects it appears to make simply an acute Angle with the Lingual Nerve, and as this Lingual Nerve is something larger after this Angle, it ought rather to be believed to come from the Tympanum, and to unite with the Lingual Nerve, than to arise from this Nerve, and run up to the Tympanum. In some Subjects the Union of this Nerve with the Lingualis is in a manner Plexiform, and very difficult to be unfolded.

538. THE Lingual Nerve of the eighth Pair which is its first Branch, runs first of all on the inside of the Digastric Muscle of the Lower Jaw, and supplies the Genio-Hyoidæi, the neighbouring Muscles of the Basis of the Tongue and those of the Pharynx. Afterwards it sends out the Ramifications, and forms the Communications described in the History of the Nerves; and lastly goes to the lower part of the Tongue, where it communicates with the Lingual Ramus of the fifth Pair, and with the Lingual Ramus of the ninth.

539. THE Tongue is the Organ of the Sense, called the Taste, by means of the Papillæ, especially the Villosæ or Pyramidales. It is not as yet discovered in what manner the Papillæ Semi-lenticulares contribute to the Taste; and the Capitatae ought to be looked upon as Salival Glands.

540. THE Tongue is likewise one of the principal Instruments of Speech, and of the Articulation of the Voice. *Riolan* in his *Anthropographia* mentions a Child of five Years of Age, who though he had lost his Tongue by the Small Pox, but not the Uvula, continued still to speak almost as distinctly as before. Probably the Basis of the Tongue still remained. *M. de Jussieu* has published an Observation in the Memoirs of the Royal Academy concerning a little Girl who could speak, though she was born without a Tongue, in room of which there was only a kind of small Tubercle.

541. THE Tongue serves also to collect all the Morsels which we chew, to turn them in different manners and to different parts of the Mouth, and to rub off whatever sticks to the Palate; and it is useful in Spitting, Sucking, &c. It bears a great part in Deglutition, being assisted by the Digastric Muscles, which by contracting at the same time that the other Muscles press the lower Jaw against the upper, raise the Os Hyoides, and fix it at a convenient height, that the Stylo-Glossi and Hyo-Glossi may make the Basis of the Tongue bear back upon the Morsel which is to be swallowed, and so force it into the Pharynx, the Portions of which that are at that time immediately above the Morsel, do instantly contract, and push it into the Œsophagus.

§ 5. The Cheeks, Lips, and Gums.

542. THE Cheeks and Lips form the sides and entry of the Cavity of the Mouth. They are formed in general by the Connexion of several fleshy Portions of different breadths, fixed round the convex sides of the two Jaws,

Jaws, covered on the outside with the Skin and Fat, and lined on the inside by a glandulous Membrane. Besides all this, the Lips seem likewise to have a soft spongy Substance in their Composition, which swells and subsides on certain occasions independently of the Action of the Muscles belonging to them, and is mixed with Fat.

543. THE Substance which forms the red Border of the Lips is very different from the rest of the Skin, being a Collection of very fine, long, villous Papillæ, closely connected together and covered by a fine Membrane, which seems to be both a Continuation of the Epidermis, and of that Pellicle which covers the glandulous Membrane of the Cavity of the Mouth. This Substance is extremely sensible, and very painful when the outer Membrane is by any accident destroyed. The internal Membrane of the upper Lip forms a small middle Frænum above the first Dentes Incisorii.

544. THE Gums are that reddish Substance like Leather, which covers the two sides of the whole Alveolar Border of both Jaws, insinuates itself between all the Teeth, surrounds what I called the Collar of each Tooth in particular, and adheres very strongly to them. Therefore the outer and inner Gums are continuous, and both together form just as many Openings as there are Teeth.

545. THE Substance of the Gums is of a very singular Structure, resembling in some measure the Texture of a Hat, supposed to be very compact and elastic. It is not immediately fixed to the Bones of the Jaws, but by the Intervention of the Periosteum with which it is perfectly united; and it is covered by a fine, strong, even Membrane, which sticks very close to the Substance of the Gums, and seems to be a Continuation of that thin Membrane which goes to the Lips and Cheeks, and of that which goes to the Tongue.

546. THE Arteries which go to the Lips, Cheeks and Gums are Ramifications of the external Carotid, and chiefly of those Branches called Maxillares Externæ & Internæ, of which I desire the Reader to consult the Distributions and different Communications in the Description of the Arteries N^o 55, 58. The Veins are Ramifications of the external anterior Jugular.

547. THE Nerves of these Parts come from the Maxillaris Superior and Inferior, which are Branches of the fifth Pair; and also from the Portio Dura of the Auditory Nerve, or Sympatheticus Minimus, the Ramifications of which are spread in great numbers on all these parts, and communicate in a pretty singular manner with the Nerves of the fifth Pair in several places, as may be seen in the Description of the Nerves.

548. THERE is so much Variety to be met with in the Muscles of the Lips in different Subjects, that it is not at all surprising to find the Descriptions given of them by Anatomists very unlike one another. In some Subjects Portions of these Muscles are wanting; in some they can scarcely be distinguished, because of the paleness and attenuation of the Fibres; and in others there are really some particular Fasciculi which are not generally to be

be found. About fifteen Years ago I dissected an old Woman, in which Subject alone I observed a great many singular things which I have not met with in great numbers of other Subjects more proper for Dissection. In this Subject the Muscles of the Face in general were very much multiplied, and very distinct, as I shall shew in particular Observations.

549. THE Muscles of the Lips are commonly divided into common and proper. The common Muscles are those which end at the Angles or Commissures of the two Lips; and those are proper which are fixed in one Lip only, which are again subdivided into the proper Muscles of the upper Lip, and proper Muscles of the under Lip. All these Muscles have particular names, some of which are taken from something in the Conformation of the Muscles, some from the Insertions or Situation, and some from the Uses attributed to them.

550. I shall here describe those which I am able to shew, without mentioning those which I have not hitherto found, though I am in no doubt about the Accuracy of these great Anatomists who have published accounts of them, and who have besides given unquestionable proofs of their being faithful and judicious Observers. I shall lay aside the names taken from the supposed uses, partly because I have done so all along for reasons already given, partly because I am still uncertain about some of the uses attributed to them, and partly to encourage Anatomists and even Beginners to try their Hands at guessing, at which they may perhaps succeed better than I have done.

551. THE Muscles to which I confine my self may be enumerated in the following Order.

Musculi Communes.

Semi-Orbiculares.
Supra-Semi-Orbiculares.
Buccinatores.
Zygomatici Majores.

Musculi Proprii Labii Superioris.

Zygomatici Minores.
Canini.
Incisorii Laterales.
Incisorii Medii.

Musculi Proprii Labii Inferioris.

Triangulares.
Triangularium Collaterales.
Quadratus.
Incisorii Inferiores.
Cutanei.

552. THE upper Lip is sometimes moved by the Action of the Muscles of the Nose, especially of the Pyramidales; and both Lips either jointly or separately are moved by Suction, without the assistance of the Muscles belonging to them.

553. THE Semi-Orbiculares are commonly looked upon as one Muscle, surrounding both Lips, from whence it is called Orbicularis; but when we examine carefully the Angles of the Lips, we find that the Fibres of the upper Lip intersect those of the under Lip, and we easily distinguish the muscular Arch of one Lip from that of the other; and for this reason I divide this Muscle into two, and I call them either by the common name of Semi-Orbicularis, or I call one of them Semi-Orbicularis Superior, and the other Semi-Orbicularis Inferior; but the name of Semi-Ovales would be still more proper.

554. THE superior Semi-Orbicular Muscle is oftentimes broader than the inferior; and it has this peculiarity likewise, that all its Fibres do not go to the Corner of the Mouth, but terminate by degrees between the Middle and Extremities of this Arch, nearly like the Semi-Oval Fibres of the upper Palpebra. The inferior Semi-Orbicular Muscle is commonly more uniform in the Disposition of its Fibres.

555. THE Supra-Semi-Orbiculares are Fibres which increase the breadth of the two lateral Portions of the superior Semi-Orbicularis, upward; and they appear at first sight to be one continued Arch like the Muscle last named, but being narrowly examined, they will be found to be separated by a small Interstice, lying betwixt their contiguous Extremities which are fixed in the Gums opposite to the Edges of that Cutaneous Fossula that runs down from the Septum Narium, to the middle of the Edge of the upper Lip. Their other Extremities are confounded with those of the Semi-Orbicularis Superior.

556. THE Buccinatores are two in number, each of them situated transversely between the posterior part of the two Jaws and the Corner of the Mouth. They are broad backward and narrower forward, in the Shape of a Triangle or Trapezium, and they form a considerable Portion of the Cheeks, and for that reason are sometimes called the Muscles of the Cheeks. To have a just Idea of these Muscles, we must be made acquainted with a Ligament on each side of the Face which I call Ligamentum Inter-Maxillare, because it connects the two Jaws, and also gives Insertion to the posterior Fibres of the Buccinator.

557. THIS Ligament is strong and pretty broad. It is fixed by one end to the outside of the upper Jaw above the last Dens Molaris, and at the side of the Apophysis Pterygoides where it adheres very closely to the Musculus Pterygoidæus Internus. By the other end it is fixed in the posterior or superior Extremity of the oblique prominent Line on the outside of the lower Jaw, below the last Dens Molaris. It serves likewise as a Frænum to check and limit the Depression of the lower Jaw in opening the Mouth, and we may feel it our selves, with the end of the Finger in the Mouth, especially when it is wide open.

558. THE Buccinator is inserted posteriorly in three different places. The middle Fibres are fixed transversely in the Ligamentum Intermaxillare, and run directly to the Corner of the Mouth. The superior Fibres run down in an oblique graduated manner, from the Alveoli of the upper Jaw to the Corner of the Mouth; and the inferior Fibres run up from the lower Jaw in the same manner. All these Fibres contract by degrees as they approach the Commissure of the Lips, where they run in behind the Extremities and Union of the Semi-Orbiculars, by which they are covered, and to which they adhere closely. There is a large Hollow between this Muscle and the Masseter filled with Fat.

559. THE Zygomatici Majores are two Muscles situated, one on each side, between the Zygoma and the Corner of the Mouth. Each Muscle is thin, long, oblique, and fixed by one Extremity to the lower Edge of that Portion of the Os Malæ, which is connected with the Zygomatic Apophysis of the Os Temporis. From thence it runs down obliquely from behind forward, being in its passage, commonly involved in Fat. It ends at the Commissure of the two Lips, adhering strongly to the Buccinator which covers it. This Muscle is very often complex.

560. THE Zygomatici Minores are two small slender Muscles, lying above the great Zygomatici, and almost parallel to them. Their superior Extremity seems to be a detachment from the lower Fibres of the Orbicularis Palpebrarum; but they may always be distinguished. Their lower Extremity unites with the neighbouring Incisorius. These Muscles are quite buried in Fat, and for that reason often disappear.

561. EACH of the two Canini is fixed by a broad Insertion in the upper Jaw above the Socket of the Dens Caninus, in a depression below the inferior Edge of the Orbit near the Os Malæ. From thence it runs down a little obliquely, crossing the lower Extremity of the Zygomaticus Major, which covers it at this place. Afterwards it terminates at the Extremity of the Arch of the Semi-Orbicularis Superior, and communicates by some Fibres with the Triangularis. I formerly looked upon this as a neutral Muscle, that is, as being neither a proper Muscle of the upper Lip, nor common to both.

562. EACH of the two Incisorii Laterales is a sort of Biceps, its upper part being divided into two Portions which unite below. One of these superior Portions is larger than the other, and is fixed in the Os Maxillare below the middle Tendon of the Orbicularis Palpebrarum, seeming to communicate by some Fibres with the contiguous Fibres of that Muscle. From thence it runs down a little obliquely toward the Cheek, along the Apophysis Nasalis, mixing with the Pyramidalis Nasi, and sending some Fibres to the Nares. Afterwards it passes over and adheres to the Myrtiformis, or Transversalis Nasi, and unites with the other Portion.

563. THIS other Portion is fixed by a broad Insertion immediately below the Edge of the Orbit, in the Os Maxillare near the Union of this Bone with the Os Malæ, and likewise a little in the last named Bone, being at this place

covered by the inferior Portion of the Orbicularis Palpebrarum, with which it has sometimes a kind of Communication. From thence it runs down obliquely toward the Nose, and unites with the first Portion.

564. THE two Portions thus united and contracting in breadth, run behind the Semi-Orbicularis Superior, and are fixed therein opposite to the lateral Dens Incisorius. Sometimes it sends a small Fasciculus of Fibres to the Musculus Caninus, which may be reckoned an Assistant to that Muscle, and named Caninus Minor.

565. THE Incisorii Medii are commonly called Incisorii Minores Cowperi or Incisorii Minores Superiores. They are two small short Muscles situated near each other below the Septum Narium. They are fixed by one Extremity in the Os Maxillare, on the Alveoli of the first Incisores behind the Semi-Orbicularis Superior, and by their other Extremity in the middle and superior part of the Substance of the upper Lip, near the Nares, in which they likewise have an Insertion; and they sometimes send lateral Fibres to the Semi-Orbicularis.

566. EACH of the two Triangulares is fixed by a broad Extremity in the outside of the Basis of the lower Jaw, from the Masseter to the Hole near the Chin. From thence it ascends, contracting in breadth in a bent triangular Form, runs in between the Extremities of the Buccinator and Zygomaticus Major, to both which it adheres very closely, and terminates at the Commissure of the Lip, partly in the Semi-Orbicularis Superior, and partly, though not always equally, in the Semi-Orbicularis Inferior. This Muscle seems sometimes to be a Continuation of the Caninus Major.

567. THE Quadratus forms the thick part of the Chin below the under Lip. It is a very complex Muscle, and very difficult to be prepared, because its Fibres are interwoven with a great Quantity of Fat or a pellicular Texture of the Membrana Adiposa. It is first of all inserted in the foreside of the lower Jaw, where it partly fills the broad Fossula on each side of the Symphysis. From thence it runs up, intersecting, along the Symphysis, the contiguous Fibres of the Skin, and terminates by a broad Insertion in the Semi-Orbicularis Inferior. The Direction of the other Fibres of which it is composed; varies in different Subjects, and it communicates by some Fibres with the Cutanei.

568. THE Incisorii Inferiores are two small Muscles, commonly mentioned with the addition of *M. Cowper's* name. Each of them is fixed by the superior Extremity, on the Alveoli of the lateral Incisores of the lower Jaw. From thence they run down, approaching each other, and are inserted together in the lower part of the middle of the Semi-Orbicularis Inferior.

569. ON the outside of the superior Insertion of each of these Muscles, we meet with a Fasciculus of Fibres which seem to be detached from it near the Incisors. This Fasciculus goes off laterally in form of an Arch, and unites with the Fibres of the Semi-Orbicularis Inferior, with which it may be easily confounded. It may be looked upon as a Musculus Accessorius to the Semi-Orbicularis Inferior, or as a Collateralis to the Incisorius Minor.

570. THE two Musculi Cutanei form a kind of fleshy Membrane, which covers the whole foreside of the Throat and Neck, from the Cheek and Chin, all the way down below the Claviculæ, and adheres very strongly to the Membranous or Aponeurotic Expansion described above N^o 196, 197. This Expansion has a particular Adhesion to the anterior Portion of the Basis of the lower Jaw, of the same kind with that at the lower part of the Zygoma, and it is spread over all the Muscles that lie round the Neck, and over the upper Portion of the Pectorales Majores, Deltoïdes, and Trapezii.

571. THE Fibres of each Cutaneous Muscle run obliquely upward and forward, and meet and seem to intersect those of the other Muscle at acute Angles, from the Sternum all the way to the Chin. They adhere very closely to the Skin by the Intervention of the cellular Substance. From the Clavicles to the upper part of the Neck, these Muscles are very thin, and from thence increase a little in thickness as they approach the Basis of the lower Jaw, and especially from the Masseter to the Chin.

572. THEY adhere strongly to the lower Portion of the Masseter, Triangularis, and Quadratus, and on the Masseter and Buccinator their fleshy Fibres become Aponeurotic, but continue longer on the Triangularis, being mixed with the Fibres of that Muscle all the way to the Commissure of the Lips. They likewise advance a little on the neighbouring Portion of the Quadratus.

573. THE Portion of these Muscles which answers to the Basis of the Triangularis, is in a manner divided into two fleshy Laminæ, the outermost of which is what advances over the Triangularis and Quadratus, the other being inserted separately in the lower Jaw. I have sometimes observed a part of the fleshy Extremity of the right side, to pass before the Symphysis of the Chin, over a like part from the left side, the one covering the other.

574. THE common Muscles of the Lips either draw both Corners of the Mouth at once, or only one at a time, according to the different Direction of their Fibres. The proper Muscles pull the different parts of the Lips in which they are inserted. The Buccinators in particular may serve to move the Food in Mastication. An intire Treatise might be written on the almost innumerable Combinations of the different Motions of all these Muscles, according to the different Passions, and according to the different Postures in which a Man may put his Face, as I shall shew elsewhere. None are more affecting, than those produced by the Cutanei alone, especially in Weeping, which they do by their Adhesions to the Triangulares, &c. But by their Insertions in the Bone of the lower Jaw, they draw up the lower part of the Integuments of the Neck, and those of the Breast next to these; for they cannot move the Jaw. In old People, and in those who are very much emaciated, these Muscles may be perceived by the Eye, under the Chin, and on the Neck.

§ 6. *The Salival Glands, &c.*

575. BY Saliva we mean in general, that Fluid by which the Mouth and Tongue are continually moistened in their natural state. This Fluid is chiefly supplied by Glands, called for that reason *Glandulæ Salivales*, of which they commonly reckon three Pairs, two *Parotides*, two *Maxillares*, and two *Sublinguales*. These are indeed the largest, and they furnish the greatest quantities of Saliva; but there are a great number of other lesser Glands of the same kind, which may be reckoned Assistants or Substitutes to the former. All these may be termed *Salival Glands*, and they may be enumerated in the following manner:

Glandulæ Parotides.
Glandulæ Maxillares.
Glandulæ Sublinguales.
Glandulæ Molares.
Glandulæ Buccales.
Glandulæ Labiales.
Glandulæ Linguales.
Amygdalæ.
Glandulæ Palatinæ.
Glandulæ Uvulares.
Glandulæ Arytenoidææ.
Glandula Thyroidæa.

576. THE *Parotides* are two large, whitish Glands, irregularly oblong and protuberant, situated on each side, between the external Ear, and the posterior or ascending Ramus of the lower Jaw, and lying on some part of the neighbouring *Masseter Muscle*. The superior Portion of this Gland lies before the Cartilaginous Meatus of the Ear, and touches the *Apophysis Zygomatica* of the *Os Temporis*; and it is extended forward and backward under the Lobe of the Ear, as far as the *Mastoide Apophysis*.

577. FROM the anterior and superior Portion of this Gland, a white membranous Duct or Canal is produced by the Union of a great number of small Tubes representing so many Roots. This Duct runs obliquely forward on the outside of the *Masseter*, and then perforates the *Buccinator* from without inward, opposite to the Interstice between the second and third *Dentes Molares*, where the Hole or Orifice represents the Spout of an Ewer.

578. THIS Canal is named *Ductus Salivalis Stenonis*, or *Ductus Superior*. It is about the twelfth part of an Inch in Diameter, and in some Subjects is partly covered by small glandular Bodies, united with it in different quantities. The *Arteria* and *Vena Angularis* run up over this Duct, and the Por-

tio Dura of the Auditory Nerve runs through the Gland itself; and it also receives Filaments from the second Vertebral Pair.

579. THE Maxillary Glands are smaller and rounder than the Parotides, and are situated each on the inside of the Angle of the lower Jaw, near the Musculus Pterygoidæus Inferior. From the inside, or that which is turned to the Musculus Hyo-Glossus, each of them sends out a Duct in the same manner as the Parotides, but it is smaller and longer, and goes by the name of Ductus Salivalis *Whartoni*, or Ductus Inferior.

580. THIS Duct advances on the side of the Musculus Genio-Glossus, along the inner Part and superior Edge of the Glandula Sublingualis, to the Frænum of the Tongue, where it terminates by a small Orifice in form of a Papilla.

581. THE Glandulæ Sublinguales are likewise two in number, of the same kind with the former, only smaller, something oblong, and flattened like a blanched Almond. They are situated under the anterior Portion of the Tongue, one on each side, near the lower Jaw, on the lateral Portions of the Musculi Mylo-Hyoidæi which sustain them. The two Extremities of each Gland are turned backward and forward, and the Edges obliquely inward and outward.

582. THEY are covered on the upper side by a very thin Membrane, which is a Continuation of the Membrane that covers the under side of the Tongue. They send out laterally several small short Ducts which open near the Gums by the same number of Orifices, all ranked in the same Line, at a small distance from the Frænum, and a little more backward. In many Animals we find particular Ducts belonging to these Glands, like those of the Glandulæ Maxillares, but they are not to be found so distinctly in Men. The Musculi Genio-Glossi lie between the two Sublingual Glands, and also between the two Maxillary Ducts.

583. THE Molares are two Glands nearly of the same kind with the former, each of them being situated between the Masseter and Buccinator; and in some Subjects they may easily be mistaken for two small Lumps of Fat. They send out small Ducts which perforate the Buccinator, and open into the Cavity of the Mouth, almost over against the last Dentes Molares; and from thence *M. Heister*, who first described them, called them Glandulæ Molares.

584. ALL the inside of the Cheeks near the Mouth, is full of small glandulous Bodies, called Glandulæ Buccales, which open by small Holes or Orifices through the inner Membrane of the Mouth. The Membrane which covers the inside of the Lips, a Continuation of that on the Cheeks, is likewise perforated by a great number of small Holes, which answer to the same number of small Glands, called Glandulæ Labiales. The Glandulæ Linguales are those of the Foramen Cæcum of the Basis of the Tongue, which have been already spoken to.

585. I have also explained the Glandulæ Palatinæ, or those that belong to the Arch and Septum of the Palate; and the Glandulæ Arytenoidææ.

THE ANATOMY OF

noidæ were described with the Larynx. The Uvular Glands are only a Continuation of the Membrane of the Palate in form of a small Bunch of Grapes. We might likewise reckon among the Salival Glands those of the superior Portion of the Pharynx, mentioned in the Description of that part, and also the glandular Bodies of the Membrana Pituitaria of the Nares, and of the Sinuses that communicate with these.

586. THE Amygdalæ are two glandular Bodies of a reddish Colour, lying in the Interstices between the two lateral half Arches of the Septum Palati, one on the right, the other on the left side of the Basis of the Tongue. Their appearance is not unlike that of the outside of an Almond Shell, both because their Surface is uneven, and because it is full of Holes big enough to admit the Head of a large Pin.

587. THESE Holes which represent a Sieve, or a piece of Net-Work, are continued to an irregular Sinus or Cavity within the Gland, filled commonly with a viscid Fluid, which comes from the bottom of the Sinus, and is from thence gradually discharged through these Holes into the Throat. To see the true Structure of the Amygdalæ, they must be examined in clear Water, having first been washed in lukewarm Water, and handled very gently.

588. THE Thyroide Gland is a large whitish Mass which covers the anterior convex side of the Larynx. It seems at first sight to be made up of two oblong glandular Portions, united by their inferior Extremities, below the Cricoide Cartilage, in such a manner as to have some resemblance to a Crescent, with the Cornua turned upward. It is of a moderate thickness, and bent laterally like the Thyroide Cartilage, from which its name is taken. The two lateral Portions lie on the Musculi Thyro-Hyoidæi, and the middle, or inferior Portion, on the Crico-Thyroidæi. The Thyro-Pharyngæi Inferiores send Fibres over this Gland, and they communicate on each side by some such Fibres, with the Sterno-Thyroidæi and Hyo-Thyroidæi.

589. THIS Gland seems to be of the same kind with the other Salival Glands, but it is more solid. Some Anatomists thought they had discovered the Excretory Duct, but they mistook a Blood-Vessel for it. We sometimes meet with a kind of glandular Rope which runs before the Cartilago Thyroides, and disappears before the Basis of the Os Hyoides.

590. THIS glandular Rope goes out from the common Basis of the lateral Portions of the Thyroide Gland, and is lost between the Musculi Sterno-Hyoidæi, behind the Basis of the Os Hyoides, or between that Basis and the Epiglottis. I have likewise shewn in my private Courses, small Openings on the side of the anterior Ligament of the Epiglottis, or that by which it is connected to the Basis of the Tongue. One of these Openings appears like a small Papilla; and this is the furthest that I have been able to trace the glandular Rope.

§ 7. *Glandulæ Lymphaticæ.*

591. BELOW each of the first Salival Glands above described, or Parotides, toward the Mastoide Apophysis, is fixed a small Gland of another kind, differing from the former in Figure, Colour, Excretory Duct, and in the Fluid which it secretes. It is round, and of an even Surface, without Tubercles, and it is the uppermost of a great number of Glands of the same kind, which lie partly below the Interstice between the Parotid and Maxillary Glands and at different distances, along the internal Jugular Vein, all the way to the lower part of the Neck. We observe among these Glands and upon this Vein a great number of transparent Vessels, with an appearance of numerous Valves. The Fluid which they contain is transparent, a little mucilaginous, and is called Lympha.

592. THE Vessels are likewise termed Lymphatic Vessels, and the Glands, Lymphatic Glands. These Glands are not all equally large, nor equally round, some being oblong, thick, flat, small, &c. The Lymphatic Vessels go out alternately by one Extremity, from one Gland, and enter by the other Extremity some other Gland near the former, and both as they go out and as they enter, these Extremities are very much ramified. The Trunk is commonly single, and the Valves are so disposed, as that the Fluid contained in the Vessel can only run toward the Thorax, but cannot return to the Head.

593. THESE Glands and Vessels are to be found in many other parts of the Body. We meet with them not only in several parts of the Head, but also in many outward and inward parts of the Thorax, Abdomen, and both Extremities. They accompany the maxillary Salival Glands, as well as the Parotides; and there are several spread on the lateral and backsides of the Neck, in the Membrana Adiposa, near the Muscles.

594. IN the Cavity of the Thorax the Lymphatic Glands are situated at different distances on one side and behind the Œsophagus, especially at the place which is even with the fifth Vertebra of the Back. I have found some on the anterior Portion of the Diaphragm on one side of the Mediastinum; and there are others round the Basis of the Heart, in the Fat which lies there. They are to be met with likewise in the Substance of the Membrana Adiposa which covers the Thorax, near the inner Surface, especially about the Clavicles, and in the cellular Interstices of the Muscles which lie on the Thorax.

595. IN the Cavity of the Abdomen these Glands are very numerous, and particularly round the superior Orifice, and on the two Curvatures of the Stomach; on the Capsula of the Sinus of the Vena Portæ; on the cellular Ligament of the Vesicula Fellea; near the beginning of the Ductus Cysticus; at the Adhesions of the Omentum to the Spleen, and to the Colon; through the whole extent of the Mesentery; at the Adhesions of the Mesocolon;

Mesocolon; behind the Adhesions of these two Membranes to the Vertebrae of the Loins; near the Bifurcation of the Aorta; and along the Iliac Vessels. There are likewise other such Glands on the outside of the Abdomen, in the Substance, and toward the inside of the Membrana Adiposa.

596. In the superior Extremities of the Body, these Glands lie chiefly under the Articulation of the Os Humeri with the Scapula, in the hollow of the Axilla. The most considerable Lymphatic Glands in the lower Extremity are toward the lower part of the Inguina, commonly called the Inguinal Glands, to which the Fascia Lata or Crural Aponeurosis gives a kind of double Capsula, which makes some of them lie very near the Skin, and the rest at a greater distance from it.

597. As all these Lymphatic Glands differ more in Situation, than in Size or Figure, they are commonly enumerated and denominated from the places already mentioned, where they lie in the following Order.

Glandulae Parotides Lymphaticae.

Glandulae Maxillares Lymphaticae.

Glandulae Jugulares.

Glandulae Cervicales.

Glandulae Occipitales.

Glandulae Claviculares.

Glandulae Axillares.

Glandulae Thoracicae.

Glandulae Oesophagicae.

Glandulae Mediastinae.

Glandulae Cardiacae.

Glandulae Ventrals Externae, Internae.

Glandulae Stomachicae.

Glandulae Hepaticae.

Glandulae Cysticae.

Glandulae Epiploicae.

Glandulae Mesentericae.

Glandulae Lumbares.

Glandulae Iliacae.

Glandulae Inguinales.

Glandulae Crurales, &c.

598. THERE are three sorts of Vessels that now go by the name of Lymphatics, whereas formerly that word was used only to signify the transparent Vessels already mentioned, which accompany the Lymphatic Glands. The original Sources of these Vessels are very difficult to be found out; and even their Distribution through the Body has not been sufficiently traced to enable us to describe them particularly in this Treatise, and therefore I must reserve that for the Subject of another. As to their

their Termination, we are sure that for the most part they end in the Ductus Thoracicus.

599. BESIDES these Vessels which accompany the Glands, there are others of the same Structure found on the several Viscera, where no Lymphatic Glands have hitherto been discovered. We meet with them in very great numbers in the external Membrane of the Liver, and in the Duplicature of the superior membranous Ligament of this Viscus, as I have already observed. Several Discoveries have been made about these Vessels in Brutes, which I here pass over in silence, the sole design of this Work being to describe the Human Body.

600. THE third sort of Vessels termed Lymphatics, are the small Arteries and Veins which in the natural state, transmit only the serous part of the Blood. These Vessels differ from those of the first in the smallness of their Diameter, and in their Structure and Situation. All these little Arteries and Veins are uniform, extremely narrow, and though their sides are not thinner than those of the Valvular Lymphatics, yet their Diameters are generally less. The other Lymphatics are full of Valves, and very thin, but they are not narrow in proportion. The Arterial and Venal Lymphatics are found on the parts which are naturally white, as on the Skin, the White of the Eye, &c. and their Origins are easily discoverable; but the Valvular Lymphatics are confined to the internal parts of the Body, and are found on Parts of all Colours that are in the Body, and we cannot easily trace them to their Original Sources.

601. BESIDES what has been here said about the Glands, I have explained several things relating to them in the Compendious View, in the Description of the Liver, and in the Description of the Cortical Substance of the Brain. I have only here to add, that in order to have a general Enumeration of all the Glands of the Human Body, we need only add to the Salival and Lymphatic Glands, all the particular Glands and glandular Viscera which have been explained in the Descriptions of the Abdomen, Thorax and Head.

602. I think it very proper that the ancient Division of Glands into Conglobate and Conglomerate should be retained. Under the first kind I include the Lymphatic Glands alone, and all the other Glands of the Body under the second; and these again may be subdivided into Simple and Compound. I must be obliged to refer what still remains to be said concerning the internal Structure of Glands and glandular Bodies to a particular Dissertation, which is designed to contain an Answer to *M. Helvetius's* Letter published at the End of his late Performance concerning the Pulmonary Blood.

F I N I S.

The Explication of the Figures.

Table AA, the xxv. of *Eustachius*.

Lancisi's Explication.

- a. The Heart with the Vena Cava annexed.
- b. The External Jugular Vein of the right Side, cut.
- c. Vena Jugularis Interna.
- d. d. Venæ Subclaviæ.
- e. e. Venæ Axillares.
- f. f. The Cephalic Veins of both sides.
- g. g. Venæ Medianæ.
- h. Vena Basilica Dextra.
- i. i. Arteriæ & Venæ Renales or Emulgentes.
- k. k. The Passage of the Aorta, hid by the Diaphragm, viewed on the under side.
- l. l. Arteriæ & Venæ Iliacæ, which afterwards become Crurales, &c.
- m. Vasa Pudica.

Additional Explication.

- n. The Vascular Arch on the Palm of the Right Hand.
- o. Another Distribution of the Vessels of the Left Hand.
- p. The Arch or Curvature of the Trunk of the Aorta.
- p. Aorta Inferior.
- q. Vena Cava Superior.
- r. Vena Cava Inferior, as it passes through the Diaphragm.
- s. Vena Cava Inferior, as it passes behind the Liver.
- t. The left Iliac Vein.
- u. u. Arteriæ & Venæ Crurales, or Crurales Superiores.
- x. x. Arteriæ & Venæ Crurales Inferiores.
- y. y. y. y. The two Tibiæ.
- z. z. The Tendon of the Rectus Anterior, cut off.
- 1. 1. 1. 1. The Musculus Vastus Externus inverted.
- 2. 2. Vastus Internus.
- 3. 3. Crureus.
- 4. 4. Musculus Fasciæ Latæ.
- 5. 5. Triceps.
- 6. 6. The Kidneys.
- 7. 7. Musculus Latissimus Dorsi.
- 8. 8. Trapezius.

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8. 8. Trapezius.
9. 9. Deltoides.
10. 10. Biceps.
11. 11. Anconæus Maximus.
12. 12. Supinator Longus.
13. Ulnaris Externus.
14. The Radialis Internus, cut.
15. The Ulnaris Gracilis or Palmaris, cut.
- * Vena Jugularis & Arteria Carotis.
- * * Venæ & Arteriæ Frontales.
17. Venæ & Arteriæ Temporales.
18. Venæ & Arteriæ Occipitales.
19. Musculus Perforatus.
20. 20. Gastrocnemii.
21. 21. Soleus.

Table BB, the xviii. of *Eustachius*.

Lancisi's Explication.

Fig. II.

- a. a. Nervi Olfactorii.
- b. b. The Nervi Optici, cut.
- c. c. Motores Oculorum communes.
- d. d. Nervi Pathetici.
- e. Processus Annularis.
- f. f. The three Branches of the fifth Pair.
- g. g. The sixth Pair.
- h. h. The two Portions of the Nervi Auditorii.
- i. i. i. i. The Origin of the eighth Pair.
- m. m. Nervi Recurrentes.
- n. The left Nerve of the ninth Pair.
- o. The right Nerve of the ninth Pair.
- p. p. Corpora Pyramidalia.
- q. q. The tenth Pair cut, according to *Lancisi's* Explication of these two white Points ; but as these two Marks are not to be found in the other four Figures of the Brain, this Explication is without Foundation.
- r. r. The superior Extremity of the Nerves, commonly called Intercoftales, which according to *Lancisi*, may be reckoned an eleventh Pair.
- s. s. s. The great Trunks of these Nerves.

THE EXPLICATION OF

- t. u. u. The Nervus Accessorius of the eighth Pair, and its Communication with the third Pair of the Vertebrales.
 x. x. x. The Nervi Diaphragmatici, of which the Left is naturally longer than the Right.
 y. The inferior Opening of the Infundibulum.
 z. z. The Nerves which go to the Testes, Uterus, &c.

Additional Explication.

1. 1. Nervi Brachiales.
 2. 2. &c. The Communications of the Vertebral Nerves, with those commonly called Intercostrales.
 3. 3. Nervi Crurales & Sciatici.

Fig. I. and III.

- From a to k, the References are the same as in the foregoing Figure.
 l. The Nervus Accessorius of the eighth Pair, or Nervus Spinalis, with its different Origins.
 m. Chorda Tympani.
 n. The Communication of the Portio Dura Nervi Auditorii, with the Nervus Maxillaris Inferior.
 o. Nervus Ocularis, or Ophthalmicus.
 p. Nervus Maxillaris Superior.
 q. Nervus Maxillaris Inferior.

Fig. IV. and V.

These Figures are the same with the first and second, the Sections of the Nerves excepted.

Table CC. the xli. of *Eustachius*.

Lancisi's Explication.

Fig. I.

- a. a The Musculi Frontales, bifurcated. This Bifurcation is not always to be found.
 b b. The superior Segments of the Musculi Palpebrarum Orbiculares.
 c. c. The inferior Segments of the same Muscles.
 d. Musculus Levator Auriculæ,
 e. Musculus Temporalis,

f. Musculus

THE FIGURES

- f. Musculus Masseter.
- g. The inferior Edge of the Zygoma.
- h. A Portion of the Lower Jaw.
- i. The upper Extremity of the Musculus Depressor Alæ Narium. This whole Muscle is seen Fig. 3. a.
- l. Musculi Pyramidales Alæ Narium.
- m.m. Musculi Zygomatici Majores.
- n. Zygomaticus Minor Accessorius.
- o.o. Musculi Canini.
- p. Musculus Quadratus Menti.
- q. Musculus Triangularis. There is here a Mistake in *Lancisi's* Original Explication.
- r. Musculus Labiorum Orbicularis. Vide Fig. 3. b.
- s. Musculus Buccinator. Vide Fig. 3. c.

Additional Explication.

- t.t. Musculi Palpebrarum Minores.
- u. Musculus Zygomaticus Minor.
- x. Musculus Incisorius Major.
- y. The small Muscle of the Sub-Septum Narium.

Fig. II.

This Figure, and the fifth and sixth, seem not to have been taken from Human Subjects.

- a. Musculus Sterno-Thyroidæus Dexter.
- α. Musculus Hyo-Thyroidæus Dexter in situ.
- b. Sterno-Hyoidæus Dexter.

Fig. III.

- a. The Musculus Depressor Narium intirely.
- b. Musculus Orbicularis Labiorum.
- c. Buccinator.
- d.d. Musculi Canini.

Fig. IV.

The Musculus Temporalis, extra situm.

Fig. V.

- a. Musculi Sterno-Hyoidæi.
- b. Musculus Coraco-Hyoidæus, or Omo-Hyoidæus.

c. The

THE EXPLICATION OF

- c. The middle Tendon of this Muscle.
- d. Musculus Mylo-Hyoidæus, called here Genio-Hyoidæus Externus, five Obliquus.
- e. Musculus Genio-Hyoidæus, called here Genio-Hyoidæus Internus, five Rectus.
- f. The Stylo-Hyoidæus of the right side.
- g. g. Cerato-Glossi, or Hyo-Cerato-Glossi.
- h. h. Stylo-Glossi.
- i. Os Hyoides.
- k. Glandulæ Sublinguales.
- l. Glandula Thyroidæa.
- m. The Appendix of that Gland.

Addition.

- n. Musculus Sterno-Thyroidæus.

Fig. VI. and VII.

These two Figures are nearly the same with the second.

Fig. VIII.

- a. Aspera Arteria.
- b. Œsophagus.
- c. c. Musculus Colli Longus.
- d. The Glandula Thyroidæa, which appears to be divided.
- e. The Appendix to that Gland, according to Morgagni.
- f. f. Musculi Crico-Thyroidæi.
- g. Cartilago Thyroides.
- h. Musculus Thyro-Pharyngæus.
- i. Musculus Stylo-Pharyngæus Sinister.
- k. The Tendon and common Insertion of that Muscle.
- l. l. Musculi Basio-Glossi. That on the right Side appears like a Genio-Glossus.
- m. Os Hyoides.
- n. Musculus Genio-Hyoidæus Obliquus, which is more properly named Genio-Glossus.
- o. Genio-Hyoidæus Rectus. It appears here like a Portion of the Basio-Glossus.
- p. Stylo-Glossus.

Fig. V.

Fig.

THE FIGURES.

Fig. IX. and X.

The Officula Auditus. The Stapes and Muscle of the Malleus were discovered by *Eustachius*.

Fig. XI.

- a. a. Musculi Basio-Glossi. That on the right side appears here like a Genio-Hyoidæus.
- b. Cerato-Glossus Sinister.
- c. Stylo-Glossus Sinister.
- d. Stylo-Pharyngæus Sinister.
- e. Œsophagæus. This appears rather to be the Thyro-Crico-Pharyngæus, raised and inverted.
- f. Stylo-Hyoidæus Sinister.
- g. Crico-Thyroidæus Sinister.
- h. Aspera Arteria.
- i. A Portion of the Œsophagus, cut off.

Addition.

- k. The Ligament of the Stylo-Glossus.
- l. Musculus Cerato-Pharyngæus.
- m. Syndesmo-Pharyngæus. These two Muscles cover the middle Portion of the Stylo-Pharyngæus.
- n. The lower Portion of the Stylo-Pharyngæus, inserted partly in the Cartilago Thyroides, and partly in the Cornu of the Os Hyoides.
- o. The Basis of the Os Hyoides.
- p. The left Cornu of that Bone.
- q. Cartilago Thyroides.

Fig. XII.

- a. The Basis of the Os Hyoides.
- b. The Notch and left Side of the Cartilago Thyroides.
- c. Musculus Hyo-Thyroidæus Sinister.
- d. Sterno-Thyroidæus Sinister.

Addition.

- e. A small distinct Muscle.
- f. Another.
- g. The Basis of the Os Hyoides.
- h. The left Great Cornu.
- i. The left Small Cornu or Appendix.

Fig.

THE EXPLICATION OF

Fig. XIII.

- a. Musculus Pterygoidæus Internus.
- b. Pterygoidæus Externus.
- c. The Musculus Colli Longus Superior of the left Side, which is likewise called Rectus Anterior.
- d. Longus Colli Inferior of the right Side.

Addition.

- e. Musculus Salpingo-Staphylinus, or rather the Ptery-Salpingoides.
- f. The Obliquus Anterior of the right side.
- g.g. Recti Minores five Laterales Anteriores.
- h.h. The Lower Jaw divided by the Chin.

Fig. XIV.

This Figure does not appear in Human Subjects.

Table DD. the xlii. of *Eustachius*.

Lancisi's Explication.

Fig. I.

- a. The Epiglottis raised a little.
- b. b. The two Tops or small Heads of the Cartilagine Arytenoides.
- c. The left Ala of the Cartilago Thyroides, extra situm.
- d. The Superior Apophysis or Cornu of that Ala.
- e. The Inferior Apophysis or Cornu.
- f. The right Ala, in situ.
- g. Musculus Thyro-Arytenoidæus Sinister.
- h. Crico-Arytenoidæus Lateralis.
- i. Crico-Arytenoidæus Posterior.
- k. k. Arytenoidæus.
- l. Aspera Arteria.
- m. A Portion of the Musculus Œsophagæus. This appears rather to be the membranous Portion of the Aspera Arteria.

Addition.

- n. The left, small, lateral, articular side of the Cartilago Cricoides, with which the inferior Apophysis of the Cartilago Thyroides, is articulated.

Fig.

OF THE FIGURES.

Fig. II.

- a. The inner side of the Epiglottis.
- b. b. Musculi Arytenoidæi.
- c. c. Crico-Arytenoidæi Posteriores.
- d. d. The posterior and lower side of the Cartilago Cricoides.

Addition.

- e. The Prominent Line on the backside of the Cricoides.
- f. Musculus Arytenoidæus Verus.
- g. g. The Heads of the Cartilagine Arytenoides.
- h. h. The superior Cornua of the Cartilago Thyroides.
- i. i. The inferior Cornua.

Fig. III.

- a. Rimula Laryngis.
- b. Musculus Hyo-Thyroidæus sinister.
- c. Sterno-Thyroidæus sinister.
- d. Pharynx.
- e. Œsophagus.

Addition.

If this Figure be taken from an Human Subject, it is a very extraordinary one.

Fig. IV. and VI.

- a. The Point of the Tongue.
- b. The Basis of the Tongue.
- c. c. and d. d. The Musculi Stylo-Glossi cut; according to *Lancisi*.
- e. e. and f. f. Stylo-Pharyngæi.
- g. g. Cephalo-Pharyngæi; united by a Linea Alba.
- h. h. Œsophagæus; or rather the Cerato-Syndesmo-Pharyngæus.
- i. The Opening of the Pharynx.
- k. k. Œsophagus.
- l. l. Aspera Arteria.

Addition.

- m. Musculus Hyo-Crico-Pharyngæus.
- n. n. Glossopharyngæi.
- o. A Portion of the Stylo-Pharyngæus.
- p. p. p. p. The Velum or Septum Palati.

* X

q. q. The

THE EXPLICATION OF

- q. q. The Arch of the Pharynx, with the Rugæ.
- r. r. Musculi Petro Pharyngæi.
- s. Stylo-Pharyngæus Minor *D. Santorini.*
- t. t. t. t. Perystaphylini Externi

Fig. V.

- a. The Tongue.
- b. Epiglottis.
- c. Ligamentum Epiglotticum *Morgagnii* five Glosso-Epiglotticum.
- d. Ligamentum Hyo-Epiglotticum Synistrum.
- e. Os Hyoides.
- f. The Glands of the Basis of the Tongue.

Fig. VII.

A Fore-View of the Cartilago Cricoides.

- a. The Forepart.
- b. The Backpart.
- c. c. The small articular Heads or Tops.

Fig. VIII.

A Side-View of the Cricoid Cartilage, in which the small articular Surface expressed in Fig. I. is left out.

- a. The anterior Part or Basis.
- b. The posterior or upper part.
- c. The lateral part, in which the small articular Surface is wanting. Vide Fig. I. n.

Fig. IX.

- a. The right side of the Cartilago Thyroides.
- b. The right side of the Cartilago Cricoides.
- c. Epiglottis.
- d. The right superior Cornu of the Cartilago Thyroides.
- e. The left superior Cornu.
- f. The right inferior Cornu.

Fig. X.

A Back View of the Cartilago Cricoides.

- a. The prominent Line.
- b. b. The lateral sides.
- c. c. The small articular Eminences or Heads.

Fig.

THE FIGURES.

Fig. XI.

- a. Epiglottis.
- b. The right superior Cornu of the Cartilago Thyroides.
- c. The Superior Portion or Head of the right Arytenoide Cartilage.
- d. d. The Orifice of the right Ventricle of the Larynx.
- e. The right Portion of the Cricoides.
- g. An anterior Section of the Cricoides.
- h. A posterior Section.

Fig. XII.

One of the Arytenoide Cartilages cleared from the Muscles.

Addition.

- a. b. The Basis of this Cartilage.
- b. The internal Angle of the Basis.
- c. The articular Cavity of the Basis.
- d. The Appendix or small Head of this Cartilage.

THE FIGURES

Fig. XI.

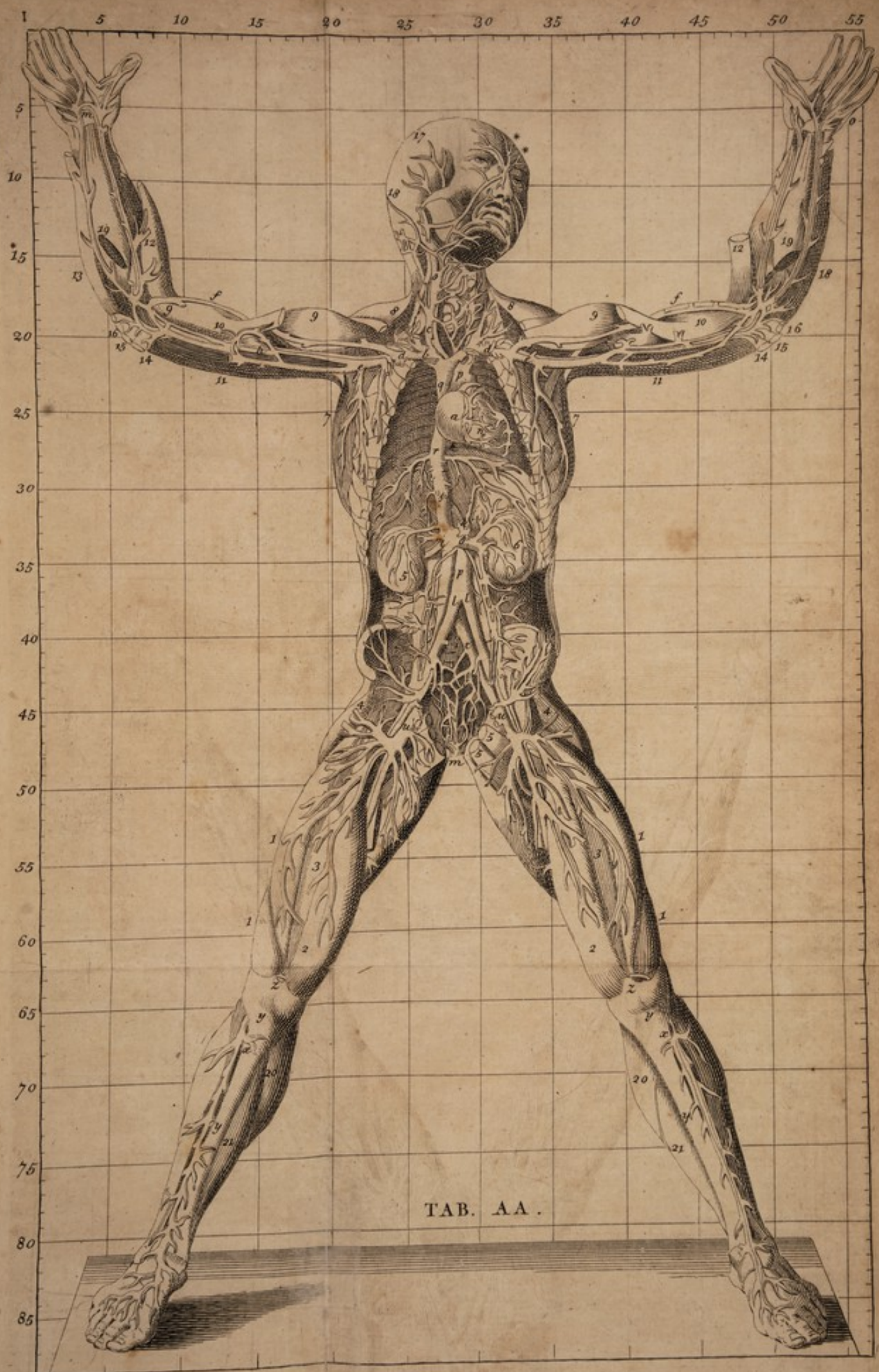
- a. Epiglottis.
- b. The right lateral Cornu of the Cartilage Thyroidea.
- c. The Superior Portion or Head of the right Arytenoid Cartilage.
- d. The Office of the right Ventricle of the Larynx.
- e. The right Portion of the Cricoid.
- f. An anterior Section of the Cricoid.
- h. A posterior Section.

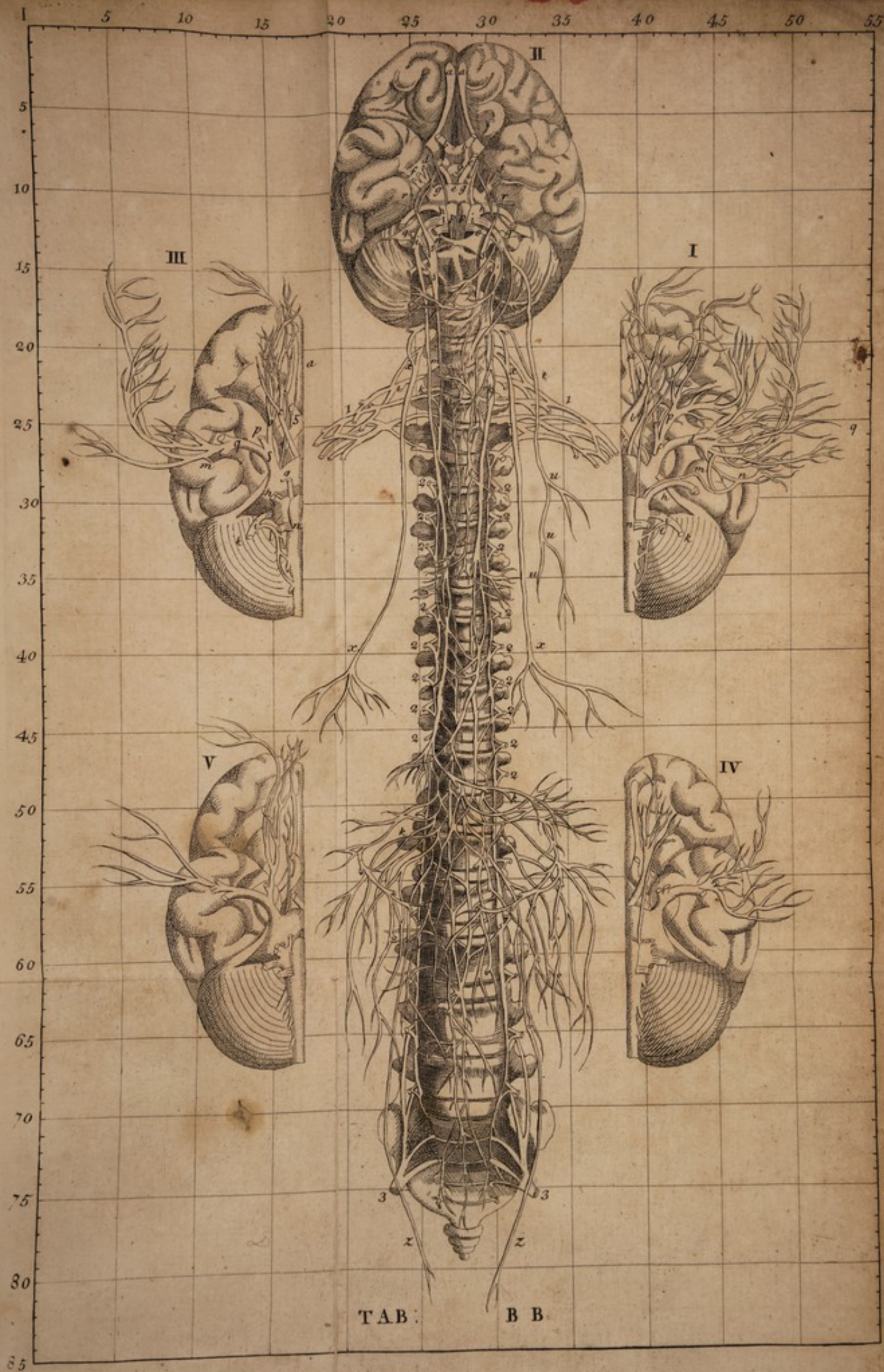
Fig. XII.

One of the Arytenoid Cartilages cleared from the Muscles.

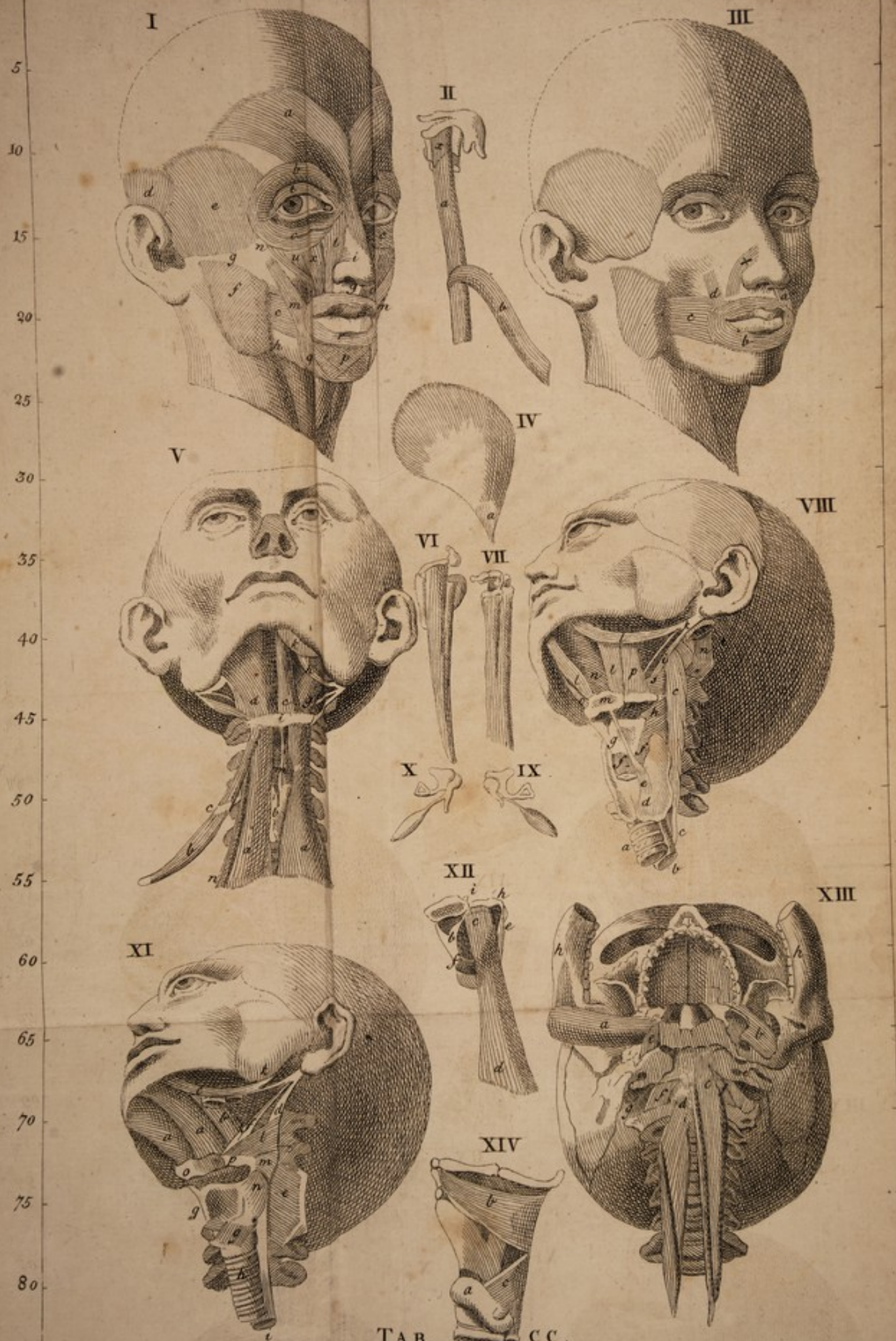
Addition.

- a. b. The Basis of this Cartilage.
- b. The internal Angle of the Basis.
- c. The articular Cavity of the Basis.
- d. The Appendix or small Head of this Cartilage.









TAB. CC.









