Text of lectures on anatomy and surgery given at Edinburgh Medical School, by Dr. Alexander Monro (Secundus). Vol. 1

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Lectures

by

Dr. Alexander Monro.

on

Anatomy and Surgery.

Edinburgh 1st January 31st. 1778.

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Vol. 1st

Dr Monro's Lectures on Anatomy
and Surgery

Page 1.

Lecture 1st

When we consider Gentlemen the Office of a Physician or Surgeon one of which I am to endeavour all present mean to be, viz. to preserve health or to cure diseases — i.e. to prevent or to redress disorders in the human body, it will appear to you evidently to follow, that the foundation of their Science must consist in a just knowledge of the situation, structure, connexion and properties of the several Organs, & of the several powers by which their Functions are performed in health. This knowledge being acquired by taking a view of the parts of our body, or by dissecting it, the art is term'd Anatomy — But by it we ought to understand that the dissection is conducted in a skilful manner: & further: every experiment and aid is called in, that art has yet furnish'd to discover, not only the Structure but the Oeconomy of the Body. ——— The Physician applies his Anatomical knowledge to physic in one or two ways, either, by a proper direction and modification of the machinery he enables it to resist such impressions as prove hurtfull to it, to rectify the irregularities of its own functions, or to subdue and expell such matter as being received disturbs & interrupts its functions: or, in a more visible and Mechanical manner, by the new application of the hand & the assistance of proper Instruments, he endeavours to cure or palliate Diseases with little or no assistance of the Machine itself — In the former of these ways he is said to perform the Office of a Physician: in the latter to execute the Business of a Surgeon. ——— The dependance of both upon Anatomy will appear evident on the slightest reflection. — Unless the Physician knows exactly the situation and connexion of the several Organs: their particular use their importance to the general welfare, their use, connexion

and termination of the Circulating & Absorbent Vessels, &
how far these may influence the Body considered as an
Hydraulic Engine: the Nerves: their particular vis=
cibility: the general Sympathy: the degree of Motion;
the manner and cause of this: it will be impossible
to determine y^e^ seat of an inward disorder: to foresee
the Symptoms & probable Event, or to lay down rational
Indication of Cure, adapting y^e^ known Effects of a
remedy to y^e^ nature of the part diseased.

The Chirurgical branch is still more dependant upon
Anatomy for unless y^e^ Surgeon be intimately acquainted
w^th^ y^e^ several Circumstances enumerated: & knows still
more particularly y^e^ Situation & Connexion of Nerves and
Vessels, it will be impossible to determine how far
an Operation may be advisable or whether y^e^ Patient
runs more danger from the disease being committed to
Nature than he can do from the Operation.—
His Ignorance perhaps in one case will deter him from
attempting the only possible means of Cure while in
another he is led to do something that is unnecessary
or improper—May I not carry this further, supposing
an Operation is advised to be performed or Application
that y^e^ common Chaw of dexterity of hand & y^e^ Surgeon
most of them profess, providing it be skillfully conducted,
is sufficient for most cases, their general Success will
be in proportion to their Skill in Surgery w^ch^ entirely depends
on Anatomy.—And an Anatomist tho' he has never seen
a particular kind of an Operation performed may with
more safety undertake it than another who is deficient
in Anatomical knowledge, tho' he has seen y^e^ Operation
performed a number of times; for an Operation is only a
piece of Dissection performed on a living Body, y^e^ Anatomist
proceeds upon certain principles, knows the Reason—

of every step & where to place his greatest caution; and in case anything unforeseen sho. happen he knows how to remedy it; whereas the other imitates only certain movements of the hand or Instrument without knowing certainly what he is doing, if any thing unforeseen happens from his Ignorance or Confusion he is altogether at a stand — his rash pushes where y.e utmost Caution is requir'd, & tedious and giving pain where there is no real danger. — In y.e Manual Branch the Art can only make a slow progress of Improvement by Observation or Accident without the knowledge of Anatomy: & if we look back to the different periods of Physic we will find that the Improvements in Anatomy & Surgery have constantly kept an Uniform pace. — Nor is it alone sufficient that we understand fully y.e Structure of the sound state: we must likewise know the changes that are made by disease: otherwise informing our opinions concerning them we may be led into dangerous mistakes: nor need we be surpris'd if mistakes sho. take place: if we consider y.t all our Organs are supply'd & in a great measure compos'd of Branches of y.e Hydraulic System: So that an affection of a Single part may influence all the rest in various degrees. — Next let us reflect y.t all our Organs are influenc'd by one living principle, w.ch may reach upon all in a manner w.ch our Ignorance of its nature renders it impossible for us to reduce to rule; may we not know the external appearance of the Nerves yet the nature of the Nervous Energy or of that Medium by w.h the minds of Animals are connected to the corporeal part, altogether escapes our Observation & perhaps mocks human investigation — When these circumstances are held in view we perceive y.e vanity of pretending a priori

to investigate the Cause of Diseases & learn y.^t necessity we are under of beginning our reasoning far from the Sof. of that Chain by w.^ch y.^e Author of Nature has tied together causes & effects. — From the Dissection of morbid bodies, to w.^ch we must have recourse), y.^t we may not mistake in the Cure of Diseases: for without dissections the attempts we make to cure are the Experiments of Chance: but when we know the changes that has taken place we are guided by reality; may let us put on the one hand the most favorable Supposition that one by administering a certain remedy has remov'd a certain Symptom yet without knowing the Cause of it, his observation cannot admit of a general application for this Symptom may proceed from different causes, & the Cure must be varied according to the N.^o we. So we know by Dissection y.^t Dropsical Swellings may depend upon a variety of causes, some of w.^ch require Diametrically opposite means of Cure. — Again let us put the most unfavorable Supposition y.^t by dissection we have discover'd y.^t certain Symptoms have proceeded from some incurable disorder of the Bowels or elsewhere, whether saving y.^r own reputation by a judicious prognostic it is even due to the patient, when instead of exhausting his strength by attempting a radical Cure, we endeavour merely to palliate y.^e disease & support Nature in her declining State: thereby rendering y.^e remainder of Life more comfortable. — And when the first causes of Diseases escape our Observation as when it depends upon the Poisonous Influence of contagious diseases where the Infection is communicated to the Mass of Blood, it is still

highly unjust to observe its effects wch become secondary
causes of new disorders. — But to insist further upon the
advantages of practical Anatomy may seem unnecessary
and what shows ye neglect of Physicians wth regard
to this works upon this subject have been universally
sought after. ——— The obvious & acknowledged
necessity of practical Anatomy, or of the Dissection of morbid
Bodies leads me back to observe ye absolute necessity
there is of our being perfectly acquainted with the
Structure in a sound State, in order to be able to point out
ye deviations from it: and in proof of this it might be
sufficient to have recourse to the mistakes of Physicians.
But to endeavour to illustrate this by particular examples
wd at present be improper, as I am to suppose that
you are ignorant of ye Subject; & it wd be superfluous,
as every step we take will afford abundant proofs of it
So I shall next proceed to consider the most fit method of
studying Anatomy so as to attain a sufficient knowledge:
& to propose the plan I am to follow; for I make it a
rule to avoid the form of a single preliminary Lecture,
as we may be more agreeably intertain'd upon the
Subject itself. ——— It must appear evident to you that
an investigation of the functions of an Animal
must be attended wth considerable difficulty, as we
undertake to explain a Machine not only of the most
complicated, but of the most delicate mechanism, &
wch tho' ye influence of ye animating principle, proves
wonderful powers & has its operations varyd in many ways

This multiplicity has determined many Physicians to divide y.e Study into 2 distinct parts or Branches — The strictly speaking Anatomical & y.e Physiological, the first taking account of y.e pieces of w.ch Machine is composed and describing them y.e 2.d shewing in what manner they what causes they perform their functions. — Now admitting y.t this division can be properly made neither of them can be pursued without considerable interruptions; thus in y.e anatomical Branch we cannot lay the pieces before us & join them again in y.e Synthetic method; nor can we separate them and investigate y.e machine properly without a previous knowledge of its basis, in y.e analytic method; we must combine them & use a more complex method than we use in describing other pieces of machinery. — In y.e physiological branch again we are equally at a loss where to begin. If we begin with the Heart, as being the prime mover, the Heart receives its principle activity from the Brain, or if with the Brain this has an immediate dependance upon the heart so that we may say w.th Hippocrates, y.t in attempting to find a proper order we are endeavouring to discover the beginning of a Circle. But this may be sufficient to point out y.e difficulties y.t attend this Study to shew to you the need there is for a proper method & to draw your attention to the one I am to propose. — It is unnecessary to explain the various methods y.t have been proposed, w.ch are generally obscure & too much limited: whereas I am to attempt one y.t will be more clear & y.t is more extensive in its views. —

Of y.e appli—

The common way of describing the parts of y.d machine as inanimate must be dry and disgusting; & we cannot attend to a detail of facts so carefully without use at the same time of y.e application — Besides y.e functions of y.d body will be best understood while the parts lie before us so it will not only be more entertaining but more useful to adopt a method y.t will lead to the knowledge of the Structure & at y.e same time have such an Eye as to explain em as we proceed, & to apply em to the practice of physic & Surgery. — With this view the following plan is proposed by me. —

1.st — It is customary w.th Writers & Teachers to premise some History of the Science they treat of and may be said in defence of y.e method that it introduces Students to an acquaintance w.th y.e chief Improvers of y.e Art, & leads em to the sources of knowledge. — But it consists of an Impropriety, as the History of an art properly speaking comprehends the whole: neither does any Art attain to perfection in the order it is proper to treat of it. I shall so far adopt this method as to begin with a short Hist.y of y.e rise and progress of Anatomy, & shall from the great number of Authors, point out to you y.e chief sources of Improvement & select such as seem the most fit for your perusal.

2.d I shall next lay before you the principal materials of w.ch y.e human body is compos'd & endeavour to put these by either in such a way as to give a general idea of it's Oeconomy: for without an introduction of this sort, beginners will be at a loss to understand what is afterwards to be proposed more particularly concerning y.e use of y.e parts & y.e application to the Practice

9. This will prepare us for entering upon y.d particular branches of Anatomy, & for reasons before hinted & begin with y.d study of the parts of a Body of y.e bones & Organs connected w.th these; w.ch are for the support, attachment, and defence of the softer Bodies or Organs from the general Mass of the body.

10th We are led to consider these Organs, w.ch are immediately inserted into the Bones, take their rise from one bone & end in another; and w.ch by their Contraction make y.d bones to approach one another & to perform y.d various motions of the body, & while we observe y.d effect of each muscle, we will divide 'em into Classes & consider y.r Cooperation so far as may seem necessary.

8th

11th The Bone and the Muscles afford a ground-work or outline, by w.ch we can with y.e utmost precision describe the Circulation, y.d Connexion of all the other Organs: the Bowels, Glands & the Organs of the Senses, and then we get y.d use of the parts, dividing 'em into their particular Classes.

12th And now knowing the distinguishing marks of y.d several Organs, y.r situation and connexions we are fully prepared for viewing the Body of an animal in a more extensive & entertaining light as having its Organs connected and communicating with one another so as to form a complete System.

13th And as in y.d dissection we observe y.e 2.d y.e nutritious juice or fluid, y.e Chyle is intimately mix'd w.th y.e general mass of

we are led to trace y.e to the different Organs & to observe the means by w.ch it is conveyd & dispersd in the several canals; the Heart & Arteries conveying it, to the several parts of y.e Body, while it is retaind by the Veins, to complete the Circulation of the Mass, for preventing its coagulation and for the nourishment.

8.th In this tracing of y.e Circulation by w.ch y.e several humors are dispersd & their views, & the same a corresponding absorption carried on in Animals, this last is performd by certain Vessels y.t have been long known to Anatomists & have been describ'd under the name of the Valvular Lymphatics: but the general use of these being misunderstood the doctrine will be found to have been placed in a much less important view than it may justly claim

9.th How after reflecting upon the Impressions made on y.e Organs of Sense, & on the Labours of the Heart & Vessels in circulating the humors, in order to describe the complete Machine, it remains to shew the medium by which the animating part is connected with the Corporeal; & we shall find certain Cords derived from the Brain & distributed to every part of the Body, by simple experiments we shall prove that by these we are sensible of impressions & are noticed to action; and that by them are y.e muscles contract & perform their various functions.

10.th After we have thus in a general way taken a view of the circulating, absorbent, & the nervous Systems

of animals their structure, powers & affections we will prosecute the particular branches of each & consider y.
effect of their distribution upon the various Organs — till we have seen y.r rise, course, & termination of the Veins Arteries, Absorbent Vessels and Nerves: we are not prepared for enquiring into or describing y.e intimate Structure of each Organ. —

11.th — So shall with this close y.e Anatomy of y.e Body, so far as takes place in the sound State. — This I shall do by means of preparations veiling it in a variety of different points of view: then, I shall explain y.e functions of each so far as can be done w.th certainty and an usefull application to the practice

12.th Then having shewn you the Functions of y.e sound state, I shall give you some morbid preparations, or parts of diseas'd bodies, I have preserv'd in order to give you an Idea of the changes a disease produces. — and thereby lay some foundation for the practical Anatomy or the Anatomical Pathology.

13.th Besides y.e many observations relative to Surgery, as well as to physic w.ch will be introduc'd into y.e Anatomical part of y.e course — I shall now consider, in a distinct part Surgery: or attempt to explain y.e manner of palliating or curing diseases, or Accidents, by the Hand or Instrum.ts and from the nature of the parts diseas'd & y.e changes made upon 'em; I shall lay down the proper Indications of cure: and the manner of conducting y.e Operation, where upon Anatomical principles we may venture sometimes to correct the present practice; I shall explain y.e several

Instruments and perform all y^e^ Surgical Operations before you: as also shew you the use of Bandages & other things necessary for the Cure. ——

14^th^ Having finished y^e^ human Anatomy, & what is dependant upon it, I shall illustrate y^e^ more hidden functions by comparison of the Structure of other Animals: and in order to abridge the work I shall reduce y^e^ Animals to Classes, & make a proper choice from each —— and

15^th^ Having exhausted now every means of throwing light upon the several animal functions, I shall conclude y^e^ course w^th^ a few Lectures upon such parts of y^e^ Physiology as our Demonstrations did not lead me to consider. ——

Lecture 2^nd^

At our last meeting after endeavouring to point out the importance of Anatomy in y^e^ practice of Physic & Surgery, I laid before you the plan w^ch^ we follow in the present course. — Upon y^e^ whole I propose to demonstrate y^e^ Structure & to explain the functions of our Body so far as can be done w^th^ certainty & w^th^ useful application to y^e^ practice: to explain the nature of such accidents or diseases as require y^e^ assistance of y^e^ Surgeon, and to perform y^e^ operations before you & afterwards shew you y^e^ applic^n^ of Bandages & other Machines. — And I gave you my reasons for beginning w^th^ y^e^ Visc^ls^ of Anatomy. Formerly I us'd to enter minutely into this subject, in endeavouring to point y^e^ principal discoveries ings that have been made y^e^ have been made in — Dup.

Anatomy — & to mention all y.e most Eminent Authors.
But the subject grew to such an extent, that, tho' the
reach into these Authors was by no means disagreeable
to myself; yet on your acc.t I think it necessary to abridge
it greatly y.t I may have more time for the other more important
Parts of our course: & do that the more readily y.t you have
also an opportunity of consulting in y.e public Library of
the University such Authors as you may think I mention in
too cursory a manner. — In treating this subject I find it
best to follow y.e order of Time: for tho' this is a Science containing
in some measure yet we better in this way gratify our
curiosity in observing y.e gradual steps by w.ch we advance to
perfection: we do justice to y.e I.s discoverers of the Art, are led
to observe whence chiefly improvement is to be expected
& w.ch is perhaps of y.e most consequence we are enabled to
understand y.e foundation of the Theory & practice of the
Ancient Writers in different ages, since we must consider
Anatomy as constantly subservient to the practice —
As the Antiquity of a Science is a presumption of its import.ce
so generally Teachers endeavour to trace y.e rise of that
they profess, as far as possible back, pointing out every
circumstance y.t might have contributed to its introduction
or after improvement: while at y.e same time such enquiries
are of little use & afford little entertainment from the
extreme uncertainty attend.g on at the distance of time in
w.ch they are plac.d. — But we are not here as in
tracing y.e rise of the other Arts allow'd to indulge in
conjecture, for we are ty'd down by y.e sacred writings
w.ch expressly tell us y.t y.e Sons of our I. Parents offer'd up

Sacrifice long before animal Food was permitted in w.ch as also in Butchery, when animal food was permitted to Noah, a regular division of parts became necessary. some parts were reckon'd impure & cast aside, while others some were reckon'd more proper for the purpose intended & other parts again were allotted to y.e Sacrificers.—— In the Butchery for of y.e larger Animals a division to a certain degree is necessary.—And when the World came to be more peopled Jealousy, Avarice, & Ambition embroild mankind in wars, and we read very early of Battles in w.ch y.e Intestines of y.e body wo. be more frequently bro.t into view y.n y.y are now from their chiefly using sharp Cutting Weapons.—— When Men came to be further protected by Laws, Ease, & Security, led them to conceive many things th. had not before thought of so they endeavoured to preserve y.e bodies of those who had made a figure in life, after their Death.—This practice was familiar to the Egyptians in the days of Joseph and from the term Mummy it seems to have come from y.e Persians Omm, in their language signifying Wax, w.t w.ch y.e Vessels were stuff'd; But from this tho' not such accurate knowledge of Anatomy co. have been obtain'd as some fancy; for if you look into Herodote you will find that the Operators were oblig'd to extract the Bowels piecemeal to prevent y.e Body from being maim'd.—This however w.h y.e inspection of wounds, must have convinced Mankind of y.e Analogy between y.e Structure of their own Body & that of Quadrupeds.—At last we find y.e Priesthood equally Ambitious in acquiring power & Ingenuity in contriving y.e means of doing so: pretending y.e future Events

were avoid'd to form by certain signs and tokens & y.th those were more especially discoverable in y.e Bowels of such Animals as were offerd in Sacrifice: & y.e credulity of those keeping place w.th y.e grossness of y.e impostures nothing of importance was undertaken without first consulting y.e Augurs, this Art was kept in the Eastern Nations & took place amongst y.e Romans from y.e building of Rome — Little addition cou'd indeed be made to the to the knowledge of Anatomy from this practice for nothing was done accurately; Thus if you look into L. Vives who takes particular notice of this, in one instance the Heart is said to be wanting; while in another 2 Hearts were said to be found, so y.t y.e whole was a mere illusion, & as only of the Bowels were examin'd, yet these are the chief, or at least the chief means, that for many ages introduc'd or improv'd our knowledge in Anatomy: for we dont find in y.e sacred writings, nor in the Books of Homer or Herodotus y.e Anatomy was considered as a Science of use & Entertainment, nor are the Sons of Aesculapius celebrated for their Skill in that Art but for their Skill in the Virtues of Herbs — at length y.e curiosity of the Philosophers of Greece seem to have paved y.e way for y.e further improvement of Anatomy by admitting it into their studies as one of y.e Branches of natural Philosophy Thales, Democritus, Empedocles, are celebrated for their improvements in anatomy: and Specimens of y.r Skill are found quoted in diff.t Authors — But we are chiefly indebted to Hippocrates who first not only separated Medicine as a distinct Science in profession from the

study of physiosophy, but seem to have considerd Anatomy as
chiefly and immediately relative to physic & Surgery.
The degree in wch y. skill of Physicians ought to be possessd
has been in all ages of very great dispute some pretending
to find in him all y. is useful, whilst others depreciate
this skill in y. opposite extreme — how far as I can
observe from a perusal of his works we discover in them
a general knowledge of all y. parts of anatomy, but this is
extremely superficial & in some circumstances highly
erroneous. — He every where confounds y. Arteries wth
y. veins, not only using y. same term of Vessels to
express both, but considering both as branches of the
same general Trunk — In like manner he confounds
the nerves wth y. Tendons, not only under one Term, but
so far is he from having y. smallest Idea of y. Office
of y. Organs we now call Nerves, y. he ascribes this to
the Blood Vessels may further I do not find in any of
his works wch by y. most accurate Critics are allowd
him, or are shown to have been wrote in y. 6th Century
before y. Christian Æra y. any dissection was made of y.
human body. — For the proof of y. contrary given us by
Dr. Haller. (viz.) that he describes y. Sublavian muscle
is by no means sufficient, because y. is found in y. Ape
y. common anatomical Martyr of y. age & Country
Soon after in other works generally published as
belonging to Hippocrates, but wrote by his sons and
Disciples — y. are evident proofs that the human
Body was dissected. — for we find the exact number
of the lobes of the Lungs and of the Vertebræ, and there
is a tolerable just parallel between y. Thoracic
Viscera of a Man and of a Dog. — The Observers of

Hippocrates not contented with having considerable knowledge of y^e structure of y^e body himself, have pretended y^t he also understood much of its oeconomy & especially y^t he understood y^e circulation of y^e blood but I shall consider this matter afterwards when I come to y^e real period when y^t was discovered, when I shall lay down all y^t was known in former ages concerning it.

In y^e following Centuries y^e 4^th & 3^d before y^e Birth of Christ we find anatomy still cultivated by y^e Philosophers. Plato reasons with considerable ingenuity with regard to it: & Aristotle his Contemporary, who liv'd in the Century after Hippocrates not only reasons from the Descriptions of others — but undertakes a natural Hist^y of y^e figure and structure of animals in w^ch he was engaged by Alex^r the great & we are told by Pliny y^t Aristotle compiled this undertaking in 50. Books in Vol. of w^ch 11. are still extant, unluckily there more immediately treating of y^e dissection of Animals are lost, but in these remain. we find numerous marks of considerable skill: & he seems to have been the first who illustrated his descriptions by figures — an art extremely obvious and of unspeakable use w^ch has been so much overlook'd, that when it is revived near 2000. Years thereafter it is consider'd as a new invention Near about y^e same period we find a distinction made by Praxagoras of Cos: between y^e vein & Arteries he supposing that these last contain'd air or Spt. at the same time he teaches us to judge of y^e state of the Blood & of diseases by feeling y^e Pulse — A

Circumstance very much overlooked by Hippocrates &
from the want of it his Descriptions of Diseases
are much less accurate than we are taught to believe.
We are ignorant of the state of Learning in the Eastern Nations
at or before this period almost all we know is that the
Philosophers of Greece travell'd into diff.t parts for their improve
ment. Physic was brot. to some perfection in Egypt by the
Physicians being confin'd to the treatment of a few diseases.
But now an Academy was form'd & founded at Alexandria
by the Ptolemies the Successors of Alexander wch subsisted
100. Years & in wch medicine & Anatomy in particular was so
highly cultivated as the Kings themselves were sometimes
present at dissections, & in the works of Galen the names
of many of the Anatomists are handed down to us; two of
which more immediately merit our attention I mean
Herophilus & Erasistratus they seem to have been
Cotemporaries for the same discoveries are ascribed to both.
Besides numberless improvements in the names of Anatomy
wch are many of them still retain'd, in the names works of both
Authors there is a description of Vessels wch can only apply
to those we call Lacteals & wch take in our nourishment
& in both we not only find the names distinguish'd by a name
appropriated to them in distinction from the other hard
substances the Tendons of the Muscles but the office of the
Nerves is ascertain'd to us by simple & decisive Experiments
They have also described the Nerves as Parts of the Heart with value
We know little of the state of medicine among the Romans
for some ages, we find in the Roman Writers (pretty
early after the foundation of Rome) the sum of Medicine

employ'd; but in reality their Physicians were Slaves or Freedmen who practic'd without knowledge of Anatomy or Surgery & without rational principles, & apprehend we may say y.t as Anatomy to Physic was introduc'd as a science by the Greek Physicians after y.e conquest of Greece; & before y.e era of Christ it does not appear that Anatomy was practis'd amongst y.e Romans.

Celsus speaks of several Physicians before him; he has been supposed to have copied from Hippocrates & other ancient Writers, & certainly he seldom mentions himself but he himself practis'd Physic, for he himself gives us various methods of cure w.th regard to disorders of y.e Eye; tho' I dont recollect to have seen any cure in the manner he proposes. — In the preface of his work he recommends y.e study of Anatomy & gives a slight description of y.e Organs of y.e body w.ch tho' it is not incorrect it is in a great measure tho' by no means wholly borrow'd from y.e Greeks. — Not long after this Rufus and Soranus appear'd towards y.e beginning of the 2.d Century & wrote original pieces. — & before the close of the 2.d Century there appear'd a most extensive & elaborate work wrote by Galen, w.ch is enrich'd w.th y.e learning of former ages, & in which we find many of the minute parts of y.e Body so accurately describ'd as to prevent y.e Moderns in number of instances: y.e whole is connected so plausibly into a System, that his Opinions were adopted for more than 12.00 Years till Experience & Experiments & more accurate observation were at length introduc'd and shew'd y.e fallacy of many parts of his

System — He has traced the Blood vessels further than ever had been done before by any art w.ch were not to have been found out solely, likewise the first Origin, course and termination of y.e nerves — in many parts he has thrown considerable light on the Functions of y.e parts by decisive experiments as the use of the muscles, the action of the Heart, the state of y.e Blood, the manner in which y.e voice is form'd, y.e use of the several nerves &c. But upon y.e whole notwithstanding, I say y.t Galens Anat. was universally follow'd for 12. Cent.s that his physiological abilities & Opinions were adopted still later, yet I must observe y.t his descriptions were almost all drawn from quadrupeds, This opinions are not to be rec.d but w.th caution & reverence. — they are generally merely Hypothetical, and therefore in the present age are justly laid aside as being only the Sallies of a luxuriant Fancy

In the 4.th Century the Roman Empire was overrun in the West by barbarous Nations and learning extinguish'd, w.ch did not soon revive again; while in the Eastern Empire y.e Physicians still continued to build their practice upon the Anatomy of Galen. —

In the 5.th Century Alexandria was taken by the Arabians or Saracens, The Academy found there and w.ch had subsisted near a thousand Years & a celebrated Library, the repository of y.e learning in y.e Eastern parts of y.e world almost entirely consumed At length when y.e Saracens came to be better settled in their new possessions — they began to look into the

the remains of y^e^ Greek and Roman Writers & to translate their work into their own Language) & there are plenty in diff^t^ parts of Europe particularly in the Library of y^e^ King of Spain several translations of their originals which have been Severall never publish'd. But they made little or no improvement only have discover'd some new diseases particularly Smallpox & Measles, & mention some new remedies y^t^ produce of their Country. But in Anatomy no improvement could be expected since by y^e^ Laws of their Religion a person is reckoned to be defiled by touching a dead Body. At length carrying y^e^ knowledge of them into the Western parts about y^e^ 11th Century Academies and Universities were instituted in Italy & at Montpelier in France, only they contented themselves with reading y^e^ works of y^e^ Arabians — Thus y^e^ 12th Century by a decree from the Pope of Germany & Sicily y^e^ 2^d^ no person was to practice Physick who had not studied Anatomy and Montanus Grecer is handed down to us as having taught it so from y^e^ time of Galen i.e. for near 1200 Years, the Study of Anatomy so far grown making any progress but then it from the decline — y^e^ Greek Learning was lost & the true original improvements neglected, while y^e^ writings of the Arabians tho' very imperfect were substituted in their place — At length in y^e^ beginn. of y^e^ 16th Cent. was found an Original work compos'd by Melindanus abt. y^e^ year 1315. w^ch^ tho' imperfect in description & made in the dark, by an order of y^e^ Senate of Venice no Phys. was allowed to be taught by the Professors of Padua w^ch^ gave great abundance of Dammiat. Before y^e^ middle of the following Cent. i.e. from 1440. the art of Printing was discover'd & abt. y^e^ same time

Constantinople was taken by y.e Turks & learning agn.
wich & diffused over Europe by y.e learned men who fled
from y.e Slavery of y.e Turks & carr.d y.e original seeds of y.e
Sciences along w.th them into y.e West of Europe, so that
before y.e end of y.e 15.th Cent. we find several very Valuable
Compositions of Anatomy, parts & Uses of y.e Body and
Benedictus. — In y.e 16.th Century we find y.e Spirit
of improvem.t very lively exert.d new discoveries made &
we find y.e traces of some circumstances of wch there is
little to be found in y.e Ancients in Vesalius Anatomia
we find a descript.n of Vessels wch can only apply to the
Lymphatick System. The Speaks of y.e glandes Illeus
and Pancreas of y.e Serum, but y.e merit of these Authors
is much eclips'd by Vesalius — Eustachius — Fallopius —
Columbus — perhaps I may add Columbus who in a few
years improv'd y.e discript.n of y.e human Body more y.n
Anatomists had done before in former ages — Vesalius
in y.e 23.d in y.e 28.th year of his age was appointed Professor
Padua — he publish'd his Epitome of Anatomy & y.e
Six Large work, in both of which he follows an excellent
order, a most elegant discript.n of y.e parts of y.e human
body in a pure & nervous Stile — Vesalius is y.e first
who not Plato according to Haller, who gives names
to the muscles — Fallopius follow'd him and he more
particularly describes y.e body in y.e same order every
where endeavouring to correct, improve & amend the
works of Vesalius. In like manner Eustachius imitat=
Vesalius & Fallopius endeavours not only in words
but by Tables to describe y.e p.ts of y.e Body w.ch he does in a

a more simple & accurate manner y.t was done in the
Cabbage of Verulam. — We are now within 70 Years
of y.e compleate knowledge of the circulation of y.e Blood
by D.r Harvey. — Anatomical knowledge was now
more general in Europe — Fabricius Spigelius &
Casparius succeeded one another in y.e University of
Padua & Riolin who succeeded them was for many
years y.e common standard of Anatomy — how
great attention was paid to experiments by w.ch alone
we can attempt to disclose y.e mysteries of nature;
now we have descried y.e manner in w.ch y.e nourishment
is conveyd to the Body by Asellius, in y.e year 1622.
who happening to open some living animals observd
the Lacteals upon the Intestines & mesentary & attending
to y.e course of the Fluids found them directed constantly
in one way, in consequ.ce of certain resistances made
by Valves or Floodgates within them, and he at length
found y.t y.e colour of the Contents corresponded to
y.t in y.e Intestines & Stomach, wch y.t evidently served
to take in our nourishment, & as y.t matter in our
alimentary Canal is generally a mixt.e of water & oil
wch gives y.e appearance of Milk he gave them the
name of Lacteals, we find mention of these imperfectly
in Hippocrates, Erasistratus & Galen y.t did not understd.
y.e true use of them — The manner of y.e circulation thro'
the Body was found out by D.r Harvey M.D. to King
Charles y.e 1.st — He published a small tract de

Dodis et Sanguinis in wch he has proved ye Arteries, & Veins form a circulation in wch the Blood is moved wth constancy & rapidity: ye from the Heart is conveyd by ye Arteries into ye most distant pts, that the branches of these are joined to the Veins as when I join the fingers of my Hands so ye blood in ye Veins returns again to ye Heart. Thus if a ligature be thrown round an Artery the Vessels swells between ye ligature and the heart: but of the like is done before opening a Vein the Vein swells beyond the ligature, and if you divide an Artery and a Vein, in ye Artery ye blood is thrown from that side next to the Heart, while in the Vein it is thrown from the most distant part of it: and as the quantity evacuated in a given time is considerable it is evident ye these must be connected wth one another. This Doctrine, wch at once overturn all the former Systems, & plain'd a material pt of the Human Oeconomy, & laid the way for ye discovery of many important truths, did not fail to draw upon it'self many cumberlike opponents. At first they endeavoured to set aside his doctrine, but as soon as discovered every Evidence ye can be required, & not being able to invalidate the Truth of the System they endeavoured to shew ye he had it from some ancient Author, & so this is an useful Enquiry I shall enter upon it so far as appears useful. Two very learned Critics Vandenlinden & Almeloveen have labour'd to prove ye Hippocrates understood

circulation of the Blood — Hippocrates supposed y^e Blood motion is beyond all doubt — and compares y^e Body to a cle — but more particularly to examine the literary meaning his Expressions it appears perfectly evident he supposed Ebb & flow of blood in the same vessels w^ch he compares the motion of the sea — This comparing y^e Body to a circle y^e clearest proof of the contrary, as he only means that Oeconomy of the body is so unintelligible, that as in Circle we neither find beginning or end, so it is in the composition & Functions — Erasistratus seeing y^e when the Blood passed into the Arteries a fever was occasion'd, and he imagin'd that y^e Blood rush'd in because the Spirit went out wholly a disease was caus'd Herophilus again supposes that the right side of the Heart was to force y^e blood to all the parts of y^e Body, whilst the left side was employ'd in conveying the Spirits — Galen took out with observing ag^st Erasistratus & Herophilus y^t our Arteries in a sound state of y^e Body contain and transmit the Blood, This proof is deceitful, he says an Artery in view, tho it in two places, cuts out a piece & finds it fill'd w^th Blood. The discovery y^e Division of the aneurism into 2 species & obs. y^t in y^e false as well as the true aneurism y^e tunica is formed and owing to blood collected in the Arteries or effused from them he traces y^e arteries in many places w^th surprizing accuracy, he supposes y^t the Arteries and Veins communicated y^t y^e arterial He knew from having practis'd Arteriotomy discharge in a given time was a very great quantity of Blood

that the motion in them is rapid, by the Blood flows from the side nearest the heart — and knew y.t if a Ligature was thrown upon a member the veins swell beyond it — In describing the partition of the Heart he says y.t y. Septum has no holes, so y.t y. blood contain'd in the Arteries cannot pass thro' the Septum into them; & as a further proof of the Communication w.ch y. Lungs have by means of Vessels w.ch y. rest of y.e Body, he obs. y.t in Phthisis or Consumption where matter is collected, this descends into the Aorta and is hasted off by Urine. —

The next in the order of time are the Chinese Physicians if. that been accurately affirm'd by the first Europeans who travell'd there y.t the Chinese understood y.e circulation of the Blood, and a word w.ch literally expresses it, and that they were very attentive to the pulse. — Next we find mention of Servetus — Columbus — Aurantius — & Cesalpinus but I find nothing in them but what is copied from Galen — Cesalpinus indeed speaks of a circulation but entirely form'd on conjecture. The author it was by no means either constant or rapid but y.t when we were awake the Blood has by the Heart to the Arteries & in the time of sleep again returned by the Veins — Vesalius in the last Book of his Anatomy, upon the Subject of the Arteries of Animals he proves w.th Galen ag.st Erasistratus &c. that y.e arteries naturally contain blood, & he repeats y.e experim.t of tying and cutting out an intermediate piece, he next observes ag.st Galen y.t y. Arteries possess no inher.t power of dilating themselves, y.t in dilatation they are passive & not active or possess'd of a Vis insita as he supposed w.ch the powers lay

decisive experiment he cuts an Artery transversely w.th a knife and y.e motion instantly ceases beyond the Incision & least it might be supposed y.t y.e artery was deprived of its Energy, he joins the two parts again by a hollow Tube, & y.e motion is again restored even in y.e most distant part of y.e artery. He insists upon the rapid motion of y.e blood in y.e Artery and upon y.e great quan.ty that is evacuated in a given time when y.e Artery is wounded. — He goes even a Step further & asks by y.e power y.e arteries strike y.e finger: & he solves it justly, y.t y.e artery swells when the Heart contracts & y.e y.e contraction of y.e Heart & expulsion of y.e blood is y.e cause of y.e swelling, y.e contractions & dilatations being exactly synchronous. — He describes a very curious experiment w.ch has been supposed to be the Invention of D.r Hook, the obs.n y.t upon opening y.e Thorax of an animal the Lungs collapse; but upon inserting a Tube into the Trach.a Arteria & blowing in air, the free motion of y.e Heart was again restored, and contracted as before with evidence & y.e motion of the Arteries corresponding to it. — How I think it beyond all dispute that we are indebted to D.r Harvey for having explain.d the true motion of y.e blood, & that before him any circumstances relating to it are merely Hypothetical prejudices prevented these before him from seeing the full force of y.e experiments & I am doubtful if D.r Harvey has not more merit in seeing thro' the plausible Systems of Galen and others than if he had found it out by first making experiments upon the Subject. — We are at first sight pleas.d w.th y.e System of Galen the drawing in the air by y.e Lungs, the finding the Arteries empty & Heart divided by a partition not perforated readily lead us to suppose, y.t y.e one side is intended for y.e motion of y.e Blood & y.e other only for y.e motion of y.e Spirit —

Yesterday I gave you an acct. of y^e hist^y of Anatomy as far as to the discovery of y^e circulation of y^e Blood by D^r Harvey and I have endeavour'd to explain what has been known in former ages with regard to this. Notw^th standing the clear Evidence w^ch Harvey produc'd in proof of his opinion yet several years elaps'd before it was generally rec^d. amongst Anatomists. — within the space of 30 years from the date of Harveys publication we find very tolerable compends of Anatomy published adapted to the new method by Glyson Wharton &c. and several considerable discoveries distinguished this period the duct of y^e curious Gland we name y^e Pancreas was now discover'd. — Soon after a compleat System of Vessels were shewn by Bartholine & Rudbeck named vasa lactea Lymphatica from the color of their Contents. — Pecquet traces y^e Lacteals to the Thoracic Duct of w^ch only an obscure description had been before and y^e use of it unknown w^ch is to convey Chyle to the Mass of Blood. — Lower ventur'd to substitute y^e Blood of one animal for another, attempt^d a transfusion of it by force of y^e arteries of one animal pushing y^e blood into y^e vein of another, by means of a communicating Tube & in this way it was supposed many diseases might be cured — but y^e danger y^e attends y^e attempt & y^e remain^g taint being communicated to the new mass made it to be laid aside. —

With regard to authors the h^s of Books was soon greatly encreas'd & it will be better to divide them into 2 periods the one reaching to the End of the last Century the other reaching from the Beginning of this Cent. to the present time. — Many in the last Cent. was published in Italy as Pellini Galliard. Sanctor. &c

but the most celebrated is Marcell. Malpigh. who is perhaps
the first person who had accurate demonstration of the
Circulation by seeing the blood pass from y.e extremities
of y.e Arteries into the Veins without y.e interposition of any
Glandulous or other substance as was formerly supposed.
However he too frequently substitutes the Structure of other
Animals for the human, this article is very different & imperfect.
In Switzerland there seems to have been little improvement
in anatomy by dissections of y.e human Body, but Wepfer
made many Experiments on other Animals.
In France the System Vesalii was followed Duverni. Dion.
Vieuss. &c. wrote upon Anatomy but now later works are
substituted in their place. In Germany little effort
of Dissection has been of y.e human body, yet many learned
& useful works have appeared among em. But y.e Dutch
have made y.e most considerable advances in Anatomy the h.e
value of their works exceeding y.e of any other nation.
Vorhaving. Swammerdam. Vruck. Ruysch. &c. Bidloo &
Bartholin were supplanted by Diemerbroeck, Verheyen
was considered as y.e fittest for Beginners. Bidloo
explained y.e structure of y.e human body w.th excellent
Figures. Fred. Ruysch was celebrated for a Description of
several parts of w.ch no other Authors had any Idea.
The British Writers likewise improved the Anatomy of the body
considerably but less so by dissection than the Italian
and the Dutch several Authors shone conspicuously in the
knowledge of the Circulation as Glysson. Wharton, Highmore
Lower Ridley & particularly W.m Cowper have been considered as
knowing Anatomists. Cowpers work was an accurate of y.e muscles

under the Title of Anatomia reformata — in the descriptions of which he is highly Elegant. — With regard to the present Century in Italy we find the Ct. of anatomical enquiry revolving for some time till of late it is upon the Decline — The Chief works are those of Sanctorius — Valsalva, and Morgagni the last of whom merits our particular attention. In France the chief writer is Winslow, who is perhaps the first Author since the 16. Cent.y who considers the body in its true situation, This System is justly considerd as the most correct y.t we have as far as we can learn Anatomy by the art of Dissection. — We have works from Sicuta and w.ch I shall mention and very ingenious pieces, by Petit. Ferrein. Bertin & Dr Beaulieu. From the Germans we have an excellent compend by Heister on Anatomy. — A History of y.e Ligaments by Midwright. — The Anatomy of the Eye by Zinn. — of the nerves by Meikle. of the gravid Uterus by Ruler &c. &c. & to close the account of y.e Germans I must mention Dr. Haller who has improved Anatomy & Physiology more than any in the age we live in. In Holland we have valuable pieces by D.r Albinus who with y.e most indefatigable Industry has published some of the largest and most correct works y.t have appeared upon Anatomy. — But I proceed to mention more particularly such books as I imagine to be fittest for your perusal in order to attain a sufficient knowledge of the art. — It is evident y.t in Anatomy from mere description & figures we cannot acquire a sufficient knowledge of the for the practice of physic & Surgery, yet Books serve to prepare us for what we are demonstrated, to enable us to

judge what is new and recall to our memory what is demonstrated. — In the study of all Sciences it is best for Beginners to content themselves with a few Books, therefore I shall endeavour to point out to you what Books may be necessary to those who prosecute y.d study in general: and I shall endeavour to mention to you where we may find assistance in any Particular Enquiry in w.ch we may be engaged. — Perhaps previous to Anatomy, or y.e dissection of y.e Body, we sh.d endeavour to acquire some general Idea of the Subject, & for this purpose Theil is gen.y recommended but I wd. prefer Cheselden, as his Descriptions are short. The endeavours to explain them by Figures w.ch are tolerably well delineated —

The very accurate System of Winslows I wd. recommend as in it you will find y.e utmost attention paid not only to the shape, and so far as Dissection can possibly illustrate: if we find fault with him it is from his treating the part of the least importance w.th y.e same accuracy as those of the greatest. Being little acquainted w.th the arts of Malpighi & Ruysch he seldom ventures to explain the very minute parts of Anatomy

D.r Heister's compend of Anatomy I advise who endeavours to explain in a small veze the principal circumstances relative to each Organ. With the descriptions of Winslow we ought to peruse a System of Tables to endeavour to apply what Winslow himself intended: formerly the Tables of Vesalius were very generally studied; the character of it you

you are sufficiently acquainted w.th But when I spoke of it you rightly understood me to make allowance for the time in w.ch it appeard, his figures are very elegant and the situation of every part most beautifully shewn. — but nowadays instead of this System we prefer y.e more exact and simple System of Eustachius — But if we must study w.th this greater accuracy along w.th Eustachius we shd. connect the Anatomy of Bidloo, w.th the Plates of M.r Cowper w.ch are executed w.th a high degree of Elegance Likewise upon the Authority of the late Dr. Albinus I will venture to recommend a small Book wrote by my Father After we have made ourselves sufficiently acquainted with the Skeleton we ought to study the Cartilages and Ligaments and their Connexion and for this we have excellent assistance from Dr. Heabright whose work is as compleate as the Subject will admit of — and likewise Dr. Monro's Treatise of Wet bones. For the acquiring a competent knowledge of the muscles we have recourse to a very elegant work of Dr. Albinus — i.e. his Historia Musculorum, in it he refers to the Tables of Eustachius and others.

The Bones & Muscles as I observed formerly serve as y.e outline by w.ch we can examine and describe y.e other Organs We now have recourse therefore to Monro & the Tables of Eustachius & Bidloo for understanding y.e relative Situation of the parts. — We then consider the Body in a more extensive way as having a communication formed by means of the vascular and nervous systems: and considering y.e Heart as the prime mover, we wd. first study y.e Anatomy of that Organ & in the late very learnd Mons.r Senac we have ample assistance in his Treatise upon y.e Heart 2 Vols.o

1st The first Vol. is employ'd on the Anatomy of y.e heart and is rather more diffuse & prolix than is necessary, but he manages his Subject with much skill and address that leads one on insensibly both in the physiology & pathology We will then follow the course of the Blood and upon this Subject we will have the curiosity of looking into the original work of y.e D.r Harvey, who is extremely short but perfectly distinct Nothing is wanting in it but what a few later observations have supply'd as anatomical injections & the applic.n of y.e Microscope by w.ch we can see the Blood move in a continued stream from the Arteries into the Veins. — From the circulation we are led to y.e absorbent or imbibing system; and here besides consulting the original works of Bartholine & Rudbeck we find a condens.d y.e of absorbent vessels illustrated by Knuck & for the want of a more complete & extensive work I wou'd refer I publish.d in 1757. at Berlin of w.ch I have lodg'd several copies in the Library for your perusal. I wo. also now put into your hands a work publish.d by the late M.r Hewson where you have a tolerable full description of y.e Lymphatic System but on too small a scale — For the Study of the Nerves we have recourse to Eustachius & likewise some very accurate Tables by D.r Meikle present professor at Berlin, who shew'd me Tables of all y.e Nerves & it only remains that he sho.d compare them with nature to render them still more accurate but being too much engag'd in the practice of physic y.e work has never been publish'd. — Some of the Organs require more partic.r attention from y.e S.r of K.s entering into y.e Structure as the Eye, Ear &.c for this we have y.e excellent works of Duverney, Valsalva & Cauvalon. There is also one by Scarpa

on this Subject: and the justly admired Dr. Linn who did not live to do what he intended in the physiology of this Subject. After we have made ourselves sufficiently acquainted w.th the Anatomy of the Body in a sound state, certainly we should think it necessary to study the changes wh. are produced by Disease, & of late years we have a very excellent Treatise by Morgagni De Sedibus morborum and since wh. we have additional Observations of Dr. Vieussens. Morgagni's are too minute to be read or understood — Vieussens too superficial but the former fault is more remedied than the latter — To throw some light on the Functions of the human Body it is necessary to make some comparison between the human structure & wh. of Animals; & for this purpose we must first understand their natural history, to enable us to separate them into proper Classes, &c. you will find done in the Linnaean System of Quadrupeds I might refer to Buffon, for the dissections of large Animals I may refer you to Anatomy of Animals collected by Blasius and Valentini & for Insects & Worms and for an abstract to the purpose of physiology, as I find myself at a loss for a proper Author: I am under some necessity of recommending a very imperfect Copy many years ago published from notes taken from my Father under the Title of an Essay of Comparative Anatomy.

Surgery to wh. it is so intimately related and subservient this being only a piece of Dissection, performed on a living Animal — Observing the same order I did in Anatomy I must 1.st pitch upon some proper System & beyond all doubt Hunters is wh. best yet extant, there were an acct. of all that was done before his time, wh. the modern improvements & very tolerable Tables representing wh. Instruments & wh. method of Operating

only we are to remember y.t y.t art was then only emerging from a rude state, y.t Surgeons at that time treated wounds & sores too artfully, scarcely knowing more y.n what nature & suppur: and I may observe y.t my Father was one of the 1.st who first introduced into this Island the simple method of dressing an Surgery w.ch is now in common use, we used not look into a little sylabus & there I shew you 2. very excellent pieces the first by Platner his Institutiones Chirurgicæ & the other a short compend of the celebrated D.r Ludwicie w.ch he composed when he had consider'd Platner for some years as a sufficient guide & for these confining the number to the practice of physic one other work on this subject need be recommended y.n y.e of Platner, he is learned and judicious & this Book is wrote w.th Spirit and Elegance of Stile but before we can enter upon the practice of Surgery w.th Safety we've recourse to the works of later Surgeons & we have several excellent modern detached pieces as those of Le Dran, Puteau, &c. in this Island the works of Sharp, w.ch as far as they go are a most excellent compend of Surgery, there are also the works of Gooch, Warner, Pott, White, Bromfield, H. S. and one lately D.r W.m Hill. We have also many things relating to Surgery in the Medical Essays of this Place, and in the Memoirs of y.e French Academy

Lecture 5.th

As I propose that we shd. consider the Functions of the several parts of the human Body as well as their Structure & Jobs. the necessity we are under as well of Regimen, to prevent our ease & to give some Idea of y.e general œconomy of our body for without this the conclusions drawn from demonstrations cou.d not well be understood. — We distinguish y.e animal

By distinguishing or observing y.e whilst Animals in comon with vegetables live, grow, & in a certain degree feel, they y.e poss.s the further property of volition — They will & w.th out any external impulse perform certain actions w.ch duly con= sidered are found to be attended w.th some wise & useful conside= Hence we suppose y.t to the body is conjoin'd a principle superior to matter somewhat y.t acts and animates the whole The Body of the Animals consisting of solids and fluids, the former wearing down the latter dissipating & degenerating for the continuance of life we see then the necessity of a fresh supply — Hence animals are provided w.th Organs of sense, the possess.n of these, & whether from our being unable to conceive any further power in Animals or that they really possess it not, we observe nearly y.e same number in y.e wt.d of the Vegetable Kingdom: But in order y.t y.e Animal may reach to what it perceives & judges to be useful, we must next imagine y.t they are possess'd of a power of moving from place to place, for y.t are few Animals so happily situated as to live upon y.e surrounding Elements, for this purpose therefore y.e Body needs to be supported by a hard substance such as the Bone is, & in order to increase the surface of y.e Bones, & at same time to save us of y.e unnecessary load, you obs.e y.t y.e a Bone is divided it is hollow. — Nor is merely a hard, rigid, inflexible substance sufficient for the purposes of motion, but the whole must be divided into a N.o of pieces in order to render the motions ready and various; accordingly you view y.e human Skeleton consisting of a very great N.o of Bones. Next to prevent them from slipping off from one another, & at same time to allow them to play with ease, we find that the extremities of y.e Bones are tipped w.th a softer substance such as you are all acquainted with called Cartilage, or Gristle & the Surface of this is rendered slippery by Ligaments y.t are spread

hold out upon it, whilst further to prevent one Bone from sliding of from another, the extremities are inclosed in a membrane or purse which joins them together and wch we for that reason name Ligament, or if the seperation of the two pieces be attended with danger to life we find the neighbouring pts ordained glued together by Cartilages so in this way y. Sternum is connected to the Ribs, as also y. several pieces wch compose the trunk of the Body, and as the Cartilage is soft & slight there is no necessity for forming it hollow within, but it is solid throughout, thus we find the barrie of y. Body fit for being moved & to give it motion it only remains y. we conceive this is capable of contraction, to be stretched between the diffr Bones, & these as you all know are the Flesh of Animals divided into regular parcels, sealed from their contractile power or muscles. — That y. muscles may shorten readily we find y. y. are compos'd of a vast No of soft fibres that at the same time they may be kept of sufficient strength. — Hence y. necessity of enlarging the surface of y. Bones, in order to give room for y. attachment of y. muscles; nor is this alone sufft we find a further contrivance: the beginning of a muscle may be any where along y. surface or whole extent of y. Bone, but the termination must be near to the extremity of the Bone e.g. near y. joint of my Elbow, otherwise y. effect we have been in a great measure lost. and as there wo. not be room here for inserting all the soft fleshy fibres of y. muscles to these are connected y. sinews or what Anatomists call the tendons, wch being firmer y. y. muscle require less room for their insertion into the Bone: Just as if we meant to move a large log of wood & to employ several Men for that purpose

they are not endeavoured to lay hold of the wood w.th their hands but wd tye a rope to it ~~to~~ greater y.t a greater strength might come hereby together in y.e action. & in y.s manner are we to consider the Legam as more strong & not as professing y.t power of contraction w.ch is inherent in y.e red fibres of our Body: or y.t it happen that the tendon of a muscle passes over a hinge Joint, & y.t by performs a very large flexion to prevent y.e consequences y.t would arise from inserting y.e tendons at a considerable distance they are lyd down with leather as in y.e hands.

Now in consequence of our progressive motion we transport the Body from place to place and by y.e help of substances proper for nourishment, these we tear to pieces by y.e intervention of muscular power of y.e Jaws, and y.e internal parts of the mouth are Cancer & being still muscular, the fleshy fibres push the body downwards, till it is lodg.d in y.e receptacle of an animal - viz.y. Stomach. - In y.e Stomach y.e food undergoes from a variety of circumstances two principal changes, whilst it is dissolv.d it is at y.e same time taken by y.e constituents of y.e animal so as to be incorporated into y.e Body w.th safety, this Way is produced by a h.e of concurring circumstances, as the preparation before it is taken in, its further subdivision by the teeth, y.e mixture of various liquors, y.e warmth of many animals, y.e dissolving powers w.ch diffuse wide[n]ly profess - & join.d to all these a peristaltic motion or fermentation by w.ch y.e food is dissolv.d & assimilated; & as we find a long tube lead.g downwards from the stomach viz.y. y.e intestinal Canal compos.d of materials widely differing from those of the stomach we may conclude y.t y.e food is changed further in a muscular & rapid manner along this Tube, whilst by its length y.e surface is increas.d & nutritious juices given to y.e mouths of y.e vessels w.ch take the food into y.e Constitution; y.e useless parts being pushed

downwards by means of the like muscular force
however by laws y.e are original and intr. the action
examin.d whatever way y. irritation may happen to be applyd
If you are ready to circulate about the Lacteal vessels
without examin.g y.m by dissection, we might look also to
determine y.e parti.r manner of y.e Course & nightcercise
y.t every part of y.e Canal supplies a correspondent part of y.e
Body. y.t if y.e Stomach furnish Chyle to y.e head y.e next tract
of Intestines supply the Chest, the lower part y.e extremities &
y.e Belly, & in fact we find in some few Animals a division is
found somewhat of y.e sort, as some species of Worms in that
But in many y.e smaller branches run together to form
larger & at length they are all united in one Canal w.ch from
its running upwards thro' y.e Thorax before it terminates
is called y.e Thoracic Duct, w.ch runs mesne, being defended
by the ascending parts of the Thoracic viscera, it termin.s
at y.e joining of y.e principal veins of y.e arm & neck: the
Subclavian & Jugular Veins & there we find y.e Chyle
blended with y.e red blood, being found into a large
vein near y.e heart — how are we know y.t thro' y.e lacteals
y.e nourishment of animals is conveyd it evidently
follows y.t from y.e pt. in point of y.e Body there must be
passages leading to all others obtaining y.e lacteals
we must be led to discover y.e gen.l & constant motion of y.e
Blood — But before we wo. proceed to trace y.e passages
of y.e Circulation we wo. surely wish to be acquainted w.th
the general properties of the mass of Blood —
especially as y.e matter is of real importance in the
practice of physic — the general acct. given of it but
which of late years has been corrected in many particulars
is y.t y.e blood consists of globules, the Opinion is founded

on the opinions of Leeuwenhoeck a Dutch Writer of y^e^ last Century who improv'd y^e^ Microscope and employ'd it in a more extensive way y^n^ had been done before and his acc^t^ was more readily rec^d^ as several circumstances generally known, appear to coincide with it The general main in a Microscope appears to be of a red color and appears to be globular a common expression us'd for want of a better.- These Leeuwenhoeck tells us are compos'd of three more minute Globules the number to be six, That by a struggle of the Animal, a sudden action or convulsion of its muscles, they instantaneously loose y^e^ adhesion and assume y^e^ appearance of a Serum, may be went further & sayth and alledges that the Serum consists in like manner of globules divisible into 6. aqueous particles The sulphures y^t^ y^e^ is still a further descending Series of Globules..

Hippocrates. Boerhave Van Swieten, (Monro) that when they put a vessel of Blood in a moist Cellar y^e^ red color very soon was lost by y^e^ Globules melting down into a Serum and when a purgative medicine is given to a patient a quantity of a watery serous Liquor is discharg^d by the Intestines and the patient grows pale, as if the purgative had melted down y^e^ red globules into the Serum.

Now let us see how far the Facts or conclusions I have mention^d may be depended upon.

1^st^ That y^e^ red globular parts in our Blood is beyond all Doubt; y^e^ there may be melted down a broken is likewise certain; but after having very frequently view^d y^e^ Blood with Microscopes both in y^e^ circulation & out of it, & with glasses too possess^d of higher magnifying powers y^n^ Leeuwenhoeck I never could find any reason for supposing y^e^ y^e^ red parts

consist of a certain number of smaller globules, I have never found a single instance where a red globule broke down into a serous or colorless one; only I have seen an appearance which might have deceived one, that on turning the light strongly upon the Object, what appeard before of a red color appear more transparent & a glass of red wine and water will shew the same appearance by altering the position with regard to the Light — and what is much more to the purpose I dare venture to deny that any microscope can demonstrate Globules in the Serum, I do not deny but that it may be globular, but I maintain that they are too small to be seen by us, and it is extremely improbable to suppose that the colour of a Body shou. change merely by the separation of its parts without any thing being added or withdrawn from it — The color of a large glass containing red wine appears deeper than that of a small glass, but the color is equally intense in all the parts tho' unequally diffused. — But to make a more direct appeal to experiments, I have said the globules are not to be seen in the Serum, neither by condensing, agitating it, and tho' the red globules are broke down amongst water until they entirely disappear, they constantly retain their Colour, so that a certain size of the globules & red color have no necessary connexion, and there has been undoubtedly some mistake in the experiments of Boerh. & De Haen by adding too great a quantity of water and diluting the Serum have overlook'd the true appearance for at diff. times I have kept the blood of Animals 14. a 15. Months in a moist & warm place and the color still remained — The other Arg. will bear a very different interpretation can we imagine that 2 or 3 Gr. of Mercury or Jallap shall have the effect of breaking down

all y^e globules in the blood of a person, for we observe the same degree of pallidity is bro^t on by anything y^t relaxes or debilitates y^e body, as a piece of bad news &c. We suppose that a long continued course of purgatives shall alter the texture of y^e blood, by means of y^e effect they have on the constitution but this is a very diff^t case from the former. — The most diff^t circumstance, is to explain y^e change of color in the blood y^t is extravasated — but y^e difficulty is taken off by y^e supposition of red globules may be divided into very small parts still retaining y^e color, so y^t it may happen y^t they may be broke down into invisible parts and be readily reabsorbed as one of y^e serous parts. And in fact we see the blood y^t has still retained its color after extravasation as in y^e pile &c. We say therefore y^t the parts of our blood cannot be suddenly changed into each other & are in their nature essentially diff^t That of Serum cannot be converted into red blood — I do not mean to say, but this can only be effected by a repeated circulation, & there is no more affinity between these parts than there is between the nourishment of y^e body and y^e circulating red blood. — The general mass of blood consists chiefly of 3 visible parts 1. the red globular part as we shall call it for want of a name more expressive. — a second part resembles very much y^e urine of animals & we call that Serosity meaning y^t it differs from the liquor we usually call Serum in not containing a part y^t by heat, acid or spirits or acids coagulates. — The third part is coagulable w^ch is totally diff^t from y^e red part & is called y^e gluten or coagulable lymph. y^e coagulation of y^e blood is entirely owing to this. When blood is drawn if you receive it into a vessel w^th Water & agitate y^e Blood as it falls w^th a stick, y^e water will soon

of y.e red globules w.ch will be diffused & remain fluid in the water, while the coagulable part is left adhering to the stick like to the consistence of glue but softer.

Blood likewise contains likewise a quantity of matter or elastic air. — The general properties of the 3. visible parts we have — the red part is evidently the heaviest of the mass of things subsisting in the Serum, and oxygen has also probably obtained, in y.e coagulable part likewise y.e smaller part of y.e Clot of Blood of a much darker color than the upper: the specific of this part is found to vary in different animals — It may at first sight appear in general a round shape but not a spherical: I am formerly to allege y.t the globules were perfect spheres, but I am now plainly convinced of y.e contrary: my Friend Dr North who took his degree here 12 years ago, & who was present at our first lecture, first pointed this out to me. Indeed Swammerdam upon the heart y.e very accurate Author describes y.e globules of y.e Blood as being flat like a Lens or magnifying Glass & tells us that he examined them floating in water following him I was misled. But if Lowy be followed, who in y.e year 78. sent an account of y.e blood with Microscopes of a very high magnifying power to the Royal Society: & instead of water y.e Serosity of Blood or urine is employed, the globules are of a very different shape. Dr North soon after the publication of Lowy and the Instruments, had an opportunity of examining y.e Blood with him at Hadley: Only Lowy imagined y.t it was a prefocation in the globules w.ch North thinks owing to an imperfection in his Glass & y.t y.e middle substance is filled up — Mr Hewson having given us a just description of y.e red globules only perhaps y.e comparison of 10 to 7 shillings is not so accurate & y.e more resembles the shape of a single Gloucester Cheese, or we may compare

gluten is kept in a fluid by the heat & more especially by the motion of animals. This not sufficient to prevent it from affecting it last in the common manner, i.e. it coagulates does it however coagulate without being exposed to the air within y. vessels of animals for if you tye a vessel in two places, keep the intermediate piece for some hours and y. then cut it, you will find nearly the same separation of parts y. happens when y. blood is exposed to the air. ——— we may know from being acquainted with the texture of the blood some general ideas of the purposes which the several parts serve in the oeconomy of animals. The red particles give a certain momentum to the mass: and perhaps the very difficulty with which they pass thro' y. extremities, and the friction they thereby occasion may have a more extensive effect than we are aware of. The serosity serves to dilute the mass, & especially to preserve the figure of y. red globules, and as it wo. appear by a certain degree of repulsion that there is between them too hard to prevent them from uniting, for when the globules seem to be in contact they readily separate again and we can't say but a small quantity of y. fluid may be interposed, but when they are put in water, y. readily mix with it. The Lymph. or Coagulable part gives a certain body to the mass prevent y. ready effusion of the serum into the several Cavities of the Body, such as occurs in the Dropsy &c. & like a mucilage of Gum Arabic, it keeps up the separation of the red part and this part is also best fitted for y. nourishment of the Body ———

We may likewise understand several appearances of

happen in the bodies of animals: we find sometimes
that have been named hydropsi, within the heart & larger
vessels; now can't we admit y.e y.e Lymphi part of our
can be coagulated without the access of Air, we cannot
understand these — The Coagulation or Coagulum in general
also seem. Tho we may conceive on certain occasions the
parts may run together as in fainting fits, and y.e upon
the body being restored to its vigor y.e action of the Heart may
make the clot beginning to form; but if the person continues
ing in this Languid State, and the powers of life, are
not sufficient to seperate the parts, the ground work of a
Polypus may be laid. We can also understand wt happens
afterwards, the mouths of the Vessels do not continue to pour
out their blood violently and the Coagulation form'd in
the mouths of the Vessels contributes very considerably
to this, while at y.e same time other Circumstances
occur —. Also with regard to the Buff coat upon the
Blood in Inflammatory Diseases, if we follow the System
of Newton's we find no proper manner of explaining it,
but here y.e Vis new principle form'd & the appearance may
happen tho' the change upon the Blood be extremely slight,
may caused y.e present the sudden coagulation, rendering
the principles more apparent, y.e red globules as being
heavier subsiding, & y.e Lymphatic appearing more pure
from y.e surface forming y.e buff Coat tho' in several
cases there may be a certain degree of a morbid
appearance, as we appear from the difference in the
Colour —

Lecture 5th

In our last meeting I began to explain y.e gen.l structure & economy of y.e body and after shewing y.e necessity of a constant supply of nourishm.t for y.e contin.ce of life I proceeded to give you an acct. of y.e blood as seems necessary to be known for the purposes of physiology, and in its practice. — in prosecuting this Topic we find it is conveyed w.th y.e blood from y.e termination of y.e thoracic Duct downwards to the heart in a large vein formed by the meeting of several others and w.ch is named by Anatomists y.e vena Cava inferior: & y.e first part of the V.e w.ch we meet with standing projected from y.e rest, like the bar of a riverruched from the form is named y.e Sinus or Auricle likewise perceive another large cavity w.ch Anatomists have called the Belly, venter, or Ventricle of the heart from y.e Ventricle we find a passage leading out, & we readily conceive that this must be divided into y.e diff.t parts of y.e Body from an erroneous Idea entertained long since by Hippocrates & w.ch was widely rec.d for many ages, that it was called Artery from y.e supposition of its containing Air not Blood, but as y.e blood descends from y.e vena cava into y.e Auricle, & there is a large passage for communication to the Ventricle, & no other outlet for it, we conclude y.e Artery receives y.e blood; & you will observe y.e y.e auricle & valves serving to direct the course of y.e Blood surrounding the Communication betw.n y.e Auricle and Ventricle, w.ch from its having three principal attachm.ts is called the three pointed Valve & y.e it very readily opens from y.e Auricle but if you attempt to do it from y.e Ventricle you find a resistance, again if we examine y.e mouth of the Artery

fibrous membranes y.t have y.e same effect as the
blood vessels and differing only in their shape w.ch is that the artery
is cylindric. And at the same time we perceive y.t the
heart is actively organ'd y.t it is muscular and possesses therefore
the power of contraction, and if we suppose y.e blood to
fill it, and the fibres of y.e heart to be shortened, it is evident
y.t the blood will be thrown from the heart w.th very considerable
force: so the motion does not depend upon y.e vis a tergo
of the Chyle or blood pushing forward the Blood; but it
receives a new force from y.e heart, so y.t in a general
way but more particularly we shall find y.e y.e circulation
in w.ch y.e blood moves is double when we consider it more
extensive than we at first imagine, for having traced it
thro' the vena cava ascendens into the Auricle thence into
the Ventricle, & then into an artery, this Artery does not
supply the whole of our body, y.t it is so far from being y.e case
y.t it is entirely spent upon the Lungs, dividing into two
great branches one sent to each side of the Chest; this
is called the pulmonary artery and is entirely spent on
the Blood within the Substance of y.e Lungs, dividing into very
minute parts. The whole of the Chyle then and the blood
passing into the Lungs by the pulmonary artery we
also expect to find corresponding vessels w.ch the return
it to the rest of y.e Body y.t y.e distribution may be general
accordingly if you perceive the pulmonary veins w.ch return
from the Lungs y.e whole of the Blood to the heart again
you in consequence of y.e division of y.e Vessels within y.e Lungs
a new impulse is reg.d the sinus to strike the Blood rec.d
from y.e heart being left upon the Lungs, so the vessels
terminate in another Auricle w.ch from its situation

call the posterior, while the former is called y^e^ anterior
ventricle: at y^e^ bottom of y^e^ pericardium we find another cavity of
posterior or left ventricle; and from y^e^ proceeds another very
great Artery w^ch^ supplies all the rest of the Body, and to w^ch^
Anatomists have given y^e^ name of Aorta, w^ch^ in like manner
has 3 pair of valves, is muscular & has also a very considerable
degree of Elasticity: how we find y^e^ y^e^ Aorta is very generally
dispersed over the whole Body, But as we are still better in
viewing the whole course of y^e^ Aorta, it will be better to keep
a view of the principal branches into w^ch^ y^e^ aorta divides
and first I shall shew you an Artery in the Kidney injected
with wax, and the flesh consumed by an acid: it divides into
a vast number of exceedingly minute pt^s^ and the Artery is
always attended w^th^ a corresponding vein, as you will
observe if y^e^ bulk of y^e^ pt^s^ of the Body, and also the whole is m^ch^
owing to the division of the blood vessels. Let us next take
a view of the membranous viscera as the Stomach, or Intestines
which form a very beautiful net work very often you
will have the pieces of Intestines w^ch^ I have spread out &
dry'd, after injecting them to be so much painting, and
likewise we take a view of y^e^ immediate coat of y^e^ Intestines
as there with the separations of them which w^ch^ appear to be
very small now appears to be thicker than others y^e^ are
a great deal smaller, and w^ch^ the whole immediate coat
has a very uniform red color in consequence of y^e^ injecting of
y^e^ vessels, so that the parts are only to be distinguished
by applying the Microscope & reflection on the smallness
of the globules y^t^ are seen in the blood, y^t^ we are obliged
to every^y^ my highest magnifiers to distinguish them
chiefly: y^e^ extreme vessels must be very small for there

Capillaries fill y^e ultimate branches of y^e Arteries, and
have been a change in the shape in some degree while the
blood passed from the Artery to the corresponding vein
we find it in almost every part of the Body y^e color is chang'd
by an injection as the flesh, the skin of y^e head &c.

We next enquire into y^e communication between y^e Arteries &
Veins, by making experiments after death, I have thrown
an Injection into the Temporal Artery, & made it return by
the Temporal Vein; so having y^e veins from y^e beginning
to the heart we can led back to the place from w^ch we about
contributing the circulation in w^ch y^e blood is moved.

After determining y^e course of the blood, we can next prove
w^t the motion in this course is constant & rapid, a very few
simple experiments are suff^t to satisfy us of this. We obs.
the constant labour of the heart by feeling the pulse, w^ch
strikes y^e finger only because y^e blood is drove violently
into the Aorta; and if we attend to the size & p^ce of time y^e
Organ beats, it will be very evident y^t a great q^y of blood
is thrown out in a short space of time, and satisfied
with ascertaining this fact, we easily go to experiment. we observe
that from a Vein wounded, and still more from an Artery
a very great quant^y of Blood is soon discharged; and we
find y^t a wound in a small artery is sufficient to kill
an animal and hence we know y^t y^e blood is conveyed
constantly from the heart to y^e place wounded
and a curious experiment first made by Dr. Lower, of
transfusing y^e blood from one animal into another
is also in proof of this, and by the application of the
Microscope we can see the blood passing in a continued
uninterrupted & rapid stream into y^e beginn. of y^e veins

Next if we attend to the motion of the Blood as described by G.
in the human body, and similar animals we find y.t there
are 2 Circles in w.ch the blood is moved, y.t a smaller circle is
described thro' the Lungs and a larger thro' the rest of y.e body
or if we attend to the parts necessary to carry on a circulation
viz. the Auricle, Ventricle and Artery and Vein and if we
chiefly y.e name of Heart to denote an organ capable of moving
the blood in a circulation then an Artery and vein is
called an Heart two hearts one employed for pushing the
blood thro' y.e Lungs w.ch were a variety of useful purposes
in the Oeconomy, continually throwing out a noxious
matter with the Air & receiving from it something nec=
essary to life, also y.e picture of w.ch y.e blood in its course
thro' y.e Lungs is subjected, in this alternate course of
inspiration and expiration must have a considerable
effect, in some other animals y.e process is more simple
as in a frog, where the Lungs only receive a small branch
from y.e aorta & there is but one Auricle & one Ventricle
Next let us attend to the use of y.e 2 parts forming each
circulation, here I shew you the two hearts separate from
each other & fill'd w.th wax, & then y.e flesh consumed, and
so little is the connexion y.t in order to keep them together
I was obliged to cut a hole in the partition between the
Ventricles & tie them together — Next let us consider y.e
Situation of each p.t — We may consider the Vein as
a tube entirely serving to convey y.e chyle and y.e blood to
the Heart without paying much regard to its living powers
w.ch perhaps are not very sensibly exerted, I do not say
y.t they are not possessed of living powers, but we may

very much overlook these, and may chiefly consider them as tubes y.t serve to conduct the fluid: they Artery may be considered in like manner, in y.e first place as serving to convey y.e blood as a tube from the heart to y.e most distant extremities & dispersing it in a proper manner but besides we find in y.e arteries very considerable activity, for as soon as y.e impulse from the heart ceases, they draw themselves together, in a certain degree, owing, as it wo. appear to the Elasticity they possess; but upon attending more particularly to the structure of y.e body & of y.e arteries, we find that they likewise possess in a considerable degree, y.e living or contractile power giving new impulse & force, to the blood in its course and a great force must evidently be employ.d to drive the blood into capillaries so much divided and expos.d to so many causes of resistance; to overcome these we see the necessity of so strong & living muscular & of their being possess.d of a great number of muscular fibres, y.e only difficulty y.t occurs here is to say what purpose y.e Auricle serves? but a slight reflection shews y.t it serves a double purpose, first as a receptacle to the blood returning by the veins, whilst y.e Auricle is in action, and without this whilst y.e ventricle was contracting y.e blood must have been stopp.d in y.e veins, & therefore y.e arteries must have attenuable, swell.d, and this wo. have had a very bad effect upon this tender beginning; so whilst y.e Ventricle is in action y.e auricle receives as much blood as passes in from y.e veins, & as soon as y.e Ventricle ceases from action y.e auricle y.t was filled with blood is empty.d into it; and the sudden impulse w.ch y.e Auricle empty.d itself serves as a fresh stimulus to y.e ventricle to renew its impulse with due force & to invitate & stimulate it to such action: and if we conceive rightly how y.e parts in one of our hearts dissected

we easily can understand how both operate for the same
thing is done at y.e same time in both: we wo. suppose wo
reasoning upon it, y.t one heart only receiv.d what the other has
transmitted, y.t they therefore wo. act together: but we also see
other reasons for their being Synchronous, for one cannot
contract without affecting the other, the Fibres of y.e Septum
between them being in common to both so let us first suppose
the two Auricles to act in action & not the two Ventricles in action
the arteries must act at the same time w.th y.e Auricles, for let us
suppose y.t all y.e parts of y.e circulating System are moderately
distended with blood & y.t both Auricles & both ventricles were
likewise full, w.ch is y.e most unfavorable supposition, & yet as
the Ventricles are much thicker y.n the Auricles & consequ.tly much
stronger, and as all are stimulated to act at the same instant
the Ventricles must act first and throw y.e blood into the
Arteries, whilst the Ventricle is acting y.e Auricle is prevented
from emptying itself, so upon the Ventricles ceasing the
y.e Auricles are still full & at the same time the Arteries are now
more distended, so upon the Ventricles being at rest, y.e blood
will enter them from y.e Auricles, at the same time y.e the
Arteries push on their Contents and thus y.e Auricles &
Arteries are Synchronous in their Action, but act at a time
diff.t from the Motion of y.e Ventricles, now whilst we attend
to this Explanation we perceive a reason why the Arteries
heat & y.e veins want pulsation, for the Blood is drove from
the ventricle of the heart with a sudden violence into the
Artery and tho' all the Branches are wider than the Trunk
yet y.e Quant.y of blood to be kept in motion is so great and
the action of the Heart so quick that a portion of the Blood
remains in the Trunks of y.e Arteries greater than what

vac in them before, dilating them and also forcing them to change their place, in consequence of which circumstance the fingers receive the stroke a great way from the heart, the force is however in a great measure lost before it reaches the most distant Extremities, hence the blood, whose motion influenced by the hearts action causes, & whose action & pulsation is less considerable moves in an almost uniform stream one way it passes into the Veins, & as this is a circumstance in consequence of the Interposition of the Muscles, they can make an alternate stop of the motion, it appears nearly uniform except it be in a small part of the Vena Cava near to the heart, with regard to the regularity of this motion as the causes of it &c. it wd. be improper to enter upon the Subject; as yet to consider fully the laws of this Circulation. It evidently serves to convert the Chyle into proper nourishment as for changing it into blood, in milk & Chyle as well as blood there is a coagulable part & they contain Globules but they are smaller than those in the blood are oily & certainly of a round figure, and more inflammable than the other parts, whence we are uncertain with regard to the Inflammability of the red Globules of the blood; and that there is a necessity for the continual motion of the Machine for preserving a due mixture of the Animal fluid when it is form'd for as I have observed the Coagulation can take place without the Air having access. By this means too the putrefaction to which all animal Bodies are prone is in various ways prevented: for by the motion the putrescent matter is thrown off just as the putrid matter is thrown off from the sea by means of the Tides, also the food is gradually fitted to the several

Organs of the Body, to supply the constant waste of the
one solids & fluids; while at the same time the solided parts
of our Solids & the thinner part of our fluids are
exhaled, & new liquors prepared or secreted for a variety of purposes
and perhaps the connexion is maintained between the living
principle & y.e body, by a process of that nature: further the
Circulation serves for the healing of wounds &c for y.e repairing
y.e loss of substance; and many other curious processes depend
upon it, as the heat of animals w.ch is evidently connected w.th
the degree of the Circulation.

Lecture 6.th

At our last meeting Saturday we endeavoured to shew y.e Use
of y.e Blood in the animal; and we found that they all carried
constantly & rapidly in a circle, when we attended more particularly
to the parts of it we found y.t y.e Blood is thrown out from
the heart & after a time upon it reaches y.e same place
again. — We then explained y.e effect of each part of y.e Circulation
& when y.t is understood we easily comprehend y.e manner
in w.ch the two hearts separate & y.e effect of each upon the
Arteries & veins. — In describing y.e genral course of y.e
Blood it was not necessary to mention y.e Arteries & Veins
further y.n in the most genral way. — But when we reflect
on what we have seen and know of the texture of y.e blood,
that there are parts discoverable by y.e microscope in it
particles of several sizes, whilst nothing of y.e sort can be
shewn in y.e Serum or in y.e lymph; & if at y.e same time
you consider y.e very great diff.ce of Color w.ch is shewn even
in the outer parts of the Body, and still more when diseased
we may conclude y.t there are Arteries w.ch exclude the red

Globules, & y.ᵗ all the terminations of y.ᵉ Arteries don't
obtain the gen.ˡ rule, but y.ᵗ there are many of them w.ᶜʰ receive
y.ᵉ Lymph as they receive only, & w.ᶜʰ we have seen to sympathize
may y.ᵗ by some of them even y.ᵉ coagulable part of y.ᵉ Blood
may be excluded & y.ᵉ watery part only admitted. — But
besides the Circulation or transmission of Arteries you must
must suppose y.ᵗ y.ᵉ are others intended for y.ᵉ separation of
part from y.ᵉ blood & y.ᵗ are thrown out of y.ᵉ course of circulation
Seen without this is the Tongue & the Eye to be kept moist
or any Change to fall within y.ᵉ Thorax, or our Joints to move
without very considerable friction? We ought to conceive
y.ᵗ there must be returning branches w.ᶜʰ make a respiration
& with open mouth discharge fluids into y.ᵉ diff.ᵗ Cavities
& in proportion to the gen.ˡ Secretion there must be an
Absorption, & the Fluids must be in a constant state of
Change; for without this they wᵈ be continually collecting
& the whole Cavities of y.ᵉ Body wᵈ become dropsical; and
by fermenting by y.ᵉ heat of our Body they wᵈ likewise
run into putrefaction so must suppose y.ᵗ they are every
where imbibing; or absorbent Vessels corresponding w.ᵗʰ
the returning ones; & surely without any applic.ⁿ to dispute
we wᵈ conclude y.ᵉ absorbent vessels must be veins, in w.ᶜʰ
y.ᵉ force of the blood is greatly broke, from y.ᵉ almost infinite
number of minute branches into w.ᶜʰ y.ᵉ Arteries are divided
& in fact we find y.ᵗ if an Artery is tied in an Artery ab
y.ᵉ Carot.ᵈ one, & an other into y.ᵉ corresp.ᵈ vein the
blood will ascend 10 times higher in the Artery y.ᵗ it does
in the Vein, w.ᵗʰ all y.ᵗ it appears to have lost $\frac{9}{10}$ of it's force
But before we can speak more particularly concerning y.ᵉ Absorb.ᵗˢ
it is necessary to open a new Set. that have been
Veins w.ᶜʰ are known to all, w.ᶜʰ shine thro' the Skin and

ve of a red Color. These are found in Animals immediately
vessels evidently veins, as they swell beyond the pressure
& subside more to that but instead of containing the red parts
of the Blood in its natural state, they contain a pellucid
Ligeon like to the Lymph of the Blood when the red globules
are separated from it, so they are termed Lymphatic Veins
and as they are found to be crowded with floodgates, even
where these are wanting in the red veins they accompany them,
they are generally termed the valvula. Lymphatic vessels:
so that there are two kinds of veins corresponding with the arteries.
And we trace the course of the valvula. Lymphatic Veins
upwards we find they terminate in the Thoracic Duct
along with the Lacteal Veins. - and these veins in their
Course pass thro' small glands or kernels which we may
distinguish under the Skin in many places as in the
Groin & in the Neck; I need not at present be particular
in explaining the Structure of the gland it is sufficient
that you know the Lymphatic vessels pass into one side
of them, & come out at the other. - Now that we are acquainted
with the existence of two kinds of veins, & have spoke in
a general way of the termination of the Arteries let us next
trace these valv. Lymphatics from their beginning. we must
have recourse here to observations made upon the Animal
upon their larger Branches, to the effects of diseases, or
of Medicines, for their minute beginnings altogether escape
our observation, & as the Lymph. vessels don't contain
Gl. Rubra they are to be distinguished by the microscope
we are obliged to many indirect means for ascertaining
their first beginnings and tho' these are Lymph. & Serous
Arteries, we in like manner run none of them because
these fluids are without Globules that are not to be

extinguish'd by the Glass. — If you look into the (56.)
Systematic writers, y.e universal Doctrine is y.t y.e veins
generally known, not only retain y.e red Col.r of y.e Blood to the
Heart, but likewise y.t they retain y.e colourless Fluide, w.ch
it is supposed they exude in by their minute branches
& mixd w.th y.e Blood in its course, whilst y.e valvular
Lymphatic veins are supposed to be the continuation of
the Serous or y.e Lymph.c Arteries. — But instead of
such a supposition I shall hereafter substitute another
explanat.n w.ch I apprehend will appear at first sight more
probable; & the certainty of w.ch I shall endeavour to
establish from a variety of circumstances. — But it will
appear more consistent w.th y.e simplicity w.ch obtains in y.e
works of nature to imagine y.t as the Arteries divide into
red & colourless Branches y.e veins w.ch we know who.ever
with Blood, for circulating y.e thinner parts of y.e Blood as
well as y.e red globules; & y.t as a red Artery ramifies into
a red & colourless termination, a red vein is likewise
form'd of red and colourless beginn.gs. whilst y.e evaporated
humour, for the purposes hinted at, are suck'd in by veins,
found to be colourless, & by y.e valvular Lymphatics
I omit this likewise more consistent w.th Analogy, w.ch shou
suppose y.e Lacteal Vessels, w.ch we find always accom
pany y.e red veins with the corresp.d Arteries of the
Intestines. But I shall afterwards mention a variety of
other Circumstances all concurring in proof of y.e former,
from attending to y.e structure of these vessels parti.r
to the number of valves w.ch w.ch they are every where crowd
in the deepest parts of y.e body as well as in y.e superficial
& muscular: and when y.e valves are wanting in the red
Veins; for tho' I mention the Valves in the Veins

ther considering y^e cause of y^e Circulation there are
none to be found in the 3 great Cavities of y^e Head, Thorax &
Abdomen. — From observations made upon them after y^e
Circulation of y^e Blood is interrupted from various experiments
w^ch I have made with regard to them, since I had occasion to
consider y^e Subject in this light — and from observing
y^e effect w^ch acrid medicines and y^e matter of Diseases
have upon the Body & from various other considerations we are
led to y^e same Conclusion; and from y^e whole I shall prove
y^t while y^e red veins serve merely for Circulation y^e valvular
Lymph^cs serve merely for the purpose of absorption, & there is
so far from being reason to suppose y^t either performs
double office, y^t I think the Contrary may be clearly
demonstrated I admit of y^e same division of y^e arteries
as the Systematic Writers have established, viz. y^t arising
branches are sent off & y^t they are divided into colour'd &
colourless ones: but instead of admitting that y^e red veins
receive y^e absorbent vessels, & y^t y^e various Juices from the
Valvular Lymph^cs; I suppose y^t as both y^e colour'd and
colourless ones come from the red artery y^t both serve to form
the red veins: whilst y^e valvular Lymph^cs are not continued
from either but begin with open mouths and take up a
fluid diffused into Cavity. — Having now seen y^e necessity
of Secretion & its absorption corresponding. — Having
endeavoured to determine the Vessels by w^ch y^e last Office
is performed we return to consider more particularly y^e
manner & of the purposes of Secretion.

You certainly will suppose, what is found to be true
in part y^t in many places y^e arteries lay y^e most simple
absorbents, serve as thinner fluids merely to
lubricate & prevent y^e connection of neighbouring

ato: or as we find y.e a humor is perpetually exuding
from y.e Skin, and from y.e Cavity of our Lungs, we shou.d
imagine y.t fluids are discharg.d in a similar way into
the deeper Cavities. But lest I shou.d y.e simple manner in w.ch y.e
mosst is perform.d, there must be wanting in particular
places, certain percurrent Organs in very g.t q.ties. Whea
there is not meerly a seperation of y.e th.t of y.e blood from
each other, but a change produc.d upon them, thus for
example Gall or Bile is made for digestion y.t y.e sto.
be pour.d in near to the Stomach, the mix.d w.th y.e blood
before it descend to the y.e trunk of y.e Intestinal Canal
hence the necessity in y.e 1.st place y.t there shou.d be a y.t=
e Organization or convolution of y.e vessels in ord.r to procure
y.e necessary change & y.t there shou.d be connected together to
send out the Organs for its proper destination & while there
are seeming vessels of y.e most simple kind, called exhalant
vessels we shou.d imagine y.t like to y.e heart to perform its
ment of y.e Child, so shou.d be similar ones within y.e Body
& these from their shape are nam.d glandes or when
large-aggregated glandular viscera, or a Bowel sewing
to perform a Secretion as y.e Skin. - and in ord.r to convey
y.e secreted Organs to it proper place we find vessels
from y.e gland a Duct or Canal as from y.e Pancreas,
w.ch form it collecting from a h.e of Boanches into a
trunk, from y.e fluids flowing into them from y.e most
minute beginn.s y.t way towards the larger trunks,
resembles a vein. - That y.e Glandes modify y.e fluids
in a certain way we shall prove afterwards & reflecting
y.t by the general circulation, y.e nourish.t is chang.d into
red blood we may suppose y.t y.e undergoes similar

and still further changes in y.e Glands: but w.th regard
to y.e communication which y.e Intestines have w.th y.e glands, there
is not yet a single experiment w.ch explains their structure;
I shall therefore in an after part of my course endeavour
to explain to you y.e structure of y.e most of y.e glands of the
Body. By means of a glandular structure, we find a
variety of useful purposes answ.d: at present it may seem
very unnecessary to induce them to gen.l heads, & I shall
only point out a few of them. — Besides many lubricat.g
y.e parts, and allow.g y.e motions to be performed w.th ease
there are two glandulæ viscera w.ch are connected w.th y.e
Alimentary Canal; their are two glands w.ch separate
Spittle or Saliva to the Mouth, & we find y.e pancreas
pouring a liquor into y.e Cavity of y.e Intestines, and
along with this y.e bile entering, & all these fluids are
mixed with y.e nourishment we take in, y.t it may be made
into y.e Constitution w.th safety; & accordingly find y.t all animals
Stomach into w.ch their nourishm.t is first put. A proceeding
a step as we find y.e 4 animal fluids are mixed w.th y.e nour.g
ishm.t & y.t they are of Essential import.ce to it, so we shall
find y.t y.e nutritious fluid is chiefly for y.e purposes of
y.e new.s &c by a secretion performed by y.e Intestines & not by
the veins to perceive still the main important offices, to
many it appears very evident & it is probable in a certain
degree, y.t y.e communication, by a similar process is
maintained between y.e mind & body of Animals; as y.e the
Brain & y.e nerves supply all y.e glands before mentioned.
& at y.e same time it seems to be evident chiefly by or
Secretion, y.t animals are enabled to continue their
Species. — To insist upon y.e new.s Organs would lead us too
much from our present purpose, but there is one fact

Began wt you to know viz. the Brain & y. parts
wch proceed from it, by means of wch we receive impressions
& are render'd sensible of Injury done to the Body, have
power to give y. muscles their proper movements. From
dissecting y. Brain, the leading circumstance we find
We find upon y. surface of it a vascular dark colour'd
substance, from its situation named cortical or external
y. Bark as it were or outer cover of y. Brain: & from its
colour resembling ashes it has been call'd the Cortical
Dimensions part of y. Brain: cutting deeper we find
closely connected wt it a white matter, wch from its
softness has been call'd Medullar, tho' it is in reality
harder y. y. Cortical Substance, when we attend to this
medullary part of y. Brain wt y. naked Eye & more
especially with a Glass, we discover y. it is compos'd
of threads laid parallel to each other, & y. y. number
of them is almost infinite: if we cut still deeper we
perceive coming off from y. undr pt. of y. Brain includ
-ed in y. term both y. Cerebrum & y. hr pt. call'd Cerebellum
threads call'd nerves, the largest of wch pass down y.
Bones wch support y. trunk of y. Body inclos'd in
y. Spine are y. name of Spinal marrow, from this
smaller nerves are sent off in its progress. Towards the
end of it we find an appearance like unto y. hairs hang-
-ing from y. tail of a Horse; & therefore nam'd Cauda Equina
& upon examining this by dissection we find y. y. nerves
continue fibrous just as they began, & y. we may divide
them into small parts almost without end, or at least so
far as our observation goes. The Brain itself has a
vascular membrane wch many numerous vessels closely

adhering to y^e Cortical Substance of the Brain, &
sending Branches every where into it; y^e Anatomists
have call'd y^e pia mater, no matter for y^e meaning of y^e name
This same membrane we find continued over y^e nerves:
Upon the Brain its office has been suppos'd very important
in assisting y^e functions of y^e nerves and Brain, & upon
leaving the nerves beyond y^e the cavity of y^e head & backbone
we find y^t y^e membrane performs similar offices and its
importance is perhaps even much greater y^n has been
generally supposed. Besides y^e substance we
find another w^ch closely connects the bones in the head
& has no connexion w^th y^e Brain, for a Person is intitled
y^e Author have nam'd y^e dura mater; it is a membrane
of a much harder Consist^ce y^n y^e other & is extremely tough:
But tho' upon examining y^e head y^e membrane appear rather
to belong to the Bone y^n to y^e brain, & to cover as a cover to
the Brain, yet upon prosecuting the nerves, we find this
very where inclosing them, & giving them a very great degree of
toughness & their strength is entirely owing to y^e dura mater
being continued, or to a substance like it; y^t we may con-
sider it as the same. The y^e Power of giving Sensation
& motion belong to y^e nerves; for if you divide the nerve
belonging to any part it instantly loses all feeling, &
y^n altho' y^e Circulation be continued rapid & free. Experiments
of y^e kind I have made upon frogs when cutting y^e nerve
or burning it w^th a hot Iron, without y^e knowledge of feeling
it; & in like manner it loses all power of moving y^e part.
When we now view y^e principal Circumstances, I have
mention'd that in proportion to y^e waste y^t is made in
the Body as y^e discharges from y^e Skin, Lungs & Kidneys

structure of such vessels by y^e heart & Brain influencing each other continue a motion w^ch encreasing vigor; we will find it difficult to ascertain y^e end of Life, & must learn y^e y^e duration of animals is to be limited by y^e primum Mobile but the accidents to w^ch all animals are subject & w^ch must in time hurt & destroy y^e functions as well as the Beauty of y^e machine render it necessary, y^t they should have y^e power of propagating their Species, so far w^ch regard to the general Idea & leading circumstances in y^e Structure & Oeconomy of Animals as I thought must lay to a more particular examination of particular parts

Lecture 7^th

In y^e human family given I shall begin with y^e Bones these in many Instances, as in y^e head & Trunk were for y^e defence of y^e softer Organs; & very often they were for their attachment & support: & without know^g y^e exact shape of y^e w^ch bones, and y^e motions they are capable of being made to perform, we surely can have no just Idea of y^e muscles &c. I will upon y^e whole follow a small book published by my Father as a Syst: but I shall take y^e liberty of alter^g as may seem necessary to differ from it, particularly with regard to y^e conclusions drawn from y^e structure &c. of y^e w^ch parts, the first part of y^e Book treats of y^e Bones & basis of y^e body in general tho' by no means in a superficial way, for we find y^e various circumstances relating to them accurately described; in y^e 2^d part of it y^e Skeleton is consider'd But it will be more convenient, w^th the plan I have laid down to pursue y^e common order & to take y^e description

of y^e Skeleton first as being most simple, & then having mentioned y^e component parts in a superficial way we are better prepar^d for considering y^e intimate structure of y^e several substances wh^ch are join^d to y^e bones wh^ch is really y^t part to a very large field for inquiry: besides unless y^e parts & pieces of y^e machine are known how can we divide y^e articulations &c. into Classes, & know y^e uses of y^e component parts, & we perhaps ought rather to end an inquiries in that^t here: & having examin^d y^e Structure of all y^e other parts, conclude wth y^e intimate Structure of y^e Bones: However it is not the same here as it is in treating of several of y^e Organs of y^e Body as the Brain, Lungs &c. where we find light thrown upon those Organs by tracing y^e blood vessels & Nerves from their source; but here in y^e bones y^e small branches of y^e enter on one side & go off from y^e nearest vessels. — But to give you a very general Idea of their structure — viz. of y^e bones owe their rigidity to a great quan^ty of Earth entering into their composition, for when a Bone is burnt in the fire it very nearly retains its shape, & scarcely loses more y^n 1/3 of its weight. — The Bone is covered every where wth a membrane wch is connected to them by numerous vessels, as well as by fibres serving y^e purpose of Ligaments; whilst y^e External Surface of it is connected very loosely to y^e neighbouring parts by a Substance resembling Cotton, viz. y^e Cellular membrane only y^e fibres of it are connected into layers & when drawn out, y^e membrane by its elasticity is brought back to its proper place. — This membrane passes from one articulation to another over y^e intervening Substance — Bones when open'd are Cavernous and these Cavities contain marrow, y^e sides of y^e Bones are fibrous wh

appears after softening ym by means of an acid, H. vide Monro's Anatomy l. 6. The solid pts of ye bone serve for the formation of ye Canelli &c. — The marrow is contain'd in a fine membrane wch lines ye Cauaes; & it is amongst ye thin membrane ye ye marrow is not effus'd when it is expos'd to ye heat of boiling water like any other Oil, but can be struck out of ye Bone like a Cylinder &c. H. The Bones are intended for ye purpose of motion — In some places of the Body where motion is necessary at first, but is afterwards lost; as in the Head ye edges are ragg'd, & are join'd by a kind of Teeth to each other, but where motion is intended to be continued thro' life they are either join'd together by a softer Substance calld Cartilage or Gristle, or are ty'd together by membranes calld Ligaments: if a free motion is dangerous we find a Cartilage is interposed, as in ye Spine of the Back, if a free motion be safe and useful, we find ye membranes or capsular Ligaments are employ'd as in ye Joint of ye knee, Thigh, &c. To prevent ye rubbing and loss of Substance wch wo. arise if ye hard bones acted against each other they are cover'd with a thin crust of Cartilage, & these again are cover'd with ye continuation of the inner layer of ye ligament wch is moisten'd by a liquor separated by glands within the Joint, just as we rub ye axle tree of a carriage wth grease to prevent ye attrition, so the parts of ye body are in this way fitted for being mov'd: and we now proceed to examine the several pieces wch compose it, & wch are more numerous ye they appear at first sight especially when we look to the Skeleton of an Adult; because the number of pieces exceeds the number of motions or joints: thus there are a number of Bones in the Cranium & face all without motion, also the

number of pieces are greater at first than afterwards
for reasons wch I shall have occasion to consider, as in
the Infant time, when cartilaginous substances are united
to the epiphisies called Epiphyses & when they are again
connected with y.e bone they are called Apophyses a process
and these again in diff.t parts get diff.t names as Trochanter
&c. — But for a general view of y.e Skeleton if we attend
to the direction & situation of y.e general pieces with regard to
each other, at first they do not appear to be placed in the
most favorable way, for if you attend to the general
pillar, you find y.e y.e vast.r pieces of wch it is composed
are not placed perpendicularly over one another as a
Mason wo. wear a fabrick, but there are vast.r turnings
forming upon y.e whole an Oval S. Curve tho' a person
in any situation of y.e body may throw y.e weight upon
the common basis, or make it fall between y.e feet, yet
he is under a necessity of employing a number of muscles
to support himself, so is worn in any of even y.e most
favorable postures: but to balance y.e y.e parts are added
to a great variety of motions wch are performed readily.
First upon taking a mean view of y.e Skeleton, we find y.e
we may reduce y.e bones into 3 gen.l Shapes, some the
circumstances nearly of this shape. — 2. the long and
round shaped bones as those of the Arm, Thigh, Leg &c.
3.rd the thin flat bones as in y.e head &c. & many Anatomists
have contented themselves with reducing them all under
these 3. gen.l Heads; but I attributed wch who add a third
for we find a Vast of Bones y.t are irregular, as in y.e Joints
of y.e foot &c. We divide y.e body into certain regions,
the Head: Trunk: & Extremities: — The Head consists of
the Brain case, y.e Bones of y.e Face & 2 Jaws — and in
the 2.d I follow a Capite ad Calcem wch is just as
convenient as any other. I shall begin with considering the

Cranium or Braincase. — It very much resembles an Egg w.th y.e small end turn'd towards. ——

In accounting for this particular figure, agree w.th Dr Willis to suppose y.e y.e Brain are disposed to shoot in this manner as an event rather to consider y.e Brain & Cerebellum as the mold on w.ch y.e bones afterwards chify; by y.e we are to consid. the whole as being y.e most convenient: the spherical figure in general is not only very capacious, but resists most to any accident: but the oblong shape is evidently more conven.t to us y.n y.e perfect round shape, thus in passing forwards between Ears & y.e sides of y.e head are less exposed to Injury: thy lengthening out y.e fore & back part the resistance is increas'd, as in y.e Case of y.e Shell of an Egg when tho' it is a brittle substance, y.e resistance is very considerable when you press y.e ends of it together, thy y.e flatness of the sides of y.e head y.t are less exposed to injury & round makes a stronger impression upon the Organ y.t Circle of Vision is consid.y increas'd by our taking in a larger field. —— That accident & disease can alter y.e shape is very evident & it is even influenc'd by the weight of the Brain bearing down upon it, & we find y.t y.e farther we advance in life it makes y.e deeper & deeper impression. — Formerly when y.e diff.t nations of Europe were more addicted to particular customs y.e head dress had more influence, & the ladies pretended y.t by it cou'd distinguish of what country a person was from the effects these diff.t customs had upon the shape of y.e head — we also observe, that collections made within y.e Brain push it out on y.e side it is from any accident or custom

the head is inclin'd over to one side, y^e brain becomes
larger on y^t side: after remarking y^e general shape and
figure, we wo. make wt we wo. make a cut into y^e Skull, &
examine the structure of it more accurately: when a Section
is thus made horizontally, we discover y^e plates of y^e bone
& y^e interposed Cancelli. In anatomical books you will
find it described as consisting of two Tables & an intermedial
Cancelli. Diploe, so wo. wish here y^t there is some thing particular
here, but y^e structure is in comon to all y^e bones in y^e body
& y^e wo ilicem & ossa have y^e same appearance: Comparing y^e
Tables of y^e skull wth each other, y^e inner Table is described
as being thinner & more brittle call'd Vitrea & y^e other is
some diffe Dallow; but it is by no means any conse^d wth &
is various in diff^t subjects. The inner Table is more wth
more subject to pressure, wch makes a slight diff but
this has no considerable influence in practise. Thus
when matter is collected in the Diploe we are told from
the nature of y^e inner Table it may make it way readily
into y^e Brain; but on the contrary I say wthstanding y^e
inner Table was only half y^e thickness of y^e other, for y^e
most part of y^e matter wo. push outwards y^e resistance
being less; for in going inwards it acts upon y^e convex
part of y^e Bone, & in some Skulls wch I have seen, & where
there are exostulous appearances, & where there has
been what may be call'd a Spina Ventosa, you observe
y^t y^e external Table is first eroded altho' y^e in many
instances y^e matter goes inwards is beyond all doubt
as when y^e skull is eroded by y^e Lues venerea, here the
Disease may more readily attack y^e inner Table, as it

chiefly attacks & they're often y^e harder substances: so
y^t in judging with regard to matter form'd here we are
more to be determin'd by y^e Symptoms y^t by the seat:
when y^e patient complains of pains without intermission
this puts us w^th some degree of remission, & we find symptoms
of an oppress'd brain, y^e Surgeon led by y^e accident & y^e
Appearance, w^ch in gen^l admonishes us to make an opening
if y^e matter is not lodg'd in y^e Diploe, he w^ch. go farther,
for if y^e inteval' periosteum & dura mater be kept entire
the danger from a mere perforation of y^e Brain is alto-
gether inconsiderable if we prevent y^e air from having
access. ___ Surgeons lay down other rules grounded
upon y^e Structure of y^e Cranium, many of 'em tell us y^t
when we are to trepan a pat^t we may proceed quickly ent.
we are sensible of a very considerable quantity of
resistance from y^e substance of y^e diploe, but after that
we are to work with much more caution. But it will
be very unsafe to trust to y^e Mark, as we are often not
sensible of y^e want of resistance for in w^ch instances
y^e Tables of y^e bones grow closely together, nor is the
thickness y^e same in almost any pt of y^e head, w^ch may
depend upon a variety of circumstances for y^e Cranium
contains an Organ y^t is constantly straining to extend
itself, & from y^e distribution of y^e Arteries &c. y^e effort
may be stronger in one part y^n it is in another: y^e Brain
too may grow luxuriantly and when the blood of y^e
Brain push out much y^e bone may be wn diaphanous
and in old persons we are always to be more cautious
for in comparing Skulls of persons of diff^t ages, we observe
that the sutural bones are constantly becoming thinner

not manly from y^d quick expansion of y^e brain but more especially from y^d constant state of change to w^ch wen y^e bones are subjected, a considble absorption of their Earthy matter going always on: and besides this we must where a whole state of y^e Brain has pressd against y^d Bone, in many cases there are a number of pits, w^ch are special: instances owing to a number of small vessels running out upon these places; sometimes to an effusion of lymphatic fluid upon y^d surface of y^d dura mater; it may also be owing to a n^o. of small glands being collected in these places in clusters: And besides these cases, we must keep in view the changes y^t may be made by diseases; We sometimes find y^d bone very much thickend as in rickitty cases, while in others it is as thin as an old Shilling: Now & then y^e thickness is unnaturally increased, of w^ch I shew you an instance in a rickitty skull where in some pt^s y^e thickness is upwds. of an Inch, upon y^d whole y^e Surg^n in ale pt^s of y^e operation ought proceed with great caution, partic^ly when he has nearly divided the thickness of y^d bone. — So far we also of y^d gen^l structure: We will next examine y^d partic^r pieces to see in what manner y^d whole fabrick is composd. — The Bones of y^e Cranium consist of 8. large & constantly to be found pieces contain. y^e brain & Cerebellum; besides y^e Ossa triquetra w^ch differ greatly in diff^t Skulls both w^th regard to Shape & after seeing y^e gen^l situation of y^d bones, you have in effect seen y^e Seams & Sutures w^ch unite them one from another — We are at last to explain y^d cause of y^e form of y^d Ossa triquetra: nature seems to have placed them where y^e situation is least vigorous & they seem

the parts: and to fill up a void for in y.e cave of the Hyd-
rophalus I have found an immense No. of pores in y.e Intestines
of y.e bones. — It is of some consequence to be aware of these in practice
for they are sometimes very large, & a Surgeon might be in
Danger of mistaking a piece of this kind for a piece of a
fractured bone; but y.e serpentine course of y.e Irregular Cells having
no regular order, while the fracture is more distinct & runs in
straight lines may serve to distinguish them. — Several
of y.e Sutures as we advance in life become less obscure, & in old
Age long the entirely disappear, y.e bones running together
at y.e first halfpenny in y.e inner surface where we find y.e 2.d
Sutures are constantly much less vascular y.n they are on
y.e outside; for you will observe y.e native begins to form y.e
vascular pores at their middle, y.e fibres gradually proceeding
like rays from y.e Centre of a circle; & I suppose that
nature in both tables, fractures y.e fibres w.h equal speed, y.e
outer Table describing a large circle, y.e ends of y.e fibres
will be more separated & appear more vascular, while y.e fibres
of y.e inner table will be kept close together running into
one another. And in worn old Skulls y.e several Sutures
are often scarcely to be remarked on y.e outside. After shewing
the vascular Sutures, & y.e appearance they occasion: I
point out to you still other marks upon y.e Skull, w.h are
beautifully scattered like y.e branches of a Tree; these marks
are made by blood vessels. — w.h age y.e marks become
larger & deeper as y.e Skull becomes paster thin over these
places: so probably in case of a fracture near on, it may
readily get into one of these furrows & run along it, there
Cavities y.e are occasioned by y.e beating of y.e vessels, & y.e
pressure upon these parts, occasioning a greater absorption

and is not as Dr. Albinus supposd to a disposition in the Bones to grow around the Vessels.

Lecture 8th

As ye. several Bones in ye. Cranium of an Adult are consid. divided by just as without motion, we wd. wish to have explaind to us, Why, instead of one single ossification, the Cranium consist of a number of pieces ye. ossification begins in a No. of points at ye. same time. — If you look into ye. writings of Anat. you will find several purposes enumerated, but I apprehend ye. many of them are to be considered merely as secondary, & ye. we shd. explain it in ye. following manner.

We begin by attending to a plain fact, ye. every bone of ye. body in a small point: and from ye. Nd. ye. fibres are extended, in ye. flat bones, like rays from ye. centre of a Circle: we take that as a fact & say ye. by ye. ossification begins in a No. of points ye. whole fabric is more compleatly. 2nd. The spherical figure is more exactly form'd just as a polygon in proportion to ye. number of sides approaches nearer to ye. circle, as ye. room wt. having Sides is nearer to ye. Circle ye. n. it had 4. only. But there are other considerations perhaps of greater weight, for as ye. ossification begins in points, and the fibres respective from these diverge like rays from a Candle ye. Bone becomes thinner ye. farther we go from ye. beginning; so unless a No. of pieces had been simply laid, we shd. have found ye. thickness of ye. Skull very unequal: then by ye. intervention of membranes &c. Nature offers ye. bone yields more equally to ye. growth of ye. Brain, for we find yt. a part grows in Size nearly in proportion to its softness & ye. harder part wt. more difficulty: so wt. regard to ye. teeth wch. are title harder ye. the Jaw bones

they do not grow in the same proportion w.th them and as the last primary juncture we ought to observe the change of shape w.ch y.e head undergoes in delivery when it comes down in an oblong form. But these and all the other secondary advantages attend.g y.e structure of y.e fractures don't extend so far as y.e otherwise would have done; just as a fracture of a large piece of Ice will run much further y.n if a number of plates of Ice had been laid together: a Suture however does not absolutely intercept a fracture, if y.e blow is violent and if y.e person is far advanced in life y.e fractures may go from one Suture to another: nay in certain diseases the bones of y.e head are separated from each other, & y.e very frequently happens in Children particularly in y.e Hydrocephalus internus I have disputed with Subjects where y.e water was contained in very considerable quantity within y.e brain in a subject of 3 years old I found 3 lb. & in one of 9 years 9 lb. so y.t a great dilation must have taken place & we have instances of y.e like happening in Adults, we have an instance of this kind from Dr. Simpson at St. Andrews in y.e MDCC. Years & another from Mr. Hill Surg.n in Dumfries. Dr. Simpson assured me y.t he could lay his forefinger between y.e parietal Bones & that upon letting water & drain & a watery matter was discharged from it in such great quantity y.t he had an allowance of 2 pints a day, & at the end of 6 months y.e patient was considerably advanced, now in such cases, without y.e yielding of y.e Bones y.e disease must have proved fatal by y.e compression of the Brain and in young Children the Sinus longitudinalis is intimately with the lining of y.e Bones & dura Mater connected at y.e several Sutures, & besides a No. of communicating sinus we find a great communication of Vessels at these y.ts at

any other part of y^e head, w^ch may be attended w^th some use; for
tho' we lay aside y^e Theory of y^e benefit to y^e openings we left
in y^e head for allow^g y^e passage of Fuliginous vapours, yet a
discharge made at these places will have more effect y^n when
made over y^e most solid part of the Bone. — Hence begin
to examine each of y^e pieces w^ch have been shewn to compose
the Cranium & we begin with y^e Frontis.

At first it is composed of 2 pieces, & sometimes y^e division
remains in Adults & it is allidg^d y^t y^e happens more frequ:
in y^e Female y^n in y^e male, & y^e Capittal Suture may be
continued to the nose, so may be taken for a fracture; but
it is easily distinguish^d, when y^e 2 pieces of y^e bone unite
in y^e middle their Edges turn inwards, at most w^th least
resistance: here between y^e two great lobes of y^e Brain. —
The Falx below receives its covering from y^e Dura Mater
& we must attend to y^e situation of y^e Sinus, for as this
Ridge stands out here a sufficient room along y^e inside of
we can't procure y^e separat^n of y^e Scalpan without being in
danger of wounding y^e Sinus, & y^e matter from w^ch cannot
easily get out; so y^e Surg^n if he has a choice ought not to apply
y^e Trepan here — The Eye is especially y^e Lachrymal Gland
is partic^y protected by a very consid^le projection of y^e Bone,
& without attending to y^e also y^e might be led to apply his Trepan
too low, & instead of penetrating into y^e Cavity of y^e Cranium
y^e Integum^t might only make its way thro' y^e Pabit, so y^e open:
cho^d be made y^e breadth of a finger above y^e Edge of y^e Superc:
:ciliary ridge: the Orbitar plate is generally thin very & smooth
here w^th arch^s pointed inwards. — The frontal Sinuses are often
wanting in Child^n we perceive nothing farther of y^m as spongy
bone & y^e Cavern^s small: their Size increases with age, but
more or less in proportion to y^e rise of y^e forehead, there is
frequently too a variet^y in y^e diff^t sides & they are frequently

too a variety in y^e diff^t sides of y^e frequent w^ch we dm imperforate
Partitions, tho' y^e gen^l communicate w^th y^e cavity of y^e nose.
In applying y^e Trepan we ought to shun these Cavities as much
as possible; for Ot. ——— The Artery of y^e Eye is not sent from
y^e Internal Carotid, according to Monro, but from y^e Internal
Hippocrates thought y^e fevers were cured by a few drops of Blood taken
y^e nose & it has been proved by D^r Blair when y^e had is much
affected in fevers to open y^e frontal Artery but it is by no means
to be recommended: for y^e num^r made by Hippocrates y^e y^d fine Drops
from y^e nose prov^d y^e cure of y^e fever is to be doubted, as it was
probably owing to y^e y^e about y^e crisis from y^e general
struggle of nature some of y^e Blood vessels gave way & perhaps
y^e y^e was established, we wo. rather open another Vessel as y^e
Temporal Artery. ——— Parietal Bones. ———
Under the Sagittal Suture we find y^e Continuation of y^e furrow
I mentiond in Speak^g of y^e last bone; & also y^e Large sinuous
Canal w^ch follows y^e Incisure we name Sinus. viz. y^e Superior
longitudinal Sinus, is continued here, the remark we made
w^th regard to the Trepan applies here: In most Subjects we
find branches from y^e veins in y^e innerside w^ch communicate
w^th y^e branches on the outside; but y^e cutting of these is not
so material as Surgeons have supposed for tho' y^e vein is
divided close to y^e Skull we can stop y^e Hæmorhage by
Compression. ——— The connexion of these Bones with y^e O.
Sphenoides is very curious: y^e upper p^t of y^e O. Sphenoides is wedged
in their Arch but as at y^e sides y^e parietal are more in
danger of being compressed, the parietal now has got over
y^e frontal & at this p^t y^e frontal is remarkably strong,
so that this part of the head has every advantage y^t can
be given it for resisting pressure. — At y^e Birth there is
a want of Bone where y^e two pieces of the Adult is joined
with the parietal Bones — 87. and there is a membrane

in plan of it & the ossification here extends in a very gradual
manner for persons under 2 years of age before y^e ossification
is completed: ——— By laying the hand on y^e Bregma a pul-
sation is perceived from whence we call some pulsatilis &c.
Children dead or alive in y^e time of labour it is not y^e part
of y^e head we first meet to but y^e valley, still however y^e Bregma
may be reached by y^e finger but little confidence is to be
placed on this mark: y^e want of y^e suture of y^e child
y^e fatness of y^e water, y^e separation of y^e tubuli, & y^e want
of pulsation in y^e umbilical Chord &c. are more to be trusted
to than this. It is very possible y^t a Hernia of y^e Brain
may happen in laborious births as we by no means
have recourse to incisions: when we shall treat more
in y^e trade of Children as it is probable y^t there will in
a few days dissection of the liver. Further may be observed y^t
y^e bones are very much separated in y^e Hydrocephalus: & in
y^t disease y^e water is generally lodged within y^e substance
of y^e Brain; but tho it is extremely possible, may it not
appear equally reasonable to suppose y^t y^e water may be
collected between y^e membranes of y^e Brain & it may be
advisable to let it off by an operation; and in y^e place the
Bregma is y^e most proper place taking care to avoid y^e middle
of it & to make y^e opening at one side, as a slight laceration of a
Sinus will have efficient. Deciphital Bone. It has been
supposed y^t y^e sagittal suture is sometimes continued by a fontanel
magnum as well as to y^e nose, probably y^e finding a
large os triquetrum commonly lay down into it may have
given occasion to y^e mistake, but there is nothing in y^e
formation of y^e bone to countenance it. Avoid y^e Occipital
Bone in y^e Operation of y^e Trepan on account of its longitudinal

Sinus as also y^e Fatal ones, but cases may occur
when y^e Surg^n is to ballance between y^e danger of attending
y^e Suppuration of y^e Sinus, & y^e neglect of it, as when y^e bone
is beat in upon y^e Brain; but where the depression happens
to be situated between y^e ridge of y^e Sinus, and y^e Basis of y^e
Cranium y^e smooth part of the bone, & y^e Sinus is made by the
muscles, between y^e place at y^e Lambdoidal Suture
there is no danger; & if an exfoliation happens, this is
one of y^e best places for making an opening for y^e blood or matter
falling in, it might upon y^e membranes & dura mater of y^e
Brain & cerebellum. ——

Lecture 9th

We proceed next to examine the Temporal Bones of w^ch
(as I gave you down at a table) we are never to apply the
Trepan to; we were but at a loss to give a good reason why
if we did not know y^e gen^l belief of y^e tenderness of y^e body
are highly sensible parts, & y^e slightest irritation of
them may bring on fatal Symptoms; & therefore as the
Temporal muscle is cover'd w^th a tendinous Aponeurosis,
they carefully avoid this place, but we shall afterwards
prove y^t freedom may be us'd with tenderness without
danger. & have caused y^e tender Part to be cut by a
crucial Incision, without any bad consequences following it
Symptoms. Therefore as y^e Temporal bone is subject to a
depression of y^e Bone y^e danger would be greater from allowing
it to remain y^n from cutting y^e tender. Tho' y^e Bone may
become y^e Subject of Exfoliation in consequ^e of fracture in two
ways; it may be push'd inwards; & sometimes from y^e Part of y^e
Head may extend downwards, where y^e same is evident,
from the parietal bone thro' y^e suture; y^e later W^m Saunders

Surg.n in Edinburgh was killed in this way, by a fall
from his Horse; y.e parietal bone was broke by y.e stroke
extended to the rest of the Cranium; & tho' there was
no Lesion in the Skin, yet upon abstracting it to the
part of the Brain was found upon them w.ch they cd. not well
account for, but after his death they found y.t y.e bone was fractur.d
y.e dura mater torn & likewise y.e membrane of y.e Drum
Surg.n part of y.e Brain had actually got thro' y.e Ear: We
have met with another Case w.ch was fully similar to this
There is still another way in w.ch y.e bone may be affected w.ch
I was suggested by the common postures in paying Anatomy
and w.ch I must be very willing to admit as a possible case:
that tho' y.e bone on the Top of y.e Head be not fractured, yet
by y.e force of y.e blow, y.e lower part of y.e parietal Bone
may start outwards & break y.e scale of y.e temporal &
I found a drawing of y.e kind sent by a Surg.n to my father
where y.e starting of y.e parietal Bone seemed to have had
y.e effect tho' perhaps, y.e matter did not occur to y.e Surg.n
in y.e Night. — Next we proceed to an Examination
of y.e Sphenoid & after y.t y.e Ethmoid Bone. —
It is very necessary to be well acquainted with the several
parts of y.e Sphenoid Bone, for tho' from its situation it
can hardly ever be y.e Subject of any Surgical Operation
yet nothing perhaps y.e simple case of a tumour growing in
y.e throat & back part of the nose, many of y.e principal
Vessels & Nerves of y.e body pass thro' here so y.t we need
to attend to the situation of y.e Bone to judge of their
situation; & it likewise forms very principal parts
of the Nose & Eye.

Theoldens Anatomy vide 222. 185. 191.

Morris's Anatomy 92. 114. 108. 325. 369. 119.

Lecture 10th

Lecture 10th

Review of the general Circumstances with regard to y^e bones of y^e Cranium, their Situation the advantages of this Spheroidal figure &c. for the sake of beginners. ——

What Anatomists have named the two Hemispheres of the Brain only form about y^e fourth part of a Sphaeroid. ——

The gen^l Situation of y^e Arteries &c. —— The Blood Vessels. —

The Dura mater receives its blood from &c. ——

The Brain & Cerebellum are supply'd w^th two pair of very large Arteries y^e internal Carotid & Vertebral &c. ——

The blood is returned first by veins in the common manner but after many of y^e small branches have run together they are covered by the Dura Mater & have got within the Head the name of Sinuses. — The Longitudinal Sinus divides at y^e Tentorium into two branches, w^ch I consider as nearly equal, for tho' it may appear to go intirely to y^e right side, yet other veins are added to these, w^ch turn to the left, so for any purpose in Anatomy we may consider it as dividing into two equal parts, these getting out of the head are named internal jugular veins. ——

Next we mention the 2^d nerves, first the Olfactory &c. ——

The 10th pair of y^e head is better named by Winslow Suboccipital. — We next proceed to consider the Structure of the Jaws: the several bones of which have got their names from their Shape or Situation. ——

152. 153. 152.

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For a brief & sufficiently accurate description of
these Cartilages see Bell's Anatomy page 126.

Lecture N.º 12 ^111

In the upper Jaw, as in the Cranium, there are a considerable number of Bones, by w.ch the Ossification, beginning at a No. of points at once is soon completed, & this irregular shape found: and you will observe y.e dividing of the Bones here has y.e effect of protecting y.e orbits of enlarging y.e Jaw & giv. attachment to the muscles &c. — Under Jaw. — Infants sometimes luxate their under Jaw by opening their mouth too wide, for the Condyles are then in a very critical Situat.n standing upon the ridge of a Bone, & they may slip upon the fore part of y.e Zygomatic process & there be entangled, & this is y.e real hindrance to the reduction. — So in order to disengage it, we must draw the Jaw forwards a little & downwards, before we attempt to push it back, w.ch even in weakly persons requires a good deal of force.

After the Jaws Anatomists gen.y enter upon the Structure of the Teeth: But I apprehend y.e reasons y.e determine us to avoid it general the Structure of y.e basis of y.e bones &c. shall only here be shall only observe in general that in a Child there are only viz Sockets on each side, 16. of the Teeth only appear before 7 Years of Age, when the number is gradually increas.d to 32. Anatomists have divided in three classes, & given them names which are abundantly proper. I proceed next to demonstrate y.e Bones. Cartilages are found immediately behind the under Jaw, so as rather to make part of y.e Head & Jaw than of y.e Trunk of the Body.

Os Hyoides. — At the top of y.e Windpipe we find the Cartilages w.ch serve to give passage to the Air: and a little w.ch covers the passage, & as y.e passage is named Glottis, the Cover is call'd Epiglottis.

I shew you two Chords a Ligaments upon which perhaps 80.
we shall find our voice depends; these join to the roots of the
Aryteanoid Cartilages, with regard to these we make a Tri=
angular opening, the Cavity of wch I can shut at pleasure
If I bring them forwards & shut it, by means of the
Aryteanoid Cartilage, so these Cartilages moving upon
each other can be variously turned by the muscles as to give
different degrees of Tension to these Ligaments and it
is in this way we form y.r voice Sometimes the Strength of
it at pleasure.

Lecture 10th

We now proceed to consider y.r structure of the Trunk of y.r Body
and we are naturally led to begin with the Chain of Bones
wch are connected intimately with the head, support y.r Trunk,
and by their Joints yielding give motion to the whole —
Vertebræ y.r Spine 163.) with regard to y.r mechanism of
the Cartilages in y.r whole V.de medical Essays Vol 5. Art. 67.
After we have seen y.r structure in y.r sound body, & consider'd
y.r manner of each part of y.r structure we are enabled to judge
of the Diseases & accidents to wch this part we find by experience
subjected. — The diminution of height 169.
Preternatural Curvatures — 170. — Causes of these viz old Age 169.
The most unnatural Custom of wearing Stays wch if they are
too high or too low give unnatural & make y.r person lean over
to y.r other side, whence a curvature is necessarily form'd, &
the disease soon grows more compliated than we might at
first sight have been apt to conceive, for the endeavour of
Nature by an instinct of nature we are led to make in order to
throw the body upon the common basis, occasions a corresponding

curvature the other way, unless you view a curvature in this manner you will be apt to draw a faulty Conclusion or Prognosis. For when it has continued for any length of Time the Cure is generally difficult, when taken in Time the Cure is to be effected. My Father used to give some Instances of y.e kind of a Boy who had contracted a curvature by leaning to one side upon a Chair w.ch generally stood on one side of the Fire; so said the Chair to be plac'd upon the other side w.ch prov'd a sure But in gen.l if y.e Curvature be made Sideways the Two Spaces we ought to be extraordinarily cautious in our Prognosis, as I have seldom seen any Success from an endeavour to remedy the Complaint; for what is of advantage to the one is of prejudice to the other as an diff.t Inclination of y.e body, besides y.e bones on the one side are now become thinner than the other thicker than natural & we can't aptly a general Measure on acct. of the Situation of the parts.

Luxations of y.e Spine happen very rarely, so that a learned Penman Monro has been able to collect only a few Instances We will expect it to occur at the Top of the neck & then it may be in Sev.l diff.t ways; If you look into Petit's Surgical Notes he gives a Description of this Sort: A Man lifted a Boy from y.e Ground by the Head, the Boy struggled & soon grew pale & upon letting him go he was found to be motionless & died in a few minutes, so y.e most probable Conjecture is, y.t perhaps the 2.nd Vertb. by the weight of the body was drawn away from the 1.st & the tooth like proc.s turn'd backwards upon the Spinal marrow as y.e from the body's being turn'd circularly round y.e 2.d Vertb. was turn'd off from y.e 1.st Thus is a 2.nd way in w.ch it may happen very readily — y.e 1.st Vertb. may slip off from y.e 2.nd so as the like proc.s remaining, but y.e oblique

nocess of the first vertebra from y^e oblique processes of
the second, touching upon it and the membrane lying at
the same time before in other luxations — a Luxation
happened ab^t a year ago in this place — A Gentleman about
30. who slipp'd very much, was thrown backwards in a
hackle upon the stone on a gravel & his head did not strike
the Ground — he had no pain in that place nor was any
bruise to be observed, yet soon y^e very instant of y^e fall
he found a want of motion in all the other parts of y^e body
he cd. neither move his legs or arms, or assist himself in
any shape, yet he was sensible in the Act of what had
happened. About 12. hours after he grew quite insensible
the Eye was fix'd in his head & only was seen y^e Conjunct^a
y^e 2^d y^e upper part of the neck might have been broke by a
fall but found y^e 2^d y^e motion was perfectly free, he died in a
few hours, and upon dyaming y^e body we found a
compleat dislocation of y^e 3^d vertebra from y^e 4^th not
only y^e Ligamenta Alligam^ta were torn but y^e oblique processes
of the cartilages between the Bodies of y^e vertebra & the
fibres of y^e short muscles were seperated, the Spinal marrow
however was not to the Eye lacerated or injured in any way
but we must suppose y^t it was so compressed as to render
the nervous fibres unfit for conveying their Energy.
In dislocations of y^e vertebra as y^e Bones cath each other
it is in vain to endeavour by violent measures, as pressure
as has been recommended; as by means of a Screw or
pushing y^e pieces inwards which can only break & bruise
as rather y^n by force as Hippocrates the Mechanic directs:
seperate the pieces by stretching the body a little more over
a Bed or Barrel; y^n y^e Surgeon w^t his hands endeavours
to push y^e bone back into its place — Between these accidents
are very rare in Comparison of Tumors.

marrow wch are extremely frequent, and the danger attending them is yt most part not so the most part sufficiently envid. I have attended now 9. or 10. persons in whom one particular part of the Spine began to swell out, in some cases yt patient had been rickety when young, in others there was a scrophulous taint, & in one yt swelling was in consequ: of a Blow, but in the rest no cause was assignd: but the Spinal processes were at first found to be enlargd & gradually increasing the neighbouring Vertebra came to be affected — The Bone affected the Spinal marrow & an Inflammation is communicated both Membranes the dura mater wch is found to be considerably thickend, & so must have compressd yt marrow. I had an Instance of its proving fatal: yt pt was at first paraplegic, & a total paralysis was but on & yt whole body came to be affected. — But I am at a loss to mention any probable means for giving relief — I've caused various methods to be tried wthout any considerable effect; in almost all of them blood was drawn artificially from yt part — Issues were made very near to it, in some there was a scrophulous taint, the patients took Saline purgatives some the Bark, Shrub Cicuta, & others were trifled with a long course of the Quicksilver pills and yt generally very little change was made upon the bones, and we can't expect to every successful when the disease is so deep seated — and has perhaps made considerable progress before yt patient took advice — In one of the Cases yt pat was about 50. & upon his death I examind yt part and found no such compression on yt spin: marrow as might have been expected, but yt membrane within yt Bones was very greatly thickend, & instead of a shining natural appearance, was of a dark purple clor. But it is only from attending to a vast variety of diff: Cases

y^e cause y^t produces y^m we shall be able to give any considerable
relief — I have indeed had an opportunity of again puncturing the
head with y^e trocar to a greater length, & have convey'd relief
after y^e membrane had been affected for about 10. Weeks: It was
even then found to be of use with y^e whole to punish this y^n any
other yet known Medicine.

Lecture 13th

We proceed to examine y^e false vertebræ. Dr Alpinus first
describes a disease w^ch he calls Spina Bifida: it is a tumor
formed projecting about y^e loins, y^e nature of w^ch as yet is not
has not been well discovered; only it is found to communicate
w^th y^e Cavity of y^e Spine, and y^t a Vigour is contain'd within
it; I have had occasion two or 3. times to dissect a Tumor of
y^e kind, in one case y^e matter forming a part of y^e Tumor
was found out when y^e Spinal process of one or two of the
Vertebræ are want^g. 2dly y^e want of these has been consider'd as
as y^e cause of the Compt. but we may rather consider it as y^e
Effect of y^e disease, y^e watery Fluid separat^g y^e protuberant parts of
the Vertebræ — The holes on y^e back part here are expanding
& yet y^e nerves here are very small; there is a Difficulty in
giving a good reason for this formation, we may suppose
y^t y^e nerves will have more room, will be in less danger
from pressure, or from fracture &c. but still this is not satisfy-
ing: & we cannot see why we are expos'd to painful Disturb^ces
&c. in y^e part. — Os Coccygis. — Notwithstanding of
what D^r Cowper has said to y^e contrary, this bone becoming
more useful as we advance in Life is one reason why
elderly women have more difficulty in labor it is indeed
a small circumstance compar'd w^th many others, yet it is
certainly one: & it has been y^e Instances where y^e Os Coccygis
was found to be remarkably depress'd & yet y^e labour was
easy it only follows y^t y^e pelvis was sufficiently large

in other respects, for the yielding of y.e fœtus perhaps half an inch must be of considerable service; when from y.e other cause this joint is press'd outwards it is brot back by the musculus Coccygeus. — Os innominata — 198. Here is the proper place for making the comparison between y.e Male & Female Pelvis. — From the greater laxity of fœtus, the ossification seems to advance somewhat more slowly, & the Bones in general neither become so thick nor so hard in the Female as in the male: hence when two origin.l pieces of Bone run together, so as to form a ridge, as in the os frontis, this ridge is more remarkable in the male: again if the 2. pieces do not unite together, we find the want of bone more frequent in the Female. From the same general cause, & from the less active life of the Female, we find the want of Impressions made by the muscles on the bones being not so distinct as in the male. And from the very same circumst.a of strength we find that the furrows made by the blood = vessels are more superficial in the female, in so much y.t in the Osteology we always have recourse to the male Skel = eton for pointing out these marks in the Bones. Besides this Buffon alledges that the Thorax in the Female is some = what deeper than in the male, y.t it may act more in res = piration when the Diaphragm is stretch'd in time of preg = nancy. But the chief difference is in the formation of the Pelvis, with.t any regard to proportion it is evid.t at first sight that the pelvis in the Female is larger than that of the Male, if we regard proportion, & follow the painters and Statuaries, we wo. say that the distance between the shoulders of a well made man compar'd w.th the distance between the tops of the Ossa Ilia is in the proportion of three

to two. In females again they allege y.t y.e is aver'd, but in that circumstance they exaggerate, for the pelvis is never found a third wider than the shoulders.

Next let us make the more particr. comparison. 1.st The Ossa Ischia are larger, at the Basin there is an evid.t difference of size, the top of the os Sacrum is a good deal broader, so y.t y.e arch form'd by the Sacrum & the pubis is wider, they describe a wider Circle or rather oval. Nay to be very particr. the Cartilage between the ossa pubis is remarkably thicker, & that not merely increases the Diameter in y.e round state, but it is more readily relax'd. Next comparing the under parts, there is still a greater difference in the size of the opening below, wch depends upon the os Sacrum being turn'd farther back=wards: Cin a recent subject the os Coccygis is more mov=able: next we observe a circumstance wch is generally overlook'd that the hole in the Back of the Sacrum is ag. deal wider: now surely larger bloodvessels and nerves are not needed for the Legs &c. but it is to thrust the ossa Ischia more outwards & at a greater distance from each other; & comparing the angles form'd by the two ossa pubis, they form very nearly a right angle, whereas in the male the Angle is acute. By these two circumstances then, the Ossa Ischia are push'd farther out, or the sides of the Pelvis are made almost perpendicular in the female. The last circumstance to be noticed, is that the depth of y.e Cartilage in the male is much greater than in the female, & thence besides the Angle wch the ossa pubis form, the space is en=larg'd by that circumstance. — Next with Smellie who first wrote rationally, upon that subject, let us obs. the different proportions of the parts of the Pelvis: we

need not pretend to keep to the number of Inches, or quarters of Inches with Smellie: only it is not circular but oval, & the breadth is greater than the depth, generally from 5. to 6. Inches, & the depth from 4. to 5. If we examine below these proportions, when the Coccyx is stretch'd, are nearly answer'd, tho' not exactly so as he alledges, the depth below, being almost equal to the breadth above, & the breadth equal to the depth. If we measure y^e^ depth in different places, behind it is about 6. Inches, at the sides about 4. & at the Os pubis abt. 2. Inches. These are the general proportions. — Next let us compare y^e^ head of the Child with the pelvis, & endeavor to discover the manner in w^ch^ the head passes thro' the Pelvis. —

The Head has in like manner the Oval shape like the top of the pelvis, but not exactly so, for the length is greater in proportion to the sides, being 5. Inches in depth or thereabouts, & scarcely 4. over. In y^e^ Uterus y^e^ head is naturally uppermost, falling down by its greater weight, so y^t^ it is generally y^e^ first part of the body y^t^ enters the pelvis, & the efforts of the uterus, abdominal muscles, & Diaphragm, makes it slip down, when it finds most room, i.e. with the Face turn'd towards the Back & Belly of the mother, & in this way it descends till it is stopp'd by the os Ischia, & now y^e^ direction is chang'd & the top of the Head presents nearly at the Vertex: the only difficulty, & w^ch^ Smellie has not sufficiently is to tell why the hind head presents in that manner, and not with the forehead, now I apprehend we can readily determine it, y^t^ it is the wedge like shape of the head, w^ch^ gives it that determination

the water being rounder & more slippery than the face: the chest even in a dead Child will be pressed in, wch will bring this two too to be the undermost part, & yt will still more readily happen in a living Child, where the muscles drawn into action will give the head that situation wch is the most favorable: it is pushd round therefore in that manner as it comes forward to the Orifice.

Lecture 11th

It remains that we examine those bones wch with the Dorsal Vertebræ complete the Thorax. — Ribs their general structure demonstrated. — The Cartilages by wch the ribs are connected to the Sternum are essentially differt in their nature from the Bone, this appears from the smoothness of the pits where they are joind to the bone: so yt instead of the Cartilage being the rib, in a soft state, the rib has a more forcible growth, whereby the Cartilage is restraind from growing: & when they are ossifyd, this takes place in a very irregular way, beginning at a great many different places in the Cartilage, & does not proceed from the Ribs. These Cartilages have a kind of imperfect joint where they bend more considerably at the Sternum & we dis. somewhat of the same kind when we cut the Cartilage by the rib, tho' it is not so very evident here. — We find yt yt head of the rib is articulated wth yd Cartilage wch joins the bodies of the vertebræ together; now why there & not upon the middle of the bodies of the vertebræ, wch we wd. have imagind wd. have been a firmer prop, but the attrition from the constant motion of the Ribs is less

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hence, by their playing upon a soft substance; y.d Substance
of the ribs comes to be more supported by being join'd to the
transverse processes: besides if the head of the rib had been
connected to the middle of a vertebra, we co. not have given
the rib its proper degree of obliquity, they wo. have been forc'd
closer together in the flexion of the Spine, hence we co. not
well have bended the body forwards, & rais'd at the same
time. The connexion of the rib to the transverse processes,
not only adds to the security, & hinders the head of y.e rib
from starting out, but it regulates y.e manner of its motion
only admitting of that rolling motion w.ch the ribs possess
in respiration. ——— We find y.t the obliquity of y.e ribs
is continually increasing: y.e efficient cause of this, is the
greater thickness of y.e dorsal vertebra, & in consequ.ce of this
the greater distance of the transverse processes: & y.e final
cause is for allowing the greater motion of the lower than
of the upper ribs: for they are not mov'd as D.r Boerhaave
& such as have followed him, have supposed so many
of 'em upwards & so many downwards, but they are all
mov'd uniformly in one way — i.e. in inspiration upw.ds
while the Cartilages from their elastic nature serve to push
them back mechanically; & it is in consequence of this, y.t
the body after death is always in y.e state of Expiration,
the Cartilages pushing down the ribs. For the Diaphragm
it ascends into the Thorax, in expiration like to the crown
of a hat, is push'd downwards in inspiration, whereby
the length of the Thorax is increas'd from the Sup: y.e ribs
are at the same time push'd out at a greater distance
from each other, & the Sternum rais'd forwards, where-
-by room is made for the lungs to get behind y.e heart &.

We chiefly live however by the action of the Diaphragm &
& life can be continued with the motion of the ribs or
Sternum, wch is sometimes very completely effected, & we
have instances where almost all the bones of the body
have run together, & where the Cartilages of the Sternum
were entirely obliterated, & their place solid bone found:
wch must have taken place gradually, & the respiration
been performed all the while; so that the principal motion
must be performed by the Diaphragm. From the connexion
of the ribs to the Cartilages, & of these to the Sternum, you
may sometime or other meet with a dislocation of the Cartila-
ges, they may be made to start from the Sternum or from the
ribs, & must be replaced as in other dislocations. Next
from the manner in wch the Sternum is supported upon a
soft bed of Elastic matter, that the bulk of it is very con-
siderable, & the strength of the plates increased from the
considerable quantity of fibrous matter employed in forming it, we
may suppose the fracture of it will be very rare, & accord-
ingly we find very few instances of it in Authors. where
the fracture does happen, the bones do not pass over each
other but are retained in their place by the Cartilages, so
the Surgeon need only apply some slight compress
to keep the surface smooth, In some cases however
the bones do pass each other, the one part being
inserted within the other, we have a case of this kind
in Parey, & the method he had recourse to was very
proper, he bended the Body backward upon a Board
whereby the Abdominal viscera connected to the Sternum
were put upon the stretch, & the patient making an
effort at the same time the pieces were disengaged.

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When the ribs are broke consid'ring the constant motion to which they are subjected, & the care that is always taken to keep fractur'd bones in a state of rest, one wo'd be apt to imagine that the fracture wo'd not heal without difficulty: but there is no fracture in the body that heals so easily; & many persons I am persuaded have had their ribs broke with't knowing it: for here the neighbouring parts make the extension, and counter extension as Surgeons speak: or keep the ends from riding over each other, and keep the broken rib of its proper length: & farther as I have shewn that we can live without any motion of the Ribs, the sense of uneasiness leads the person to breathe almost entirely with the Diaphragm so that the motion of the ribs comes to be very inconsiderable

One other part of the Thorax has been thought a cause of much disorder, viz. the Cartilago Ensiformis. If you look into the Authors quoted in our text you will find that dangerous complaints have been occasion'd from the parts of it being turn'd into the Bowels: you'll however find no clear proof, that this was certainly the cause of the Complaint, & you will seldom or ever find it naturally turn'd so far inwards as to become a cause of any considerable Complaint, It may be broke off, & beat inwards, but it may be easily replac'd, or it will only be necessary to use some soft Substance for pushing the Bone outwards, and to keep it in that situation, till the bottom of

it shall grow together again. — I have seen it turn'd so much outwards in some diseases as in Ascites, that it hurt the Tegumento to such a degree as to occasion an ulceration of them. — The only other remark I have to make is that you wh. attend to y^d. Furrow that I pointed out to you on the ribs for lodging the Intercostal vessels, when cutting into the Cavity of the Thorax, for water, pus, or Air, or Blood, we wo. in such cases avoid the under edge of the rib, & keep near to the upper edge, taking care only not to hurt it so as to bring on a Caries: for tho' the principal trunk is secured by the Rib, considerable branches may come in our way.

Lecture 15th

We are now fully prepar'd for entering upon the Recent Subject. having examin'd all the Bones but those of the Extremities, & it is surely very nearly the same whether we had finish'd the Skeleton, or y^t we defer that till we come to the accent Anatomy of the Extremities: nay y^d. advantage is rather in our favour, we will surely understand the muscles of the arm their insertions in y^d. bones &. better the day after we have seen the bones demonstrated than a month after seeing them.

You will now recollect what I propos'd to you formerly as our genral plan: I endeavour'd to shew you the impropriety, of attempting at once to investigate the intimate structure of each organ, this wo. lead us into too wide a field, & many, of the demonstrations wo. appear extremely unintelligible, thus if when we come to examine the Liver, I sh^d. present you with

a preparation of the vena portarum and another of the Hepatic Artery, wch I have seen done: but being ignorant of the Course of the blood we cannot understand them. So, when the recent Subject is first brought before us, we sh. avoid the prosecution of the Blood vessels, of the Lymphatic vessels & of the nervous System. We sh. prosecute the several Organs, divided into Classes, merely from what is obvious: we should attempt to understand the general viz of each, the Colour, Consistence, Situation and Connexion with other Organs: its division into genl Lobes and parts, & so far as we can judge by dissec=tion, its obvious purpose, by finding the Gall=bladr connected to the Liver, & Ducts coming out of the Liver leading to it, we say that the Liver serves for the seperation of the Bile: & so much we can say without knowing anything of its preparation. — In this view we are nearly at Liberty to choose our Method, & it is not very material whether we begin with the head and go downwards wth some Anatomists, or with others yt we begin with the Abdomen, where the Bowels are more corruptible than the other organs are: for keeping out of sight the Blood vessels there is no reason for examining the Brain before the Abdom=en, or the Abdomen before the Brain. — I shall therefore take that method which I have upon ex=perience found to be most useful. — viz. after shewing the structure of the common Tegumento,

I first explain the Eye, and the Brain, the Eye being ready to sink by the dissipation of the humours, & the Brain to become flaccid in a short time, whereas, for a few days, the Abdominal viscera undergo very little change. Then I go to the Abdomen, the Thorax &c. & end with the Extremities of the Body. — Or, I propose that in this Subject we sh^d. examine the obvious circumstances already pointed out, relating to the muscles, bowels, glands the Organs of the Senses, & the articulations of the Body: & I think it beyond all doubt proper that instead of examining every one of the muscles before we examine the Bowels, we should take them together: for we learn nothing of the shape and connexion of the muscles in one part: from knowing these circumstances with regard to them in another, & they are not like the blood vessels and nerves to be considerd as one System: but dividing 'em into Classes as we prosecute the Bowels &c. we may attend to each Class singly. So with regard to the abdomen having seen the Bones, we examine the muscles, then opening y^e. Abdomen we examine the situation of the Bowels, w^ch. we can now describe by that of the muscles, w^ch. we had immediately seen before. I now proceed then to shew you some of the parts in^o. order I have mentiond and I begin with the Teguments. At this meeting I shall confine myself m^ch. to a demonstration, because where parts are very minute, I want to give you time to examine them fully, before I attempt to explain their use. & first the appearance of y^e. Teguments by dissection: but I shall join with these some preparations, because in fact we learn more from these than from the mere dissection, they tracing the vessels of the

skin, I can't explain any particr. circumstance with regard to it, only that every part of it is supplied by blood from the bloodvessels that are next to it. ——
You all know the general parts of the Integuments with. any dissection: you have seen an insensible substance raised by a Blister, what we call Scarf Skin, within that there is the sensible true skin and under the true skin there is a soft elastic substance wch. connects that loosely to the parts beneath; because we find a certain degree of resistance upon drawing it out, & upon letting it go again, it falls back to its place, & you all know there is a good deal of fat under the skin, more or less of it in different places: as also that there are a number of hairs in the skin, there are too a number of pores in the skin from wch. unctuous matters may be squeez'd out, as in the face, wch. is expos'd to the Air and upon squeezing the sides of these a kind of sebaceous matter is thrust out wch. looks like a species of small worm. —— The cuticle is remarkably thickend in some places, as in the soles of the feet, & in general the Cutis vera is somewhat thicker in such places, it is in some measure double, as we observe within it a softer skin, wch. in the European is extremely thin, and difficultly seperated, but in the Negroes it is thicker and is seperated more easily: y. substance not being expos'd to the Air renders it a good deal softer than the outer layer. —— The first who discrib'd

it accurately was Malpighius he tho't it was first discovered and so called Reticulum mucosum but the best name is Corpus mucosum: it is white and opake, not so clear as the other part of the Cuticle: in the Negro the Corpus mucosum is of a darker colour, but the color is not confin'd entirely to this, as has been very generally alledg'd, for we find it likewise on the other surface: looking still more narrowly, we find the inner part of the Corpus mucosum is mark'd with the ridges of the Cutis vera, so that it is extended over all its inequalities: & when the Cuticle is seperated from the Cutis vera by dipping the part in boiling water, we find still a degree of resistence from a No. of very minute fibres, w.ch was first I believe demonstrated by my father 20. years ago, & these very where make a close connexion. Next upon the surface of the Cutis vera we find ridges, the surface of w.ch is very beautiful, as upon the extremities of the fingers: next upon examining the cut edge of it for the thickness and consistence, we find that this varies a little in different places: half way in it is opake, of a whitish colour, & the deeper we go it becomes the softer, & there is a greater quantity of liquor in it, till at length we trace it into the fatty and Cellular substance. The Cellular substance forms every where Cavities w.ch communicate with each other; so w.n if water is collected under the skin, in the superior parts of the body, it falls by its weight to the most depending parts, & upon blowing in Air it is in like manner spread every where, not only along the surface of the Body but it also penetrates between the muscles, w.ch are all connected loosely to each other, in the same manner that the skin is

connected to them: this therefore may be considered as the universally connecting medium of the human body. Dr. Haller carrying this to an extreme describes most parts as being little else than Cellular Substance compacted together. — This Substance sustains the fat: it is a mistake that the fat is found out into the very same cells, that in dropsical Cases contain the water: I shall shew you the contrary with the Microscope: it has been frequently observed that the marrow consists of little globules, and that it is contained in short sacs: but nobody has conceived so of the fat, I find however that upon cutting a little bit of the fat and exposing it to the microscope, it is contained in like manner in short sacks, & looks like a cluster of Pearl. — The nails we find are a part of the Cuticle, & cooperate with it. ——— In the Arm pit and groin I find very minute Glands about the size of the heads of very large pins, wch are placed under the Skin, & wch have been little attended to, as their Colour is darker than the fat you may see em in it. — When a nerve is followed into the Skin it is soon lost in very minute branches. ———

We sometimes find a growth from the surface of the skin, particularly in those places wch discharge a quantity of sebaceous matter, here I shew you a growth from the papilla of a woman's breast. Another of a horny consistence, wch I cut out from

a persons forehead. — Another wch has lain there 98.
hundred years or more in our Library and which grew
in like manner from the forehead, & was cut out by a
Surgeon, the length of it is about 7. Inches, & it seems to
be of the same nature with the other. ——————
I shall next shew you a new skin formd, or y. Structure
of the Cicatrice of the skin, after having cut out the skin,
& allowd the part to heal up again: I find a vast No.
of vessels in the Cicatrice, wch appear more vascular than
the skin, does in any other part: we see vessels coming
from all sides to it, & that these are interwoven, but it
remains a question whether these new vessels communicate
with each other, as is the case with the rest of the blood
-vessels. In order to determine this I durst not trust to
the Eye, or to the microscope, but I cut into the belly of
an Animal by a longitudinal Incision till the Cavity
of the Abdomen was fully opend, & then allowd y. part
to heal by sewing the opposite sides together: & after
that cut transversely above and below: & then made
another cut parallel to the former by wch means I had
cut quite round a certain portion of the skin & Abdomen:
I then injected the vessels from the heart & I found y.
there were numerous vessels filled in that part I had
now cut round. ——— I proceed to demonstrate the ex=
=ternal parts of the Eye: & the coverings of the skull, to
prepare us for the structure of each of these organs; &
I begin with the head, on one side the skin taken off, we
find under the skin above the Ear first a muscle some=
=what of the shape of a Fan with its spokes spread, &
the narrow part connected to the Ear: y. upper part

grows thin, & is join'd to a Tendon y.t lies under y.e skin of the head, it is nam'd the superior auris, or attollens Aurem: on the fore & back part of the head we find two thin muscles connected by a Tendon, w.ch is common to both, so they are call'd Occipito frontalis within the Attollens Aurem & get hold of a firm tendinous substa. w.ch is the covering of the temporal muscle: & y.t remov'd we have a fine view of that muscle: it does not arise meerly from the Bone, but also on the outside from y.e tendinous Aponeurosis: & we find a cell.r Substance only connecting it to the Zygomatic process. Here you obs. y.t if a suppur.n begins upon the side of the head, it may appear again at the bottom of the Cheek, with.t any appearance of an intermediate swelling, the matter passing down below y.e Zygomatic process. The more pains is taken to leave this tendinous aponeurosis in this manner y.t we may dispute a mistake that D.r Haller & some of his disciples have gone into, in attempting to determine the degree of sensibility of our Periosteum by making experim.ts upon y.e tendon: but the proper periosteum of the Cranium is quite distinct from y.t Tendon & is only loosely connected to it: in so much y.t matter may collect between them & spread some way before it gets vent. I shew you y.e appearance of the skin of the Cranium, w.ch is thick, the cellul.r Subst.ce is shorter: there is some fat, but it is harder here y.n elsewhere, & it makes more a part of the body of the skin, & this greater thickness & hardness of y.e skin is also increas'd by the quantity of the hair w.ch is rooted in the fat & passes thro' the Cutis vera. — Next we come

examine the muscles & fleshy parts of the Eye.
The one side of the skin is only seperated & soon have a very
good view of the whole of the covering upon y.d Eye lids
made by Orbicularis muscle. Albinus has unnecessarily used two names for this, calling the inner part of
it Biliary, & the outer part Orbicular but we may
as well apply 2d. names, as there is no particular
distinction, at the inner part of the Eye is the chief
connexion, where it runs into a Ligamentous substr.
w.ch is connected to the nasal process of the superior
maxillary Bone — Next raising this muscle, I find y.d
Corrugator Supercilionum: & going a little deeper to
examine the muscles within the Orbit I find y.e attollens
palpebræ super. the under Eye Lid falling down by
its own weight — I next shew you the muscles of y.e
Ball itself as far as can be done in this view, w.ch I
must do: is the most useful being y.e w.ch we are oblig'd
with in doing any operation upon the Eye. We find 6
y.e are called straight, one above, another below, & one
on each side, & which are pretty equal in size, two
obliqui, viz. the Inferior & superior a Trochlearis. —
The remaining parts are fill'd up by a quantity of
fat forming a cushion on which the Eye ball is sup-
ported & plays. — Within the Orbit we also find
a very consid.le Gland that seperates the Tears, called
Glandula Lachrymalis, & the puncta Lachrym.
into which the Tears are suck'd they w.ch the pass into
what is call'd the Lachrymal Sac.

Lecture 16th

I have mention'd to you the Cuticle divided into two layers: viz. Cutis vera: under it the Cellular Substance, or Tela Cellulosa, with that the fat or Tunica Adiposa, from the fat the hairs are sent off in most places of the body: & in a few places we can demonstrate Glands plac'd within the Skin, the ducts of wch perforate it. I need not now to mention what we find describ'd as a Tunica propria musculorum, because this is nothing more than the Subcutaneous Cellular Substance collaps'd upon the substance of the muscles: or of a Tunica Carnosa, or pannicalosa, wch is proper to Quadrupeds wch have the power of corrugating the Skin by this muscular substance under it, we only find something like it on the head &c. as the Occipital & frontal muscles, but we do not find it a common Tegum.

Let us now consider what we may conclude with regard to each of these Coats, & first with the Cellular Substance, wch is not to be describ'd as a general Covering, but rather as the Medium connecting the covering to the other parts, as we find it common to all, & as I said Dr Haller carrying this to an extreme undertaker to prove that many parts of the Body are nothing else but this condens'd membrane.

I have prov'd the communic.n wch the sev.l Cells have with each other: we found that it is soft and yielding, having a consid.le degree of elasticity: & it is found to be insensible: in consequence therefore of its toughness Elasticity & insensibility it is excellently fitted for a connecting substance it yields easily when any part is stretch'd, by its contractility serves to replace it: it also serves to conduct the nerves & Bloodvessels to their distribution on the Skin, whereby

they are less in danger of being torn from the Cell.r Subst.ce we find connected. — The Tunica Adipora, but w.ch is to be consider'd as distinct from it, just as the marrow is distinct from the Cancelli within the Bones, w.ch may be compar'd to y.e Cell.r Substance elsewhere; — Upon examining the Omentum w.ch is intended to lubricate the surface of the Bowels I find when I put the Microscope bags appearing round & exceeding small, yet the oil sweats out, we may therefore consider this as an instance of what Anatomists call a follicle, & connected to these Bags we perceive a number of Absorb.ts or Cholents, so it appears that the fat is in a continual state of change, & consum'd more particularly by Exercise & fatigue, & as we observ'd that the nourishm.t we naturally receive from y.e aliment.y Canal is white and opake or a mixture of oil with other substances, there is ground for supposing y.t as y.e fat is reabsorb'd into the Circulating mass, it may give a similar opacity to the parts of the Blood; from its there exuding thro' the membranes in w.ch it is there deposited we perceive several of its most important offices, that it serves to prevent the accretion of the diff.t parts by being interpos'd between em, as it there gradually escapes: in like manner it allows y.e several membranes to play & slide upon each other: it fills up the inequalities of the several parts, whereby it gives order form & figure to the body: it also defends the diff.t Organs of our body from compression in the different postures they assume, & by being absorb'd into the Circulating Mass, & is chiefly consum'd by exercise, it performs more especial purposes, as preventing the bad effects of Exercise): & we can imagine y.t the fat serves for the nourishm.t of Animals, as we know fat substances are remarkably nutritious; so

the fat from the Cells of the body may have y.ᵗ same effect
& in dormant animals we find at the beginn.ᵍ of the winter
a consid.ᵉ quantity of fat accumulated, w.ᶜʰ is greatly dimin-
-ish'd during the time they continue in that state, as in the
case of Hedgehogs &c. & I think it seems very probable that
the subcutaneous fat sweats thro' the pores of the skin, w.ᶜʰ is by
no means so inconceivable as has been supposed: for this
exudation not only takes place after death, but we find for
instance that the Gall bladder tinges all the parts in its
neighbourhood, & in like manner the fat may exude thro'
the diff.ᵗ pores. ——— From the fat the hairs are sent out, &
upon examining the root we find the structure to be very
curious & beautiful we shou.ᵈ a Bulb, or rather an appearance
of two, the one smaller than the other: upon the surface of y.ᵉ
Bulb we see evidently vessels y.ᵗ contain red blood dispers'd:
& we can give the same acc.ᵗ of 'em as of the vessels that are
dispers'd on the Bags, y.ᵗ contain the oil, & we find in the
Bulb a matter varying in different parts according to the
colour of the hair, if we trace the hair itself we shall find y.ᵗ
each is compos'd of still smaller fibres, as in a Bristle, & these
are ty'd together by very minute fibres, along which the
coloring matter from the Bulb passes, whether it is push'd
in by force, or passes by such a power of attraction as cap-
-illary tubes are found to possess it is impossible to determine.
From this Structure may be explain'd sev.ᵈ circumstances
w.ᶜʰ at first sight appear unaccountable. Thus by age
there is a natural change in the color of the Hair, & we can
conceive this readily to happen if from the steaming vessels
of the bulb becoming too small for allowing colour'd matter
to pass, in this Case the hair returns to its constituent

parts; & the ground work of the Hair in all persons is the same, the matter from the bulb giving the colour, so we can understand how a like change may be produced by Disease, as in Consumptions &c. Here the fat is in general consumed, so there may be a want of secretion, wch is made at the root of the hair, in consequence of wch it becomes loose & readily falls out. — So if we attend to the Eruptions wch happen on the skin, we shall find that these are more frequent in those parts, where a quantity of hair is collected than in other places, so we are led to conclude yt the Disease does not so much affect the substance of the Skin as the roots of the hair: so yt the practice of cutting out the hair in these cases we seem to be proper as the bulb thereby more easily discharges its contents. — Over the fat we have seen the true skin extended: in most places it is intimately connected wth the fatty Bags, as well as with the Cellular Substance, so the innerside of the skin appears a great deal softer than the outer: it is compos'd of a vast number of fibres, matted together in a most regular manner, as in a Glove, many of them we consider as proper to the Skin, perhaps we may admit yt a great part of it consists of cellular membrane more condens'd, but at the same time a quantity of nerves, & a great subdivision of blood vessels do enter it, wch we can inject & see divided into very minute Branches. If we attend to the thickness in diffr places, we find that there is originally a difference in this respect, that those parts of the body wch are the most exposed to pressure have originally within the limits a greater thickness than the rest, so the back parts of the body have a greater thickness than the fore parts, but the vascular & sensible Substance

increase &c according to the force to wch it comes to be ex=
=pos'd: & in some places the number of vessels entering is
greater than in others, hence the difference in color. The
Cellular Substance serves to join the skin to the deeper pts
& when stretch'd to bring it again into its place. And ac=
=cording to the state of the body, its being expos'd to more or
less heat &c. The Skin draws itself together by means of
a vast number of joints you observe in it, & wch surrounds
extremely minute spaces. Upon the skin, we find its surf=
=ace very beautifully figur'd in some parts, in those chiefly
that are apply'd to objects as on the points of the fingers,
also in some measure in the points of the toes: the surface
is form'd into Ridges, & these are subdivided into Tubercles
to wch Authors have given the name of papilla; from the
Analogy of what is seen upon the Tongue &c. & not only
is the structure furrow'd, but when we mean to examine
any substance very accurately, the several risings are
fill'd with blood, & the nerves are render'd more sensible
by the distention, as in the base of the penis: the
Nipple in women, & the papilla in the Tongue.
The uses of the Skin are so very obvious that I need scarcely
to mention 'em: by its Sensibility to Injury, it serves as
a defence to the Animal: leading us to shun any thing y.
gives pain, whilst by that particr degree of feeling we
possess in the Skin in general, & in some parts more than
others, we are enabled to judge of the nature of external
Surfaces, moving the Body upon the Skin, or the Skin
upon the body, or Object, & we may suppose y.t y. papilla
upon the skin, are rais'd in the manner I mention'd.
The Skin serves to defend the Interior parts from too great

an waporation, whilst by the division of the vessels upon its surface somewhat humid is continually discharg'd: and in the warmer Countries what passes this way exceeds the quantity of Urine, & we may suppose that there is not only a corresponding Absorption; but perhaps we may suppose that we receive thro' the pores of the skin a some-thing necessary to Life, resembling what we receive thro' the Lungs. ——

Corresponding to the surface of the cutis Vera we find the Cuticle every where pierc'd entering between y.e furrows of the skin, so that we must use boiling water, or must allow the parts to putrefy, in order to seperate it. ——

The Cuticle we find to consist of two layers, y.e external which is thicker & harder, & as we observe that Nature changes the external covering of many Animals yearly, as in the Lobster, & as the nails, w.ch are evidently a part of the Cuticle are gradually push'd forwards, & as a scaly matter is constantly seperating from the surface of our body, it has been suppos'd y.t y.e body is continually throwing off its Cuticle, & y.t as one part seperates another is form'd beneath it: I have observ'd that the colour, w.ch is universally allegd to be found only in the inner Layer, is to be found in both; & the difference between the outer & inner part is very much owing to condensation, & to the drying of the outer part: upon drying the inner p.t we find it to be nearly the same as the outer, tho' the color may be partly dispos'd by the Air, & they both agree in their Texture; they are by no means easily corrupted: coming off in the form of a membrane after the putre-faction has advanc'd very far in the skin itself, & in

the parts beneath: the Cuticle is extremely dense, so that matters are evaporated thro' it with very considerable difficulty: whereas when it is taken off the skin itself and parts beneath soon grow dry and hard, as Anatomists frequently experience.

It is altogether insensible, & we never find that by disease it acquires sensibility. It is well fitted therefore for protecting the Extremities of the nerves, & so allowing to apply the Skin to the examination of Objects. The only other point is with regard to the manner of its formation, whether we are to consider it as a substance extravasated & crusted upon the surface, or organized and having vessels, but these are too small to be the subject of demonstration. Some of the latest and most accurate Anatomists, as Meckle and Haller, are of opinion, that the Cuticle is merely an humour pour'd out from the Extremities of the exhalent vessels & hardened upon the surface of the Skin, this they infer from several obvious Considerations: viz. we do not demonstrate vessels in the Cuticle, when we inject the vessels of the Skin, & make them red: nor can we ever force a colour'd matter thro' the pores of the Cuticle in a dead body, without making a separation of it: & when a Blister is applyed the water gets between the Skin and Cuticle, so they conceive that the water is naturally pour'd out there, but that now the Quantity being increas'd a separation ensues, the water not passing so fast thro' the inorganic pores, as it is pour'd out by the

Cyhalents: & when the Blister is cut & the Cuticle re-
-mov'd in a few days it is again form'd: So much for the
probability of their opinion; I apprehend however that
if every circumstance is held in view we shall form a
very different conclusion concerning it: & the first; we
are by no means to admit that the Cuticle wants vessels
because we cannot demonstrate them. For we find the
Cornea of the Eye, the Cartilages of many other organiz'd
Substances into wch we can push as little Injections;
neither are we to say with Meckle that if the Cuticle
were organiz'd, the compression wo. stop the passage of
Liquors thro' it, as in the pulse it is no doubt wonderful
that compression sh. not have a greater effect than it has,
yet the same reasoning wo. aptly to a want of vessels in
the Cutis vera wch is equally exposd to pressure.
In like manner when we apply a Blister if we co. prove
that the Blister had no other effect, but to occasion the
effusion of a quantity of Liquors, the seperation of the
Cuticle co. not upon the other supposition be very well ac-
-counted for: but persuaded of the Organic Structure, I have
repeatedly examin'd the matter, & I find that it is not the
useless & hurtful part alone that passes out here, but that
the Lymph & Serum of the Blood are discharg'd, & it happens
here as when we irritate any sensible part & inflame
it, as when the Eye is irritated, not meerly the Serum &
Lymphatic parts are effus'd, but y. irritation continuing,
the red parts of the Blood pass into y. Cellular substance
likewise: so the vessels are considerably alterd & chang'd,
The weaker give way, their continuation is broke off, & a
Liquor effus'd which is by no means natural. And

109. The regeneration of the Cuticle only shews that y.
Cutis vera is capable of supplying it, & that y. divided
vessels are again continued: so let us compare the
Cuticle with the nails, as we to consider these as pro-
-duc'd by an exudation, we see a regular structure;
fibres growing lengthways, & we may suppose the
vessels of the Cuticle may be equally organic as those
of the nails. Let us also examine the Analogy of other
parts, where the Cuticle is continued, in the Stomach
and Alimentary Canal, w.ch are cover'd in like manner,
so that we may suppose the common Tegument
pass down into the Alimentary Canal, & that there
is a similarity of structure, only the Vessels are
larger in the one part than in the other, & the quantity
of matter they pour out more considerable. Besides
we can perceive little holes dispers'd upon y. edges
of the skin: & upon tying the finger loosely there is
a greater effusion produc'd, & we can plainly per-
-ceive that the exhalent vessels penetrate into the
Cuticle: Dly. Therefore conclude that these fibres I
shew'd you passing from the Surface of the Cutis vera
are the continuation of the exhalent vessels of y. skin:
That the nerves do not enter the Cuticle appears pro-
-bable whether we attend to the Dissection of from or to
the properties of the parts.

I proceed to the demonstration w.ch I began with Yes-
-terday of the Eye. — The Eye lid is a doubling of y. skin
w.ch is inverted at the edge of the Eye lid, & then laid
over the fore part of the Ball, so that the common
Tegument form the edge of the Eye lid, they become

indeed a great deal thinner, but the same general structure remains and the vessels shining thro' communicate their colour hence we find y.t. when an Inflam.n attacks the Eye, the loose skin within the Eye lid swells out so sometimes as almost to cover the whole of the Cornea. — In the doubling of the Eye lid I find a firm substance, the shape of w.ch you see when I turn out the Eye lid; it is intended to prevent the Eye lid from wainkling, to stretch it properly, & make it take the figure of the Ball, this is call'd y.e Ciliary Cartilage, & is largest in the upper Eye lid, w.ch chiefly possesses motion: Immed.ly within the hairs upon the Eye lid we perceive a vast N.o of small openings, y.t are just visible to the naked Eye, they are the mouths of ducts w.ch are situated upon the Cartilages below the inner skin: their length is nearly equal to the breadth of the Cartilage, & y.e matter they contain appears yellowish when we look at y.e ducts lying upon the Cartilage, but upon squeezing the ducts we find it white: these ducts prevent the Injury y.t w.d arise from the meeting of our Eye Lids, by lessening the friction. — These are very often the Subject of disease, when y.e Eyes are tender: & we are oblig'd to supply the want of y.e matter hence the use of Opthalmic Ointments. —

Lecture 17.th

Merely a demonstration of the Brain, & any Criticisms that were made were again mention'd in

Lecture 18.th

The Brain and Cerebellum form a very principal part of the nervous System, w.ch we are afterwards to examine &

to consider very particularly: I shall therefore take notice only of such uses of the parts as are obviously deduc'd from the simple dissection of ane. When cut the Cranium circularly we find a very considerable Adhesion of the inner membrane, y^t Dura mater to it, & when it is drawn asunder we discr. a vast number of red points, w^ch are the extremities of lacerated vessels & hence we conceive that the dura mater serves as y^e external periosteum to the inner table of the scull, y^e use we assigne to it is that of supplying the bone with vessels: so conclude y^t Surgeons in performing operations, as useing the Trepan sh^d be extremely cautious not to detach much of it y^t is absolutely necessary: for the same consideration y^t we avoid to scrape the periosteum from a Bone, viz. least we sh^d bring on a Caries. — We also further that there can be no such motion of y^e dura mater as was formerly alledg'd, & upon attending to the communication w^ch the vessels upon the opposite sides of the scull have with each other, it appears probable y^t the affection of the external membrane may disorder y^e dura mater; but not however in such a degree as M^r Pott has supposed: when the pericranium is seperated by violence the dura mater will be detach'd too, but this is not from y^e communic^n of the vessels, but from the same violence affect^g both: in such cases we find y^e dura mater adhering. As the thickness of the dura mater is more

considerable than the external periosteum we are led to conceive y.t it serves as a soft cushion to defend the very tender substance of the Brain. Next made about into a vessel call'd Sinus, w.ch we found to be y. Trunk of a vein cover'd by the dura mater, & we observ'd the small branches entering at the sides of that: we shall afterwards find several useful purposes serv'd by this structure, that the vein is greatly strengthen'd by it, & several dangers thereby avoided: and the small branches passing obliquely thro' the dura mater, y.e oblique passage serves the office of valves.

We next took asunder the 2. Hemispheres of y.e Brain, and found a process of the dura mater going down to a considerable way betwixt them, & from observing y.e appearance of the dura mater we see some foundation for saying that this is a double membrane, the two layers of which adhere very closely, & the middle parts are softer & connected by strong cellul.r threads. Raising the Brain from the Cerebellum we found a similar membrane stretch'd between em: y.e evidently prevents one part of the Brain from gravitating upon another in the different postures of the body: while the two membranes, the falx and Tentorium mutually support each other: & in some very large and swift animals we find this partition form'd of Bone.

Going still deeper we find that the dura mater runs down into the Spine, serving the same office to the Spinal marrow as to the Brain in general, & lastly we obs. where the nerves go out to the external parts y.e Membrane is wraps close about them as in y.e Optic

neur when this membrane terminates in the Sclerotic Coat. ——— Next we observe the appearance of the surface of the Brain & Cerebellum: both are very much convoluted, but particularly the Cerebellum the evident purpose of this is to increase the external surface in order to give room for the very minute divisions of the blood vessels for the pia mater, or vascular membrane descending between each of the convolutions: and the several doublings of the Pia Mater are kept together by a very fine coat without vessels, the Arachnoid, w.ch is connected to the Pia Mater by Cellular Substance: & we may consider it likewise as depending the very tender vessels of the pia mater. — Perhaps farther the Arachnoid coat may prevent concretions better than a membrane with a great number of different vessels, & we find that nature guards against the Contact of the dura Mater w.th the surface of the Brain by the interposition of a Liquor. — If the Liquor sh.d at any time be collected in unusual quantity so as to form a Hydrocephalus, Externus, the water w.d fall down into the Spinal Marrow, between the two membranes in consequ.ce of w.ch the vertebra may be push'd outwards so as to give the appearance of the Spina Bifida, so that this may depend upon a dropsical disposition, whether of the Spinal marrow or of the Brain: It does not however in all cases depend upon a general disposition of corroding matter; or

upon a diminish'd Absorption: for the water may be confin'd to a particular part of the Spine, perhaps proceeding from a certain degree of Inflammation & a connection of parts in consequence of wch a watery Tumor may be form'd. Next cutting into the substance of the Brain & Cerebellum: we obs. that the Cortical or Cineritious substance is by no means so thick as we are apt to conceive it: the Deception is owing to the convulsion convolutions of the Brain, the thickness being only about 1/6. part of an Inch. — The Cortical substance has very when the pia mater immediately applyd to it: nexty. medullary substance is very when connected with the Cortical; so that we can't shew medullary fibres with. being able to trace them back to a Cortical Substance, or a Cortical Substance wch does not form medullary.

We next trace the fibres of the medullary substance; wch we can see with the naked Eye, & we can see 1st. the nerves are very where their Continuation, last obs. to you that all the medullary fibres are not continu'd to form nerves; some of 'em are continu'd in a direction that is the most unfavorable to the formation of nerves, & the fibres that compose the Substance of the Brain and Cerebellum is much greater than that of all the nerves join'd together. Within the Brain we find many Tubercles: & there seems to be a necessity some how or other, for reasons that perhaps we can't conjecture, that of several Tubercles be kept from adhering to each other, & hence we find ventricles within the Brain; & as it is use to observe these Hollows for the sake of Diseases particularly of water collected there: & to judge how far it will be proper to follow Surgeons

in Operations they propose to perform here: you have seen their place and manner of communication: I have demonstrated that the two lateral ventricles communicate with each other, under the Anterior Crura of the Fornix, between these and the Choroid plexus, the communication large enough to receive a large wing'd Quill: at the same they communicate with the 3. ventricle, the hole being open underneath: & that the third by the Ad quartum ventriculum communicates with the 4th so that D.r Haller is mistaken in denying the communication of the lateral ventricles: & he was probably misled by some affirming that they had found water collected in one ventricle and none in another; wch may have been the Case: thus we can suppose such a degree of Inflammation to have taken place as to have occasion'd a concretion of parts: or a Schirrous Tumour might occasion it: — But accurate observations of this kind have not been made: & the water might run out from the one ventricle into the other, in consequence of which it wo. be collapsed: so that this Circumstance gives the greatest & clearest proof of the communication. — He is also mistaken in alledging that the fourth ventricle communicates with the Spinal Marrow: probably he was misled by Ruysch who upon opening the Spina Bifida found the water to run down from the head, but the water must have

been collected between the Pia & Dura Mater: or if we shall we find that the water in the ventricles communicates with the Spinal marrow, such a rupture has taken place, as sometimes happens in y.e Abdomen in the Case of the Ascites; the water breaking out where there is the least resistence. It is pretty certain that the Glandula pituitaria is of the same nature w.th the Lymphatic Glands in the rest of the Body.

From the situation of water contain'd within y.e ventricles you will apprehend at once reject the proposal of perforating into it with a Trocar, there is no success to be expected, for before we reach the water from the side of the Brain, we must wound it to a great depth, if we keep in the middle we must wound y.e Corpus Callosum: But suppose that by a wish a person could effect the evacuation of the water; that very circumstance wo.d produce death, by allowing the parts to collapse: & therefore as water happens 20. times at least for once in any other place, the perforating the scull will seldom be of use; & if upon making an opening at the side of the Bregma, we find the water is much deeper: we ought to push our Enquiries no farther.

Having fully examin'd the Eye with the Cranium & its contents, We proceed to examine the other parts: beginning with the Abdomen, naming first its muscles, then its viscera: the Thorax: Jaws: & Throat, and finish with the Extremities. At this meeting I propose to shew you the muscles of the Abdomen.

The spermatic Chord does not pass thro' y.e internal oblique according to Douglass, but passes lower as

Albinus describes it; so that Turning is only in y.
extenal oblique. — You can have no difficulty
of understanding the action of the Abdominal
muscles, without premising more than a few
of the most simple observations, such as one
upon thinking a little readily recollects. You
know that the muscles are composed of fleshy
fibres or threads: to allow the general body of
the muscle to play with ease, there is a thick
coat over it of Cellular Substance, wch collapsd
gives the appearance of the membrana propria
musculorum, but as every fibre is active, & as
the fibres are not only pulled out, but are thrown
into a zig zag form, to allow of this the Cellular
Substance dips in between all the fibres of our
Body. most of the muscles are of a red colour wch
they receive from the blood circulating along y.
fibres, but that is not essential to the proper
effect of a muscle, for the flesh of a fish is white,
& in the human body some parts possess a
muscular power wch have a very different color:
but we generally find the muscles of this color,
more especially those that serve for the general
motions of the Body, & its Extremities. Next
in the Jaw examples you have seen you have
constantly observed that the muscle begins
and ends tendinous. I explained the use of
Tendon formerly: y. y. fibres from some necessity

of nature, are bulky and tender, hence a vast number of 'em are needed, and room is not given for y.e insertion of them all, so the Tendons serve the same purpose y.t a rope does to a number of men in pulling any heavy substance. These Tendons run nearly in y.e same direction with the flesh, & hence it is generally conceiv'd y.t they are nothing more than a muscular part harden'd, and accordingly when the muscles are prest'd we find them Tendinous: but notwithstanding of y.e apparent continuation, they seem to be rather originally so found; for in the youngest Fœtus we find the intersection found. & in the Temporal muscles for instance the fibres of the Aponeurosis run in a diff.t direction from the flesh. But whether made originally out of y.e muscle, or a substance essentially different from it, y.e only circumstance at present I need to insist upon is: That the Tendon has no contraction, so y.t y.e motion depends upon the length of the muscular fibres entirely; & the extent of the motion is in proportion to the N.o so Pitcairn run into a strange mistake in reckoning y.e strength of the muscles from their weight. Every muscle in action endeavors to contract: but while the muscles are in their strongest action they are lengthen'd out: & we can overcome perhaps with the force of our Arm 250. but we can also allow 25. to overcome the force of the muscles of the Arm: & we shall scarcely find y.t the muscular Energy is so suddenly thrown in as to overcome the resistence of both Extremities at y.e same time

it passes in so gradually, that it ceases when the one yields, & thus we raise the limbs alternately, the term therefore of Origin & insertion of a muscle is improper, for what is origin in one part is insertion in another. Now these evident facts being mentioned, for I need scarcely say any thing with regard to the power of muscles in shortening themselves: with regard to their being hollow Bladders & inflated, that they can never shorten more than one third &c. for in many instances I shall shew that they shorten a great deal more, thus I can thrust my whole hand into my mouth, & then I can contract it so as to grasp, when the contraction is six times. I shall begin with the straight muscles wch are most in view. As this is pushed out into a convex line when it acts it being itself straight, & therefore pushes in the Belly & compresses it. Next we suppose it is brought to a straight line, & that we are in the state of a full inspiration; it will draw down the lower Ribs, & assist in expiration: but if after the Ribs are brot down, we wish to bend the Thorax, or to push any thing away before us, we move the whole upper part of the Body by means of it, or we draw the Body nearer to the pelvis. The last effect is that if the Thorax that if the Thorax be fixed, the Pelvis will be drawn up towards the Thorax, thus a person can throw his heels over his head upon taking hold of a Bar of Iron & pushing with his hands: the Pyramidales concurs in producing this effect and serves further to compress the Bladder &c. With regard to the

Obliqui their action may be reduc'd to the greatest simplicity: for the External Obliqui have ye fibres in ye same direction with the Internal of the other, so may be consider'd as forming one Digastric muscle, & so with regard to the other two, when I draw down the Thorax or raise the Pelvis with a Degree of obliquity those muscles are employ'd; but in other respects their action is similar to that of the Recti, for if I act with them all the slanting direction of the one Balancing that of the other the body is mov'd streight. — The remaining muscle is the Transversalis, its action is very much confin'd to ye constriction of the Belly, it is continu'd in sheaths, & the effect of these is to increase the action of the Rectus muscle, & we accordingly do employ the Transversalis when we want to have its action more considerably increas'd. —

By the action of the Abdominal muscles, the Contents of the Belly are carried downwards, delivery is assisted, the Circulation of the Blood thro' the Viscera promoted, & when we act with the Abdominal muscles violently we throw the content of the Stomach upwards by vomiting: also in Expiration while the ribs are displac'd by the Elasticity of the Cartilages, the Diaphragm is replac'd by pushing the Belly inwards. —

Lecture 19th

Within the Peritonæum, besides the passage of the Blood vessels, & nerves, we find the Bowels serving 3. different purposes. — viz. those that serve for reception or preparation of the Aliment so call'd as the Chylopoetic

Viscera, or the Stomach & Alimentary Canal, as also
other viscera, that are assisting to this, & wch pour in liquors
into the Cavity as the Liver & Pancreas, & we shall perhaps
find it probable that the Spleen is subservient to ye Liver
in preparing the Bile; when the Splanchnic viscera are
remov'd we find the urinary Organs; & at the uppermost
part of the General Cavity we find part of the Organs of
Generation, & to allow an easy motion, we shall find a
quantity of fat, & an organ nam'd Omentum. With reg.
to the Structure of the Umbilicus it is easily conceiv'd a
Fœtus in Utero swims in water, but it must somehow or
other be connected to the Mother: & the conveyance is made
by a Chord of vessels wch pass out at this place, consist.g
of two Arteries wch are sent upwards from the Iliacs & go
out at this place, & a vein wch enters at the same hole;
but immediately alters its direction, & runs up to the
Liver. Now had either of the vessels pass'd directly thro'
the Cavity of the Abdomen, the course of the liquors
might have been disturb'd by the motion of the Bowels,
so they run on the outside of the peritonæum in ye Cellular
Substance, & perforate the Linea Alba, or tendons of the
Abdominal muscles, so the umbilicus is nothing more
than a hole in the Tendons; & the vessels carry with'm
a thin sheath continued from the Cuticle: so after Birth
there being no circulation in the vessels they cast off
at the Umbilicus, & the opposite sides growing together
form a little knot wch makes a prominence at ye part:
We find in the Adult nothing more than the Arteries
shrunk into a Ligament towards the pelvis: the rema-
ins of the Umbilical vein are better seen from this

circumstance that a doubling of the Peritonæum supports it. — Hernia may happen here the Bowels may be pushed outwards covered with the Peritonæum — The 1st. thing that comes into view when I lay the Belly open is the Omentum. — It never reaches so low as it is described by Anatomists, & they are deceiv'd from the change which happens to the Abdominal viscera, with reg. to their situation when we open the Body, the cooling of the Air in y. alimentary Canal allowing them to subside, & further upon y. pressure of the external Air every part subsides according to its Tone, & a Collapse takes place here similar to that wch. happens to the Lungs upon opening the Chest; It is not continued farther than y. Umbilicus, & the Intestines below that lay directly upon the Peritonæum. — Stomach, like to a Bag pipe with the large end towards the left side. — What is nam'd the Anterior side is rather the superior, when the Stomach is moderately distended, & the 2. curvatures may be consider'd as Anterior & Posterior with regard to their situation: also the orifices approach nearer to one another when the Stomach is moderately full, the Cardia being then not two Inches higher than the Pylorus. —

It is not very necessary to distinguish that part of the small Intestines nam'd Jejunum, from it being supposed to be empty of Chyle, from that part nam'd Ileum, & Physicians seldom make y. distinction, comprehending both parts under the name of Ileum: so they call it an Iliac passion whatever part of the Gut may be affected. —

The Intestines are nearly, but not altogether of a Cylindrical shape when distended, their Coats are thin, & as you go down they gradually become more pellucid. —

† we can easily understand the formation of the Omentum

Paying no regard to the names w.ch have been borrow'd from Quadrupeds: we wo. say that the Ileum went into a great sack, w.ch makes the Beginning of an Intestine universally nam'd the Colon, this enters the Caput Coli nearly at right Angles: then the Colon is lengthen'd out some way, & is lodg'd in the hollow of the Os Ileum, & this we wo. name the Caput Caecum Coli, & from y.e part goes of the appendix vermiformis. — In the Colon we find 3. portions of a circle joining together to form it: & we find it drawn in between these Circles by cords running longitudinally w.ch have been nam'd Ligaments, but they are in reality muscular organs, & become broader as we descend towards the Extremity of the Gut. To explain the manner of the formation of the several Ligaments, here we find y.e Peritoneum lining the Os Ileum, & following it, we find y.t it next comes forwards to cover the side of the Colon, when it has past down, so y.t the substance call'd Ligament is only the Continuation of the peritoneum & the surface of the Bowel appears smooth & shining in consequence of its being cover'd with the peritoneum, in the same manner that the Abdominal Muscles are. Then passing over y.e Gut & falling down upon the opposite side it forms the mesentary, w.ch is only the peritoneum doubled, y.e it arises to form the mesocolon; & having seen the mesocolon and mesentery form by the peritoneum, we next have y.e mesocolon over the colon to form the omentum, in like manner the Liver is cover'd by the peritoneum, & doubling goes down to the Stomach & forms the small Intestines Omenta, & y.e continu'd down from the Stomach forms the large Omentum, w.ch receiving vessels & there seperating fat,

Lecture 20th

We proceed to examine the structure of the Bowels: Nº 1st of the Alimentary Canal. — wch is in general compos'd of 3. or as Anatomists for the most part reckon of 4 diffen: parts. — The external coat is the continuation of the peritoneum. — The 2nd is the fleshy or muscular, consisting of two rows of muscular fibres, one row disposd longitudinally, & wch are exceedingly minute, but the inner layer of the fibres, ye threads of wch are disposd circularly are very evident. The 3. coat, the innermost one is generally namd villous: & this is connected to the muscular by what has been described uni = versally as the 2d coat under the name of nervous, but I rather consider it the medium serving to join these and resembling the subcutaneous Cellr Substance, or wch serves the same office to the Intestines, wch ye subcutaneous Cellr membrane does to the skin, in several respects however it seems different it wants the fatty Bags connected to the Cellr Substce & the threads are shorter, so we may follow Dr Hallers description in saying ye within the muscular coat is a Cellr Substce ye villous nervous coat & yn an other Cellr Substce. — On inverting the small Intestines there are a Nº of Rugæ or doublings of ye villous & nervous coat, wch make a resistence to the Contents ye valvulæ conniv = entes, by stretching them we can make the Gut smooth, but it requires some force to do this, & it is likely yt they retain pretty constantly their place; probably the Villa are again lesser vessels similar to the larger, at least the Surface by means of the villa is very greatly increasd:

The number of the Rugæ or valves in the small Intestines are continually diminishing as you descend, & the appearance of the villæ are always in proportion to the appearance of the larger valves: & in the larger Intestines their is not much room for speaking of either. — When the small Intestines are join'd to the larger, we find a strait place or valve, wch is of a very curious texture: You may imagine that the end of the Ileum wth all its Coats but the external enters between transverse or circular fibres of the Colon, wch gives an oblong shape to the valve, & ye more you distend the Colon the more you straiten that valve, the Circular fibres tieing the more to bring themselves to a streight line. But besides this, the membranes at ye sides, or ends of that valve are put upon the stretch wch brings the two lips to apply to each other: so faces lodg'd in the Caput Cæcum Coli will not readily return thro' this valve. —

The Appendix Vermiformis may be considerd as ye beginn. of the Colon, as in the Foetus it lies in the same direction: but the weight of the faces gradually push it down, so ye Appendix in the Adult comes to make ye side of the Colon: In the whole tract of the Intestines, from the mouth perhaps downwards, we find a vast quantity of slime or mucus: for the seperation of this, there are a vast number of exceedingly minute Glands, most of which & much more readily the Ducts from them, from their smallness escape our obser=ation; but in many places we can see the Bags containg the Slime, as in the mouth of the Stomach, in ye Duoden=um, jejunum, Caput Coli, & in the appendix vermiform=is. In some Subjects they are vastly more distinct than in others.

Lecture 21st

We shall now stop to consider some of the principal things that we have seen with regard to y^e^ structure of the Splanchnic viscera, & the division of the Abdomen made by Physicians into certain regions in order to direct a little better in the application of remedies. — as the Epigastric; behind w^ch^ lies the stomach, & under it a share of the middle arch of the colon; & at the sides the Liver, Splean & Pancreas, the turn the Colon makes on both sides with a share of the Kidneys. —

Umbilical, containing the upper part of the small Intestines, with the sides of the Colon: & behind in the Loins the lower part of the Kidneys. —

Hypogastric, containing part of the small Intestines, the under part of the Colon, Rectum &c.

The peritonæum is a single membrane, so far as it is to be consider'd as a membrane: & owes its double appear^ce^ to the Condensation of the Cellular substance, & in some cases it has a morbid appearance, & we find a similar appearance in other parts of the Body. — The Cellular Substance every where ties it to the other parts, & not only ties it to the other parts, lines the muscles but covers almost always the different viscera so as to give them an external Coat, & if we suppose a very accurate dissection made, & this Coat separated, we leave the peritonæum entire & the Bowels upon the outside of it between the Peritonæum & Spine. The various Substances therefore call'd Ligaments or supporting membranes are only

The continuation of the peritonæum: y. mesentery and mesocolon are a doubling of it: but y. Omentum has the peritonæum quadruple: Dr Haller describes it as a double membrane, & if you suppose the Colon drawn away from the stomach and the Omentum put upon the stretch it is only double: but take it as it lies over the Intestines, or if you open the Abdomen & cut thro' the Omentum, you cut thro' the peritonæum 4. times, one doubling of it being produc'd from the Stomach, and the other from the Mesocolon. The male Omentum is however but double because it is form'd entirely from the Membranes from the Liver, which cover the Stomach only. Next you will observe that the male Omentum with both parts of the large Omentum, with the covering of the stomach, Colon & pancreas form one great sack which has no communication with the rest of the Abdomen but by the foramen of Winslow. I observ'd that the Bowels had a different situation after we open the Body from what they have in life; so y.t tho' we speak of the Cavity of the Abdomen there is no such Cavity in it as appears in a dead body, it is quite full, & does not contain above a Teaspoonful of Liquor: so y.t it is a difficult matter to open y. Abdomen without wounding the Bowels therefore the thrusting in a Trocar is a very dangerous operation in a sound Animal, and it only

becomes safe when the parts are separated as in Ascites by a collection of water, wch goes between the Bowels and Abdomen, the mesentery and Mesocolon keeping the Bowels connected to the Back bone, while the fore parts yield to the distention. — Whenever water is collected in the Abdomen it is in the Cavity of the Peritoneum: & as that can be trac'd the whole extent of the Abdomen the water varies its situation according to the situation of the Body: from this circumstance Surgeons may discover a collection in the open Cavity, from wt is form'd in particular viscera. So it may happen y.e y.e foramen of Winslow may be inflam'd & the sides of it grown together, & that after this water may be collected in y.e sac into wch it opens, & wch I have said is bounded by the Stomach, Mesocolon, & Omentum, & as it wo. not be easy from the feel to distinguish the seat of the water, a Surg.n ought to be cautious in treating dropsical cases, he ought to enquire into the History of the case, & he will probably find that the swelling was chiefly at first about the stomach & then fell downwards. —

Farther Surgeons generally open the left side from y.e consideration that the Bowels will fall least down there: but I wo. observe that the spleen is a more moveable Body than the liver, may be in a scirrhous state, & considerably enlarg'd. There is a case of this kind mention'd by my Brother in his Treatise on the Dropsy, where the Spleen weigh'd about 12 lb. and in that very case the Paracentesis was performed, & it was found that y.e outside of the spleen had been wounded by the point

129. of the Thoracic: so that there is not much in this reason for preferring the left side: but I appre-hend we ought to prefer the right side on another account tho' there may be no obvious Bowels; namely to favour the evacuation of the water that may be contain'd in the large sack I mention'd by the foramen of Winslow. But we must proceed to consider the particular Bowels, & I shall begin w.th those we have not fully examin'd, the Alimentary Canal, w.ch I have said is compos'd of 3. or 4. Coats. The first Coat which it has from the Peritonæum, by its smoothness allows one part to slide readily upon another: it does this the better that very often from its surface a secretion is made by pores which are invisible, Winslow describes them as if he had seen them, but that is a mistake, for I never c.d in a sound body see any Glands in the Peritonæum, but from every part of it we can squeeze out a liquor, & there is a further addition made to this from the fat of the Omentum. ——

Next we w.d say y.t this covering gives all the hollow Bowels a very consid.ble additional strength, so that they dont so readily give way to an dis-tending them — besides there are fewer vessels in this membrane, whereby it is less favourable to con-cretions forming in the Abdomen, we find the outer Coat joind to the muscular by Cellular Substance. —— The muscular Coat is compos'd of two layers of fibres the external run along the

Canal, and the circular transverse; the Seat of these fibres is very considerable, for no general pressure of the Abdomen cō. forcibly push on the contents, & the food does not descend to the end of the Rectum by the pressure of the Diaphragm, or Abdominal muscles, for ye. tunicæ of the Intestines evidently run almost as often upwards as downwards: & in diseases where a paralysis is brō. upon these parts, altho' the patient continues to breathe & exercise the Abdominal muscles, yet ye. Alimentary Canal is gorg'd with fœculent matter. With regard to the manner of action it is extremely curious. Dr. Haller comes by far the nearest to the true acct. of it, but by looking into the accounts yt. are commonly given of ye. matter one wd. almost conceive yt. a contraction begins at our Throat & never leaves till the substance is push'd down regularly from top to bottom, now instead of this the motions are going on at different places, & in different ways at the same time, according to the quantity and nature of the food, the general motion from its twisting & compressing the Gut is call'd peristaltic, & it is understood that that motion is continued from ye. Stomach down to the Rectum; but there naturally takes place an Antiperistaltic motion in Animals, so ye. yt. ye. motion of our food very much resembles the water in the Ocean, by looking at wch. you can scarcely determine at first whether it is coming in or going out, only there is upon the whole a greater motion the one way yn. ye. other so in ye. Alimentry Canal the food is push'd on a certain way, yn. back a little, then on again, & the two Layers

[illegible] takes place ye. quas

of fibres are both employ'd, but they act differently, the longitudinal ones shortening the Canal, & the circular fibres straitening it: thus suppose a morsel of food is taken down the first thing is the shortening of the Tube by the Contraction of the longitud.l fibres, y.e the circular fibres contract chiefly from above downwards, & y.e food is pressd on a convex.le way, thus the longitudinal ones acting first draw the Gut upon the food, when the other fibres act with more advantage, & the longitudinal have the advantage of being fixd at the upper end by the contraction of the Circular fibres. The use of y.e antiperistaltic motion is evident, that nature means not only to prepare, but to turn the food over & over so as to expose every part of it to the mouths of the vessels wch are to receive it, & y.e is done in a more accurate manner, & there is a much closer exertion of every fibre than may be aware of: we are by no means to apply the rules here that have been laid down with reg.d to muscles, that they are so many Bladders, & only contract to a certain degree, for here they contract in such a manner as to shut the passage altogether. Thus if a person swallows a small quantity of Quicksilver, in a short time it goes thro' the whole Canal, wch it cannot possibly do by means of its weight, on acct. of the several turns it makes, & must be pressd down by the ducts contracting so closely as to bring the opposite sides together. In consequence of the agitation our food suffers here it is probably further dissolvd, & perhaps the gen.l tendency to putrefaction is in some measure prevented: also a new combination takes place y.e great

pressure occasioning the pouring out of liquors to
animalize the food & perhaps to dissolve it like menstrua.
The faeculent part is pushd downwards to be discharg.d
from the body: while the useful parts are receivd into
the Lacteal vessels: They are sucktd in as I shall after-
wards explain, but once those vessels are fillid their
muscular coat comes to be contracted, & being crowded
with valves, the food is pushd towards towards the
heart: & this is done wt. considerable force for after tying
the Lacteal duct, I have observd an effusion of Chyle
about the mesentery, by a rupture of the larger vessels.
Within the muscular Coat we find the nervous & villous
Coats; the nature of wch. have been very gen.l misunderstood,
& those after Ruysch have compard the villous Coat to
the Cuticle upon the surface of the Body, but this is
altogether improper, & it leads to another mistake, for
in consequence of this the nervous coat is supposd to
represent the skin: but it is with y.e utmost difficulty
that we can shew very minute nerves reaching any
part of the nervous Coat. Now instead of this I say y.t
villous coat not only represents the Cuticle but y.e Cutis
Vera, the insensible skin on the inside is mch thinner
than the Cuticle, & is shewn with difficulty, the villous
Coat is beyond all doubt sensible, having both nerves
& blood vessels. — The nervous Coat is rather to be
compard to the Subcutaneous cellular membrane:
only it does not contain, or suspend fat, so is a pure
cellular Substce it is much more dense too, having
much smaller Cells, & are however communicate, &

upon the whole it serves the same purpose allowing the villous to play easily, & conducting its Boats and nerves. These two inner Coats form what are call'd valves, the Valvulæ Conniventes: and again each of the valves are subdivided into villi which may be consider'd as serving nearly the same purpose, adding to the Surface, and are not to be consider'd as the mouths of one or two vessels, but as a fold of y^e^ innermost: upon the whole we see nature endeavours to lengthen out the Inner Coat much more than the outer, & the villi make a greater difficulty to the passage of the food, so that it is retarded till it is fully prepar'd, & apply'd sufficiently to the surface of the Intestines.

To defend the Alimentary Canal from the acrimony of the substances we take in, there is a vast quantity of mucus secreted: we can in some places also y^e^ small Bags or follicles, in which it is contain'd, & what we see in some few places we presume to take place in all. Now as for our observe with regard to the general structure; we'll here review the several parts of the Canal, & also the useful conclusions w^ch^ may be deduc'd from them beginning with the uppermost portion the Stomach and so tracing the Canal downwards. We shall first then attend to the passage of y^e^ Œsophagus

into the Abdomen.—We find y.t y.e Oesophagus perforates the fleshy part of the Diaphragm, one way this is very evident & material, had it passd through the tendinous part, the contents of the Stomach wo. have been easily thrown back into the Mouth, whereas by going thro' the fleshy part, & that swelling when y. Diaphragm ascends, the regurgitation is prevented: not that it is entirely shut, for I find y.t I can swallow a liquor when I make an Inspiration, but it is with difficulty.—Next you have seen the situation of the stomach with respect to the other viscera: we can understand what is very often observ'd to happen in practice, that communications are made by erosions from one Bowel to another: thus where there was a suppuration of the Liver, I have seen the matter thrown up by vomiting & pass'd by stool: or if there is an erosion at the fore part the Contents of the Stomach may be thrown out of the Body. In like manner I have seen an accretion of the Stomach to the Colon, & there was a Case in the Infirmary where a communication was between 'em, so that Glysters were vomited in 10. minutes after they were receiv'd, & a hardness could be discover'd with the hand going across the Belly near the Arch of the Colon.—Such a communic.n may have different effects according to its direction, thus it may be slanting so as to allow Liquors to go only one way, as in the case of the Gall-Bladder, where there is such a slanting direction, for we can blow Air into

the Duodenum without distending it.

We shall next observe some circumstances with regard to the emptying of the Stomach & of filling of it: we see very evident longitudinal fibres, and within these, circular ones; there is particularly a Band of longitudinal fibres running along the small curvature. Instead of the Stomach lying in a line with the Oesophagus when it is distended it comes forwards so as to make an Angle with it, which serves too to prevent our food by a moderate pressure from being thrown upwards into y^e^ Mouth, & the Pylorus is turn'd up or rais'd higher, & these membranes have the effect of straitening both Orifices considerably, especially the Cardia: so in vomiting, the pouring in a great Quantity of Liquor by distending the Stomach to a great degree, may shut the Orifices, and so endanger a rupture of the Stomach: & that this does not frequently happen, is owing to this, y^t^ every Bowel supports another, just as when I put a thin Bladder within strong Leather and distend it, I may toss about as I please, so every Bowel supports another, & all are supported by y^e^ containing parts: and the Pylorus is rais'd up^wds^ when the Stomach is distended, for a very evident purpose, for if it had hung down the more it was distended; the undigested Aliment wo. have got out, whereas it is only the lighter parts that ascend and get out: & the Ring at the Pylorus is

not merely compos'd of Coats, but is really a circular Muscle, or Sphincter, wch acts so vigidantly that you will scarce find indigested food in the Intestines. — We know that ponderous Bodies will pass down from the Stomach, & that Gall stones will be thrown up by vomiting; this leads me to observe the situation of the Pylorus, for wch we are a good deal oblig'd to Winslow, that it does not rise so high as the other Orifice, but is situated obliquely & turn'd backwards. — In a Case I met with of a Boy who had swallow'd a shilling, I follow'd what Winslow hints at; I gave a dose of Physic, when desir'd cy. the Boy should be laid first on the right side, & from that prone turn'd frequently to turned to the Back, turning the mouth of the Pylorus to the Spine, cy. the shilling might have the chance of falling into the Duodenum, & whether in consequence of this I cannot say but in two days after the shilling was pass'd. — Lastly as we have found cy. the Alimentary Canal in gen.l enjoys an anti peristaltic motion, so in the Stomach there is a waking from the right towards the left, as well as the other way, but very gently for ordinary: if however a very irritating substce is introduced by an instinct of nature y. Anti peristaltic motion comes to be superior to the peristaltic & cy. means cy. contents of the Alim.y Canal may be brot from cy. lower most part of it upwards; I had occasion to see a Case of this kind with the late Dr Gregory: there was an obstruction in the Colon, which after death was found to be almost intire, & the night before he vomited above nine pounds of faeculent matter exactly like to what was found in the Colon, and the

upper tract of the Alimentary Canal being in a measure empty, the vomiting could not be owing to a great pressure, & we can't suppose all that quantity to have been in the Stomach, it must have filled at least the upper parts of the Intestines; but that of itself is not sufficient to occasion vomiting, the manner of which has been by no means properly explained, look at the description of it in many Authors & you will find that the common account is, that of Diaphragm is push'd down & the Abdominal muscles push'd inwards, so that the stomach is as it were in a press in consequence of which the Contents are thrown up with violence: But that cannot be the case for the back of the Larynx making the fore part of the Pharynx, if the Diaphragm was in violent action, the water going with the Air, the Glottis being open, would get into the Lungs. I conceive therefore that it proceeds in y^e manner a Nausea is produced & the motion of the Stomach is inverted: we act with the Diaphragm in a slow manner, so as to push down the Stomach, whereby we put y^e Abdominal muscles on the stretch: these are thrown into a convulsive motion, & the Diaphragm yielding gently, while y^e matter is thrown up the Air is thrown out at the same time so y^e the water when thrown up is generally mix'd with Air.

Lecture 22nd

The Intestinal Canal is divided by Anatomists into the small and great Intestines, & these are again farther divided. — The Intestine connected w^th y^e Stomach is nam'd from its length Duodenum, we have even it tied very closely to the posterior part of the Diaphragm

ley a Cellr. Membrane, wanting a Mesentery & of course that very close covering wch the continuation of ys. mesentery gives & this is supply'd in some measure by the Course it takes. From the greater Size of that Intestine than of those that im. ly follow, some of the old Anatomists as Riolin have us'd the term of Intestinum Succenturiatum, & perhaps the more this Idea is consider'd the more just it will appear, for besides ys. close adhesion for supporting the stomach in its place, we observe ys. Ligaments of great Importance, ys. Bile & Pancreatic Juice, are pour'd in here: & in order to retain them longer ys. they may be better incorporated with the food, ys. Intestine without necessity makes several short turns; so that ys. food must undergo considble Alterations here. As soon as ys. Duodenum has got to the left side it turns almost quite downwards, & now the mesentery begins to be added, & it gets the name of jejunum, from this the Ileum is continued; & you'll also, that the upper end of the Jejunum is consid.ly wider ys. the lower end of the Ileum, or ys. the tract of our Intestines is somewhat of the Conical shape, wch the larger end of the Cone upwards. Next we also. a difference of colour, the Jejunum is always a great deal redder colord, for ys. Coats are in proportion to the greater Diameter thicker, & we also. a greater No. of vessels in the Jejunum ys. circulate red blood: & when it is laid open we find the valvulæ conniventes more remarkable, & the Villi or farther division of the vessels Valves likewise larger. We can acct. for these consd. Circumstes upon the most simple principles. There is a greater Velocity of food passing thro' the Jejunum ys. n. ys. Ileum, so ys. faeculent part as it descends, becomes more consistent & is more dry'd in the Ileum, hence the necessity that a greater surface should

be applied in the Secretion for the Seperation of these
Liquors from the Blood, which serves to animalize & dissolve
the food: next the surface is encreased for the purpose of greater
absorption; & the better execution of both the valves are
made larger to stop the too rapid passage of the food. as we go
downwards the Mesentery becomes somewhat looser, & the
Bowels are more moveable, but there is no such change of
place as appears in a dead body. ——From the great
length of the mesentery, especially of the lower parts of it,
we can conceive two circumstances possible, viz. 1st. mesentery
& gut may be twisted by a violent exertion: 2dly. Omentum
is of an unusual length, & there is a great quantity of fat this
may in like manner entangle the Intestine by being twist-
ed round a portion of it: & I have found 1st. Appendix
Vermiformis was catched by a twisting of 2d. mesentery.
Can have seen the End of 3d. Intestinum Ileum enter the 4th
of Intestine, & then you observe a valve, of late Years De Haen
& others have proposed 1st. in certain cases, where one part of
the Intestine falls within another, that attempts should be
made to disintangle them by throwing Injections into 3d.
Colon, & forcing it's valves. Now tho' I believe 1st. Liquors,
such as water, will pass it more readily than Air; I would
advise you to deal with the utmost caution, for 1st. valve
will sustain a pressure of 10. or 12. Inches of perpendicr.
weight of water. Have much suspicion further 1st. the action
of the muscular fibres has a very considerable effect, so that 1st.
fibres of the Colon, irritated by the Injection may contract
so as to strict the valve still closer. In one person laboring
under the Iliac passion, I threw in upwards of 16 1st. of Aqua
with oil, wch is rather more than the Colon can contain

140. In another case 20. Syringes full of air were thrown in it must have occupy'd a space equal to 16. or 12. Oz. of water, or y. the valve must have been forc'd. ——

'Tis a strong suspicion y. greater changes are made upon the Aliment in the Intestinal Canal than Anatomists are commonly aware of, & that not meerly by the stagnation, but the Ligaments erected here particularly about the Caput Coli &c. must have a very considerable effect. ——

In the appendix vermiformis we find the mucous pores comparatively very large, & in the case mention'd I found it distended with viscid stuff: it probably therefore serves to secrete a quantity of mucus to lubricate the fæculent matter. And in some of the Species, where that is wanting it is supply'd by a spongy substance immediately under the valve of the Colon. ——

From the Appendix Vermiformis the three Ligam.ts come out, & their part is to be consider'd as y.e bottom of the Caput Cæcum Coli: its situation being alter'd by the weight of the matter above, and you perceive the Advantage of this, that the fibres all come from one point: for these being all in action at the same time, & this part being tied down by the peritonæum passing over it with the meso colon, the other parts of the Colon are drawn down towards that for the retention of the Intestine by means of the longitudinal fibres. We find that the Colon from the several turns it

makes is contiguous to almost all the Abdominal viscera, w.ch is a circumstance that we ought never to lose sight off, otherwise we may be led into very considerable mistakes in judging of Diseases or in treating them. So when a Physician is about to examine the viscera on the suspicion of a Schirrus he cannot form a proper Judgem.t without knowing the state of the Belly, as he may mistake hardend faces for Schirri, & we have examples of matter a great deal more hard than the faeculent collecting within the Intestinal Canal, & by not attending to this, & first giving an Injection, when a purgative &c. person may be put on very long courses of Cicuta & Mercury. With a view to such large Balls being lodg'd in the Colon; you will observe that on both sides it is ty'd down to the Peritoneum, & there is a want of mesocolon, so we can see the possibility of making an Incision into the Cavity of the Colon without going into the Cavity of the Abdomen on the right or left side, at the posterior part between the Ribs & Os Ileum. — And tho' such an operation is never to be undertaken with.t the most urgent necessity, in some few Cases it may be useful. — We likewise see the use of Injections in many diseases, as besides emptying the Colon of its Contents, or in other Cases nourishing the Body, since the great Intestines have Lacteal vessels as well as the small; for I have shewn Lymph.c Glands in the Colon, an Injection throw'd into the Colon, in cases of Inflam.n or Irritation, may have a very consid.le effect, & not merely from the water exuding, or from a certain degree of heat acting mechanically, but from that effect w.ch an agreeable applic.n has upon our nerves: in such cases therefore

we may throw in a considerable Quantity, in order to fill the whole Colon, & I have said that Wx. may be thrown into it. ——— You have seen y.e Intestin.m Rectum run down upon the hollow of the os. sacrum, & that the peritonæum accompanies it, so that therefore in the Erect posture becomes the lowest part of the Abdomen, so if any acrid matter be there it may rest upon the turn of the Rectum, & eroding it may be discharg'd by stool: & I have met w.th an instance where an Abscess of the Liver burst into the Cavity of the Abdomen, & there was a hole eroded there large enough to admit the finger, so I have no manner of doubt that in this Case pus was discharg'd in considerable quantity by stool, and that without passing thro' the Coats of y.e Intestines. I next shew you a few things with reg.d to y.e Assistant Chylopoetic Viscera, the Liver, Spleen & Pancreas: we find no such valve in the Gallebladder as Winslow mentions. ——— And we find no reason to say with Haller that the one duct passes obliquely thro' the other, the passage being equall into both. ——— However upon introducing a probe we met with resistence from certain Rugæ that perform the office of valves, & the duct when fill'd with Air has a Varicose appearance w.th marks of constriction upon the outerside. ———

Till we have seen the whole course of the Blood I should think it improper to enter upon y.e particr. Office of these Viscera. ——— We find a Vigour com.d

from the Pancreas like to Spittle seperated by the Salivary Glands. — We have nothing to guide us with regard to the Office of the Spleen. — We find Lymphatic Glands at the Root of the Omentum where it adheres to the Stomach; so that Lymph.ᶜ Absorbents must come from it. Boerhaave & Haller suppose the office of the Omentum to be very extensive; but its principal if not its only use is to pour out an oil to lubricate the inner surface of the Peritoneum to prevent concretions, & to allow the seᵛᵉʳᵃˡ Chylopoetic Viscera to play upon each other. In the human species we find it reaching scarcely lower than the Umbilicus, the matter flowing from it, readily falling down by its weight; whereas in the Quadruped it is drawn down as far as the Pelvis. —

Lecture 23.

An Examination of the Organs of Urine and Generation.

Lecture 24.th

I am of opinion that the Glandulæ Renales have a Cavity, & contain a fluid: without however having the most distant conjecture with regard to the nature of that fluid. — As we advance in life the Back part of the Bladder comes to be lower than the beginning of the Urethra; so in sounding for the Stone, it may lie behind the Beginning of the Urethra, so beneath the Instrument it must therefore be turn'd this way. —

We see three places at wᶜʰ Hernia may readily happen. 1ˢᵗ at the Umbilicus, where there is great danger of strangulation from the hardness of the Ring, wᶜʰ opens with

difficulty. Here in cutting the Ring, the Ligaments are of no
more consequence than the Cellular Substance only we wo.
rather avoid the vein as of being of some use in sustaining
the Viscera; but the chief danger is in wounding the Bowels
wch we must carefully avoid. — 2dly in the Course of the
Spermatic Chord. This Species of Hernia is more common
than the Umbilical from the place lying about the Groin
it is called Inguinal but it wo. be better to call it Scrotal,
as it falls down to the Scrotum. — 3. We have the Crural or
Femoral Hernia when the Bowels pursue the Course of the
femoral vessels. — But tho' these are the most common
Hernia may happen in a variety of the other places: the
Bowels may be pushd out into the Thorax, along with
the Oesophagus, Aorta, or Vena Cava; or at the side of the
Belly in the Interstices of the muscles &c. You'll observe
that the Peritoneum is pushd out before the Bowels in
these Cases, but it is evident that ejy. Vesica Urinaria
is the subject of Hernia, the upper part of it is not covrd
by the Peritoneum: Therefore the muscular Coat of the
Bladder is the first thing that presents after laying
aside the common Tegiments.

We proceed to examine the coverings of the Testes.
Whether there is reason of the foundation of the term of
Dartos muscle, for expressing a muscle under the Skin of
the Scrotum is doubtful, we see the part possessd of a consid-
erable power of contraction, & we obs. a degree of rugosity there
but we shall perhaps find that there is more of muscular
power in our body than we are aware of, particularly
every part of our Skin is muscular, for it accomodates
itself to heat and Cold in the living differently from

what it does in the dead Body: but the motions of the Testicle within the Scrotum, particularly when the Testicle is inflamed, does not depend upon the Dartos, so much as upon the Cremaster muscle, &c. has such a connexion with the Cellular substance that the Skin seems to be moved by it, & it may promote the Secretion as well as the Excretion of the Semen. The Septum Scroti may be considered as Cellular substance grown more dense by having the Layers pressed against one another. ____

The Vaginal Coat of the Spermatic Chord is little more than the Cremaster muscle with some few tendinous fibres that are sent down from the External Oblique & the Cellular Substance condensed. The resistence however made by this Coat is such, that in some cases water is confined very much to the course of the Chord by the compression of the Cellular Substance. ____ The vaginal Coat of the Testicle in the Adult is shut at the upper part of the Testicle: & this is the common sack of that kind of Hydrocele wch the Surgeons are oblig'd to cure by the Operation. Heister calls the Vas deferens a nerve when he directs to avoid it, in cutting it into these parts. When we cannot introduce the Catheter into the Bladder & there is a necessity for puncturing it, Mr. Sharp advises that to be done above the Os Pubis: but this evidently attended with a number of Inconveniences, and we have a much better place for it, between the turn of the Urethra & Crus Penis;

there is a considerable space, and if you cut this the Elevator Ani you can distinguish a little deeper than at the prostate Gland. So after cutting the skin with a Knife, you push up the Trocar at the Side of the prostate Gland: So after cutting the skin with & you go into the Bladder without any danger of wounding ye. Intestinum, & at a distance from the neck of the Bladder, as well as from the enterance of the Ureters. ___ and leaving a Tube in the opening till the disease is got better off: The urine runs out as fast as it is formd. ___

Lecture 25th

The name of villous applyd to the inner coat of the Bladder; wch is smooth is widently improper ___ We do not find all the fibres in the muscular coat running from the mouth to the fundus, but many of 'em running obliquely: & we can only say that many bundles of fibres begin at ye. neck run up to the fundus, come down upon the opposite side & cross a little when they reach the neck; or ye. we find the fibres very fitly disposd for contracting the Bladder in all its directions. ___ Some have described a distinct Sphincter muscle, but in fact all that we can demonstrate is that the circular fibres grow a little thicker, & the longitudinal & oblique decussate each other, but without forming a compleate Circle as we do we at the Pylorus, or without there being any distinct muscle as we find at the extremity of the Orifice of the rectum. ___ In the operation for Lithotomy, we are to keep entirely to the membranous part of the Urethra, carefully avoiding the Bulbous part which may occasion a very considerable Hemorrhagy

What has been said with regard to the Glandulæ Pacchioni being affected in the Sinus Venosa than can be well proved, their way opening into the Urethra has not been clearly demonstrated: I would rather choose to defer the remarks with regard to the Organs of Generation till the Blood vessels are considered.

With regard to the urinary organs the principal things that occur from the Demonstration are these.

That the Kidney is defended by a quantity of fat from the pressure of the Abdominal viscera: May the like means it is defended from the Lumbar Vertebræ which lie behind it, the Tunica Adiposa being upon the back part as well as upon the fore. — We next find a proper membrane, not deriv'd from the peritonæum connecting the several lobes that we find in the fœtus: & this is in a considerable degree formed of Cellular substance condensed, but not entirely, for the inner side of it has the same smoothness as a portion of the peritonæum. When we cut the Kidney we discover two Substances, 1st. The Cortical Glandular or Vascular part, from this part we see tubes sent inwards, & as these are collected from the whole surface they give it Cortical appearance: at their ends we find the papillæ from which the urine is discharged into the pelvis of the Kidney: & the papillæ project into the Kidney to give room for more ducts, 2dly that the urine may regurgitate or be pressed back into the mass of Blood so that 3dly the more the pelvis of the Kidney is distended, the papillæ are the more compressed; as the Kidney is

originally compos'd of a number of different Lobes, we find many Infundibula uniting into one common duct, like branches of veins collected: & there is no certain rule with regard to the number and manner of joining: in some Infundibula there is a single papilla in some two &c. & also the number of Infundibula varies. — From the Pelvis of the Kidney the urine passes down to the Ureter & it gets the Conical shape from the number of Canals forming it: So Stones may more readily form here, & when they do they may not get down thro' the narrow ureter, but may remain in the Kidney. — We do not find the ureter entirely Cylindrical, but varying in its size & yt. in different places, for which we can assign no cause except at the Turn where it gets into the pelvis: & this explains the various motions of a stone in the ureter. — At the lower end it passes obliquely into the Bladder as to serve the place of a valve, & at the same time its mouth is contracted; so that a stone may readily be interrupted at its entrance: & this in some Women gives room for an operation by which the life of a person may be saved: It has a dense Coat for the muscular, & another dense and smooth coat within it: & I have repeatedly seen the action of yt. Ureter very distinctly, contracting itself like a worm upon the slightest irritation: It is material to consider this yt. it is not to be shewn as a mere membranous Tube: & in the case of the descent of a stone, we see the advantage of giving opium: for by lessening the pain we take off the Spasm & bring on the relaxation of the muscular coat by wch. means the urine may push on the Stone into the Bladder. —
The Bladder is of a curious & complex structure; & here the

common opinion with regard to the extent of muscular contraction is contradicted: for we know that the bladder can retain 8℥. of urine, & its fibres are at the same time capable of contracting so in all directions as to expell every drop of this, which shews that muscular fibres possess a very extensive power: next we do not find any particr. muscle serving as a Sphincter, & yet we possess two opposite powers of pushing the urine out and stopping it at pleasure, hence we also, that muscular fibres can act so that one part of the fibre is an Antagonist to the other, or that we can employ parts of fibres to perform an office: that we can relax the one part & employ the other, wch. we can do alternately. —

The Internal Coat of the Bladder is very dilatable, so may be pushed out by a stone between the fibres of the muscular Coat, in wch. case there will be difficulty in extract. the stone.

The Semen passes upwards thro' the Testicle, then thro' the Epydidimis to be deposited in the vesiculæ Seminales into wch. it regurgitates from the vas deferens, as the Gall to the Gall Bladder from the Liver: they a reverse motion, when necessary, it is thrown into the urethra, near to the mouths of the seminal ducts we find the mouths of the prostate glands opening, & also Cowpers glands the nature of which we do pretend to explain, & in the whole course of the urethra we find Tubes pouring out mucus to defend the passage from the Acrimony of the urine, wch. as it advances passes out the mucus from them, & these are beyond all doubt generally affected in the Gonorrhœa: tho' that disease may also affect the other parts. —

We next proceed to the consideration of the muscles of the Thorax. —

Lecture 26th

An Illustration of the Contents of the Thorax.

Lecture 27th

You observe that the Trachea, or its left branch lies over the Aorta in such a manner, that they may adhere together in the Case of an Aneurism of the Aorta, & the Coats of both being consumd, the blood may burst into the Trachea and suffocate the person; We have an example of this kind in the memoirs of the Academy of Sciences. ——
I shew you a preparation of the Heart where the foramen Ovale is found open the person hang'd himself, & did not hang above 15. minutes, & was found to be quite dead K. K. ——

Lecture 28th

As the Heart is the Centre of the vascular System, from wch the Arteries begin, & to wch all ye veins return, whether circulating or Absorbent: of wch afterwards we shall speak more to the purpose. —— The Heart is a muscular Organ, lin'd within, & without by membranes cover'd. — The Internal membrane wch is glu'd to the muscular fibres when it reaches the entrance to the Cavity of the Heart is reflected, becomes thicker, & by its continuation forms the Pericardium: for it is evident that we can trace ye membrane of the Ht into the pericardium. The Cellr Substce on ye outside of ye pericardium is connected with the vessels runs along'st on for some way, & gives to 'em an addition. thing the and

firmness. The uses of the external membrane and of the pericardium will readily occur when you recollect their situation & connexions. — We wd. say that y. pericardium serves to sustain the heart in its place to prevent it from shifting too much from bearing upon the vessels y. enter it; & from disturbing the functions of the Lungs: & for this purpose we have seen that both pleura, or the mediastinum is continued down over the pericardium. — when we cut into the pericardium we dis. that the inner surface of it, & the outer of the heart are slippery & covrd with a liquor: & besides this liquor wch. exudes from y. extremities of vessels so very minute that they escape our observation, we perceive a quantity of fat constantly collected betwn. the outer membrane of the heart & the flesh, &c. in persons who are otherwise greatly emaciated: & this fat must exude to mix with the secreted liquor, just as it does from the Omentum within the Abdomen; so whilst the concretion of the Heart to the neighbouring parts is prevented it slides & plays without injury to itself or to y. neighbouring Organs. — Next let us go a little deeper & consider the flesh of the Heart: its fibres are finer & more closely connected than they are in the other muscles; whereby they were better to contain the Blood, & perhaps further they are endow'd with greater power of motion & are more exquisitely sensible than those of the other Organs or muscles. — The fleshy fibres in general proceed from or terminate about the mouths of the ventricles, & hence every part of the heart contracts towards this place: The Auricles descend towards it;

& the ventricles are drawn upwards towards it, & the heart is admirably adapted for shortening itself in all its dimensions; It is an error to suppose that the heart in action is made narrower only, they have been led to suppose this from observing that when the ventricle is in action, the heart strikes y.e side, but this chiefly depends upon the particular kind of motion, of the ventricle, whilst at the same time it is brought nearer to the side by the Arteries and Auricles filling at the same time: for the blood begins to be stopp'd, and accumulated while the ventricle is in action, in consequ.ce of wch the heart turns as it were upon an Axis, wch is plac'd about the Basis of the Heart.

The Vena Cava meet to form the right Sinus venosus, wch is evidently muscular, as is likewise the termination of the Vena Cava wch as the same structure with the Sinus venosus, contracts like it & that in a very remarkable degree. What we call Auricle is to be consider'd as forming a common Cavity with the Sinus, upon the right side the Auricle is larger, & the Sinus Venosus less, on the left again the proportions are reversed. At the Entrance of the Inferior Cava we find a Tunicle of the Edge of the Auricle or valve nam'd after Eustachius, to prevent the Blood from falling down into the Cava in our erect posture. — Where the Auricle is join'd to the Ventricle we find the valvula Tricuspidalis, so named from its being broader in 3 places & wch serves to direct the Power of the Blood into the ventricle. The connexion of the valve to the sides of the ventricle is made by fleshy pillars, the use of wch is not as some Anatomists have supposed to open the valve, but to prevent the valve when the heart is in action, from being turn'd back into the

Auricle: we are not to suppose that these pillars are in action at one time, & all the rest of the heart at another, but rather that they are in action at one time with the sides of the ventricle. The inner side of the Ventricle is very where unequal, with a number of Carne Columnæ, and an attention to this might be sufficient to convince us that every drop of the Blood is not squeez'd out at every contract.n of the heart, but it is very nearly so, in so much that in small Animals it changes its colour, we never can imagine that every fova has its rising corresponding, to enter it, so that some small part of the Blood still rem.s From the right ventricle we see the only passage left into the Pulmonary Artery, & at the mouth of the Artery we find 3. Valves nam'd Sigmoidales, they are entirely membranous form'd of the inner membrane of the heart & Arteries lengthen' out. — The pulmonary Artery is divided into 2. g.t branches one to each Lobe of the Lungs, & the Blood is return'd by 2. great veins w.ch terminate in the left sinus: w.ch this Sinus a small Auricle is connected: the Cavity of y.e while being nearly equal to that on the right side, but hardly so large: then we have a similar passage into the ventricle, & a passage from thence into the Aorta: the chief difference here being in the thickness & strength, for a greater force is necessary to drive the Blood thro' y.e very numerous branches of the Aorta, than to drive it thro' the Lungs: & if we are to judge of the force by the thickness it is nearly as 3. to 1. The valves &c. are much the same as in the Right Ventricle: those at the beginning of the Aorta named Semi-lunares. — The Blood then is carried by the Aorta to all the different parts of the Body, & is return'd again to the

heart by the Vena Cava, as is evident from examining the heart, you will observe that a valvular structure is wanting in 2 places, where it might be expected, namely at the termination of the veins into the auricle. Why are there not valves at the termination of the Cava & pulmonary veins to prevent the Blood from being thrown back. I apprehend y^e. the reason of this may be readily given: there might be a danger from preventing a degree of regurgitation in certain Cases, from the forcing the blood constantly forwards into the heart: but even in the ordinary course of y^e. Blood a valve is not necessary, the current in y^e. veins being sufficient to direct the course of the Blood: & it can only appear difficult to account for the want of valves; to those who look upon the heart as acting like a spring; so that as much force is us'd to fill the ventricle as it employs in emptying itself: But the ventricle is altogether relax'd as soon as it is emptyd, so that a very gentle effort of the Auricle is sufficient to fill it. Whereas in consequence of the suddenness & violence with which the ventricle contracts the Blood wo. have been thrown undeguague, were there not a valve between the Auricle and Ventricle.

We next proceed to the Structure of the Lungs.

There are many things that entirely escape us here, we can't follow the Branches of the Blood vessels, or even of y^e. Trachea to their termination without preparations.

Therefore at present all we can consider is the general manner of the motion of the Lungs, & the use of the parts arising from their situation & connexion w^h. each other.

You have seen that the Lungs are contiguous to y^e. pleura, every part of the thorax pressing against another, & these

who have entertaind a contrary opinion, have been misled by drawing too close an Analogy between Animals of very different kinds; As from Birds when the Trachea Arteria perforates the Lungs, & communicates with Cavities beyond them. But the Lungs are adapted to follow the motions of the Thorax; & every circumstance shews the continuity of parts: even when the Lungs are in a collapsed state they exactly represent y^e containing parts: & we often find partial and sometimes total adhesion of the Lungs to the pleura: upon opening the Thorax we see no passage by w^ch the Air can get into it, we find the Lungs touching the pleura, & if we open the pleura under water no bubbles arise of air thro' the water. So that the Lungs fill the Chest, & we can very well understd the reason of this: we need only attend to the effect of the Air on a Weather Glass, where the weight of it is sufficient to sustain, the weight of about 30. perpendicular Inches of Quicksilver, or it is able to keep up water to the height of 30. feet and more: it is surely sufficient therefore to expand the Lungs & keep them contiguous to the pleura. — If this then is understood it only remains in order, to explain respiration, that we understand the structure of y^e Thorax & the manner in w^ch its parts may be enlarg^d & contracted: & we may view the Lungs merely as Bladders, & consider them as passive, as they certainly are with respect to their dilatation, and it is ridiculous for Surgeons, to talk of the Lungs expanding themselves so as to throw out matter y^t

is collected within'am: With regard to their contraction they have a certain degree of Elasticity, as some of the muscular fibres of the Trachea extend to their remotest Cells; but the effect of these must be inconsiderable, as y.t. while the dilatation depends upon the containing parts the contraction depends almost entirely upon the very same thing. Let us consider therefore the structure of the Bones, Cartilages, Ligaments and Muscles. Any solid body may be enlarg'd in 3. ways, in length, breadth, & depth, so we dilate the Thorax in all these three ways. ——

The Diaphragm is excellently fitted for lengthening out the Cavities of the Thorax, for we've seen it push'd up into the Thorax like the crown of a hat, & when in action its fibres become straight & the Cavities of the Thorax are elongated, Abdominal muscles are put upon the stretch or are push'd outwards: Next we observe y.t. our fibrous Ribs are fitted for making the Thorax broader, for increasing the distance between the two sides: & at the same time for rendering it deeper, or for increasing its distance between the Sternum & Spine. Thus if you the ribs to be more perpendicular the Sternum is push'd away from the Spine, for the upper ribs being more fix'd, whilst the under ones are mov'd upwards towards them they are turn'd outwards: & as the ends of the Ribs have thrown in between them a Cartilage w.h is crooked, this is thrust out so that the distance between the sides is increased. ——

The Powers by w.h this motion is performed is beyond all doubt the Contraction of both the rows of Intercostal muscles at the same instant, when these contract the most moveable part moves towards the one that is the most fix'd. —— The only difficulty here & which has

157. puzzled many Anatomists is to account for the obliquity of the Intercostal muscles, & next why there are two Rows of them. I apprehend y^t difficulty entirely depends upon Anatomists not having obs^d a circumstance of the utmost moment, & which we noted before, that wherever extensive motion is acquired oblique fibres are employ'd, the oblique fibres giving a greater play than the straight and contracting more, in proportion to its greater length, brings the two ribs much nearer, and in consequence of there being two Rows, the obliquity of y^e one balances the obliquity of the other & raises the rib in an equal way, neither pushing it backwards upon the Spine, or drawing it forwards upon the Sternum. — One difficulty more remains still, why the External Intercostal muscles, w^ch run obliquely from above obliquely forwards, are wanting near to the Sternum, & the Internal w^ch run in the contrary direction are wanting near to the Spine? now y^e depends upon the circumstance of both Rows co=operating in raising the ribs, for if the external now had been brought forwards to the Sternum the last fibres wo. have been fixd to the solid bone of the Sternum, they wo. have drawn the ribs down=wards, as soon therefore as they are brought so far forwards, that the distance at the place of the Insertion bears a considerable proportion of the distance of the origin of the muscle, from the Sternum the muscle is wanting: In like manner if the internal Row went farther back they wo.

come to be fixd to the spine below & to the rib above at some distance from the head; which must have drawn the first Rib down to the second &. In considering these motions I speak of the Ribs in general, for there is no room for supposing with Dr. Boerhaave that the motion of the Inferior ribs is different from that of the upper, they evidently all move in one direction, & the motion is greater as we go farther from the top of the Thorax, the second rib having the motion of the first, & then its own motion, & so with regard to the next. — Suppposing we have made a full Inspiration, & after a little, suppose we feel an uneasiness, and we mean to expire, the parts are replaced in this manner: The Diaphragm is replaced by its elasticity in some measure, because in its action it pulls down the elastic membranes within the Thorax, stretching the Mediastinum to a certain degree. — The Elastic air containd within the Stomach and Intestines, & wch does not readily escape, will also have some effect: but the Diaphragm is chiefly replaced by the contraction of the Abdominal muscles, for as soon as we cease from acting with it the Abdominal muscles are solliciled to act, so push the Bowels of the Abdomen upwards against the Diaphragm so as to bring it to its natural place, which is more especially necessary in the erect posture, when we are laid horizontally the Elasticity of the parts & weight of the Bowels, in a manner do the Business. For replacing the Ribs we have seen that the Cartilages are sufficient for the purpose even in the dead Body in so much that we always find the body in the state of Expiration: but further as the Abdominal muscles in expiration are bro.

into action in order to replace the Diaphragm. The external obliques being fixed to the ribs must also have the effect of drawing them downwards. when the muscles of the Abdomen by way push the Bowels of the Abdomen inwards and upwards, they must also have the effect of drawing the ribs directly downwards: & when we want to perform the expiration with greater force, we exert these muscles in a still greater degree: But if we want to perform it with violence every muscle, tho' destined principally for the motions of the Cavity or Extremities may be brought to influence the Ribs. ———

Now, after we understand the manner of respiration in life, we readily know the use of the division of the Thorax by a partition the mediastinum, for we perceive that a wound made in the Thorax thro' the pleura must be attended with a great degree of danger, as in consequence of the admission of air, a collapse of the Lungs from their natural elasticity must take place, & we cd. not have in our power to dilate and contract 'em alternately, Whereas in consequence of this division, we can make a shift to live, tho' perhaps a very considerable opening be made in one side, for the Lungs will not collapse when one side is wounded as they do in a dead body upon opening the Thorax, for then the other side is at rest, & their natural tone brings them to a small compass: but the oppression from the wound occasions a greater exertion with the other side in order to dilate the Thorax, & whilst a great deal of Air enters thro' the wound, some likewise goes

by the Trachea Arteria to the wounded side so that there is a very small degree of dilatation in that side. For this Cause too the expiration is performd with the like violence, & the Glottis is in a great measure contracted, hence the Air is thrown from the sound side into the wounded, so that there is an inspiration of the wounded side, while there is an expiration of the other: & in that way life may be continued. Besides these partition serves for conducting the vessels, for supporting the parts &c. — I have mentiond the danger there is in cutting into the Cavity of the Abdomen, & we do think that the cutting into the Cavity of the Thorax, or the operation for the Empyema must also be attended with the highest danger: & yet it is not mark'd out by Surgeons: nay does not take place in fact, & the reason is this; The matter contain'd between the Lungs and the Ribs have the same effect that the admission of the Air into them has, they are mechanically glu'd to the Ribs & prevented from collapsing, so that the Ribs drag the Lungs along with them in the different states of Respiration and the Air does not get into the Cavity of the Thorax. —

Lecture 29th

Having examin'd the containing parts, & contents of the 3 principal Cavities of the Body we next proceed to the neck & fore part of the Head. — & 1st with the small muscles, which with these already demonstrated complete the upper part of the face & side of the head: then the muscles that open or shut the fleshy part of the mouth, after them those that serve for opening or shutting the mouth by

moving the Jaw Bones: then going deeper we examine the muscles of the Tongue, & after them those of the palate; then those of the Throat, of the Pharynx & Larynx; & then we examine such as serve for the general motion of the head & neck first on the forepart, then turning the body those of the back part & finish with the Extremities. &c

Lecture 30.th

In the order of the demonstration we begin w.th the muscles of the Lips, these perform a double office, for whilst they serve to make the motions w.ch their names express, they serve likewise to explain to one another our Intentions, or to express our passions: & this in a way w.ch we all readily understand, but w.ch we find difficult to describe: and I apprehend whether we appeal to reason or to fact we shall find that there is an original texture of w.ch the meaning is readily understood, & it is vain to suppose w.th D.r Parsons that by habit alone we acquire that power: our bodies are better fitted to our minds: or in children we shall find the expression very much varied: nay in the face I have fancied that the disposition of the muscular fibres is purposely varied in different persons, for we do not find w.th any two descriptions even of accurate Anatomists to agree: & we frequently find in the face various natural. —

That however, habit has the power of giving one kind of expression more strongly mark'd, is beyond all doubt, thus we see persons of the same profession, & who are us'd to direct their attention to particular objects, have the same resemblance in their Countenances.

16th. Next let us consider these less complex actions, these performed in receiving or confining food. — In opening the mouth to receive the food we employ all the muscles that raise or depress either of the Lips: we then shut the mouth by the action of the Orbicularis muscle, & press the flesh of the cheeks and Lips close by the Masseter and Buccinator for we scarcely open it much by the Elevators of the Lips which naturlend to separate the Lips from the Gums. — In the meantime by the motion of the Jaws the food is manducated, the masseter, Temporal, & Pterygoideus muscles are filled for raising the Jaw upwards, & that w.th different degrees of obliquity as they act on both sides more or less in concert, but it is chiefly the exter.l Pterygoideus w.ch effects the Lateral motions, mov.g the Jaws alternately to the two sides: or it is used to bring the lower Jaw forwards beyond the upper Jaw, while it commonly falls within it. —— Whilst the food is manducated it is confin'd by the motion of the Tongue from being thrown inwards, & this Organ we find capable of more varied motions than we wo.d expect from viewing the muscles that are inserted into it. It depends upon y.e circumstance, that the fibres of these muscles are continued into the substance of the Tongue: & it is probable that the terminations of these fibres act in a very different way from their origins, wch.t the muscles

serving to move the whole body of the Tongue, may serve the purpose of a great variety: of. muse. Linguales particularly seems to have this varied action, just as the Sphincter of the Bladder has its action different from that of the very fibres that form it.

After the food is sufficiently manducated w.th y.e Tongue we gather it up & carry it backwards into the Throat: w.ch we chiefly do by the Stylo-Glossi muscles, w.ch pull the Tongue backwards: while at the same time we raise the point of the Tongue to the roof of the mouth, by y.e rest of its muscles: By bringing the Tongue backwards w.th the Bolus upon it we have now relax'd the muscles connecting the tongue to the Epiglottis, w.ch comes to be pressed down upon the Glottis, & therefore respiration to be stopped: Life now being in danger a sudden effort of nature succeeds to relieve us: The neural muscles are now throwinto a convulsive action, the Digastricus muscles upon which whole volumes have been wrote about its action evidently serves for pulling down y.e lower Jaw, for when we open the mouth that muscle is slacken'd & there is no surer rule for determining the action of a muscle y.n to observe in what way you shorten it most. But next we suppose that the mouth, & y.e endeavour to shorten it, it is only to be done by pushing up the Os Hyoides: and as soon as the food is prepared we shut the mouth, press the Jaws together, & then we make the effort of swallowing with this muscle. So y.t contrary to what Albinus alledges it is a muscle of deglutition: & a very principal one / w.ch with the other beneath them serve for the motions of the Jaws then act very

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suddenly: and at the same time the Coraco-hyoideus of Authors, or more properly according to Winslow the Omo-hyoideus, or Omo-palato-hyoideus Genio-hyoideus, & the Thyro-hyoideus act, that the Larynx may be pulled forwards, along with the Os hyoides: in consequence of this the Pharynx is dilated and room is made for the Bolus which is now thrown with violence over the Epiglottis: or the Epiglottis & Larynx are drawn forwards so as to leave the Bolus in the Pharynx and from the Larynx being the forepart of the Pharynx it is mechanically dilated. — In the time of this Exertion the nostrils are shut in the most accurate manner: Dr. Haller imagines that the weight of the food is sufficient to prevent from being thrown into the nose, but a person can swallow standing upon the Crown of the head and we observe that if the velum pendulum palati be eroded the meat and drink are with difficulty prevented from getting into the nose, and we observe that if the Elevatores palati have the power of shutting that in the most accurate manner. — The food being now thrown with a considerable jerk into the Pharynx it is immediately irritated to perform its exertions, and the fibres in a circular oblique manner begin their contractions from an instinct of nature which determines the motion downwards, and by the Constrictores Pharyngis the food is shoved down into the Oesophagus But as soon as it has descended a certain way the Digastric and other muscles are relaxed, there being now no danger of the food ascending again they

the successive actions of the muscular fibres of the Oesophagus the food is thrust down into the Stomach That the Pharynx is contracted in the most accurate manner & that this contraction follows the food close, appears from the accuracy with which we can swallow fluids, thus we can swallow water even when the head is undermost, and I find that I can swallow air just as easily as water.

Douglas gives a very complicate description of the Muscles of the Pharynx from Valsalva. It is joined to a great many places differently, as to the mastoid process of the Os occipitis, from the lower Jaw, from Pterygoid process of the Sphenoid Bone &c. Valsalva observing all the connexions, divides it into so many muscles: But Albinus has more properly attended to the direction of the fibres, and finds as it were three layers, so describes them as three muscles, and as these have the faculty of constringing the Pharynx and of squeezing down the food, he calls them Constrictores Pharyngis and from their situation as connected to the head, Os hyoides chiefly, or Pharynx chiefly, superior middle and Inferior Constrictor.

That the Pharynx is contracted in the most accurate manner, and that this contraction follows the food close is evident from every experiment.

Persons with nervous <u>extrem</u> Complaints frequently complain of an uneasiness from wind in the Stomach, and it is difficult to discover

from whence it proceeds: much of it may be evacuated from the food: but in a number of Cases I make no doubt that the patients uneasiness is much increased by swallowing a quantity of air. — an uneasiness is felt in the Stomach and the patient makes efforts to relieve himself, but instead of this the air is swallowed in great quantity, and I can myself bring on an uneasiness in this way. — If we want to employ any further power in swallowing we can draw the Larynx back against the food and assist the Constrictores by acting with the Stylo pharyngeus and cerato-pharyngeus which press the Larynx against the Pharynx. —

Lecture 21st

It is of use to observe that we can pass the finger from the mouth into the throat, and can turn it back till we come to touch the back part of the Septum Narium, so that we can examine all the Backpart of the opening from the nose into the Throat. — — — — — — — —

In manducation and deglutition the numerous small Salivary glands within the mouth are compressed. — When we open the lower jaw the muscles which open the mouth press the Inferior maxillary Gland and the Sublingual, the Tongue at the same time preventing these glands from

cluding the effect of the external muscles: at the same time the angle of the Jaw pushed back presses upon the parotid Gland, the duct of which is pumped by the masseter muscles: and we observe so long as we continue the action of the Jaw the increased flow of the Saliva continues: so that the Glands are not merely emptied, but the secretion is increased: and if by any accident the duct of the parotid gland has been cut thro' or corroded, in the time of eating the flow of the Liquor is found to be very considerable. The Parotid Gland is exposed to external accidents, and as there is a considerable thickness between it and the mouth it comes sometimes to be difficult to continue the flow into the mouth: how this is to be done will come to be explained afterwards. — The duct of this Gland is small and thick so that upon any Calculous concretions occurring here the mouth of the Liquor readily carries them forwards into the mouth: but these concretions are frequently found in the duct of the Inferior maxillary wch is a great deal larger than the duct of the parotid so that they may lodge in it and the flow of their Liquor still be continued: & the mouth of that duct is very much contracted in proportion to its size. — As the duct is accompanied by a considerable nerve there is some danger in making an incision into it, tho' the nerve may be readily avoided: & it is next to impossible to heal the incision the orifice remaining open after: but the slanting direction of the

Direction of the Gut serves for all alive to y.e y.e food from y.e mouth does not easily get into it. — In like manner the mucous glands are prest upon, when the contents are squeez'd, thus when we swallow y.e food we make the Tongue harden, prest it against the palate & squeeze out y.e mucous mechanically as y.e food passes along, y.e muscles y.t form y.e arch of y.e Tongue being at y.e same time in action to throw y.e food into the Pharynx, where y.e Constrictors Pharyngis, squeez the small glands, y.t are situated between its membranes & y.e muscles. — Muscles of the Larynx demonstrated.

The formation of y.e voice is made as Dr. Keill before at this place; by means of y.e Ligaments of y.e Larynx we shape y.e voice into Letters as y.e sound passes thro' the mouth. — Till about 30. years y.t Mons.r Dodart began to examine this matter by experim.ts Anat.l spoke of it in a vague & indetermined manner: the gr.t question to be determin'd is: Whether we are to compare the Voice to a wind or to a chorded Instrum.t That y.e diff.ce between these may be clearly understood, we desire y.t y.e Tones of Wind Inst.ts depend upon y.e Size & Situation of y.e Aperture & y.e Current of the Air thro' them independant of y.e materials of w.ch the entire Pipe is made; Lead, Cast Iron & Wood &c. may be play'd in Concert, whereas in the chorded Inst.ts y.e Tones depend merely not on y.e vibration of the Chords, but also upon y.e materials of w.ch y.e rest of y.e Inst.t is compos'd; thus for example y.e Tones of y.e Violin depend not merely on y.e length & Tension of y.e Strings but also on y.e nature of y.e wood am.ng it: Mons.r Sauveur contends y.t our Voice ought only to be compar'd to a chorded Inst.t so he considers y.e Ligam.ts of y.e Larynx y.t form y.e most straiten'd part of it as Chords w.ch produce y.e Sound: and y.t there have a very great effect we must certainly allow to him; because in a dead Animal, after cutting away y.e parts of y.e Oesophagus

Cartilages &c. if air be blown from y^e Lungs & of suspension given to these Chords we can in an imperfect manner imitate y^e voice of y^e Animal; I shall afterwards show this in Birds who do it more readily: But I can't help suspecting strongly to be taken into acc^t for an muscles are as well adapted for altering y^e situation of y^e Glottis, as for altering y^e tension of the Ligam^ts — We perceive a manifest resemblance between the Larynx and a Pan pipe, but to show this still more clearly, let us only attend to what happens when we mean to sound very acute notes or grave ones; if the sound depends entirely upon them y^e Ligam^ts, who alone by their motion, &c. be made tense or lax; but by an instinct of nature if I mean to sound an acute note, I first attempt to inspire, I depress my Diaphragm, the weight of y^e Viscera drives down my Lungs, & whether y^e Trachea in all its branches, & at y^e same time y^e Thyroid Cartilage is drawn thereby upwards & stretched to the full. — & let us observe what happens in whistling, it is very evident y^t y^e notes depend upon the Aperture as well as upon the Tension of y^e sides of y^e deep Vein Birds when y^e Ligam^ts of y^e Larynx are placed at y^e bottom of y^e Trachea, & when we make a hole higher up we perceive y^t not only y^e strength but y^e Tone of the Voice is altered. So I am persuaded of our Larynx possesses y^e advantage of a wind as well as a Chorded Inst^t & y^e the voice is an y^e most perfect to any Inst^t in y^t it unites them together; & instead of being acted upon by solid bodies, as a corded Instrum^t it is acted upon in a much nicer way by y^e air thrown out from y^e Lungs. — We must proceed to examine the muscles serving for y^e motion of y^e Head and of y^e Trunk of the Body.

We scarcely find any Two Anatomists agree in describing
y.e muscles of y.e Head, back &c. many of them widen'tly vary
very diff.t from one & y.e Tendons running along y.e transverse
processes of y.e Vertib.e y.e use of lig.ts w.ch ty. Vertebræ.
They are sometimes dissected from y.e 1.st insertion while others
follow'd on their whole length. Dr Albinus so far as y.e nature
of y.e thing will allow has given very. best description of y.e
muscles here, but has introduc'd y.e greatest Confusion,
from his enumerating y.e Vertebra upwards while he enum-
=erates y.e Ribs downwards, for y.t he describes y.e 1.st vertebra
of y.e Back as connected to y.e last rib. Douglas scarcely
takes notice of a muscle ascending along y.e transverse processes
of y.e neck & w.ch is mark'd by Albinus under y.e name of
y.e Transversalis colli. Douglas applies y.e term of Trans=
=versalis to y.e upper part of y.e multifidus Spinæ. The 1.st
Scalenus muscle of Douglas is inenerv'd by the 5.th pair & y.e 1.st obs.
y.t y.e Scaleni muscles are not so much of y.e Thorax as y.t y.
are applyd to y.e motions of y.e neck, w.ch is by far y.e most
moveable part, however when I make my neck an immove-
=able pillar I can act with them upon y.e Thorax. Or when the
breathing is difficult I can make use of y.e shoulders, keep
y.e neck straight and draw it a little backwards, in order
to give a tension to y.e muscli Scaleni y.t they may raise
y.e upper ribs as much as possible: when we die in what
manner y.e head can be moved, y.e combin'd action of y.e
muscles in moving it is very simple. In gen.l every muscle
draws it. Joints as w.ch as y.e articulation will allow in
a straight line, & all y.e muscles have a wanting fibres twist

the head, but if a paire of these are in action at y.e same
time y.e obliquity of one balancing y.e obliquity of the other,
they cause y.e purpose of a straight muscle, viz.t to draw
y.e Occiput & bone backwards in a straight line instead of
employing muscles w.ch run very nearly in y.e same direct.n
we can employ y.e musculi Trapezii w.ch run very nearly in y.e
direction and y.e head moves in a diagonal line betwixt
em; and by this means we can draw y.e head much farther
back y.n we cd. have done by a muscle sent directly from y.e
bottom of the neck to the Occiput. If I want to draw y.e head
straight forwards I employ all y.e muscles on both sides
whether straight or oblique; & in like manner when I want
to draw it backwards. but for pulling side ways we are oblig.d
to employ an antient & a posterior muscle at y.e same time
so in order to bring y.e mastoid process down to the Shoulder
I act w.th y.e Sterno-mastoideus & y.e Splenius muscles w.ch
counteract one another. And by a succession of these motions
I can make my head describe a Circle. Suppose I want
to turn y.e nose over y.e left shoulder y.e most immediate for
y.e purpose are y.e oblique inferior & superior strait but strong
strong muscles; but I assist by y.e Splenius of y.e same
side; & to do it w.th full swing: I also employ upon the
opposite side the Sterno-mastoid muscle & y.e complexus
for y.e Splenius & complexus cross each other, so are An-
tagonists y.e complexus thus for & Splenius on y.e opposite
sides have y.e same direction & must cooperate. And
inverting y.e action of these muscles we turn y.e head
with y.e same force backwards: The motions of y.e trunk

are more simple, for moving the Trunk sideways we can employ not only those intimately connected to y^e vertebræ but y^e abdominal muscles; and y^e Recti y^e Trunk. & allow y^e obliquus externus of y^e one side, to take it's full swing & it becomes a muscle of y^e whole Trunk. In the same manner the muscles are added, as the quadratus Lumborum & Psoas muscles, w^ch become muscles of y^e Trunk & when we fix the lower Extremities.

Lecture 33.

Of the Ligament^s of y^e Trunk demonstrated & first of y^e Spinal Dura mater in y^e Canal of y^e Bones, so there is a shining substance interposed between it & y^e first perforation of y^e bones. After finish^g y^e structure of y^e Thorax we proceed to examine y^e muscles of y^e upper extremities, & 1^st we demonstrate y^e bones &c.

Lecture 34^th

We have now seen y^e Bones, muscles, y^e motions of y^e Joints &c. and our further enquiry is considering y^e co-operation of y^e muscles as far as may be useful. — Thus if we mean to raise y^e scapula we employ two muscles w^ch decussate each other. y^e obliquity of y^e one balancing y^e obliquity of y^e other, viz: the upper p^t. of y^e trapezius & y^e Levator Scapulæ: if I mean to pull it down to press any thing under y^e arm: employ y^e lower part of y^e trapezius, for diff^t motions of a muscle may be employ'd at diff^t times; and w^th the serratus & the Serratus Anticus major particularly y^e portion of it near to Lower Angle, w^ch moves it farther y^n a straight

muscle &c. have done. I mean to bring it backwards I employ y^e whole of y^e Trapezius, but more especially y^e upper fibres, but I can likewise employ y^e Rhomboides to make it advance forwards, I can employ y^e upper Pectoral & Serratus but the large Serratus has a greater effect draw. y^e whole Scapula forwards. ——— There are in all 9. muscles w^ch directly operate upon the humerus. to raise it we employ y^e Trapezius and supra Spinatus, & to pull it a little inwards at y^e same time we add y^e Coraco-Brachialis & a small share of y^e Infra spinatus. To draw down y^e arm we use y^e posterior part of y^e Deltoid. & if push it strongly against y^e side, I use y^e 2 Pectoral and Latissimus Dorsi, so y^t it is by these muscles we support weights under y^e Arm. To bring y^e Arm back I employ a combination of Muscles, the Latissimus Dorsi & Teres major, but to prevent these from pulling it, I act at y^e same time with y^e Teres minor & Infra Spinatus; so y^t by these 4. muscles I bring y^e arm back w^th a considerable force. — To bring y^e Arm forwards we employ y^e large Pectoral. Coraco-brachialis. & Latissimus Dorsi By a succession of these motions we perform y^e circular motions with y^e arm, as we can draw a circle with a piece of Chalk upon a Wall. — The motions of y^e Elbow are very simple, for y^e purpose of flexion I employ y^e Biceps & Brachaeus externus & for extension y^e Triceps muscle. — It may not be amiss to observe the vast strength of our muscles we can sustain in life a weight y^t is sufficient after Death to tear y^e muscles to pieces These supposing I can draw in my hand to a right angle w^th the humerus a weight of 100 lb. w^ch I do by means of y^e Biceps and Brachialis; now these are inserted at about an Inch distant from y^e Center of motion whilst y^e weight act. at the distance of 12. Inches nearly, & therefore the muscles actually support 12. times 90. or 860. Besides these muscles

arm obliquely inwards then it. but if they had run straight in proportion to their number their force wd have been greater, so y.t they wd have supported, in this of 360. 400. & 500. ℔. & they not only support but overcame this weight, and further y.t muscle is as much strengthened by this exercise as any other muscle of the body, for it is equally, we must therefore say y.t our Deltoid muscles are able to overcome a y.e resistance of 300. or 400 or 1000 ℔ Weight. —

Lecture 35.th

I will observe y.t y.e are certain parts. Burs a mucosæ, within wch we find a ligament ensheathed, we find on whatever a tendon makes or takes a sudden turn & pushes upon a hard substance in y.e Joint of y.e Tarsus, as y.e Tibialis anticus of y.e Biceps muscle cubiti upon y.e bone, in like manner y.e Tendon of y.e latissimus dorsi pushes round y.e Humerus & pushes upon it. There were first positively demonstrated by Ruysch tho' a.th in the body were unknown to him. The Humerus is luxated more frequently y.n any other Joint of y.e Body, & when y.e happens y.e Ligaments of y.e Joints are so much easily not much relaxed or extended but they are actually torn: the Tendons of y.e Biceps by y.e bones without are torn in their sheaths: it is also convulsed by strength. I never saw y.e luxation to happen upwards; the luxation backwards is mentioned, but y.e I saw is not confined by y.e ridge of y.e neck of y.e Scapula. Thy y.e short muscles, so y.t it must happen very rarely, the most common kinds therefore are where y.e Bone is thrust inwards & forwards or downwards & forwards into y.e axilla, and the first of these is by much y.e most frequent on y.e suspension of 9. out of 10. immediately under y.e Coracoid process. The

round Ball is to be left behind y^e^ superior part of y^e^
pectoral muscle: and it gen^ly^ happens when a patient throws
out his arm in order to save himself. We distinguish it by
y^e^ following marks 1^st^ As y^e^ head after passing y^e^ coracoid process
is drawn up by y^e^ muscles higher y^n^ y^e^ Socket, y^e^ arm becomes
shorter y^e^ distance between y^e^ Acromion process and y^e^ Elbow
next y^e^ Elbow is turned a little outwards: & from want of
the Socket and retaining of y^e^ muscles y^e^ motion is much
less free & parties. y^e^ head of y^e^ bone being wedg'd in between
y^e^ Coracoid process & Ribs under y^e^ Pectoralis few can raise
their hand so as to apply y^e^ palm to the head: but we must
not always trust to this mark, for if y^e^ Ligam^ts^ antow
& y^e^ Laceration further were extended to y^e^ muscles, y^e^
patient may very readily raise his hand to his head
next standing behind y^e^ patient & placed upon a chair
we can immediately perceive a hollow under y^e^ Acromion
& we can trace y^e^ deltoid muscle into y^e^ Sack of y^e^ Scapula
& thence y^e^ hand forwards we find a round & hard swelling
behind y^e^ pectoral muscle & taking hold of y^e^ Arm and
bending y^e^ fore arm in order to roll it we make y^e^ Ball roll
behind y^e^ pectoral, so if all these marks are attended to
you will never fall into a mistake: next as to
Compl^ts^ we must attend to y^e^ circumstances w^ch^ occasion
y^e^ resistance in reducing y^e^ bones in a recent case.
1^st^ y^e^ Laceration of y^e^ Ligam^t^ the Head of y^e^ bone cannot
be made to enter at y^e^ hole from w^ch^ it came out, y^e^ edge
of y^e^ Lacerated part catching y^e^ round Ball. But this
can seldom be much effected for from y^e^ sudden violence the
part in y^e^ Ligam^t^ must be more y^n^ sufficient to receive the
Bone back again. Next y^e^ round Ball is catched by y^e^
edge of y^e^ Socket. next with regard to y^e^ muscles, a tendon

passes over y^e^ head of y^e^ Bone to some distance as of the
Biceps, coming from y^e^ Scapula passing over y^e^ humerus
forces to the fore arm, that tendon has no hold of y^e^ head of
y^e^ humerus it's natural situation but between as y^e^ humerus
is distant y^e^ tendon is drawn over y^e^ neck of y^e^ Bone
& passes in upon it, & y^e^ head is called upon reducing it
in y^e^ tendons of y^e^ muscles w^ch^ is a principal circumstance
y^e^ in the reduction difficult, both y^e^ long head & also
y^e^ short head of y^e^ biceps, & y^e^ share of y^e^ Cracis Brachialis
make a resistance by y^e^ reduction so when y^e^ forearm is
extended various efforts may be made to reduce it to no
purpose, y^e^ biceps being fully on y^e^ stretch, but bending
the forearm & slackening y^e^ Biceps it may be reduced eas-
ily, and as this may have effect in a dead body it must
have a much greater in y^e^ living one, when y^e^ muscles are
stretch'd beyond their natural Tone, & when they react
contrary to our will, & are effected by immediately impressed
by any Inflammation, w^ch^ has often a great shaving in what
I frequently happens y^t^ y^e^ patient has received a pain,
at y^e^ same time there is often a numbness in y^e^ whole
arm, from y^e^ muscle being stretch'd & pressed upon by the
head of y^e^ humerus. & then is a dyne of adhesion
would in y^e^ arm from y^e^ pressure of y^e^ synophalies of
are confin'd between y^e^ head of y^e^ humerus & ribs.

Lecture 36^th^

The muscles of y^e^ forearm & hand demonstrated.

Dr. Keill in computing y^e^ strength of a muscle
does not attend to y^e^ No. of fibres but merely to y^e^ weight
but y^e^ length only & the muscle a private reason
a play, & a short muscle may be much stronger

The flexor proprius pollicis longus we shall now for his Example is remarkable for his uniform & is a very fruitful Instance of a uniform muscle. — with regard to the Aponeurosis we will only add a word or two concerning it namely in performing those various operations or acts of life giving origin to muscles, and we can conceive y.e difficulty with which your Hon.e Society may get out first between y.e muscles or thro' y.e skin &c. necessity there may be for assisting nature by incisions for I have seen on different occasions where y.e suppuration had begun in y.e inside of y.e tendinous dispansion & run along y.e muscles & spread down into y.e hand & broke out in diff.t parts of it: & further other matter y.t pus may be confined, and give the appearance of circumscribed tumour, as in the case of Aneurism & where y.e blood may be confined by the Aponeurosis of the Biceps. — Next let us attend to the Combination of these several muscles & let us now view them in their proper Classes: There are 3. muscles wch principally serve for the flexion of y.e hand, the flexor radialis & ulnaris, with y.e palmaris longus and when these 3 are of y.e hand is straight forwd. from y.e fourth part we find the Carnat.e of Antagonists to these, y.e 2 extensores radialis, & ext.s ulnaris wch draw y.e hand straight backward: we have little rotatory power in y.e fingers, because both are tied by y.e adhering of y.e radius upon y.e ulna. In y.e fingers we find two flexors & but one extensor because we have more frequently occasion to bend y.e fingers forcibly y.n to extend them. Tho' y.e flexor muscles we find y.t these

Tendons are not only tyd down by ye transverse
ligaments of ye wrist but further by ye sheaths of their
fingers, because yese joints are extremely bended &
unless the starting use of the Tendon was prevented ye
effect of ye muscle would be lost, for ye musculus Lubus
being perpendicular their effection not so great as might be
expected at first sight; Without ye aid of the 2 Passives of
of what muscles ye Lumbricales & interossei, ye
Lumbricales have been guessed as a flexor, but ye
root of it begins from ye Tendon of ye perforatus, & they
can only be made to act from ye strength of the muscle
and its motion more extensive; way ye first by ye duty
flexor in drawg ye fingers farther forwards; but we
often act immediately w.th ye flexor & with ye Lumbricales
give ye lateral motion: the musculi interossei also
move ye fingers sideways and are chiefly intended for
ye lateral motion. but passing behind ye ligament to
join ye metacarpal bones they bend ye fingers a
little, & have made a quatr. section w.th long extensors
with regard to ye motion of ye hand & fingers ye ulna
is immoveable nearly so, & we may consider ye axis
of motion to be a line drawn from ye head of the Radius
above to ye head of the Ulna below. In ye supination
we use ye supinator Radii longus & brevis; As for the
pronation ye pronator teres or longus & ye pronator
quadratus: with ye pronator teres we may assist
in bending ye forearm but we never can act with it as ye
1st. nothing ye Radius but for nothing it with more force we
may employ ye biceps flexor Cubiti ye muscles of
the arm & Forefinger & ye flexor carpi Radialis.

Lecture 87.

Pitt. neg. to y^e motion performed by y^e muscles of the lower extremities, you will obs. y^t if I fix y^e Leg y^e muscles y^t commonly move it act upon y^e thigh & trunk, & y^t is one reason why nature has not furnished them merely from y^e thigh bone, but also from y^e trunk, as if we act with y^e longest muscles of y^e leg w^ch come from y^e Trunk of y^e body, on one side, & w^ch then y^t come from y^e thigh only on y^e other y^e first are now made muscles of y^e thigh. ——— I shall in a gen^l way demonstrate the operation of y^e muscles in their common offices viz. walking. Suppose a person to rest equally on both heels & y^t he means to make a step forward, y^e 1^st thing necessary is to draw y^e weight of y^e Leg w^ch he intends to move upon it is y^e left, y^t is done by acting w^th y^e muscles of y^e opposite side turning y^e trunk over & if these into action my abdominal muscles I make y^e motion & at y^e same time I fix y^e pelvis, not only by y^e weight my body but y^e abductors of y^e thigh but into action w^ch pull the pelvis over when y^e thigh is fixed by y^e weight so by this I throw y^e weight over upon y^e right leg and do stand upon it. By standing perpendicularly upon y^e right leg & y^e left having a standing direction, y^t heel is necessarily raised from y^e floor & now fixing y^e right leg I begin to raise y^e left & accordingly for the purpose 1^st the flexors of y^e thigh y^e psoas magnus, iliacus internus, 2^dly bend y^e thigh & draw it up: At y^e same time bend y^e leg a little & by thus bending y^e thigh & leg I have room for giving it the swing forwards — I raise y^e thigh then in this

manner and I mean to step forwards; but if I am
straight upon the right leg, & y^t a little slanting,
y^t coal cannot touch y^e ground: in order to this I must
allow y^e joints of y^e right to bend gently: I now mean
to throw y^e weight forwards & by degrees to bring it
from y^e right to the left: first by bowing & bending y^e Thi-
-thel for w^ch I employ y^e Vastus magnus & Iliacus
internus as before; but on y^e right side w^ch now draws
forward y^e Trunk as before being now moveable, & re-
-sists y^e action of y^e Trunk by y^e Abdominal muscles
while these of y^e neck bring forwards y^e head. At the
same time I mean to raise my thigh forwards upon
my leg: & to push y^e weight still farther forwards I
employ y^e extensors of y^e right leg, & as y^e leg is more
fix'd y^n y^e thigh they move y^e thigh & y^e whole Trunk
forwards: By these means y^e y^e weight is thrown more
& more forwards but still not sufficiently, I still want
more weight on y^e left leg to do y^t. I first employ the
Gastrocnemii muscles, & as it can't be beat downwards
y^e muscles must be beaten / & y^e ascenders are immov-
-able, y^e Soleus absolutely so, & even y^e rectus can have
little effect from its slanting direction, so that is
laid, & so comes y^e Tibia, y^e leg & y^e whole body upon it
is thrown forwards. As soon as I am sensible y^t y^e weight
is thrown sufficiently upon y^e left leg to fix it more y^n y^e
Trunk: I now begin to employ y^e muscles of y^e right leg in
pulling it forwards, & the whole of y^e weight falls upon
the right & do y^e very same thing over again, only I give
the leg a greater swing, after w^ch all the other actions
are effected in y^e very same manner.

I was consulted in a Case of an old woman who had her
thigh bone dislocated in coming of a field w.th a burden
of y.e Corn instead of resting as usual on y.e Posterior
was pushed upon y.e bones in y.e Groin when y.e leg was
became rather shorter, but y.e Toes are still turned
outwards, & as y.e head is more sensibly felt y.e can
be little danger of mistaking it.

Lecture 38.

Luxation of y^e^ Thigh Bone. — Suppose a person slips his foot with a heavy burden y^e^ weight of w^ch^ w^ch^ y^e^ of y^r^ Body, forces y^e^ Leg outwards &c y^e^ luxation will be made inwards. We know they y^e^ following marks, y^t^ Ball of y^e^ Bone not in y^r^ frame thy rotund: y^e^ Cave can be felt more outwards &c y^e^ Cylinder w^th^ difficulty w^ch^ is owing to y^e^ situat^n^ of y^r^ foramen thyroid. w^ch^ is lower y^n^ the Acetabulum & in a slanting direction: upon pressg^e^ y^t^ y^e^ acetabulum we are sensible y^t^ y^e^ tegum^t^ of flesh yield inwards: upon pressing a little further forwards towards y^e^ pubis, we are sensible of a Ball: Upon bend^g^ y^e^ Leg in order to get y^e^ better of y^e^ rotation we are sensible of y^e^ Ball moving under y^r^ hand: now if these marks are attended to y^y^ will distinguish y^e^ disease.

To redress it, y^e^ method in gen^l^ has been, to pull y^e^ p^t^ straight till y^e^ bones were supposed to be sufficiently separated by y^r^ y^e^ pushed y^e^ bone outwards. But by attending to y^e^ circumstances we will be led to a much better method; Now as in y^e^ Luxation of y^e^ humerus, the tendons thrown across y^e^ neck of y^e^ Bone make a very considerable resistance, more especially those of y^e^ ileacus internus & psoas muscle, w^ch^ are intimately known over y^e^ neck of y^e^ Bone; by^r^ means you pull y^r^ Leg y^r^ more you stretch these & make them to resist y^e^ reduction. Surg^n^ Surg^n^ out first to raise y^e^ foot a little outwards, because these muscles are y^e^ most affected of it in y^e^ direction: nay we may so bend y^e^ knee when by y^e^ principal flexors & all the adductors y^t^ can make any considerable resistance are slackened. Then y^e^ Surg^n^ turns y^e^ knee inw^d^ while another person draws y^e^ upper part of the Thigh outwards & in this manner we shall succeed very often w^th^ little pain — Next let us suppose y^e^ Thigh outwards & backwards, w^ch^ happens more rarely In this case y^e^ bone is pushed upon y^e^ back of y^e^ os innominatum & then it may take various situations: I met w^th^ 2 cases of y^s^ kind: both Gentlemen who attended Lectures here, in the one case y^e^ Thigh bone was luxated in the fossa of

the Gentleman co. walk so well it was scarcely observed. —
We distinguish y^e Luxation by a limb becoming shorter y^n Jaw
seem'd turn'd inwards, y^e head also drawn back upon y^e vertebræ
by y^e y^t Cataract is term'd. —— The Luxation of y^e Patella
w^ch is sometimes indeed w^t considerable difficulty, suppose it
is Luxated outwards w^ch is y^e most kind for y^e inner side is
broader & stretch'd y^e Ligaments of y^e Joint in that way & thus
y^e Lig^t purchase may be stretch'd w^tout alienation. y^e distinguish
ing y^e Luxation is easy: Connect w^th a Law when y^e Patella
was moved upon y^e outside of y^e Thigh bone perf^d on by Tesum^r
I then first went to the outside of y^e Patella & indeavoured to dis-
engage y^e bones I put my hand upon the Ligament &
push'd it backwards with all my strength, in consq. of w^ch
y^e inner side started forwards was immediately disengaged
& replaced in w^ch a Crack. & tho' y^e difficulty is not always
so great, cases may occur when y^e is y^e only method of
succeeding. y.

Lecture 30^th

To compleat y^e Osteology of y^e Structure of y^e Joints I
am come to y^e View you y^e Epiphyses of both Extremities
Whence from our knowledge of y^e Invention of y^e muscles
we know y^t a Tendon rubs upon a hard bone, or projecting
Substance we will find between it and y^e Substance
a Bursa interposed. upon examining we find y^e membrane
within every smooth, a q^ty of fatty constantly found at
y^e outside & slippery upon upon y^e inner side, w^ch have
been collected in considerable q^ties in y^e Bursa between
between y^e Tendo Achillis. — The Bursa may become y^e seat
of partic^r diseases & in fact I have seen the Bursa filled
w^th a viscid matter and the size of an egg. In exam.
I also suspect y^t in circumstances where y^e Air is freely admitted
can not to be practised without danger from y^e air blowing

between ym & yr capsular Ligamts of yr Joint. Will
regard the yr Lamentations of yr muscles, besides yr anc. Dt
they are exposed to by being out, by violent efforts they
may be torn; from knowing their situation & insertions
we may often put natural in assisting on, & are apt to draw
wrong views of yr Cause of these Lamentations as in case
of yr Tendo Achillis wch is most frequently lamented, as of
yr Tendon yr goes into yr patella, & from yr into yr Tibia
we are apt to imagine yr it is yr weight of yr body falling
down & binding the Joint suddenly, yr occasions it, but it
rather depends upon yr action of yr muscle itself, & it is
observed to happen at yr very instant of yr action as in yr
Tendo Achillis — My Father. used to mention the Case of John
Duke of Argyle who by an effort had yr sheath lying down
yr peronei muscles torn, wch yr Tendons Glided out
behind yr fibula, wn yr three muscles came to be spas-
modically affected, & were replaced with difficulty, in
such cases when we find the cure has been neglected we
endeavour by making a proper compression to confine yr
Tendon to its place.

Lecture 40th

Next let us consider yr new joint in the lower part of yr fibula
is made as flexible as is consistent wth safety, & yr whole
of yr Bowels prevented as much as possible by the
elasticity of yr Os Coccygis & yr new Ligamentous & muscly
lining & filling up yr Cavity of the pelvis; but as the
Bones of yr pelvis support yr whole weight of yr Body
in a transverse way & unfavorable situation we find
them not only joined together by very thick capsular Ligts
& Cartilages, but glued to one another wch yr there is a

considerable resistance in reducing ye Luxation
ye head of the thigh bone sunk very deep into ye socket
& a quantity of Ligamentous substance forced out to allow ye dislocation upon
every motion of the joint we found ye nature endeavours
to agitate ye gland, at ye same time lodging them in
Cavities we are to be in little danger of being catched by the
head of ye Bone, yet from violence in our reducing ye head
of ye bone may push in upon ye Os sacrum & ye gland
a cause of collection within ye Joint. My Father saw a
case of ye kind where by a fall upon ye Trochanter a collect.
of fetid matter was made in ye Joint of ye thigh, & ye gland
at ye bottom was consumed, so yt ye head had been beaten
too deep & ruined ye gland. In such case ye may be
necessity of making an Incision, wch tho it can't hinder
without considerable danger may come to be proper to the
confining ye matter. In such case ye Ligt may come to
be eroded. Such an accident of a pain may happen yt
ye head of the thigh bone may be fix'd to ye acetabulum
but in gen: it will make its way thro ye bone before the
Ligt can be consumed, thro ye acetabulum & the diffused in
the cellular membrane & substance wch is done to allow ye
ready motion of the joint, so we endeavour to prevent
ye by making an incision in ye Capsular Ligt tho we come
deep. It is of use to obs: ye ye Os sacrum goes a considerable
way upon the neck of ye bone, descending a great deal
lower ye ye round base, & ye wch be ye best pt for making
ye Incision. In ye case of ye fracture of ye thigh
bone it is evident yt whilst by machinery we endeav:
to push down ye thigh, we are to be very careful to prev-
ent ye patient from walking soon, because ye body will
more unfavorably against this Bone than make
others.

The Joint of ye Ancle is entirely a pure hinge.

In ye foot we find ye Tarsal motion made chiefly by ye Astragalus upon it's end, & ye is particularly to be attended to in one disease call'd ye Talipes or Club foot. In Birth ye toes are sometimes found very much inwards, now Surgeons commonly ye ye flexion is entirely in ye Joint of ye Ancle, whereas it is chiefly in ye Joint of the Toes forwards so the Muscles ought to be applyed chiefly to the foot. In ye foot we find the Body supported upon an Arch, ye sides of wch are tyed together by very strong ligts which make us ye shock is very considerably lessened; & in Quadrupeds are supported by ye Toes, ye Os hium in reality ye foot of ye Animal but by ye Spring of ye muscles, wch we manage so as to make every part of ye body yielding, has also a principal share here: there in descending from a height, to lessen ye fall by an instinct of nature we draw up ye Legs ye ye weight may be supported by ye Spring of ye muscles: In ye case of a very violent effort these Muscles may be stretch'd, and having little elasticity ye anger. sore & ye not only reason thereof wth difficulty but there is reason to believe ye ligts are sometimes torn asunder, & their place never afterwards so well supply'd. Lastly with regard to the Patella &c.

instead of considering them merely as pertaining to the Joint by ye pressure of ye Tendons we are to consider them as parts contrived for defending ye Joint & chiefly for throwing ye Tendons of the muscles at a greater distance from ye Center of motion, and so really adding to the strength of ye muscles: and we may view the Patella as ye principal Sesamoid bone in ye body, & whilst ye Bone protects ye Joint of ye Knee from injury by throwing the Tendon of ye Extensor out of ye Joint it brings it to ye Tibia at a greater angle wch from is increased just as we increase ye force of

a hammer by lengthening y^e handle — By attending to
situation of y^e Epiphyses there are several Cases we wo. avoid
wo to distinguish between a Fracture or Luxation, when they
separate from y^e bone we ought to be very careful in y^e application
of y^e proper Bandages, & perhaps a greater length of time may be
necessary here for y^e cure of y^m in y^e case of a fracture or luxation of y^e
bones — Lastly you can understand what happens in Practice that
from Scrophulous & other internal causes y^e Epiphyses may be
push'd from its place & distortions in y^e Joints may proceed from
y^e cause, two or 3 Cases of w^ch you will find in M^r Sharpe. —

Lecture 41.^st

In the Osteology we have seen many examples particul^rs in y^e
head where the N^o of pieces are more considerable y^n y^e number
of motions intended, or when y^e bones are connected by a k^d of
Suture w^ch gives an appearance compar'd to a Suture y^t obtains
not only in y^e Cranium but in y^e face & in y^e Jaws we see a
connexion of y^e Suture made in a diff^t manner, they are sunk into y^e
Jaws, & adhere to 'em as a nail adheres to a board, or to use a
Gen^l term we wo. say y^e bones are ajoin'd to each other for we may
overlook y^e numerous w^ch are almost obliterated in every thin
Plate of y^e parts from their Shape &c^a we might therefore
call Symphyses in to keep up a gen^l Analogy.

With regard to y^e N^o of diff^t articulations in y^e Trunk chiefly
we see even y^t whenever a motion is intended but when y^e danger
of Separation is consid^d or whenever extent of motion is dangerous
there is interpos'd a Cartilage, or y^e w^ch a mixture of Ligam^t
& y^e has been nam'd Synchondrosis; but w^d regard to y^e kind
of articulation the Cartilage is seldom found pure. — Another
kind of Articulation is y^e Syndesmosis from y^e Connexion
being by Ligaments, while y^e Bones or whole have no

immediate adhesion but are tied w.th Cartilages & ty'd together w.th Ligam.ts This obtains particularly in y.e extremities of y.e Os sacrum & Os ilium.

1.st when there is a pronation in ale directions, & this is made by Ball & Socket, w.ch is most remarkable at y.e joining of y.e two extremities to y.e Trunk of y.e Body: but we find two instances of y.e same kind in y.e Joints. ——— Next in a 2.d place we find a motion in a certain degree in all directions but very limited, as when y.e surfaces of y.e bones were almost flat & y.e Ligam.ts very short partic.ly in y.e joining of y.e Tarsal & Carpal Bones w.th those of the hand ——— 3.d kind is y.e hinge w.ch is of 3. species. ——— 1.st y.e connexion of y.e Head to the Spine turning upon a Center pin, & we've no instance of y.e same kind in y.e other parts. ——— 2.d when one or more bones are included in one capsular Lig.t as y.e joining of y.e humerus w.th y.e scapula, & when y.e shape of y.e Bones & length of y.e Lig.s regulate y.e motion to two directions, y.e Ligam.ts at y.e side preventing y.e rotation of motion, & even y.e bones themselves not readily performing a lateral motion. 3.d When two bones move upon each other in diff.t places & w.th 2. joints, yet we consider them as one, thus y.e back parts of all our Vertebræ have a pair of oblique processes, w.ch are intended for one motion, in like manner y.e Ribs are not only connected to y.e vertebræ by around Ball but likewise to y.e transverse processes, and thus too is y.e radius connected to y.e Ulna, w.ch contribute to accomplish one gen.l motion, as in like manner do y.e Tibia and Fibula, how every one of y.e joints of y.e Body can be reduced under one or other of these Retrict.ns for y.e Sybarcosis is only to be seen in Quadrupeds, & y.e Scapula & Clavicle are connected in y.e

ye usual way to the Glands of ye Body.

Lecture 42nd

The Situation & Structure of ye mamma demonstrated.

It Fat found here below ye Skin. Ogling prettily deep into the substance of ye gland under it for ye purpose of defence, but it by no means gathers this according to Dr. Hall., to contribute to ye formation of milk nor is his argument conclusive even if it were in fact ye milk Duct ye mercury gets into ye Absorbent branches only shews ye Absorbents are easily burst, but does not prove any communication. The Nos of ye Duct. arise from 15 to 20. The Areola get its color from a No. of Sebaceous Ducts Glands, which pour out a quantity of Sebaceous matter to prevent ye Skin from being excoriated: ye nipple is elastic & when drawn out collapses again whereby ye Ducts in it become narrower & likewise crooked and the flow of ye milk is retarded much while ye Child is apply'd. - Read ye manner of sucking minutely attention: the Child does not merely apply ye lips around ye nipple and ye make a void in ye mouth but it stiffs ye elongation of ye nipple & stimulates it so as to cause ye filling of ye Cells; & ye Ch. takes hold of it w. the tongue & drags it mechanically into ye mouth using ye Tongue like ye sucker of a Syringe; and ye membrane of ye lips of ye Child is called in aid for excluding ye Air, ye Tongue being drawn back for making a void, ye pressure of ye Air upon ye breast pushes ye milk where there is least resistance. But by ye instinct & nature of ye Child aided somewhat: for they apply ye hand to ye nurse breast and even at ye same time use ye feet to push against ye they may act w. the greater force. . - - - - - -

When one of y^e ovaria is cut open we find within it a h^o of vesicles containing a watery fluid, y^t h^o is com much greater y^n Dr Haller and others have supposed. They only reckon three y^t appear in cutting y^e Ovarium thro' in its middle part, but there are two layers of vesicles in y^e thickness of y^e Ovarium in two Subjects I have counted to y^e n^o of 30. Then are all cover'd w^th a hard substance & y^e surface of y^e Ovarium have adhered to it y^e contin^g of y^e peritoneum w^ch very thin & very close to it by a very dense cellular substance: We find no tube naturally leading out from y^e Ovarium & yet afterwards it will appear beyond all doubt y^t y^e Ova discharg'd involves upon y^e surface: for y^e Head w^ch is in y^e Ovarium to y^e uterus is solid, & is not as was supposed, a Tube: nor conveyance it is manifestly a Duct: & y^e only passage w^ch we find in y^e Ovarium & Uterus, is this y^t Tube nam'd Uterine or after its inventor Fallopian: The mouth of this is wide more y^n sufficient to contain an entire Vesicle from y^e Ovarium but y^t as it approaches the Uterus it becomes much smaller, only admitting a large Bristle round y^e mouth w^ch opens into y^e Cavity of y^e Uterus: We find a h^o of Fimbriæ or fringes; & tho' there seems an uniform structure of laying hold of y^e Ovarium as we lay hold of any substance w^th y^e hand, yet it is found y^t y^e fimbriæ vary in their shape in every subject their structure is muscular. The uterine Tube terminates at y^e corner of y^e Uterus serving to convey y^e rudiments of y^e fœtus into it: I do not say y^t any enter ovum passes, but y^t manifestly somewhat is conveyed. The Uterus is spongy in its inner part & is full of orifices from w^ch blood is discharg'd into y^e Cavity of y^e Uterus, at every menstrual period: The Cavity of y^e Uterus becomes gradually of a roundish shape & forms the Cavity Uteri; & this part you see unequall with a h^o of Rugæ or Valves & in these interstices a quantity of slime is deposited, & y^e Vagina is different from

y.e rest of y.e body of y.e Uterus: The end of y.e Cervix Uteri in a Virgin is directed backwards & rests against y.e Vagina & lies deepest in y.e situation, by y.e manner in w.ch y.e Uterus & its appendices is supported by y.e Ligamenta lata, w.ch are doublings of the peritoneum y.t came ab y.e inventory in: to shew y.e advantage of y.e situation & motion & remark y.e 2.d y.e Ligamentum rotundum by y.e distension of y.e uterus is gradually spun in its breadth till in y.e last months of pregnancy we scarcely can shew it any: it does not onely support y.e Uterus in y.e unimpregnated state, but is so form'd y.t y.e outer coats may yield in proportion to its growth, & y.e lamella are gradually seperated from each other to keep y.e uterus more steadily in its place.

The Vagina in passing downwards is likewise not a straight direction, but rather bends y.e Intestinum rectum, & the lower part turns towards, & y.t still in a greater degree. Within y.e Vagina we find Organs for secreting mucus & at y.e extremity cells y.t are capable of distention containing y.e Carina Carunculæ, y.e manner of their distention we cannot at present explain, we only say y.t by their Sensibility they serve to excite those motions of y.e internal w.ch are necessary for Conception, parts of y.e Uterine Tuber towards y.e Ovarium & assist in promoting y.e Ovum somewhat into y.e Cavity of y.e Uterus: Without entering into y.e reason of it, it is a fact y.t neighbouring parts sympathize or suffer together: Thus suppose my middle finger has been bruised & inflamed, y.e ear might it more readily partakes of y.e Inflam: y.t a man dies y.e part, so in practice we find y.t an irritation in y.e Bladder, Uterus, or Rectum, y.e affection is propagated from y.e one to the other, thus the menstrual flux can be retarded by an irritation begun in the Bladder or Rectum, & y.t y.e Bladder will sympathize & a Strangury be occasioned by an affection of y.e Uterus & Vagina — next we can conceive y.t y.e mechanical Connexion

y^e parts must have a very considerable effect, for y^e
bottom of y^e bladder is connected closely to y^e vagina.
I met with a remarkable case of a prolapsus uteri, when it was
to such a degree y^t y^e Uterus fell without y^e body the distinct
forming y^e lowest part of a Tumor reaching between y^e Thighs
and y^e back of y^e Bladder was dragged along with it, y^e Urethra
was inverted, so y^t y^e Urine had to ascend to get out, y^e Blad-
was so much distended y^t it reached higher y^n y^e Umbilicus
was capable of containing 6. or 8. pints of Liquor as the Cat-
were much thickened & Surg^n was called but not attending
to y^e Inversion of y^e Urethra it was thought impossible to
introduce y^e Catheter, nay y^e more distention of y^e parts
prevent^s their natural State must have a very consid^ble
effect, hence it is a rule laid down by writers on midwifry
to empty y^e Bladder & Rectum before delivery: Neglect of
y^e danger there may be of fistula forming between y^e bladder
& Vagina in consequ^e of a violent Inflam^n in a laborious
delivery. I have seen 6. melancholy examples where y^e
Urine had made its way thro' at y^e Cervix of y^e Bladder
into y^e Vagina & found it impracticable to cure y^e
patients by any operation: from the same cause as in com-
mon cases, I have seen Erroneous Communications,
between y^e vagina and Intestinum Rectum.
The Ovaria are frequently y^e seat of dropsical Complaints
& y^e water is no doubt contained in y^e natural Ova
w^ch are sometimes considerably enlarged to y^e Bulk of an
Egg: If there an small moveable in cant be taken out the
water without y^e most manifest danger, & can only
attempt it when lying pressing against y^e containing parts
they cause an inflammation and Adhesion
Suppose a stone within y^e body of y^e Bladder, we can
not only perceive y^e high Sensation w^ch more easily in a
Female y^n a male, y^e bladder when moderately filled
rising a good way above y^e Os pubis, from the greater

capacity of y^e^ pelvis, but we can cut from y^e^ Vagina into
the Bladder without meeting with any vessels or nerves of consi-
derable moment, I do not mean to say y^t^ y^s^ is y^e^ best kind of
Operation, but only to point out y^e^ possibility of it, & it may
become necessary one, as when a Stone lodges at y^e^ bottom
of y^e^ Bladder, has invited y^e^ Cut & begun an Ulcer^n^
& is making its way thro' y^e^ vagina, & we've an Instance
of y^s^ kind in Hildanus, & if in y^e^ male we prefer y^e^ Lateral
operation to any other there is a further reason for pre-
ferring it here, where there is wanting y^e^ prostate glands
& vesicula Seminales: Likewise we can do in y^e^ male
make y^e^ puncture of y^e^ bladder between y^e^ Os of y^e^
Pelvis & Side of y^e^ vagina & it may be done directly
from y^e^ vagina passing an Instr^t^ at pleasure near to
or further from y^e^ neck of y^e^ Bladder remembering y^t^ y^e^
length of y^e^ urethra is about 2 Inches, & as y^e^ membran^s^
of both Bladder & Vagina are of a consid^le^ thickness
there can be no danger of a Fistula, because we can
make an oblique passage w^ch^ will have y^e^ effect of a Valve

Lecture 18.

There are Two principal Arteries, or Two hearts in our body
y^t^ w^ch^ serves y^e^ most gen^l^ purpose y^e^ left, from y^e^ Aorta it
is evident from y^e^ view of y^e^ human body y^t^ of the heart
& pulmonary Art^y^ System is subservient to this: y^e^ 1^st^
principal Arteries after y^e^ 1^st^ itself is supplyd runs to y^e^ head
& terminate in y^e^ Brain y^e^ internal Carotids & y^e^ Pulmon
Art^y^ takes its rise from y^e^ right side of y^e^ heart. — From this
preparation of y^e^ heart, you'll obs. y^e^ y^e^ Auricles & Ventric
are considerably more capacious y^n^ is commonly believed
the right side of y^e^ heart is flatter y^n^ y^e^ left, & we observe
y^t^ y^e^ viz^z^ is greater. — The Two Coronary Arteries are inter
laid w^th^ small arteries & veins & I saw between one
an^d^ from these passing over from y^e^ one side of the heart

to the other. I need to allege y^t there is some mistake in the discription of Malpighius who describes y^e two as being originally at a distance of late years D^r Haller has explained y^e mistake from y^e Appearance in y^e Chick — The Heart entirely receives its blood entirely from y^e left side from y^e Aorta descendans almost y^e whole of its blood back into y^e right Ventricle Auricle — The Nerves of y^e heart begin alone in y^e neck and various branches are dealt the way; and some of y^e nerves keep near to y^e large Arteries others of 'em near to y^e Auricles: We find y^e y^e Artery recalls not behind y^e Valves upon being distended now y^e Mesenter. of y^e Artery, w^ch makes it of y^e figure of 8. portions of a circle joined by angles to each other, & the use of these valves to w^ch the name of Sinuses have been aptly'd by Valsalva is very They are not merely y^e effect of pressure of y^e bowels, of y^e resistance made to the blood of y^e Arteries yielding near this place, — Next we proceed to y^e coats of y^e Arteries & Veins; & shew you a piece of y^e Aorta w^ch is very elastic substance, & it shortens very considerably, nearly a 6^th part: the coats are of considerable thickness, & as these require nourishment & growth like y^e rest of the Body, we find numerous small Arteries distributed on this Coat what writers call Vasa Vasorum, the Coats of y^e pulmonary Artery are visibly from y^e Aorta. — When y^e Coats are dissected we find upon y^e outside, loose & common cellular substance, or in some few places y^e addition of membranes laid over y^e Artery as y^e pleura within y^e Cavity of y^e Thorax, we find a loose Cellular substance every where y^t seperates that we obs. of y^e coats part of an Artery is of a white colour y^e whiteness depends upon a tough and elastic Coat in w^ch a number of these exceedingly minute fibres are interwove in all directions

so that we may very properly w.d Dr Hall consider this (154)
outer coat to be a cellular Substance condensed, for I cannot see y.t y.e fibres run now in one direction y.n they do in another so we shall call it Cellulo-membranous: within y.e fibrous muscular Coat we find an inner Coat as we found y.e Lining of another Coat w.ch is extremely thin but very dense, neither is it strong & it has left long doubt in y.e mind we have expected having scarcely of y.e elasticity proper to arteries, for if y.e outer Coats are dilated it scarcely admits of being stretched; & these 2 Coats are connected to each other by y.e cellular Substance of y.e body as in y.e Alimentary Canal &c. in other animals as y.e of y.e Ox, & especially in y.e Whale y.e fibrous Coat is still more evident & distinct next y.e Coat and Structure of y.e Veins, y.e Coats of y.e smaller are so thin and transparent y.t we can't distinguish y.e one from y.e other but in y.e large veins we find nearly y.e same number of y.e 2nd is somewhat redish colour'd in y.e large Veins, in it we can distinguish fibres but much diff.t from y.e fibres of an Artery. — I find next y.e blood a membranous thick Coat w.ch is tougher than y.e within y.e Arteries, & y.e Elasticity of y.e veins very much depends upon y.e inner Coat, whereas in y.e Arteries it depends chiefly on y.e outer Coat, y.e Cellular Substance also is rather lower so y.t we can separate y.e internal Coats easier from y.e external y.n in y.e Arteries. — I next shew you some more preparations of y.e pericardium thickened & adhering to the heart, & y.e shape of y.e Cavities in some measure altered. — Lungs of a Woman ætat. 30. who dying before her death slipped her foot carrying a Tea Kettle with water; she immediately found a little pain but had

an considerable Compst. till within 24. hours of her Death
when in an instant when she was spinning w.th no violent
Exercise, she was seiz'd w.th a violent pain at her heart, &
she immediately grew pale and fainted away & pulse
was scarcely to be distinguished & in 24. hours after she
died. — I was present with M.r Adie at y.e opening of y.e body
& we expected to find a rupture of y.e heart, & y.e Blood
effus'd within y.e pericardium, but when y.e pericard.
was laid in view it had quite a sound appearance
perhaps high'd however w.th y.e notion of a rupture, perhaps
more readily from y.e hurt of y.e Cutaneous Disease w.ch
was then recent. I put a probe into y.e Vena Cava superior
& blew in a little Air, & I found y.e y.e Air immediately
filled y.e left side, I thought y.e foramen ovale might be
open, but pressing my finger on y.e part of y.e Auricle
&c. y.e Air went first into the Ventricle, so we cut
down y.e right Side from top to bottom, & we saw a very
considerable opening & laceration of y.e Septum betwixt y.e
Ventricles, extending some way round. — Following y.e blood
from y.e heart outwards, we found frequently a straitning
of y.e mouth of the Arteries, and Ossifications of the
Valves of y.e Aorta, & y.e Ventricles enlarg'd & thickened
in proportion: I have now been certain of y.e straitning
of y.e mouth of the heart from y.e Symptoms in half a
Dozen of Cases, we sometimes can trace y.e Ossifications
a great way along y.e Arteries, even to the points of y.e
Cones: and we find y.e Aorta dilated in diff.t places
within y.e Abdomen. H.

Lecture 6th.

We now proceed to treat the Course of y^e^ Blood, and you'll observe y^t^ shape of an Artery, many Authors have described an Artery as if it were Conical, but if we attend to it any place where minute branches are sent off, we find it Cylindrical or we may consider an Artery as one, w^ch^ we likewise are apt to imagine a Conical figure not attending to y^e^ Change made by y^e^ Vessels sent off to y^e^ Branches, it is likewise Cylindrical, next y^e^ manner in w^ch^ an Artery branches, consider y^e^ Institution, w^ch^ y^e^ Branches near to the Trunk, as on y^e^ right side of y^e^ neck for Instance & at y^e^ Bottom of y^e^ Abdomen, it is evident y^t^ y^e^ 2 branches joind together are larger y^n^ y^e^ Trunk, and y^e^ Institution nearly as commonly alledg'd, as 3 to 2. y^e^ 2 joind together are 1/3 larger y^n^ y^e^ Trunk, w^ch^ seems from hence as we find with divisions & subdivisions of Arteries frequently repeated as in y^e^ mesentery, y^e^ sum of all y^e^ ultimate Branches of an Artery their Capacity must be confessedly greater y^n^ that of y^e^ Trunk. - Next with regard to y^e^ Kinds of Angles w^ch^ y^e^ Branches of y^e^ Arteries form, in gen^l^ we may observe y^t^ y^e^ Blood enters in a favorable Situation, as y^e^ Angles are acute, but in this there is y^e^ utmost variety, which partly depends upon necessity & Situation, partly upon y^e^ use w^ch^ y^e^ Arteries serve, for in many places we find 'em sent off in right Angles, & in some y^e^ Angle is turned back in y^e^ most unfavorable way, y^e^ Blood moves retrograde as it were upon y^e^ which we may observe y^t^ near to the heart y^e^ Angles of y^e^ Arteries are greater than at a distance, nature seems to endeavour to render

Vessels in all as equable as possible: accordingly we find many Arteries of y^e Trunk y^t are destined for nutrient Organs contain[ing] a right Angles: whereas in the Extremities y^e are almost ever where acute; the reason why we may remark y^t near to the heart the Arteries arising from y^e Trunk are spread into a great[er] No. of Branches; following an Artery to y^e place where it is intended to be divided, we frequently find almost without exception y^t y^e neighbouring Branches communicate or we find a beautiful network of y^e Branches arising from different Canal, wou[ld] y^t altho' a No. of Branches were stopped y^e blood wo[uld] penetrate to y^e Extremities of every branch, & y^t in y^e Power of y^e Blood from y^e heart to it's distribution y^e is any danger of a considerable stoppage we find considerable Anastomoses in y^e larger Branches, as in y^e mesentery If we attend to y^e Calculations of y^e Arteries it is found by our Calculations by y^e most eminent Physiologists y^t y^e Area of Blood said together does exceed y^e breadth of an Inch, or y^e smallest hair exceed y^e diameter of y^e Artery at least in y^e proportion of 20 to one, or y^t 400 such Arteries circulating y^e blood joined together wo[uld] not be larger y^t a single hair Hence after we have forced an injection from y^e Artery into the Veins, or into y^e most minute branches of y^e Arteries we never could more y^t an unform[ed] A. Vein with naked Eye as in y^e innumerable Coats of y^e Mesentary Canal. The Veins returning from y^e Extremities of y^e Body, imitate y^e Arteries in their appearance, and there must be y^e same reason of form, we find here two small Anastomoses which are occasionally met with in y^e progress of y^e Veins from y^e heart & these Anastomoses are in greater number in the Veins:

for as y^e force of y^e blood is less, there y^re is the greater
Risk of a greater danger of its stoppage; & for y^e like reason
when y^e Veins are subject to unequal pressure, as when y^e
Veins run amongst muscular Organs, in y^e Trunk of y^e body
the head and extremities, we find within y^e veins numerous
Valves or floodgates; and whenever y^e veins approach
them a pair of valves are to be found, nor is y^e alone ^Suff^a
but we find in the muscular parts two sets of Veins, one
following nearly y^e Course of y^e Arteries & y^e other running
under y^e Skin, which they are admirably adapted to, y^e effect of
y^e action of y^e muscles as possible: And not only do these
Anastomoses take place, but we find branches passing
from y^e one set to y^e other, as in Sperm a vein the flow of
blood is increased by causing y^e patient to play with his
fingers w^ch puts y^e muscles in action & plays upon the deep
Veins, After we have y^e veins from all the parts of y^e body
to the heart we find y^e y^e & Vena Cava joined together are
considerably more capacious y^n y^e Aorta, nearly in the
proportion of 2. to 1. for y^e inferior is nearly as much larg^r
y^n y^e Aorta as y^e Superior is smaller than it. In regard to
the rapidity of the Circulation it is very easily demonstrated
we see what a vast quantity of blood is lost from a Wound
made even in Arm, but if it is made in y^e corresponding
the discharge will be greater. ——— Our Surgeons bleed between
No. 8 & 10. in a minute when a person is said to have lost we
shall call it 6 Oz. now if a single Oz. of blood be thrown out
from y^e left Ventricle of y^e heart in each pulsation it is
evident y^t there passes thro' y^e heart in a single minute
Oz. of blood, but if we double y^e quant^y w^ch from y^e size of y^e
Ventricle we may readily Oz. passed in a minute, there

fore in the Space of an hour Blood equal in weight to 30
Stone a pushafore to Dinner y^t weight of y^e Animal to w^ch it
belongs to flow in y^t Space ——— Next you know y^e manner
in w^ch y^e blood is drove w^th y^e velocity y^t it does Doctor Y.
action chiefly of y^e Auricles and Ventricles of y^e heart
and these act alternately, whilst y^e Auricle is filling from the
Veins the Ventricle is emptying (whilst y^e Auricles empty y^t
empties itself y^e Ventricle is filling; Y^e one of each I am now
at some length to shew, y^e 2^d by reason being given by a mistake
being added to the heart, there is no alternate and equable
dilation of y^e veins for whilst the Ventricle is in action, the
blood continues to flow as before from y^e veins into y^e Auricle
and as soon as y^e ventricle ceases from its action, y^e Auricle
now stimulated by y^e blood contracts and the blood flows
into y^e Ventricle w^th great quickness whilst at y^e same time
an addition is made from y^e veins hence y^e Auricles are small
w^th y^e Ventricles, and there is nothing plaid to prevent the
flow of blood entering into the Auricle directly from y^e
Veins during the contraction of y^e Ventricle, What we know
of one side of y^e heart we apthly to both; we conceive y^e
two Auricles are fill'd and empty'd at the same time but
at a Time diff^t from y^e Ventricles: and I do think it unnec-
-essary to enter into y^e System of Dr Nicols shewing them
to act at diff^t Times, nor does he suppose it necessary than y^e
the Auricles and Ventricles have a common Septum
and we can't suppose y^e 2^d y^e one half is called y^e the in-
-action, & I have seen y^e Synchronous parts of these in action
repeatedly in a living Animal. whilst I speak of the Auri-
& Ventricles being emptyd at the same Time I do not suppose
y^t they are entirely emptyd but nearly so for y^e right side
is somewhat more capacious y^n the left, so y^e certainly

does not empty itself fully, but they do so very nearly
as we may say y^t The Auricle is fill'd & empty'd alternately
But our blood which are in a very different state then by jerking
y^e study are apt to apply what is said of y^e Auricles and
Ventricles to y^e Arteries and even to the Veins; but y^e vides of
the Arteries do not come into contact when in action, as we
may sketch at one time than at another, are more stretch'd
when y^e ventricle is in action, but they are by no means empty'd
when the contract: and this leads us to attend to the causes of
the pulse. — When we apply the finger to an Artery we say
in general y^t y^e Artery strikes the finger because the blood is
drove into the heart into it with violence; but further what
changes does this produce? are we to say y^t the Artery is manly
dilated its diameter increased or are we to say with Dr Pitcairn
y^t it is not dilated, but lengthened in consequ. of w^ch it changes
its place? we are to adopt both. Apprehend that we must
for that to apprehend y^t an Artery is not dilated is impossible
we find that it can be drawn out in its diameter as readily
as in y^e length, and it meets with considerable force from y^e
muscular fibres on w^ch y^e Elasticity in a great measure
depends are plaid in a circular manner. It is in vain
to allege y^t when we make a computation of y^e quantity
of blood y^t y^e heart expells it appears to be considerably
more during y^e same time y^e great capacity of y^e
Arteries, & therefore y^e y^e changes in dilating cannot
be observed, for in this computation it is taken for
granted y^t y^e whole is diffused uniformally, in y^e Arterious
two Systems; but y^e Arteries do not consequently, are dis-
tended by one Band on the carotid Artery on y^e neck &
another upon that on the Top of y^e Foot you will perceive

y.t y. one succeeds the other, and I have plainly seen
ye dilation as well as y.e elongation & change of place in
the Artery; but both seem left to y.e Eye y.t to the finger
for we are affected by the like sensations, & imagine the
motion greater y.n in reality it will be found to be. Hence
here as when we throw an Injection into them, the Artery
instead of becoming shorter & straiter is longer & must
become tortuous & at y.e same time is dilated
Kept them by what power after the Artery having given
a stroke to the finger do they recover their former Situ=
=ation? is it merely by their Elasticity? or that which
they are also? they are likewise muscular — their
Elasticity you know and the use of it is apparent, it
is intended to prevent y.e whole force of the heart's from
being spent y.e force is eluded by y.e yielding of y.e larger
Branches, and y.e impulse is contin. instead of being
given in one moment, nothing is lost and nothing is
added by y.e Elasticity: the force is as much lost by
y.e yielding as it is increased by the reaction, & y.e force
is the same: but divided, part of it is employ'd when
the heart is in action & then it is contin.d when y.e heart
ceases — but are we to join a muscular power: that the
fibrous Coat is nearly muscular: Most Authors have
done so; but D.r Haller of late years has attempted to
undermine y.e notion w.ch is very doubtful, but in many circum=
=ces is inconsistent. N.B. in treating of y.e Structure in one Sect.n
he describes y.e fibrous Coat of y.e Arteries under y.e name of
muscular, in another we obs. him describing all y.e Coats, as
compos'd merely of a Cellular Substance condensed.

If you look into his works experiments & conclusions you
will find y.t he allows the living power of y.e larger arteries
but denies it of smaller, y.t at one place he denies y.e power
in another admits it, & at last compromises y.e matter,
how upon y.e whole we may not w.th a probability merely
but with an absolute certainty conclude y.t y.e Arteries are
muscular Organs capable of irritation, of swaying y.e action
occasionally in health & disease, & sufficient y.e proof of y.e
is full & compleat: I have at diff.t times in experiments,
tho' not made principally w.th a view to this Subject, h. occas.n
to observe y.e contractions of Arteries when irritated, I have
been sensible of their performing a motion of y.e place irritat=
ed greater y.n elsewhere, in many instances we can't shew y.m
so clearly as we might have expected, but the same of the
other Organs is true; thus it has been found y.t y.e
Intestines may on certain occasions be wounded & cut on
the outer surface, without suffering a contraction of its fibres
& many difficulties are to be had in view here, If we throw
a Ligature upon an Artery in order to intercept y.e blood
y.t we may see what portion lays and y.e Ligature, or make
an incision we may have compress'd a divided Artery very
nearly on w.th y.e very section of y.e cut muscle depends:
We are next to shew in y.e 2.d y.e irritation we apply is not in the
natural way: it has been made upon y.e outer side, when
as it apply'd to y.e inner side y.e effect may be very diff.t
Whilst the profess y.e muscular power, they profess at
the same time the Elastic; & it is by no means impos=
sible y.t in some places y.e Elasticity straitens y.e Artery
as much as y.e muscular power can do, so y.t it is not
made smaller in Life, but a greater impulse only is

given to the blood. Of these things are properly convey'd
and y^e experiment made with accuracy as has been done
by Dr Hales we will be able to discover the motion of the
muscular Coat of the Arteries, but we add to such experiments
the observ^ns made by dissections or otherways, let us consider
y^e vacuum's between Arteries & the Intestinal Canal, were
no fibres in both, so in than there moving y^e Chyle &
any fluid on judging merely from y^e appearance we call
these y^e muscular Coats we find in certain places nerves
sent into into it. Dr Haller has indeavoured to prove y^t they
are without nerves. Yet may be impossible to say where they
end, or where not. But the following experiments made on
Frogs plainly shews y^e nervous power existing in them. I
cut thro' y^e Aorta in a Frog, then fix'd a small pipe into it
in doing this 10 minutes elapsed & the motion of y^e blood
had now in a great measure ceased. Upon dropping a simple drop
of a solution of Opium in water into the Trunk of y^e Aorta
we can't imagine that this way conveyed to all the most
distant parts of the Body, yet in a few seconds y^e most
distant parts were agitated — i.e. thro' y^e nerves of y^e Artery, or
let us observe other instances, let us attend to y^e appearances
in deep disease, we must allow y^e existence of Spasm in
diff^t diseases; do not we see such effects in Hysteric
persons in y^e Spasms, or y^e effect of y^e passions of y^e mind
in fear, or the effect of mechanical irritation upon y^e glands
not only y^e quantity of y^e secreted liquors is increased
but their nature is altered by irritation. Lastly y^e effect
of topical stimulus w^ch has been insisted upon by Dr
Whytt — Dr Haller we find an inconsistency in Dr Whytt
acct of y^e small vessels; but when we impartially consider us

the whole will find none for Dr Wyatt speaking of y.e gen.l motion of the blood, conceives y.t y.e action of y.e small vessels promotes the Circulation: Inflammation is an encreasing proof of y.e living power of y.e vessels. I have tried Mr Hewson's following Obs.ns in view y.e publish'd part of an Animal by microscope. I then applied a solution w.th Dr. mistaken y.e Animal a weak Solution of y.e Sp.t C. C. Dco. immediately perceived y.e y.e redness of the part was increased. In a short time in many of y.e Vessels an obstruction had form'd, y.e y.e circulation continued tolerably free tho' some but were stopped in others, meantime y.e red parts increased, without however retaining their natural Globular form a bloody water is to be seen in y.e Interstices of y.e vessels. I next thought to give in y.e Animal & allowed y.e parts to heal for 2. or 3. days till y.e discharge of Lymph from y.e Edges was entirely stopped, Upon examining them with y.e microscope: I saw plainly many vessels w.th blood stagnating in & in the Interstices as before y.e tinged water effused. I again touched y.e parts w.th y.e Sp.t C. C. and immediately Dco. plainly perceived an increased redness round the edges & in a few seconds y.e blood was thrown in a stream from a No. of mouths. We might enlarge y.e y.e depended upon the pain given to the Animal but in a No. of experiments I apply'd Sp.t C. C. to a distant part where it gave equal pain but without y.e same effect. So y.e increased action of y.e vessels is a cause of Inflammation & y.e being excited by topical Stimuli, gives a proof of y.e living power of the Arteries, & so likewise of y.e Contractile power. For we say y.e y.e living power is much more active in y.e extremities y.e in the beginning of y.e Arteries, & co.d thus be equally subjected to Experiment we shd. find much greater changes produced.

After endeavouring to prove y^e Arteries posses'd a Vis a tergo
power, as appear'd from y^e dissection of 'em, the regul. Course
of their fibres &c. and circularly; from their being provided
with valves, as appear'd from y^e sympathy between y^e Last
Arteries & y^e other parts of y^e body; there are many other
circumstances w^ch meet together in the same point; we
find y^t after y^e death of Animals y^e Arteries are empty of
their blood & y^e veins distended with it, may I make no doubt
but y^e wo^d be found to be the Case altho' y^e heart were sud-
denly cut out of w^e body, y^e Arteries wo^d be capable of expelling
their blood forwards into the Veins: Besides I avoided w^t
circumstance w^ch might add somewhat as their being situa'd
in a diff^t manner in diff^t parts of y^e body as in y^e Palsy,
because I have never been an instance of y^e kind: I indeed
met w^th one Case of palsy in y^e Arm: & when y^e arm was weak
y^e pulse cou^d not be distinguish'd while at other times it
was felt as distinct & frequent as in the sound Arm, but here
I suspected a mechanical stoppage, y^e palsy had been bro^t
on by accident by a wound y^e patient had got in y^e Arm
However y^e Arteries have been known to beat unfrequent
ly in one part of y^e body y^n in another: But independant
of this our principle is full & compleat: not only phaenom^a
y^e mind, but physical imitations also both y^e quantity &
kind of invented Liquors, imitation produces Inflamat^n
as if it in effect'd by the right Eye: & y^e is not to be explain'd
by conspiring y^t y^e heart is irritated & drives y^e blood forw^ds
for were y^t y^e Case y^e other Eye shou^d be equally affected but y^e
vessels of y^e part are thrown into convulsion & I
mentioned an Experiment y^t I made to throw fresh Light
upon the Subject.

the vis a Tergo likewise perfect a living power in depend.
of their Elasticity, & it is observ. of the smallest veins like y.
smallest Arteries perfect it in the greatest degree, may in y.
large veins we perceive a greater alteration made by heat
& M. in a living y. in a dead body, owing to y. activity of
the latt. similar to what y. Arteries perform, especially
we find many of our Veins sparingly supply'd with blood, in w.ch
an able Phil. demonstrate marvelous structure, we find incap-
able of emptying themselves very compleatly, independ.t of a
mechanical extens. pressure made upon them, & y. large
veins are incapable of being irritated in case of haem. their
Coats in stand. & thickned, by y. blood moves in the Veins
by the Vis a tergo, & marvel. power of y. veins & y. pressure
made upon them by y. action & contr. of our muscles, while
the circumstances may have a less embed. effect, the motion
of the blood nearly uniform in y. veins tho we come near to the
heart for y. motion of y. blood from y. heart is quick, & even in
in an extraordinary situation of y. body, there is no stoppage
because y. auricle receives y. blood from y. veins during y.
contraction of y. Ventricle, & there are no Valves in them
w.ch can stop it, save for a very moderate impulse is req.d
to distend y. ventricles, w.ch we are not to look upon as a
spring but as yielding to a gentle impulse, y. valves
were unnecessary, & when y. circulation is much impeded
if there had been valves prop. mechanically upon y. auricle
it might have sent y. blood backward into y. Vena Cava
& in y. case we design'd it prop.d backward & a pulsat.
in y. branches w.ch immediately terminate in the V. Cava
When we compare y. force of y. blood in y. Art. w.th force in
the Veins, we suppose by fixing a Tube in an A. & a V. did

we find y.e y.e blood moves 10. times y.e height in the Arteries
y.t it does in y.e veins — i.e. it moves 9/10. of its space in passing thro'
the Arterial System — Hence we and a primary spring of y.e
Heart is known y.e force of y.e blood, upon y.e activity of the
Heart y.e Circulation in a great measure depends: It is in vain
to imagine y.t y.e blood runs from y.e Venous System, into y.e
Heart w.th a force sufficient to continue it's motion: Nor can y.e
Heart obtain by acting upon each other in a Circle have
an advantage over every piece of machinery in continuing
y.e motion of y.e blood w.th almost uninterrupted vigour. But
there are many other uses in y.e Circulation of y.e blood, for
y.t the Thoracic Duct terminates in a large vein near y.e
heart, & y.e heart & Arteries are perfectly well fitted to mix the
Chyle with y.e mass of blood, nay we would be led to suppose
as an Opinion highly probable y.t y.e gen.l motion of y.e Chyle
thro' y.e heart and Arteries form.s it into blood, all parts con-
tributing their share, some more y.n others, & especially y.e
Lungs; we said many circumstances w.ch lead to suppose
y.t Coagulation chiefly performed in y.e Lungs y.t y.e red globules
depend in a manner especially upon y.t Organ: whether we compare
breathing Animals w.th others or consider y.e effects y.t Air has
upon y.e mass. next we would say y.t y.e blood that formed is
prevented in a perfect state of fluidity & y.e Coagulation in
a great measure prevented: for although y.e access of the Air
disposes the Blood to Coagulate thus I have seen in making
Ether a quantity of fluid contained in y.e Cavities of y.e Pleura
when y.e body was opened tho' perfectly cold; but in a few
after exposure to the Air it coagulated, w.ch shews y.e effect
of y.e Air in producing these Circumstances, but it does by
no means shew y.t certain parts of y.e gen.l mass cannot be
coagulated without y.t or y.e Contrary all Anatomists have

found it coagulated in y^e^ contents of y^e^ heart & vessels
quickly taking place in an Animal; & after tying a large
vein in 2 places I have found the blood coagulated in it in
a short time — in short upon a variety of occasions we see
the spontaneous separation of y^e^ blood into it's constituent pts.
& find a coagulum of consid^le^ firmness in no great length of
time: next we may vary y^e^ 4^th^ circul^n^ convey y^e^ nutritious pts.
every where & lastly y^e^ reparation repeatedly. I shall after-
attempt to give an absolute proof of y^e^ nutrition is supply'd
not by the Nerves lymph by Arteries, next we will vary y^e^ 4^th^ pts
of y^e^ Chyle & of y^e^ blood one hourly repeatedly supply'd to the
parts in order to be separated from y^e^ qu^e^ mass:
Here y^e^ separ^n^ of y^e^ milk depends upon y^e^ circumstance, y^t^
same quantity cou^d^ not be collected without y^e^ constant motⁿ
of y^e^ blood in a circul^n^ in like manner y^e^ 4^th^ & the other
secretions: there are other pheno^a^ which shall after-wards more
clearly discover, while we consid^r^ y^e^ effect of y^e^ Glands in
cert^n^ pts of y^e^ circulat^g^ system, they will not only a separation
is made, but y^e^ liquor changed at y^e^ same time, & y^e^ diffe-
rence between these secreted liquors & y^e^ red blood, or between y^e^
red blood & y^e^ Chyle. — Be found in many other circum-
stances depend^g^ upon y^e^ same cause. The growth of new pts
is supply'd by y^e^ in a manner y^t^ is extremely curious &
wch is almost inexplicable. — Next let us turn our attent^n
to y^e^ diseased parts. — If we attend to y^e^ structure of y^e^ pts
y^t^ they are composed of Cats of various natures, we must
suppose & we find y^t^ y^e^ Sang^s^ Arteries are subject to inflam^n^
& all y^e^ consequ^ces^ y^t^ attend y^t^ disorder in other parts: If
the Arteries are inflam^d^ near to the heart there may be a
termin^n^ of y^e^ disease in death depend^g^ upon y^e^ N. S. —
If y^e^ inflam^n^ is not discuss'd & y^e^ patient does not die

from y^e^ disease y^t^ part may Gangrene; whereas y^e^ coats of y^e^ Arteries are become very soft & tender & give way there is some degree of gangrene has taken place, especially if these Coats are prest against some resisting substances: nyth they are subject to Schirrus, their Coats are thickened, & a matter deposited in y^e^ cellular substance adding to the thickness & bulk, and in some measure interrupting y^e^ circulation & when y^e^ is carried farther an appearance is produced like bone & we may embrace such a change to what happens in y^e^ glandulous Organs. Again as a mortification or gangrene may happen without any previous appearance of Schirrus, so as in glandulous parts y^e^ Schirrus may lay y^e^ foundation of a Gangrene, first y^e^ fibrous matter is deposited, afterwards y^e^ parts mortify & give way, we find in other Cases analogous a what we call Resolution, only we do not find y^e^ matter collected in considerable y^e^ so membranes suppurate w^th^ difficulty, & y^e^ matter is washed from y^e^ inner surface by the current of y^e^ Blood. Whenever y^e^ heart is affected by disease consequences follow greater y^n^ we can explain from mechanism y^e^ patient has an acrid & suppurative a quick pulse y^e^ convey. of irritation, but it is irregular & intermitting in various degrees, & we are to consider y^t^ these changes depend upon y^e^ sensibility of y^e^ Organ & y^e^ sympathy w^ch^ y^e^ body has in gen^l^ w^th^ & particularly the N. S. is considerably irritated To give some Idea of y^e^ I shall mention an Experim^t^ After cutting y^e^ Aorta in a Dog in w^ch^ there is only one Auricle & Ventricle the Aorta resembling the lungs, y^e^ Animal is capable of moving its body for y^e^ space of 1/4 hour but if you pour into y^e^ heart a single drop of a solution of Opium in

Water from that Instant y.e heart is rendered Spasmodic
ystic. Tho' the Aorta was cut it wd have maid near Two
hours upon the slightest irritation, but now not even
touching it wth a hot Iron is sufficient to rouse it in
a very few minutes y.e power of y.e whole muscles of the
body is entring'd, they become weak & affected wth Tremor
&c. disease of y.e heart may divide y.e more distant parts
of y.e System independt. of y.e Circulation — The heart may be
affected in y.e following ways — There may be a Concretion of it
with the pericardium. — Or a Dropsy within y.e membranes
(going little further we find in other Cases of y.e blood in life
has formed Clots within y.e heart & wch y.e name of Polypi
are given — Lastly from a Contraction of y.e Orifices of
parts of it are very considerably dilated.

A Concretion of y.e heart to the pericardium without some
previous Inflammation wthin both upon y.e heart or neigh-
bouring Organs very rarely happens; y.e patient shall
feel a pain and burning heat about y.e region of y.e heart
y.e Pulse by degrees become irreg.r & intermitting wth the
usual Symptoms of Impurity & Suffusion; & we find the
Orifices of y.e heart nearly y.e same in every part of
y.e body, & y.e Stricture confined to y.e usual place, because
y.e Concretion between y.e Heart & its Capsule will pro-
bably occasion a similar Concretion of y.e Capsule
to y.e immediate of y.e heart: next we shall suppose
water to be collected, in y.e Case many Symptoms will
be entirely y.e same as where y.e water is collected in the
Cavity of y.e pleura; a paucity of Urine: a dropsical
habit, y.e patient awakend in sleep with terror

especially in certain postures of y^e body, he finds himself affected upon changing y^e body from y^t posture to y^t because in the erect y^e water in y^e pleura presses down the diaphragm & enlarges y^e Cavity of y^e Thorax whereas in the horizontal y^e weight of y^e Abdominal viscera add to the diorder: But if y^e water is contain'd within y^e pericardium (supposing y^t y^e patient wife full & still) water can rarely upon him y^e said horizontally because of y^e water pressing upon the Auricles of y^e heart, so he is affected with y^e body erect, & we shall not in any situation of y^e Body be able to discover the stroke of y^e heart against y^e Ribs next going deeper we can suppose a disorder arising from Polypus, not of y^e 1^st to consider as many seem to concur in its near occurrence, but it is not to be altogether deny'd; for the Blood does coagulate after death without y^e assistance of y^e liver so if a person from terror &c. has fainted & continues for some time in it, we may conceive a coagulation to have taken place, y^t is perhaps not to be removed by y^e succeeding action of y^e heart: & when after dissection nothing is found but a very firm Coagulum within y^e heart, y^e could not have happened in Articulo Mortis, & we may conceive y^t it happens there so in y^e Case of Aneurism. We judge of y^e by the Cause & by finding y^t y^e person in certain postures is more uneasy than in others; for y^e polypus may be situated so as to cover y^e mouth of y^e Ventricle & may be removed by posture. The enlargem^t of y^e heart for y^e most part depends upon y^e ossification in y^e valves, parties thereof y^e Aorta, this part is most subject to pressure & therefore to this accident for y^e blood is thrown thro a narrow passage with violence & the Arteries reacting y^e valves are shut so y^t y^e are subject to pressure both from y^e heart & Arteries

In the perusal of this manuscript the Reader
may find some incoherency in the Concatenation
of some of the original Copy several parts were
left at any venture and of little signification
wch is the real foundation of its simplicity if any
be found.

Edin. Sept. Nov. 6th. 1778.

and in most people but to bad Labor, we find an Ossifi-
cation at y.e mouth of y.e Aorta, & this disease in y.e human
body is much more frequently imagined — I have met
with a Dozen instances when I was att.d of y.e had. Taken place
for such persons either died suddenly in a moment without
being at all disturbed y.e usual 2 minutes before the patient
feels anxiety, oppression y.t pulse is irregular & intermit.g
the most fast weak, much heat at y.e breast, and sometimes
some of a Coldness in the Extremities, & making an attempt
to walk up a hill, he is quickly obliged to stop very soon
become extremely oppressed, and y.e pulse irregular distinguish
pathognomonic sign is y.t y.e heart strikes y.e side lower y.n
usual. ——— From y.e structure of y.e Arteries two dis-
tinct accidents from wounds of ye Artery nothing till we come to the
Surgery, when y.e situat.n of which being better understood,
we will be better able to form an exactness of y.e appearan.ce
of y.e blood spreading in the Cellular Substance). ———
Sev.l of y.e Physicians of this place were consulted concerning a
Case of a Gentleman in England who was supposed to have
a large Aneurism in the Abdomen, & we were desired to give
our Advice with regard to it. But as the particular circum-
stances were not fully described, we thought it necessary to
have an accot of the Case; but we got a very laconic
answer, y.t some of y.e ablest Physicians in England had
examined it & were of opinion, y.t it was an Aneurism
& had been known & cured y.t it was of a very diffi-
cult nature. Question y.e to know y.t we should attend to every
circumstance of the Disease its Surgery, situation y.e
appearance of y.e part if it had a pulsation from the
beginning, if we can make it subside and find it so
again with a touch &c.

If a large Artery is thus assaulted it is evident that we can only palliate y^e disease by lessening y^e force of y^e blood, by V.S. keeping y^e body cool, & y^e belly open. In some cases I have seen advantage from Opium in others again it did hurt and in some cases where y^e Artery, tho' deep seated had worked it way towards y^e Surface, y^e patient found considerable relief by having the Tumor covered by a piece of flannel, as in cold weather it was remarkable uneasy

Lecture 16th

Considering the Arteries as mainly having for y^e purpose of Circulation — we shall proceed to their Termination & y^e beginning of y^e veins.

1st It is necessary y^t I shd shew how the Veins w^ch are universally known, and the System, y^e valvula Lymphatici veins, as they are usually followed, & many where and many where crowded with valves, they are in one Inch I have neither 8. pairs of them valves, & their Structure is exactly y^e same in y^e human body as y^t of y^e Valves found in red veins, there are almost always two valves together each describing its semicircle & filling y^e vein exactly: but it is of very considerable consequence not only in Physiology, but in practice to understand their Form as well as Structure — We find y^t they enter into small knots or glands w^ch have been described from their Shape under y^e name of Conglobate glands: when they reach y^e gland they divide into a very great No. of Branches w^ch are terminated it is difficult to force a penetrating injection thro' them, when we succeed we find y^t after dividing within y^e gland the Extremities of y^e vessels open into Cells w^ch are natural

to these glands and in all the Chyle and Lymph are deposited for in describing the Inguinal, it is all one whether we take the Lymphatics or the Lacteals for they find of these Lymphatics and Lacteals some rise from the glands beginning from the trunk so we may call the first of the vasa lymphatica ingredientia, supposing always the cellular matter in the Blood to be Substance of the Gland, it passes into Cells & from these into the Veins, these vessels in their Course have numerous Anastomoses, so these two Lacteals to run a certain way parallel each vessel of a branch, & an united to form a Trunk of these is again subdivided, & thus we may prevent the Chyle running a long great way, & hence a Lacteal can be readily obstructed, for if the passage is denyed to the right hand the Lymph can run to the left. When the Lymphatic reaches a conglobate gland, the whole of it does not enter into the gland, but it divides upon the surface into diff. branches, some passing over the gland & others entering it: and they communicate again on the other side of the gland & thus for tho' the gland should be obstructed by disease with a Scirrus or rather cancerous matter &c. the Lymph can pass on. When we follow the Lymphatic & Lacteal we find one principal or gen. termination in the Thoracic Duct.

In tracing from the Testicles we find two sets, one accompanying the substance of the Vas Deferens & the other the Spermatic vessels and as they run upwards the Lymphatics come nearer to the superficial when we trace them near the groin, we find the superficial plexus, passing into the Inguinal glands, and from these the Lymphatics entering

The Trunk behind, & 25 Tenden of y^e^ external oblique muscle
while some of the deeper branches are seen entering y^e^ vide
of y^e^ Pubis, & spread by y^e^ superficial inguinal communicate
with them sollow^d^ y^e^ Artery, then within the body y^e^ ante-
rior glands: thus we take it for granted, y^t^ y^e^ shewing
a conglobate gland, is the same as shewing lymphatic
Vessels, & so I can demonstrate these glands, I have that
y^e^ part is furnished with lymphatics running all along
the Groin, they pass thro' the glands of y^e^ Inguinal plexus
& there they meet with the Lacteal Vessels, y^e^ Lacteal Trunk
joining with the lymphatics running to y^e^ receptac^m^
Chyli; The Thoracic Duct in its Course receives y^e^ Lymphatics
of y^e^ Trunks, & when it makes a turn to pass into the
Internal jugular Vein enters a large lymphatic which
receives which receives y^e^ lymph from y^e^ left side of y^e^
head and neck. — Thus we have seen y^e^ y^e^ Thoracic Duct
receive the lymph from y^e^ lower Extremities, from y^e^ Pelvis
and Abdomen, with the Chyle from y^e^ Chylopoetic viscera
then in its passage upwards thro' the Thorax it receives the
lymph from the head & Lungs. We find the plexus from
the left arm going thro' the Axilla & running towards the
Thoracic Duct with the lymphatics of y^e^ left side of the
head and neck enter y^e^ Internal jugular vein of y^e^ same
side and right subclavian — I must shew you the mesentery
& Lacteals, as soon as I find y^e^ Lacteal Vessels are found in quiet-
ness & animals, you will in examining y^e^ preparations
when y^e^ lymphatics are demonstrated in part. Pregnant
attend to this y^t^ in many y^e^ preparations the Branches
are so very small and all crowded with valves, y^t^ we neither

yt. we neither can suppose yt. injections to have been thrown
nor suspect to have entered in the above way, for yt. they
must have been filled by an extravasation.

Lecture 17th

Certain Arteries are large enough to admit a red globule
but there are others in the body wch exclude a red globule &
then we call them Lymphatic or else Lymphatic aqueous
Arteries — now we say there can be no doubt yt. a red Artery
divide into colourd & colourless branches yt many of ye colourless
Branches come for ye purpose of secretion — & yt. we find
Lymphatic Arteries rent off, then we cannot doubt yt. a Lymph
of ye same kind has a Circulation tho' it may be in a manner
wt. superseded in the Body. That if any Arteries terminate
in the red veins in Organs all doubt is, but how are we to send
back ye Liquor contained in the Lymphatic Arteries carried
in from the different Cavities: are we to suppose wch Systematic
Writers yt. ye Lymphatic Arteries form ye valvular Lymphatic
Veins passing thro' ye glands; & yt. ye alvalent Veins pass
into the red veins, or are we to conceive yt. ye red Arteries form
ye red veins & ye Lymphatic Arteries ye Lymphatic Veins, &
yt. a part of ye alvalents wch are colourless terminate in the
colourless veins of valvular Lymphatics — but in this
not another System more simple viz. as we have seen yt.
an Artery in its Extremities divides into red & colourless
Branches wch we not suppose yt. ye red veins in like manner
are formed, & yt. these correspond wth ye Arteries in one of
their principal Offices of carrying on the Circulation & in
that only whilst ye valvular Lymphatic veins answer
with them in so far as they subserve nutrition as they

receive all the Liquors y.t are any where effus'd, so
y.t y.e Circulation is carried on by the red veins & lymphatics
by the valvulæ conniventes, & we observe y.t blood out of
the body to divide into a red & colorless part and as we
find in the body colored & colorless veins, there can be
little doubt y.t each of the Veins corresponds to their parts
of y.e diff.t colors but surely this observation touches not
y.e Origin of the veins we from thence conclude nothing w.h
reg.d to y.t from there being in the body parts of a colorless
we may emblade y.t y.e Arteries divide into colored & colorless
Branches; & we get a hint y.t there are many Arteries y.t
we can perceive with the microscope, y.t colorless Branches
weaving we from their smallness and y.t want of Globules
coy.t we have no manner of judging: just as if water was
running in a Glass Tube placed across in this Room we
would not be able to determine whether y.e water was at rest or
not. — Hoffmanns relates a violent vomiting was hushed by
hearing y.e Animal & red color was found in y.e Lymph
and the red blood was found extravasated at y.e root of y.e
Mesentery; now one of these things happening from some
sudden violence a wound y.e branches of y.e Lymphatics
are lacerated, and y.e blood enters in a mechanic.l manner
from y.e out arteries, as in jected matters enter after Death,
or in every case of an Inflam.n y.e red part of y.e blood is effus'd
I mention y.e appearance w.ch follows every inflamation
a bloody matter is effus'd into y.e Cellular substance &
this Circumstance was not attended to by those who drew
the Conclusion y.t y.e red color shew'd y.e Contin.ce of Vessels
& they overlook'd this Circumstance y.t y.e red globules break
down into invisible parts, so as perhaps are capable

of being absorb'd by the mouths of the Lymph-
atics as any of the other parts, may more readily perhaps
because when y.e whole mass is effus'd, y.e red colour disap-
pears & the yellow, instead thereof is observ'd, proving
a continuation of y.e valvula Lymphatica System from
y.e Arteries, it rather seems to shew y.e Contrary, y.t y.e
Lymphatics begin by open mouths from thence into
wch in the Case of Inflammation & wounds y.e red particles
are effus'd. ——— Nor shd there be proof of y.e colorless
arteries terminating in the Lymphatic veins, but do we
find any y.t y.e colorless arteries do not terminate in
red veins? I apprehend y.t it is very much otherwise
& any Circumstance leads to y.e Supposition y.t y.e do. —
Let us first take y.e Analogy of y.e Arteries. An Artery at
its termination consists of colour'd & colorless Branches
why shd we not suppose a vein at its beginning to
consist of y.e same? we readily admit y.t nature sends
to ev'ry part of y.e blood y.t is proper for the
purposes of Life, for maintaining y.e diffusion & cohesion
of y.e red globules from each other & so many more
otherwise; and instead therefore of imagining y.t y.e part
is carried away from the red veins, we must suppose y.t
after y.e colorless Arteries have made their colorless dispers-
ion thro' colorless Organs, they run into y.e red Veins
Thus in the Eye of a Child we find Arteries conveying
red blood, wch afterwards become too small to admit
y.e red globules, yet the Termination of y.e Arteries must
still be in the red veins, and when we view y.e different
Colour of the Iris also in wch y.e Lymphatic System is found
& where there is a greater suspension of colorless fluid, as
in a Skate where the Flesh is of a white Color, so y.t the

Arteries must exclude y.e red globules if the colorless veins terminated in the Lymph.c System, we would find the Lymph.s of a precedigious N.o and size and the Vena Cava receiv.d only y.e red globules, very small in proportion to the Aorta: But the proportions are the same in man; we may therefore safely what we find in Bears further to ourselves & take it for granted y.t y.e red Veins correspond to the red Arteries as far as concerns y.e Circulation of the blood. Now if we prove y.t y.e red veins receive all the circulating branches of the Arteries, we have Observation only as the office of y.e Lymph.c System, & we have direct proofs to shew y.t y.e valvular Lymph.c vessels begin with open mouths at y.e sev.l Cavities, and suck in with their Extremities the Liquors they convey. The Analogy of the Lacteal Vessels shew this, we find the same Structure of their Coat. viz. are thin, tough & transparent, & rounded with Valves & we trace them both thro' glands, viz. also agree, That y.e mesenteric glands and the Conglobate glands of the Groin & Axilla perfectly agree in very circumstance; the said y.e vessels in a similar way passing along y.e surface & passing thro' them, & to carry on the Analogy, they unite together, viz. the thoracic duct is y.e common Cava of both Systems. — In a Jaundice occasion'd by a total obstruction of the Biliary ducts I chose to ascertain that the Lymph.c Vessels take up the Bile almost as pure & bitter as it is found in y.e gall bladder: I have seen only y.e Lymphatics fill'd in that manner & shew'd them to Dr Young & Dr Black who were not contented with seeing y.e color, but opening the Lymphatic they tasted the Bile & found it to be as bitter nearly as when taken from the gall bladder: This is a direct proof y.t y.e Lymphatic Vessels

in the Liver begin from y.d Cavities of the Biliary
ducts first / from absorption: When acrid matter, whether
of medicine, or disease is applyd to any body externally or
internally we find in many instances that the matter
directly enters y.e Lymphatic vessels & from it shews its In-
fluence in y.e body in general tenderness swellings of the
glands &c. with which y.e Lymphatic loaded with y.e medicine or
other matter naturally passes E.g. If often happens y.t
Blisters produce swellings in y.e Inguinal glands
not in those to which the blister is applyd, as lying
immediately under it but in those which are situated so as receive
y.e Lymphatic vessels from y.e part blisterd, however distant
as in y.e Axilla or inguinal glands, when y.e blister was
applyd to the hands or feet, Surgeons often find that
Blisters on the head produce Weakness of the Neck
their situation varying according to the place of y.e blister
The same thing is observable in diseases as in the Plague
perhaps, but beyond all doubt in the measles: Cancer
Smallpox. Lues Venerea. So recollect what you have seen
in the common manner in which y.e Lues Venerea is received
The Inguinal glands swell & constantly y.e Swelling is
produced in the uppermost glands or glands of y.e Inguin-
al plexus, & the under ones tho' equally near, & tho' they al-
are supplyd with Vessels and nerves from the same
Root do not swell. I have repeatedly traced y.e Lymphatic
Vessel leading from the Root of the penis into y.e groin
and I have traced a Lymphatic vessel from y.e under part
of the Urethra behind y.e Scrotum y.e whole way into y.e groin
In other cases again as in the Cancer of the foot y.e lower
glands of y.e Inguinal plexus swell first plainly shewing

that they swell in the swell in the Course of y.e Vessels
and if y.e venereal poison have been received any other way
as if a Surgeon receives it from a wound in the finger, when
a Bubo is produced in the Axilla, or if a nurse communicates
y.e Infection to a Child by giving suck, the Child have a
sore formed in the Mouth & a Bubo is produced in the neck
again a diseased Child communicates y.e Infection to
a nurse y.e Axillary glands are affected & y.e neighbouring
parts are free from y.e Inflammation, In like manner
many other Cases where there is a suppuration as in
Scrophulous Cases or in common cases especially when they
are exposed to the Air & y.e matter becomes acrid, we frequently
meet with a swelling of the glands; and it is easy to know
when y.e Galen was acquainted with these swellings &
many others who had no particular Theory to serve and
Galen calls Glands swelled from some Bubones & we
found the matter passing to a very great distance Dr.
Bullen lately met with an instance where a Bile had
gotten in the Leg & had occasioned a swelling in the
Inguinal glands & I have now seen so many Instances
of this y.t I think it scarce worth while to take any part
ticr notice of them. ——— I find a number of conglobate
gland immediately under the Brain in preparation
greater than could be suppose'd unless y.e Lymphatics
of the Brain passed thro' them; and wounds and
suppurations of y.e Brain have frequ.t swellings of the
neck — But supposing y.e y.e Lymph.c System does perform
absorption does it follow y.t y.e Absorbents don't likewise
terminate in red vessels, as y.t Absorption is not performed by
them, also: a while y.e Lymph.c veins about are we to
suppose

that the red veins of fish in the same sense &c
not consistent with y^e simplicity of nature to make
such a supposition: to suppose one set of veins to per-
form the purposes of absorption singly, & y^t we shall
shall not only serve y^t but likewise the purpose of Circul-
ation it is more probable y^t as the two kinds of veins
correspond to diff^t kinds of Entrails in y^t the one serve entir-
ely & y^t the one office has no connexion w^th y^e other, but
y^t the red veins serve for Circulation & y^e Lymphatics for
Absorption. And if the Structure had been fully understood
understood before the other Supposition had been formed
we might have allowed it to have more weight, but the
red veins were known long before y^e Lymphatics & there-
fore were for many ages supposed to serve any purpose
in the body, & even after y^e discovery of the Circulation they
took it for granted, y^t y^e red veins served both for motion
and absorption. Tis not to any for Physiologists that
they now began to treat matters more minutely, to
divest themselves of their prejudices, & instead of
producing arguments against the former opinions more
were advanced in favor of it: Thus it has been said that
y^e Lymphatic Vessels were wanting in a variety of Animals
w^ch in other respects agree with man & so that Absorption
in them must be performed by the red veins but we find
y^t in Viviparous Animals there are Lymphatic Vessels.
They also allegd y^e want of Lymphatic Veins in certain
parts because they have not been seen as in y^e Brain
& Eye But I have met w^th a Case w^ch clearly proves this
in a Cancer affecting y^e inner part of y^e Ball a very
large swelling was produced in y^e Lymphatic

Glands in the bottom of y^e neck of the same side w^ch soon broke out into Cancer — And I have obs^d. when a N^o. of the Glands have been obstructed suppose y^e Axilla y^e y^e whole Arm has become oedematous & yet y^e. adjacent veins were not affected, & if these are provided with numerous Absorbent vessels, why do not these perform their office one Experiment w^ch is more decisive y^n all these is, that I find on tying y^e Thoracic Duct, few animals survive it & further I find from Experim^ts. of y^e want y^e y^e Thoracic duct more frequently y^n is suspected communicates w^th other veins, as with branches of y^e Vena Cava within the Abdomen, w^th y^e Azygos within the Thorax & near its usual Entrance it has frequently or on y^e one Termination, & in w^t. Experim^t. I found y^t these termin^ns had been considerably dilated & keeping y^e Animal Alive 2. or 3. Days & yet it to take some food in w^ch Madder had been mix^d. & it eat y^e same quantity w^ch other Animals of the same Age in w^ch y^e duct had not been ty^d; & yet y^e death of it was to be prevented to have been very much owing to want, it had not been nourish^d by it y^e bones had not rec^d y^e smallest tinge, while in a second animal they were ting^d in half y^t time & y^e mesenteric veins are not capable of this exception for nourish^t. & for colouring y^e bones so dont about our Aliment.

Lecture 28.

In our last Lecture I mention^d a variety of Arguments to shew y^t y^e valvular Lymph^c. veins are absorbents, upon the whole we concluded from y^e Analogy of y^e Lact^l. vessels from attending to the Structure, to their appearance in living Animals, their continuing to be filled w^th Liquor after the

Bulbs In, a the outhouse

circulation exam'd, from the Colour of their Contents par=
ticularly the green color of those coming from the Liver, To'
I add y.e Effect w.ch acrid matter with which the Virus of medicine or
disease has an producing Swellings of y.e Lymphatic glands
y.t are interpos'd between the part imitated & y.e heart, And
where a disease affects y.e body in many cases; As an ulcer
is produc'd, but in other y.e acrid matter enters without an
ulceration, & sometimes tho' seldom y.e happens in y.e Lues
Venerea, I have examin'd patients without finding
Chancre or Gonorrhœa but where a Bubo had form'd; & I
find in Salivations an obv.n of the same kind when y.e disease
produc'd more violent Effects than it does now: & in y.e
plague we find Bubo's arising in those parts of y.e body
expos'd to y.e external Air, and in y.e small pox more espe=
cially in the Highlands, in St. Kilda we are told by Mr.
Kennedy y.t it is customary to inoculate Children by
rubbing matter upon y.e wrist & the observ.n y.t in many
cases Swellings were found under y.e Armpit, tho' he did
not know the Cause & the mention an Instance where
from rubbing y.e matter upon y.e Lepilla, y.e Axillary glands
on y.t side were swell'd; Effects y.t proving from the Argument
y.e nature of y.e Lymph. Absorbent vessels. For to avoid some
few descriptions y.t may seem still more direct and
decisive because I know they are erroneous, Dr. Hickle
does not scruple to tell us y.t y.e beginn.g of y.e Lymph.c
vessels may be discover'd by y.e naked Eye, as from the
Spermatic duct: but he is deceiv'd by a particular vessel
w.ch is very diff.t it is a Duct conveying the Semen. Another
act.n is given lately in y.e Philosophic.l Transactions by
Mr. Watson of London, where with the naked Eye are pointed
out to us y.e beginning of y.e Lymphatics of y.e Urethra &

ow. year before I have seen what I apprehended true
mislead him, they are nothing more y.n mucous Duct. w.ch
very tender, & if y.e injection of y.e mercury is push'd a little
it bursts them and gets into the Cellular substance of
thumb we are very short and without entering any vessel it
runs so to represent a Lymph.c or Vein; Yet in other Cases I
have able y.e Lymph.c Vessels & Branches of y.e red veins filled
by a laceration of y.e Branches, as when we make an extra-
vasation. So that we really seen but they are the ends of
mucous ducts, not the beginning of Lymph.c vessels; & I
will admit y.t y.e mouths of y.e Lymph.c Vessels can be seen
but an Anatomist that accurately & clearly demonstrated
y.e mouths of y.e dactuals, y.t absorbent y.t take in the grass
aliment, where mouths are probably larger y.n the mouths of
the system elsewhere; & I do not know y.t any person has made
an attempt to shew the manner in w.ch y.e Lacteals arise, they ap-
pear small to be seen, and were it otherwise y.t their mouths
are larger y.n their terminations of y.e circulating system
cannot be supposed this y.t I shou reject all attempts to describe
y.e first beginnings of the Lymphatic system. ——
After endeavouring to shew y.t y.e Lymph.c Vessels are absorb.ts
I mentioned a few circumstances w.ch determined me to reject
a common opinion y.t y.e branches of the red veins assist in
absorption. I also y.t y.e Lymph.cs are distributed in the hum.n
body universally, they are found in all the large cavities. —
When we inject into a vein we fill a cavity, but without be-
able to shew y.t the injection has not passed into an Artery;
and in viewing y.e experiment we do not find y.e colored substances
to penetrate y.e Lacteal Vessels into y.e red veins: Whence
the red Vein we produce an Edema of y.e part, but y.t is
because y.e quantity of liquor exhaling is increased by the
resistance made to the freedom of y.e circulation, y.t push is

mencing upon the opthalmic w.ch accounts for y.e swell.
very fully & this is often a cause of dropsy in an
body: if the liver grows schirrous it acts like a ligature
upon the returning veins & y.e a great discharge is made
from the Arteries, and when the thoracic duct is ty'd, so
far as the experiments I have yet made, y.e Animal can't
be nourished, or a Chyle communicated to its blood.
Perhaps before I entirely quit this Subject it may be
expected y.t I take notice of a late work of Dr. Hecker
who endeavours to prove y.t y.e branches of y.e veins per-
form absorption, & y.t in many instances more y.n the
Lymphatics. But I do it with reluctance because I
see many instances in it inconsistent, this Experim.t
me inconsistent & the person to be the author in very
instances but one, with regard to the Vasa lactea seminalia
& they admit of a quite diff.t explan.n for when he injects
the Biliary duct the fills the vein, now I have done so
repeatedly, but most readily when y.e Injection was pushed
with sudden violence so as to lacerate & rupture the
Branches terminating in the Cava, y.e Bals are torn by
the injection, & it passes from one large vessel into
another, w.ch cannot I can sometimes follow w.th y.e Vessels
into y.e Vena Cava. In like manner when we blow air
into y.e Urethra the Veins are filled, & when we take wax
& then cutting open the Kidney we shall not find an
Hæmorrhoidal duct filled, & we find a great deal in y.e
side of y.e pelvis, and taking y.e injections of the duct
of y.e mamma y.e matter had made its way from the
Lactiferous ducts into the Cellular Substance, But
he alledges y.t it must first have entered y.e veins; but
to shew y.t these Experiments have not been made with

proper accessary Dr. Hunter is to this day unacquainted with y.e true Structure to know nothing of y.e Follicles of y.e mamma he has not been able to fill the Follicles & yet he pretends to fill y.e veins absorbing from their termination now we shall fill y.e Follicles & not a single branch filld. may he not suppose this experiment upon a emphysomatous gland diseased with Schirrous, where there is a destruction of part, & yet y.e is brought as a proof their vess.ls are absorbents. — Having then endeavoured to determine y.e nature of y.e Absorbent veins, let us next consider y.e way in wch we are to conceive Ligua to move in a vessel y.t wants y.e vis a tergo, y.t is not continued from an Artery I draw y.e mouth of a Lymphatic wch is provided with valves sent it to very first beginning: Haller mistakes in y.e suppposing y.t y.e Lacteals only receive Valves when they reach y.e Mesentery, but they lye in to be crowded wth valves on y.e other side of y.e villous Coat: I have introduced pipes but have not been able to force y.e valves backwards in order to discover y.e appearance of y.e orifice of y.e Lacteals I must draw a portion of our Intestines but we are not to fancy y.t y.e contraction of y.e Intestines, or y.t pressure from y.e muscles Mediastinum can force the y.e blood into our Lacteals: in proof of y.e contrary we can't after death inject y.e Lacteals from y.e guts, they therefore suck it in, or draw it in, in y.e manner wch y.e vessels of vegetables probably do, or in y.e manner in wch very small Tubes draw water from a Cistern. Thus suppose I have a Cistern filld with water to a certain height & I dip a small pipe into it suppose of Glass, y.t we may see what happens wch from its smallness resembling a hair is call'd capillary, y.e water rises to a certain

height within the Tube, higher y^t^ y^e^ surface of y^e^ Water
and the Weight is proportiond to the smallness of y^e^ Tube,
rising highest in y^e^ smallest Tube and therefore we may suppose
this to take place in our Lacteals, w^ch^ are so exceedingly minute
as to be invisible, therefore when y^e^ y^e^ Liquor in our Lacteals
rises to this height, it only enters at all if y^e^ Liquor be of a
mild nature, & hence we learn y^t^ our Lacteals possess a
living power y^t^ they shut their mouths against acrid matter
& possess motion & Contraction to such a degree as to exclude
a very thin substance altogether, provided it is extreamly
acrid. This helps us to explain y^e^ progress of y^e^ Liquor, for
although y^e^ Water will ascend in y^e^ Tube a certain way yet at
length it stops, & y^e^ attraction of Capillary Tubes only begins
a motion, but is not able to continue it rising to a certain
height and y^e^ Separating it to push it on a Living power is
necessary, & y^e^ Ley and all doubt is int^o^ in y^e^ Lacteals or
Lymphatics from its own Coats & as for the proof of its
living or muscular, after y^e^ death of an Animal when y^e^ Lacteal
vessels are full after cutting of y^e^ head or heart, they emptys
themselves completely & push on all their contents into the
Thoracic duct, tho y^t^ it is seldom y^t^ we can give a demonstration
of y^e^ Lacteal Vessels from y^e^ Color of their Contents, & then
in y^e^ Intestines it is Ley and all doubt of y^e^ muscular coat
of y^e^ Intestines alternately contracting & pushing on the
same effects y^e^ beginning of y^e^ Lacteal Veins & when the
Lacteal itself contracts y^e^ valves hinder y^e^ Liquor from
being pushed backwards, so y^t^ very frequent alternate
stand to y^e^ b^e^ of the pulsation of y^e^ Arteries, & y^e^ action of the
muscles, thus when a vein is opened by acting of y^e^ muscles
of y^e^ Arm we accelerate y^e^ flow of y^e^ blood and we would do
so if there were no valves in the Members of y^e^ Lymph^s^

appear to be principally effected to the Action of y.e Arteries
& even swelling of y.e common red veins, while from their being
crowded with valves y.e are fitted for taking advantage of every y.e
slightest pressure, and y.e principal trunk of all runs with the
Thorax parallel to y.e Aorta so y.t every stroke of y.e heart affects
it & pushes forward y.e Chyle with considerable violence so we
can readily understand y.e manner in wch y.e liquor enters y.e
absorbent System and is conveyed to the heart. Next to deter-
mine y.e principal Offices of the absorbent Veins & y.e gen.l
purpose y.t y.e System serves in our body, & y.e very first we
y.t occurs to us respects y.e Lacteal Vessels of the Guts for
taking in our nourishment & Inhale give reason for thinking
y.t whilst we throw out a principal matter from the lungs
we at the same time take in some thing useful from y.e Air
wch has been of late doubted of. — We find y.t y.e Bile in y.e Gall
bladder is much thicker & materially diff.t from y.e Bile
in the Hepatic duct so has undergone a preparation, part-
icularly y.e absorption of the thinner parts, In like manner
y.e fat is separated from the extraneous matter so y.t we have
an existence as it is found in y.e Adipose Sphyes, a watery
fluid must have conveyed it there, wch is a strong reason
to y.t in the mucous y.t is exposed to the Air, we find a sebac-
eous matter & mucous in y.e follicles & bags of y.e Trachea
&c. surely y.e mucous has been changed by absorption, perhaps
we may push this no stich further, y.t y.e Absorbent Vessels
do not merely serve for the preparation of y.e wanted liquor
but y.t a something that y.t is useful to the Oeconomy in at y.e same
time taken away & returned to the mass of blood i.e. that
by y.e Secretion such changes are produced upon y.e liquors
y.t when they are reabsorbed they have diff.t effects upon
the body from y.e effects of y.e principles of y.e blood, thus it
can be rendered probable y.t y.e Jaundice, y.e yellowness, is

not owing to the want of y^e^ separation of y^e^ bile but to its being returnd to the blood, & if we can prevent the return we can prevent y^e^ disease, take an other example in y^e^ Serum we cannot observe y^t^ the whole Constitution is affected by that if this was owing to a want of separation y^e^ same must be in y^e^ flesh of Bullocks wch. is more remarkable in y^e^ flesh of Oxen. May perhaps somewhat useful is taken in from y^e^ most experimentative Liquors, as y^e^ Urine, for in Urine there is a vehicle urinaria, now if all the parts were wch. it might be discharged from y^e^ body by y^e^ Urethra, wth. out any inconvenience to the Animal, Probr. in the last place y^t^ y^e^ Lymphatic System is connected with y^e^ Lacteal or rather y^t^ y^e^ vessels described under two names make one System and y^e^ Lymph mixd with y^e^ Chyle must be of singular use for fitting the blood to receive y^e^ chyle, & without y^e^ dilution and Separation y^e^ mysteries wch. y^e^ mass might have proved hurtful, & in proof of this observation if a small quantity of milk be injected into the Veins it is in danger of producing Convulsions. — Our views are enlarged by considering y^e^ Absorbent vessels as valvular for we can more distinctly, y^e^ benefit in health and in diseases arising from friction & Exercise, whilst we considered the Branches of the red veins to perform y^e^ office this was less evident: but from y^e^ number of Valves we accumulate in a remarkable degree y^e^ flow of the Lymph & y^t^ will lead to y^e^ use of this in a variety of diseases, as in the Dropsy: we are very apt to err in recommending rest & a horizontal posture wch. lessens y^e^ swelling of y^e^ part, because y^e^ erect posture increases y^e^ exhalation and makes y^e^ return more difficult but exercise & friction are of particular use

We next perceive from knowg. ye. division of ye. Lacteals
in ye. glands ye. reason why sometimes after ye. breaking of
Bubo or Scrophulous tumor, there is a considble. discharge
of watery matter. Physicians are apt to consider ye. as owing
to a laxity of ye. tubes but from understandg. ye. cause
ye. it is chiefly owing to ye. flow of Lymph into ye. gland &c
in these cases does not readily enter ye. vasa efferentia
Next we have found ye. ye. Lymphtc. & Lacteal vessels very
often Anastomose, ye. small branches continually receiv.
an addition from ye. neighbouring; & whilst many pass
thro' ye. gland others pass upon the surface & therefore ye. an
obstruction may happen in ye. first Lymphatic glands
wch. a poisonous matter touches upon but altho' ye. same poi
-son be conveyd further ye. glands nearer ye. heart are not
affected: Then with respt. to the Bubo accompg. a Lues Vener
in the groin I have often dreaded ye. formation of a similar
bubo within ye. body, & yet I have not met with a single
instance of it, or remember to have heard of one, & ye. is
prevented not merely from ye. warmth of ye. part, but especi
-ally from ye. poison being diluted by ye. joining of the
Lymphtc. branches from ye. inferior extremities before the
poison reaches ye. next glands — Keeping ye. same in
view we must learn ye. reason why a Stiff hog in a single
Gland does not produce an edema in ye. vessels from wch.
it is originally derivd a number of ye. vessels passing over
ye. gland & carrying on ye. absorbd fluid towards ye. heart
Next by attending to the cause of ye. swelling of the glands
we are in many instances directed in the cure, as by knowg.
ye. cause of ye. venereal bubo ye. it depends upon ye. Veneal
poison directly conveyd into ye. Gland, if we suppose that

Mercury acts topically applied, healing venereal
Ulcers more readily y.n a common Ointment, and y.e reason
may be easily made as mentioning there is a venereal
Ulcer on y.e outside of y.e throat on both sides, we may dispose
one w.th mercurial Oint. applying any common dressing to y.e
other, we endeavour to direct the mercury into the gland
by applying it as near as possible into the part receiving
the Contagion. We must know y.e state of hard Tumors, we
judge whether a Schirrus has degenerated into a Cancer
& concerning this there are numberless mistakes daily com=
=mitted; as in the Case we have from Stark & Van Swieten
under y.e name of Schirrus, w.ch were cured by Cicuta, more
y.n one half of w.ch are Cancers, so y.t if cures of such sorts be
made it is still more powerful y.n is imagined. But I must
y.e to shew y.e inadvertency & want of due explan.n of y.e appear=
=ances of swellings in y.e Inguinal glands. If a man
has a hard Lump in y.e breast, & upon y.e same side we
perceive one of the Axillary glands swelled, we may conclude
certainly y.t y.e Tumor has begun to change into a Cancer
& y.t matter is already formed within it & if an Operation
is to be done y.e Surg.n ought to take out y.e Tumor in the
Axilla, therwise y.t will contaminate the blood, not y.t the
taking it off will entirely prevent this, for a part may
have soak'd on into y.e blood; but if we leave y.e gland the
Inoculation of y.e mass is certain. & y.e disappearing of y.e
Tumor is occasion'd by its being no longer fed & completes y.e
Conversion of matter into y.e mass of blood, another way of
Judging when y.e glands are not swelled is from the
some degree of Edema, I have been instances where upon
rubbing with the finger directly with any swelling of y.e Axillary
glands, & yet they were affected but it was concealed by

the Adena wch had formd. Sometimes this is confined to the breast only, but in other cases the whole Arm is affected, these glands being also swelled into wch the Lymph from the Arm terminates & in such cases if the Skin is opend into the Axilla the glands will be found swelled, matter according to the manner in wch the glands are affected, we in some measure learn to prevent diseased matter from affecting the Constitution if you attend to the discription given of the Bubo it occurs in the plague you'll find that the habitem in those places that are exposed to the Air, we presume that the Inguinal bubo indicates the matter is only entering the body & therefore the best means of preventing the disease will be to extirpate the bubo as soon as it appears, & perhaps from this we may draw another inference that we may prevent the entrance of the plague in a certain degree by perfectly covering the whole body excepting only what is necessary for respiration: they occur frequently about the parotid glands, as also the Lymphatics near the parotid & maxillary glands & most frequently in the Axillary glands & in the Inguinal. the glands being more exposed to the Air. Such Be apt to entertain wrong notions of diseases, thus it is the Opinion of our Eminent Physicians that the verrucula is a disease proper to the Lymphatic Glands Cutitis far from being a just notion because when I come to the diseases of the bones, I shall shew Instances of Spina Ventosa, or Scrophulous Caries of the bone, the disease first beginning there & only afterwards occasioning the swelling in the Lymphatic glands, therefore the Scrophula is to be considered as a disease of the System, more readily appearing in the Lymphatic glands, from their office the diseased matter being conveyed there to the Heart

So some conceive y.t y.e Gonorrhœa & Lues Venerea are two
distinct diseases, & y.t a Chancre is produced by a diff.t cause
from y.t w.ch produces Gonorrhœa, but it is easy to shew y.t y.e
are nearly y.e same, Bubo's are sug.d by produced in the same manner
by both. From embedding y.e y.e matter enters y.e body & affects
these glands those first at y.e expediency of extirpating
a pestilential Bubo & perhaps likewise one from a Cancer
as suppose y.t a Surgeon in extirpating a Cancer wounds his
finger & y.t y.e matter gets in & causes a swelling in y.e Axillary
glands he ought to extirpate y.e gland at y.e same time
destroying y.e wounded part by cautery or Caustic. Here is
an evident danger that attends y.e diseases
some in y.e ant.r parts suppose in y.e Aorta System in
y.e pulmonary, so all absorb'd matter passes to y.e right side
of y.e heart suppose from the hands or lower Extremities &
it immediately enters y.e pulmonary System, so it mixes &
receives the Taint. Where y.e disease originally begins in
the Lungs y.e absorb'd matter passes thro' y.e Bronchial
glands, & immediately returns to them, so passes in a circle, & y.e
Lungs w.ch more difficultly get rid of y.e taint, & from compare
the Powers of y.e Lymphatic veins we see in y.e Aorta and
pulmonary Systems, we perceive an advantage attending
inoculating for the small pox, when y.e disease is rec.d
from y.e Air it is partic.s drawn into y.e Cells of y.e Bronchia.
& is in danger of irritating these, so the poison of diseases
affects y.e part of the System, w.ch if touches many y.e nerves
this y.e poison absorb'd passes into y.e Bronchial glands
w.ch is in danger of producing Inflammation & Obstructions
there. Whereas if we inoculate y.e infection does not immed.y
fall upon Organs upon a use of the utmost importance to life

in its concentrated state it is diluted with y^e blood
previous to the skin and subsequently, & from y^e vena cavæ
cations have been led to suppose y^e circulation for the
Hearts when y^e affection of the lungs is attended
one lung; w^ch might be attended with similar advantag
so, we not so readily imitate the lungs; & since y^e time
Dr Stone has made some experiments with reg^d to this
But as yet we can draw no certain conclusion from

Lecture 20th

Of y^e Temporal Artery is compressed & y^e Circulation
interrupted, it is carried on by y^e frontal & occipital of
the same side & y^e temporal of y^e opposite. It is necessary
to attend to these Anastomoses for if an Artery is wounded
in the head it is sometimes not sufficient to make a
ligature or compression on y^e side next y^e heart: and on
use the benefit of opening any of y^e Branches in case of
an affection in the neighbouring Viscera when y^e circulation
is affected we obtain great relief from drawing blood from y^e
Temporal y^e by lessening y^e momentum of y^e blood in a ft.
w^ch w^e shall is as near a Communication. Next we find
numerous nerves supplying y^e tegumenta & these of very con-
siderable size, & as y^e wounding a nerve in other places is
attended w^th y^e most dangerous symptoms, y^e same may
happen from wounds of y^e subcutaneous nerves of y^e head
in which y^e skin happens to be lacerated; & from an extremely
slight wound I have seen instances of a locked Jaw and
swellings assembling Erysipelas; and in such cases y^e
patient may be much relieved by dilating y^e wound and
thereby dividing y^e nerve w^ch we suppose wounded in part

or Sacrals or Cruciat: And we wo. avoid the larger Branches of y. nerves in letting blood. The frontal Artery is usually to y. y. stroke of it cannot be distinguished, & it is accompanied with a very large nerve we wo. therefore avoid it, for y. same reason, it being accompanied w. a nerve of great size we wo. avoid y. Occipital Artery & it is difficult to find it from y. thickness of y. Integuments, w. also prevents the Artery from being readily compressed & we cannot with y. finger distinguish y. stroke, even when it is large. y. the branches of the Temporal from w. we let blood; whenever we find the stroke of this distinct we may venture to open it, because if a gentle pressure is not sufficient we may venture to stop a greater but it will be difficult to clean the blood from the Anterior branch tho' it is no larger because we distinguish it easier from the thinness of the Integuments & there is no considt. nerve near it.

Section 30.

Considering y. Appearance of y. Internal Carotid & Vertebral we must be sensible y. a greate. y. q. common portion of blood is circulated here than comparing the Brain & Cerebellum w. y. Arm, where w. we find only we find y. Axillary Artery & part, each of y. Internal Carotids are nearly as large & the two Vertebrals joined together are larger — Haller compares y. Carotid & Vertb. with the Trunk of y. Aorta, instead of comparing 'em with similar branches, if we are to suppose y. q. quantity is to be judged of nearly 1/10. or 1/12. of y. whole is circulated upon the Surface of y. Brain & Cerebellum but we are oblig'd to make a deduction from this Supposition because y. Arm y. blood within y. head is broke by a number of circumflexions, y. momentum in a angular manner is diminish:

Ob
y. we must make allowance for y. blood rising
contrary to its weight; & this has great effect y. is commonly
imagin'd. In a person disposd to the Dropsy, it gen.ly appears
first in the feet, from the descent of y. blood & exhalation
is greater as well as y. absorption more difficult; &
change of posture in Inflammatory Cases is sometimes
attended with practic. advantage, so in Rheumatism
a person will find pains in his limbs when he only sits
upon Bed; and in an inflam.n of y. testicles a horizontal
posture is of y. greatest emolument, & in general wounds
of y. lower extremities are in an disposd to inflame y.n
than in the other parts of y. body, And if w.th regard to the
Brain itself if a person from a languid Circulation
is disposd to faint we will prevent by laying his body
horizontally; as if we elect with y. head low we find
mutual consent: & Dr. Sydenh. are recommend. y.
taking patients labouring under Rheumatic out of Bed
whereby y. body is not only more cool, but we must ad-
mire something to the change of posture, & in Apoplexy
y. patient is relievd by raising the head to a more than
common height with pillows, further when we attend to y.
Coats of y. Arts. They are very thin within y. head, & even
without y. head they are thinner in y. extremities, & more
so in y. superior extrem.s y.n y. lower tho' both equally affected
by y. action of y. muscles, wch y. momentum is greatly dimi-
nishd by the ascent of y. blood; & it is lessend also by
the thinness of y. Coats, for y. being fewer of y. Arteries
contribute to carry on the Circulation: When we pursue y.
Arteries further we perceive y. y.n branches bear a g.r proport.n
to the Trunks, we can't make an exact comparison w.th
the Veins, but we can readily perceive y.t they are

manner, & y.e surface of y.e pia mater is vastly incre[a]s'd
by the doublings in y.e Convolutions of y.e Brain & Cerebellum.
But notwithstanding these vast Circumstances y.t diminish
y.e force of y.e blood we can by no means be conceive, as we
shall have done, y.t y.e Arteries of y.e brain want pulsat[ion]
& y.t y.e blood moves in them nearly in y.e same manner
as it moves thro' immoveable tubes, shall be what they
will we can by no means conclude, as y.t y.e candid Reader
will soon find a hole in the Cranium, that is to be
glued to the hole. I grant that y.e Scalp have no motion
in the Respiration but it does not prevent y.e insultation
of y.e Heart, for y.e pulsation remains in an Artery
after you have cut it in the middle & joind the ends by
a tube, now if you can suppose y.t all y.e veins y.t let out
the blood are accurately tyed up after y.e Artery is full
stretch'd, it can't be emptyd. But supposing y.t y.e Artery
and vein run parallel & y.e heart gives a stroke, this is
extended, & pushing upon the Brain pushes y.e blood down
to the heart, & now y.e Scalp contracting pushes y.e blood
downwards forwards into the brain so y.e blood moves in
the same manner in y.e inner part of y.e head as in the rest
of the body by y.e alternate dilatation & contraction of
the Arteries. We must have seen y.t y.e obstruction in any
part is guarded against by y.e unusual joining
and Anastomosis of y.e principal trunks. The 2. Vertebral
unite into y.e Basilar & y.e 2 Circul.s is formed around
y.e Sella Turcica, & thence from accid.t or disease, upon
y.e motion of y.e head & any of y.e 4 principal Arteries
are stopp'd, y.e blood can pass to every minute

termination in the head & in spasms of other Muscles
fied y^e Carotids Communicate & yet y^e ordinary functions
were performed. Tam y^e Sinuses y^e blood passes into y^e
internal jugular vein, w^ch is a vessel of very considerable
size, & is made larger in proportion to it's artery. So
Anatomists mistake in y^e Sinuses & great multitudes
of blood, in which it undergoes great changes; y^e Sinuses
Simpson are scarcely larger compared w^th y^e Carotid &
Vertebrae altho' y^e y^e veins are in other places, But
their Coats yield readily in y^e human body & in
Animals y^t dive under water we find large Bags to
prevent y^e accumulation of blood within the head.
There are two motions in y^e Brain 1^st y^e common pulsation
produced by y^e Stroke of y^e heart 2^nd in y^e original
Systole of respiration There is a considerable pressure back-
wards for y^e internal jugular that but a pair of valves
w^ch do not accurately prev^t y^e regurgitation of y^e blood
to y^e discharge of y^e smaller veins into y^e Sinuses in for
some time stopped, so a considerable swelling of y^e larger
Branches of y^e veins entering into em, If we remove a
considerable portion of y^e Skull and detach y^e membranes
y^e alternate dilatation is seen in a very remarkable de-
gree, & we are apt to deceive ourselves in supposing y^t such
a motion takes place before y^e Brain is exposed, but y^e
is no such hearing of it for ordinary occurs in this
Experiment for suppose a simple bladder is thrown into
the Brain y^e whole impulse appears at the first. O
However tho' we allow y^t y^e Brain has a pulsation
of it's Arteries as in other places & y^e there is no great
difference in y^e return of y^e venous Blood, we have it not in
our power to empty y^e vessels of y^e Brain by letting blood

as we can empty y.e vessels of other parts than I shall draw
a pound of blood from y.e Arm, I empty y.e vessels & lessen the
Bulk of many parts of y.e Arm the veins subside & become
smaller, but this can't happen in the Brain w.ch constantly
contains nearly y.e same quantity of blood. From y.e danger
arising from a stoppage of y.e blood within y.e head if that
have happened, if when persons killed by hanging it must
be owing to y.e stagnation of the blood within the head, But
the blood continues to find its way, there may be a kind
of Relapse & Apoplexy from y.e pressure upon y.e vessels
but upon opening the Trachea Arteria of a Dog it was kept
hanging 3/4. of an hour with.t him's killed: but upon putting
the Pipe upon the whole it was found irrecoverably dead
after 7. minutes; so y.t y.e Death is chiefly ow.g to y.e cessation

Lecture 51.

We shall take a view of y.e first pair of nerves with the
corresponding Arteries; & then of the Nerves & blood vessels
y.t supply the Eye. — The Arteries of y.e Eye are not from
y.e internal Carotid according to Winslow; but y.e muscles &
Coats are supply'd by y.e internal & Winslow commits two
mistakes here, the principal Arteries go in at y.e middle of y.e
muscles of y.e Eyes, as it y.e Case in other parts of y.e body, y.e
reason we shall shew hereafter. The nose too receives blood from
y.e internal Carotids. I shew'd you several Branches of
Arteries going into y.e Glandes D.r Haller w.d persuade
us y.t the pass over y.e gland but he was led into y.e mistake
from y.e opinion y.t y.e glandes have little conveibility and
we shall have occasion to shew many other terminating
in Glandes.

Lect. 52nd

The forepart of y.e Eye is round y.t the next, or y.e Connexion portion of a smaller Circle above y.t formed by the Sclerotica, which makes a portion of a larger Circle, & y.e Retina runs y.e Eye towards one side, nearest y.e innermost, the Pecten is plaited upon the fore y.t the Backpart, and the Ciliary processes are connected to the Edge of y.e Crystalline Lens &c. as I shewn you in this horizontal Section of y.e Eye w.ch I am drawing with Chalk upon a Black Board. Recollect now y.t it is not necessary y.t y.e bottom of an Eye be made invisible y.t y.e rest of y.e Body in order to prevent y.e introduction of Light, but it is also necessary y.t y.e Rays be collected, as y.e rays of the Sun are collected w.th a burning glass, by w.ch means y.e rays make a sharper stroke upon y.e Retina. The humours of y.e Eye are peculiarly fit for defending y.e sensible bottom & for collecting y.e rays, By their pellucidity y.e allow them to pass thro, by their softness they defend y.e parts & by their shape the collect y.e Rays w.ch form a picture of y.e Object at y.e bottom of y.e Eye, just as y.e burning glass we saw form upon the Floor an Image of y.e window in this Room. — By y.e humour y.e Crystalline lens is y.e principal, for with it when out of the body, I can form a picture as I do with a Burning glass we y.t it is calculated to collect y.e Rays upon y.e bottom of the Eye & it can do y.t independant of a long distance from y.e other parts tho' these cooperate. You recollect y.e situation of y.e Lens y.t it is a firm substance inclosed in a Capsule & which gradually grows softer towards the Center. This leads to the opinion y.t a fluid is interposed between y.e Capsule & Lens. But when we examine a recent Subject there is only a void, and y.e reason of y.e softness is y.t in all such

substances y.t rays are collected in an unequal man-
y.e edges drawing on to a point wards y.e y.e middle; hence
there is no perfect focus made by Art, but how in converg.
of y.e rays the y.e light is less gathered at y.e edges, than y.t at
y.e rays unite at y.e bottom of y.e Eye. There are vessels of con-
siderable bigness y.t are seen upon y.e Capsule in Child.n &
afterwards include y.e aqueous humour but contin.e to circulate
y.e other parts of the Blood, this causes to grow y.e tender
Eyes of Child.n soon being injured by y.e light & there is a
want of clearness in their Vision. & this circul.n ceases to
shew us y.t y.e Capsule is provided w.th Vessels as y.t ancest.s
knew y.t membranes may be thicken'd by Inflam.n & be a
cause of Opacity, as y.t altho' in y.e Cataract y.e Opacity
is chiefly seated in y.e body of y.e Lens, it may be contin.d
to the Capsule; as after y.e body of y.e Lens has been ex-
tracted it sometimes happens shaky, from y.e wound &
admission of y.e Air becoming thicker and darker.
The Vitreous Humour is plac'd betw.n y.e Lens & bottom of y.e
Eye it appears like y.e glair of an Egg, but we have reas.n
to believe y.t it is contain'd in a Capsule, tho' it is not so
evid.t its principal use is to support y.e Lens at y.e proper
distance from y.e bottom of y.e Eye as an Obstruction, & y.t it
being thinner y.n y.e Lens it also assists in collecting y.e
Rays, & if it did not interpose y.e picture w.d have form'd
behind y.e Retina. The Aqueous humour is plac'd betw.n
y.e Lens and Cornea in w.ch y.e Iris is plac'd, so y.t it is
partly lodg'd on y.e one side, & partly on the other side of y.e
Iris, a supposing that an called y.e Anterior & posterior
Chamber y.e Anterior is larger, as an uncertain whence it
is deriv'd, whether from y.e Cornea or Iris, but I suspect
y.t it is from y.e latter, as y.e vessels I found upon y.e Iris com

better fitted for providing this humour, w.ch is regenerated in the space of 24 hours; & I have seen an Injection of Indian ink arising from y.e Iris tho' y.e aqueous humour probably imitating y.e natural Secretion. The Aqueous humour allows y.e motion of y.e Curtain of y.e Iris to regulate y.e Light passing thro' y.e Pupil wider y.e Crystaline is much better armed from danger as from Blows &c. a Light rub might have divided y.e Iris its velocity & Copiousness, & there is reason to imagine y.t it helps to keep the Cornea transparent for it is naturally intitled between y.e Sclerotic & Choroides tho' these; & after death the Cystoides its Shape this humour exuding thro' y.e Cornea. With reg.d to the vessels Coats beginning at y.e immediate, The Retina is y.e Centrin. of y.e Optic Nerve & these take their rise from y.e Thalami Nervorum opticorum, from a certain Tubercle from y.e bottom of y.e lateral Ventricles & y.e side of y.e 3.d Ventricle, & hence we understand, why in y.e internal Hydrocephalus, y.e Eyes come to be affected; there y.e Thalami are squeezed on two sides above by y.e water in y.e lateral Ventricles & within by y.e in y.e third y.e Ventricles all communicating, may y.e affection of y.e Eye proceed out of y.e collection within y.e head, when we trace these nerves from y.e Thalami we find y.t they are united Halls. & then encrease y.t y.e Union is made by a Cellular Substance, but we can in y.e way give no rational acc.t of y.e Union, I advanced to consider y.e matter more particularly & I found y.t there is a real Intermixture & Decussation of Fibres as y.t is right & left Optic Nerves for instance is formed from both y.e Thalami & nearly equally and we see the Advantage of y.e y.t it is better that y.e half of y.e Sensibility of both Eyes be preserved if y.t y.e Sensibility of one Eye be lost altogether. We derive many advantages from 2 Eyes, & from y.e uniform motion we judge better of distances & accidents are better guarded y.t suppose a divarication in y.e right Eye, y.e half of the Sensibility in both may remain & suppose any

a blow given to the Eye afterwards we shall ascertain as much right as is necessary in the common affairs of Life, so we must admit of a mixture of y.e optic nerve where they adhere. — We next follow the nerve into the Eye, we find y.t it is crooked a little between y.e foramen Opticum & Ball of y.e Eye to allow y.e fascination by the Recti muscles, we then find it enters tho' not directly opposite to the Pupil, but at the Innerside, now what reason do we assign for this? Dr Hunter & Mr Sheldon y.e use of this in the clearest manner, it was made in the last Century by Mariotte. if you bring y.e picture to fall upon y.e entrance of y.e Optic nerve you lose y.e Object altogether then if y.e rest of the Eye look at y.e piece of Chalk before me; & I was it from y.e Image falling on y.e outside but turning my Eye a very little I have lost y.e Chalk: I might suppose y.t y.e was owing to the Obliquity, but following it a little further I again lost it & making y.e Experiment with accuracy I find y.t we lose the object whose diameter is equal to 1/9. of y.e distance we y.e Eye from y.e Eye you will lose a circle one foot in Diameter. It is material to attend to this, because many have imagined y.e sensibility to be owing to the small Artery entering w.th the nerve; but I find on making a calculation y.t y.e whole medullary substance or entrance of y.e nerve is insensible, y.e nerve not being spread into Coats fine enough to receive y.e impression or when a nerve is spread upon y.e Tongue a bone, y.e nerve is not fitted to receive the Impression. The nerve enters towards y.e innerside & we find from attending to y.e Angle, y.e Eye looks w.th y.e Object y.t y.e entrance is somewhat more y.t y.e 1/6.th of an Inch, y.t is the place where y.e Optic nerve enters, the reason of it enters at the innerside is evident, if y.e nerve had entered at the outerside, pictures of a single object, we should have formed at the

of y.e same instant in both Eyes, but the Rays falle
upon y.e outward part of the left when on the inward part of the right.
we find y.t nerve forming y.e Retina, with the appearance of y.e
medullary substance, y.t nerve is compressed, so it is an imi-
form membrane & no Network w.ch we have last spoke of y.t
objects, it expresses nothing more y.n a Web extended uniformly
upon y.e immediate covering y.e vitreous humour. Dr. Haller and
some of y.e French Authors describe it as going to y.e edges of
the Chrystaline Lens & some of y.e fibres passing over it
But it is unnecessary y.t they shd extend over y.e Lens it wo.
have disturbed y.e vision upon y.e posterior part of I find y.t it
terminates like y.e edge of a saucer behind y.e Lens, & y.e same
acct is given of it by Dr. Linn to whom I refer you for an
accurate figure of the Eye, there may be some fibres perhaps
going forward to the Chrystaline Lens, it may receive a
newous fibre from y.e Retina, tho' it seems to run intirely
along w.th y.e vessels. It is covered by the Choroid Coat
y.e immediate of w.ch is incrustd with a black paint from
y.e appearance of a Membrane. That serves y.e very opposite
purpose of quickening on y.e back of a mirror, it prevents
y.e reflection of y.e light, which being thrown back again
would make a 2nd. impression, it suffocates y.e rays.
From y.e Experiment y.t y.e Optic Nerve at y.e entrance of it
is insensible, Mariotte Father concluded y.t y.e Coat was
y.e Organ on w.ch y.e picture made its impression. But we
also y.t blindness is occasioned by a disease of the Thalami
nervi optici. by pressure upon them; as that is y.e use of the
Retina, why so fine a web is it only a coat of cover to the
Choroid. Next perhaps y.e Choroid as a Web & some sub.
we find it makes a term, & is connected to y.e Chryst. Lens
by w.ch has been named Ciliary processes, w.ch an only termin.

Baptist seperates there and serves to baptise ye Christ
Lives in its place, wch rests upon ye witness himself as
upon a cushion, & is suspended at ye edge by ye Continuat.
of ye Spinal Coat.

of this Boat contracted into a narrower Circle just as
the Sleeve of a Shirt is form'd into a Wrist at the
Circle, so that is not from the Light but Refl. betw. the Ciliary
processes and y. Lens, as is exhibited by Rays. Father. Sagacity
if there was y. Aqueous humor wd. mix w. y. Vitreous. This
Opinion has led to very wrong Ideas of y. parts affected in
diseases of y. Eye, as the ways of Light y. strike y. Retina
have before y. Refrd. y. Rays cut. Lens, so if a Cataract is
uncommonly opaque from y. want of transmissibility to Light
we are not immediately to infer y. y. Retina is in a diseased
State unless we find other circumstances y. may lead us to
suspect this — Let us next consider y. Iris y. has been de-
scribed before Lens as y. Centre of y. Choroid Coat on y. of
w. being perforated to form y. Ciliary processes, & y. other
from y. Choroid, & is nearly connected to it by y. Ciliary
Circle, as they are joined by a Cellular Substance w. also connects
y. Iris to y. Selerotic Coat, & y. y. watery humor is prevented
by y. Ciliary processes Circle from entering betw. the
Selerotic Coat & y. Choroid, & thus makes a white opaque
substance forming a Ciliary Ligament at y. root of the Iris
The Iris has an Aperture in y. middle w. we call y. pupil of
the Eye. When we follow y. vessels of y. Iris in an injected
preparation there are obviously derived from y. Choroid Coat, & we
find never entering in conjunction w. y. root of y. Iris
There is a circular Artery at its root all y. vessels communicate
we then trace on to y. edge of y. Iris, & follow them all y. course
w. y. naked Eye; & yet Haller & others in a fine y. no red blood
enters y. Iris, & y. its vessels convey colorless humour only; but
besides y. evidence from y. appearance of the Vessels from
accidents we know y. the Iris circulates a consid. quantity

Quantity of said blood, wch I have seen mixd with the Aqueous humour, this in a Case I met wth some time ago upon a patient attacking his head suddenly a cloud or film appeard within ye Cornea, & upon holding his head steady the cloud went off: & upon examining ye circumstances I found yt it was owing to the blood mixd wth ye aqueous humr. When ye head was held in one position ye blood fell to ye bottom of ye humour, & ye Iris is not connected where ye Sclerotic Coat joins ye Cornea but behind ye joining, & ye Iris fell over the edge of ye Cornea and went entirely out of sight, And in attempting to extract ye Crystaline Lens, if ye Iris is wounded red blood comes from it, & there is great redness & inflammation of ye part, how we may be certain ye three Vessels convey red blood in life, but ye red Colr of ye Vessels is conceald from us by ye paint a colour wch is laid over them & ye Aqueous humour is probably exempted from ye Vessels of ye Iris. The principal use of ye Iris is to exclude a superfluous quantity, & to allow as much as is useful to reach ye Retina, & how when ye is turnd towards ye Light the pupil is small & when it is turnd from ye light it becomes larger, & adapts itself to ye quantt of light: But there is something more in ye happiness, it is not meerly affected by the genl quantity of light but it is contracted or widend whereby objects become indistinct, by being placed too near the Eye & when turnd from ye Eye downwards ye pupil gets a certain diameter, but if I want to examine ye point of a small pin but near the Eye the Iris tho' not now restricted by so much light contracts a little more ye better to see it distinctly. This was alledged by the late Dr White: and I have seen him make a small hole in a bit of Paper & but a small pin'd book wch appeard confus'd, & viewing it thro' the hole it appeard more distinct & ye instrument enables us more readily to receive the

last, of in distinguish. of motion of of Iris in viewing near objects. This Circumstance respecting of pupil is of of utmost consequ. to attend to in judging of diseases, wh. the Eye is insensible to the Light. There is a very small degree of motion in the Iris, & it is of same whether of Eye be insensible to recieve impression as in of Gutta Serena, or insensibly impressd by of Light being intercepted as in of Cataract in both Cases of pupil becomes large, somewhat resembling of of motion of of Eye was owing to the Light striking the Iris & affecting it but it evidently depends upon the manner in wch of Retina is affected, for of pupil loses its motion nearly as much in of Cataract as in the Gutta Serena in of D. Eye sympathizes, & suppose an Eye is diseased & of of pupil is little affected by imitating it, yet upon opening of sound Eye of imitation upon of one affects of pupil of other too of motion depends upon of affection of the Retina But we may farther of of Circumstance of of Eye adapting itself to the Confusion of Objects shews an instinctive power wch is more extensive of we are commonly aware of: we not merely contract of pupil & allow it to relax itself by its natural tone, as Dr White supposes, but we possess a muscular power of contraction & dilation. I can shew by dilatation I can't shew a Sphincter for contraction & dilation, but we possess of power of contracting & dilating of Iris beyond its tone, the contraction is known by of common effect of light, but when of Retina is uncommonly insensible by disease, the pupil is widened, for beyond its natural tone, & in proportion dying (I have seen of pupil much larger of it was 5 minutes after death wch brings it nearly to the same size as when the Eye is not turned to a very clear light, nor in too great Obscurity. But in of Hydrocephalus or Amaurosis it is

[illegible] to return to the blood

greatly dilated: Thereby when y^e patient was
roused by giving him bark, how deep the pupil was
was very much dilated: & when y^e stimulus was made by
light by bringing a Candle near y^e Eye y^e pupil often grew
wider y^n y^e colour of y^e Iris was scarcely to be distinguished
2^d White accounts for it from mechanical imitation, but when
y^e patient is roused there is an effort made to avoid y^e
of Light is not sufficient to make an impression, therefore by
an Involuntary motion there is an effort to enlarge y^e pupil &
immediately all the death it contracts to a much smaller size y^n
in those diseases. ——— It remains to consider the external
Coat y^e Cornea & Sclerotic w^ch is intended for a defence; whilst
whilst y^e Cornea resists y^e same pressure, light pulsed by
it transmits: May it commonly it collects it: Light, for y^e
light is in a great measure collected before it reaches y^e Iris
y^t it may be accurately regulated by a small motion, y^e
light is brot into a very small pencil of rays, by y^e Iris by
a very small motion exactly regulates what is necessary.
The Eye is corroborated in its Shape by y^e Tunica Adnata & con=
junctiva w^ch is produced from y^e Eyelids doubled & we draw
it over y^e Eye, was making a part of y^e outer Layer of the
Cornea, tho' it is not separable by dissection, but it is
more closely over y^e Sclerotic Coat, & many vessels run thro
so is subject to Inflam^n & y^e Shape been over y^e whole Eye,
and y^e whole Cornea could not respire, w^ch contrary to what
Haller alledges is a very sensible substance, & was skin found
Spots produced upon it; when these vessels are very deep there
may be a dilatation of y^e natural vessels, but in y^e cases of
no. They are a new growth beginning in y^e Sclerotic Coat &
gradually extending over y^e Cornea, as in y^e Case of a piece of
Substance a wound: and we may have them w^th the Eye over
y^e Coat, & then Arteries must ag^n w^th veins to return to the blood

It remains to explain in what manner in the said Tears are conducted to the puncta Lachrymalia & pass down into the nose & are provided against in the inferior & superior eyelids as shown But it remains to consider by what power they are taken up & there conveyed to the nose, the puncta have upon the whole an oval appearance by a ring of hard Cartilaginous matter & the ducts gradually enlarge and end in the Lachrymal Sac It is said that the Tears are not sucked into the puncta by forced by pressure making a vacuum over the Cheek so they must be sucked in by the power into the small Capillary Tubes, & they are there conveyed a certain way, we shall enquire what the power is sufficient to suck the ducts altogether, the whole duct is filled by attraction which is perhaps not true, we cannot suppose the motion continued, it does not imply there is a sufficiency to subtilly cut off the duct remains full, because the same power that draws the Tear into the duct if no more Tears are added prevents the emptying. There is an attraction to suspend the Tear within the duct but if more fluid is added it comes to represent the common Syphon, if it was wide there would be nothing in the manner it would be emptied; but it remains full in a Capillary Tube; but if this duct be stretched into the figure of a long end begins to run out, to suppose it stand must mean to suppose they would continue to ascend so long as the Subtilly is made, But further the Tear will be found to stop that the Lachrymal duct altho' the head is inverted, & therefore there must be a mutual power in these Tubes by which they stretch on the fluid & prevent it return, the contraction seems made to the Eye, & a circular muscle may perhaps still upon it. It has been alledged by Albinus that if the puncta be touched by acid sprinkle it is not seen to be effected but tho' it is not seen the mutual power is not to be denied.

Lecture 52nd

We now proceed to demonstrate the external Parts and the corresponding Veins &c.

Lecture 53.

We now proceed to trace the nerves which correspond with the Arteries we saw yesterday Three on y^e external parts of the Head.

Lecture 54th

I am now to make some observations on what we have seen y^e With regard to y^e nerves — The first pair is called the Olfactory it passes thro' y^e Cribriform bone & is divided into a number of small branches, without receiving any fibres from y^e dura mater, & y^e thereof lies within y^e nose it conducts so number of fibres of y^e nerve may be divided as suddenly as possible because there must be a certain division of parts, before y^e sensation can take place, as in the Eye where the nerve is invisible at its entrance. — Next we saw the Optic nerves united, y^e nature of Union has been already explained, y^t y^e Vessels actually decussate one another the connexion has been supposed to act for y^e uniform motion of the Eyes; but we need only to obs. y^t y^e Optic nerve does not terminate as y^e Organ for y^e motion of y^e Eyes, it is merely a nerve for sensation; when we proceed to trace y^e Optic nerve we see y^e medullary substance spreading out into an uniform coat, & there is no need to imagine any kind of motion, as those who talk of muscles being y^e means of motion of nerves seem to infer, in this soft and fine substance called y^e retina y^e nerve must be spread out & terminate in expanding minute parts, & from y^e smallness of y^e picture we see infer that y^e diameter of one of the Fibres does not exceed y^e 20. thousandth part of an Inch, supposing y^t y^e picture can consist but

a single thread; but y.e probability is y.t a No. of threads are
affected by every fibre at y.e same time: we see therefore y.t there
may be numerous nerves distributed to parts, tho' we are not able
to trace them. — The 3.d pair of nerves is called Oculi motor sup-
plying many of the muscles of the Eye, we find likewise produced
from y.e Nerve or all threads w.ch join to supply the Iris. —
The next pair y.e 4.th is singular in many circumstance, into Conjun.
w.ch is very distant from y.e eyes & from y.e Origin of the 3.d pair w.ch
is a nerve of the brain & y.e other of the Cerebellum & terminates
in a single muscle y.e Trochlearis, some think y.t it is a chief
Instrum.t of inspiration the passions of y.e Eye, so receives a thread
undivided but obs. only y.e distribution of y.e 3.d pair we find a
muscle corporating supplyd by a common nerve, viz. y.e 3.d Cephalica
y.e attollens & depriment Oculi w.ch are Antagonists, so I was
loose of an a Circumstance y.t we cannot explain; whereas nature
is uniform the distribution is intended for some wise purpose
but in the present instance y.t lies concealed. —
The 5.th or y.e largest Nerve of y.e Cranium, is soon spread out into
a considerable branch, w.ch is divided into 3. branches, y.e 1.st 2.d
and some branches into y.e nose, & other branches supply muscles
so it serves both for motion, & likewise for sensation, & the third
branch serves not only for sensation on y.e point of y.e Tongue
but taking its course towards y.e point it supplies y.e muscles
of y.t Organ, & branches are sent to y.e maxillary & sublingu-
=al glands, to regulate y.e Secretion of the Saliva, now tho' centr.
Nerves, as y.e Olfactory and Opthalmic, have a great whiteish
y.t we obs. in the other Nerves, yet in y.e 5.th pair y.e branches sup-
=plying y.e nerves Senses have the same colour as those destined
for motion and hence we conclude y.t all its offices are performd
by the same medium; & we will be able to give a reason for y.e
whiter Colour of y.e optic nerves, those intended for more distant
parts are exposed to Injury & nerves perhaps an addition of y.e
nervous influence from y.e Cerebellum y.t covers the proper Nerves. —

When we now look back to y.e origin of y.e 5.th first paire, we
find y.t y.e first, second, & third paire are nerves of the Brain, whereas
y.e 4.th & 5.th are almost entirely deriv'd from y.e Cerebellum, yet simi-
lar offices are done by both, y.e 1.st & 2.nd are organs of Sense, the 3.d of
motion, y.e 4.th of motion, y.e 5.th of Sense, motion, & assisting in
regulating y.e Secretions, so there is no reason for imagining y.t y.e
offices of y.e Brain & Cerebellum are so very diff.t as some Physi-
cians have imagin'd. ——— The 5.th we have seen joining the
2.d forming a small ganglion, y.e only remark I can make
here is y.t we see ganglions in these paire of nerves the most
material perfection of. ——— The 6.th paire is spent upon the ab-
ducter muscle, for a reason, I do not pretend to understand;
why y.e 2.d may not have furnish'd y.e Abducter as well as
the other recti. ——— In its course we perceive a commu-
nication by two distinct threads with y.e Intercostal, for it is observ'd, y.t dissecting the y.e course of a
nerve whether it is upwards or downwards, whether they come from
from or go to their nerves? If they come from y.e Intercostal we
have no origin to that nerve: besides I constantly obs.e y.t the
6.th paire becomes smaller between y.e place & y.e Eye; so these
with y.e Branches from y.e 5.th paire are y.e highest origins of the
Intercostal or Sympathetic nerves. ——— The 7.th is divided into 2.
portions, one of wch is without a covering because it is in no danger
of being torn, & is call'd y.e portio mollis of y.e Auditory nerve;
but y.e other branch running outwards receives y.e covering from
y.e dura mater & is call'd y.e portio dura, & as we have found ma-
ny y.t one nerve subsisting in material Organs, y.e portio dura is join-
ed by a branch from y.e 2.d & 3.d of y.e 5.th & I find a nerve connecting it to y.e
3.d branch of the 5.th & I have no doubt wch assist to y.e Chorda tympani
y.t they are from y.e portio dura & y.e 4.th point of the Tongue is supply'd
by y.e 5.th in two places join'd to y.e 7.th by y.t care is taken y.t we may
not want y.e Sensation from y.e Tongue. ——— Pursuing y.e portio dura
we find a very great n.o of branches spent upon y.e side of y.e face
we may venture to allege y.t y.e n.o is greater here in proportion

than what is spent upon the other muscles because y^e. other muscles of the face perform a double office, they not only serve for y^e. action of y^e. Lips but for expressing our passions & are more large in proportion to y^e. exercise of y^e. motions of y^e. Organ in w^ch. they terminate: the portio dura is joind to other nerves, but the branches instead of forming continued canals, we find y^t. they grasp each other, & when a muscle is supplyd it receives a thread from each of the nerves, so we find a great care taken to prevent them from being thicker than most of the other muscles, because of y^e. importance of their office, thus if we can open & shut y^e. mouth w^th. half y^e. natural force it is better than we could open and shut it. ——— The 7^th. pair goes very far downwards to mand par vagum, it supplies y^e. Larynx & as the function of y^t. Organ are material to Life so very great precaution is taken to guard against accidents, so their is a superior Laryngea & recurrent sent back in a very particular manner; & in endeavouring to determine y^e. final Cause, I find y^t. y^e. voice will not be lost by cutting one of the nerves, y^e. recurrent, tho' y^e. tone & y^e. gen^l. strength of y^e. voice is diminished it is by no means lost. ——— The 9^th. pair like y^e. 5^th. supplies y^e. muscles & then y^e. Organ of sense & likewise y^e. integuments, for from y^e. surface of y^e. Tongue there is a considerable insertion of nerves. — All the last mentiond enter y^e. medullary substance of y^e. Brain w^th. y^t. of y^e. Cerebellum, so are deriv'd from both & since y^e. branches we've been sent from y^e. 8^th. pair to y^e. heart are by no means to be consid^d. as belonging to the Cerebellum; for I deny y^t. y^e. vital functions are performd by y^e. influence of y^e. nerves of y^e. Cerebellum, tho' we must admit the Cerebellum to have its share in these functions. So far we have remark'd y^e. nerves. — Next with reg^d. to y^e. Blood-vessels tracing these outwards from y^e. heart, we've seen y^e. arch of y^e. Aorta send off 3 principal branches; y^e. first branch supplies

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to the Carotis communis runns upwards parallel to
Trachea a very consid.ble way, it is very convenient for various Experim.ts
that I have seen in it's dilatation of Arteries in diff.t Animals,
& I have seen a degree of it's living or contractile power, that was
very evident y.t was disputed after making every allowance;
we find too by tying y.e Carotid in two places, y.t a consid.le q.ty
of Air enters into y.e Composition of y.e blood, & we also y.t without
y.e assistance of y.e Air it coagulates; We find y.e Carotid divides
into y.e external & internal Carotides, & y.t last communicates
with the Vertebral vess.ls. there is little danger of a Extravasation of
Blood in any part of the Brain or Cerebellum, & we have seen
numerous examples of Communications between y.e Inter.l & external
Arteries, & hence after tying y.e Carotis Communis I found y.t not
only y.e functions of y.e brain continued but also those of the
external parts, y.e blood getting thro' y.e Vertebral to y.e External
Carotides, & from these into y.e external, whilst another portion
went from y.e Subclavian Artery by y.e intercostal Laryngea and
Cervical, nay y.t in a few minutes y.e whole external branches of y.e
Carotides came to be filled with it, & y.e new communications
soon became enlarg.d. Dr Monro has published an acc.t of this
experi.t & when y.e head seems to be oppressed with too great quant.y
of Blood, wch is frequently a cause of Apoplexy, Vertigo, also
of the Epilepsy, he proposes opening y.e Jugulars by tying one
of the Carotides. now although from y.e vicinity of y.e nerves, after
y.e pain & intercostal, y.e oppression is attended with a consid.le degree
of danger, indisp.t of y.t from tying y.e Artery, yet equally y.e Idea
is worth pursuing in other Animals; so in y.e Rage or Epilepsy
in a Horse, we might tye one of y.e Carotides to see the effect.
but attending to y.e situation of y.e Carotides w.ch are just beside each
other, y.e internal is sent off at an angle, & y.e external is y.e more
direct continu.n of y.e Trunk, & y.e Vertebral arteries arise at a right
Angle & from y.e Subclavian. We find y.t both y.e Arteries which

supply y^e^ Encephalon comes off in an unfavourable manner
y^t^ there is no foundation for D^r^ Boerhaave's Opinion of y^e^
most active parts of y^e^ blood being convey'd to y^e^ Brain
in consequence of y^r^ more favourable direct^n^ of y^e^ Carotid^s^.
Next let us prosecute y^e^ particular branches of y^e^ E^t^ branch
we went to the Larynx, & y^t^ turning downwards entered the
Thyroid gland, where it freely communicates w^th^ ascending &
transverse y^e^ Trachea of y^e^ gland we shall find y^t^ a great
Quantity of blood is circulated here. Nice care to be taken by
y^e^ Size in ant^r^ Operations particularly in Bronchotomy, where we
must pass out this y^e^ gland), & if y^e^ is done y^e^ blood getting
into y^e^ Trachea may raise a convulsive Cough, w^ch^ is attended
w^th^ real danger, now considering y^t^ Operat^n^ we may assist
on y^e^ way of gaining advantage in ant^r^ cases of Inflamm^n^
& of avoiding y^e^ danger of blood falling into the Lungs.
Higher up y^e^ we see a considd^e^ Branch, the Lingual, passing
above y^e^ Cornua of y^e^ Os Hyoides, attending y^e^ Os Hyoides y^t^
joins to its fellow it conveys a very large proportion of blood
Nice care to judge of its situat^n^ in Surgical Operations;
when turn'd aside in here, we do not know readily its course
by the Finger because it is supported chiefly by Muscles, so
if we do easily distinguish its pulsation. The next Artery we call
Facial, supplying y^e^ inferior maxillary & sublingual Glands
The branches are sent off at right Angles, as those of y^e^ Temporal
Artery y^t^ supplies y^e^ Temporal Glander, so that can not move
parts by fitted to receive y^e^ very active moving, & y^e^ effect of
y^e^ biting in throwing out y^e^ mercury is not to be ascribed to
its passing off at right Angle but to the structure of the
ultimate branches, as of y^e^ gland, & y^e^ great sensibility of y^e^
part: going thro' the Jaw we find y^e^ Facial Artery passing over
y^e^ lower Jaw, abt an Inch from its Angle called Arteria
Angularis, where we can distinguish y^e^ pulsation & can
open it on certain occasions, & in some operations we allow

the parts to bleed freely, & it may be of advantage to empty all y^e vessels very fully: but in many other cases we wish to stop y^e bleeding, as in y^e operation for y^e hare lip in the Case of Thomas Ashton. Mr Lizars Surgeon gen^l was present upon y^e 19^th instant, only of y^e bleeding Artery at take up with the Needle, But applying two fingers upon y^e root of y^e Facial Artery will effect very considerably not but y^t blood is poured in in small quantity from y^e neighbouring branches, but if y^e principal source is interrupted it will be found to cease.

Tracing y^e facial Artery higher up y^e face we find it supplying y^e small glands of y^e Lips & y^e cheek in their course it takes down a double serpentine turn allowing an extension of y^e mouth y^e Artery coming near to y^e Nostrils Lips, but the turns and still greater length that is necessary for y^e purposes of conveying y^e nutriment of y^e vessels within y^e muscles, we may conceive y^t from y^e nutrient & comes y^e Spittle to be better prepared, & the Secretion moved by y^e motion as well as y^e secretion, & y^e Art^y of y^e face we find y^e Artery communicating with y^e carotid & frontal, communications between y^e internal & external Arteries. Hence y^e reason for Dr Blair proposing to open y^e frontal Artery in diseases of y^e Encephalon; but I have mentioned y^e reasons for avoiding y^e operation, from it's being turned over a bone it is impossible to bind it &c.

Following y^e Artery still higher we find y^e occipital runs backwards to Mastoid. From y^e root of the Temporal Artery the Trunk of y^e Carotid is turned inwards & y^e first gets y^e name of internal maxillary, splitting into a very great number of Branches supplying y^e muscles, y^e substance of y^e jaws y^e roof of y^e mouth, & there is a branch going into y^e dura mater. Thus y^e Artery terminates in y^e sides of y^e nose which is a continuation of y^e external Carotid. And tho' there are branches running all in the way of artery yet it is easy to know from what source

each organ receives its blood & the knowledge of
their connexion & vicinity may be of advantage in certain
dangerous diseases to lessen y^e force very considerably, thus
if y^e dura mater is inflamed to a great degree, as in case of fract-
ure in Child^n. y^e force of y^e blood may be more lessened by
open. y^e temporal Artery in y^e neighbourhood, than by
opening vessels y^t are more distant. We are to consider at y^e
same time y^t nerves, almost every principal branch of y^e
Artery is closely accompanyd by a nerve, w^ch it is of use, for
y^e purpose of Surgery to know in y^e most accurate manner
Corresponding to y^e Arteries there are two sets of veins, viz. y^e
inter^l jugular attending y^e Carotis communis, & 2. external
jugulars, so y^t we see in this part of the body, that y^e blood
returns y^e most readily to y^e heart in y^e erect posture, we have
seen under under our muscular Organs, y^e veins running in very
diff^t directions; one set on y^e outside of y^e muscles, free from
y^e action & freely communicating — In y^e external jugular
veins are two valves, w^ch are in front y^t they are chiefly in-
tended to prevent y^e blood from being driven backwards to
y^e small branches. — From the free communication w^ch the
external & jugulars have w^th the internal you must be convinced y^t y^e
drawing of blood from them, in diseases of y^e Encephalon may be attend^d
w^th great benefit; y^e only danger attending of one arises from certain
small nerves, branches of y^e Par vicatus & Sac^l shown many of y^e princi-
pal Vessels of y^e body, y^t may be a proper occasion for explaining the
effect of opening Arteries and veins, w^ch shall determine us in our preference
& y^e whether we are to prefer y^e open^n of an Artery to y^e open^n a vein, or w^ch
we are to adopt, whether it is to be done in y^e neighbourhood of the place
affected or at a distance? And I imagine these depend upon the same
principles, so y^t in determining y^e one circumstance, we in effect det-
ermine y^e other. I need say anything w^th regard to y^e degree of
danger, on the score of this, it will be better considered in y^e Surgical

part of the Bowels only at present, I presume that opening an Artery is a more dangerous operation than opening a vein of the same size the blood being thrown out from the Artery with much greater violence. Now to determine this whole question I will venture to offer to the 2 observations, that I've made, when I am injecting a dead body: If any one Artery happens to burst, I constantly observe that the Arteries in the neighbourhood are not so well injected, as the arteries are at a very considerable distance. Thus suppose the internal Iliac bursts, I don't find the external Iliac of the side is so well injected, as the Brachial Artery is, suppose that the Leg in the common way for the space of the injection in the external Iliac is much lessened, by the blood's outlet from the internal, & this therefore plainly evident to me that if the force of the blood in any part, that any part is assaulted with an Inflammation, Love of the disease in general we ought to take away the blood in the safest manner, but supposing the question to turn upon Topical Complaints, the nearer the opening is made to the part diseased, so much the better: In one case we prefer the Artery, in another the vein, as we can draw the blood more immediately from the part, always preferring near vessels to distant ones: So suppose an Inflammation to occupy the anterior side of the head or Ear, surely the proper way of giving relief would be opening the Temporal Artery; perhaps by stopping the Artery the force might be lessened, & sufficient quantity can still be had for carrying on Life, or if you want to make an open it would be of this Vessels; but supposing the patient will not agree the Artery should be opened, I would surely prefer drawing the blood from the Top of the Jugular, or Temporal vein. Now in answer to Mr Watkins any objection to this, that when a Vein was opened, the flow of blood is accelerated in the vein, & the force quicken in the Artery, but the force is not increased, only the flow is accelerated because there is less resistance: to shew that we are apt to mix apply common principles with regard to the quantity & velocity without regarding the existence: You'll observe that the force of the blood within the Aorta is greater in the pulmonic Artery, but the velocity is entirely the reverse, we are to attend, not only, to the velocity with which the Blood moves, But with what intent to remove: and the

existince. There is to this notion instead of being an argum.t 260.
to deter us from opening a neighbouring vein with lead as to do it
suppose if the Eye affected when we can't open the coat of the Ocular
Artery, here a question arises, whether we are to take a neighbour.g
Art.y or a corresponding vein? perhaps we do. Suppose a neighbour.g
Artery, for we do. lessen the force more, suppose by opening the Jugular
Artery, the blood do. not be determined with as great force into the
Ocular Artery: But now supposing the Patient won't submit
to have an Artery opened, we do. suppose opening the Jugular vein to
the right of the forum: and whenever we want to lessen Inflamm.n
tis all together clear & confirmed by practice: the drawing of
blood quickly is an advantage: we lessen the force & moving of
discard'd vessels: and give 'em time to act on themselves, &
whilst we weaken the Patient, he gains strength, but that is
momentary & we have this Consolation: we by making
a large orifice, which produces a faint & assistance we do little
more lessen the Disease.

Lecture 55.th

I shew you the foramen incisivum, which is not only open in the
Skeleton, but in the natural state of the body, tho' in many
subjects it seems to be entirely shut, I suspect the
conveys the Tears from the nasal into the mouth, for I find
that the Tears dripping from the Lachrymal duct, when the
head is inverted fall into this canal at the same time in my
veal I can't find the can make others fluids, as milk
or Ink pass into it. — I shew you an insect resembling
a Leech it was found in the nose, which exactly resembles
some others I shew you, it was preserv'd by steel: & this
Species of Insect is not described by Linnæus: Now after
shewing the structures, let us consider the use of the parts,
or the reason of the structures, & we shall begin with the nose
which is explain'd in the most simple manner the Taste. —
We have seen very large arteries & nerves went to the Tongue

We readily find a reason for this, we consider the Tongue as an organ of very consid.ble motion as exercising y.e nerves of Taste, & besides y.t from its surface there is a very consid.ble motion, for y.e last purpose, a great quantity of blood is likewise constantly found circulating in organs y.t perform a large variation motion, & still more in organs of sense: y.e reason of this at first sight, is not so certainly evid.t but I apprehend y.t we shall find reason to believe, y.t as y.e heart & brain act upon each other in a circle, so y.t we find ourselves at a loss to distinguish cause from effect: in like manner the Arteries and nerves in their progress, act upon each other, & I shall give reasons for believing it: in a manner I don't pretend fully to understand: y.e Arteries turn y.e nerves for receiving the impression, & conveying them distinctly: when we compare y.e Tongue w.th y.e nose, we see this in a clear point of view, in y.e membrane of y.e nose, there are such a vast number of pencils y.t circulate red blood, y.t we wd be apt to imagine y.t they prevent y.e distinct impression of y.e nerves, but on y.e contrary they contribute to increase y.e distinctness of it: & in making experim.ts w.th medicines, how far they act, by immediately influencing y.e nerves: I find y.t after y.e circulation is interrupted in y.e canal of the nerves: as y.e sciatic, tho' y.e Organ is quite entire, medicines cannot influence y.e system then tho' the single branch after y.e circulation has ceased tho' they produce y.e most violent Symptoms when applyd to y.e canal sending nerve when y.e circul.n is carried on: So that y.e Arteries actuate y.e nerves in their progress something more y.n merely giving them a certain degree of tension, and in like manner as we find y.e Arteries assist y.e nerves in their Office of sense and motion: we find y.e y.e nerves assist y.e Arteries performing their functions, so we may allege y.e y.e numerous nerves of the Tongue not only are extended for y.e motion of tone, but for regulating y.e secretions made from y.e extremities of y.e Arteries. — We know y.e general manner in w.ch y.e sense of Taste is exercised: we apply saline Substances w.ch are dissolv'd upon y.e surface of the Tongue, & so we don't perceive y.e Impression

pressd y^e^ tongue against y^e^ palate, but y^e^ n. palate is the principal Organ of Taste, for in rubbing y^e^ body against y^e^ palate we've no distinct impression: but the effect is to make y^e^ greater impression upon y^e^ tongue: wether y^e^ vas. papilla are rendered more sensible, I can't say. I've an id. perceive y^e^ swelling of y^e^ papilla of the tongue upon irritating 'em, but these have also y^e^ id.: & there is probably a filling of the vessels in order to give a greater sensibility to y^e^ part, & we observe y^t^ y^e^ nostrils are so situated y^t^ we may smell substances at y^e^ same time y^t^ we taste 'em, & they don't receive y^e^ current of y^e^ Atmosphere but y^e^ current of the ascending air from y^e^ substance y^t^ is apply'd to the mouth &c. & when the air enters y^e^ nose instead of running in y^e^ most direct manner into the throat, it rules above upwards to y^e^ Top of the nose: to the Os. or Spongiosa w^ch^ are the principal parts of the Organ of smelling, for upon examining a variety of animals, the acuteness of smell varies w^th^ y^e^ extent of the surface of the bones, & in a day they are extremely convoluted. From these we understand the reason of the name of turbinatum. — But we are to imagine y^t^ the Sinuses or large Cavern y^t^ communicate w^th^ the nose, contribute to increase y^e^ surface of y^e^ Organ of smell as are we to say y^t^ y^e^ membrane lining y^e^ sinuses supplies a moisture to y^e^ nose, to prevent it from being dry'd by the Current of Air, we don't see y^t^ the sinuses are necessary in order to supply a sufficient q^ty^ of moisture: for if in inspiring a q^t^ dear of moisture is carry'd away, but next moment when we inspire by y^e^ same passage, we not only return this' the nose, all we took from it, but the addition of y^e^ vapour bot. from the Lungs, & some of the Sinuses have opening's at the Top; if these were filled with moisture, when we are in an erect posture, upon bringing y^e^ head forwards, we wd. see it discharg'd & the Sinuses filled with water w^ch^ counteracts one of y^e^ main purposes of the Sinus. The effect y^e^ sinuses have upon y^e^ voice, & w^ch^ no better reason can be assign'd to extend y^e^ organ of smell, for Children smell as acutely as Adults: & yet in them the sinuses are only beginning to form: tis true, y^t^ in y^e^ measure

stends'on continually as they advance in Life This is
no doubt a dispersation in the bone to enlarge, but they are
incrus'd by wod, & this consideration also affords an argum.t
This being extended to supply the nose with moisture, for
Children have rather more moisture than adults, the y.e sinus's
are only beginning to form. Are we then now to say y.e y.e numb.r
being thin & the bones hard, such a Sound is produced as
renders y.e voice louder & more harmonious? I apprehend we
may we may venture to confirm y.e use of the sinuses to the last
purpose: & y.e y.e uses this purpose, appears from a variety of
considerations: y.e voice is found at a certain age when the
sinuses form, & we find y.e when the membrane of the nose is
thicken'd y.e voice becomes harsh, & disagreable, a comparing
y.e sinuses with a drum, we find a great Analogy between them.
Take y.e Antrum maxillare there is an impression made on
the side of it, & tis shut by membranes resembling the
parchment of a drum, y.e y.e opening in y.e Instrument &
applying of fingers to it in time of speaking would be sensible
y.e all the bones are at y.e Instant under a Tremor. We shall
delay making any remarks upon the diseases of y.e nose,
till we come to y.e Surgical part of y.e Cause, only y.e membra
ne from being expos'd to the Air is much subject to disease tho'
not so much as might, merely reasoning upon it, have been
imagin'd; we find ulcers form'd here: and there treating w.th
difficulty, from y.e thinness of y.e membranes covering the
bones, & generally producing a Caries of the bone, we find
in other instances, polypi, or fleshy excrescences growing
out from y.e membranes, and in the Antrum maxillare as
well as in y.e Cavity - Insects have sometimes been lodg'd
here: and you may consider y.e manner of treating polypi
as it is by Surgical means they are remov'd, or suppressing
an insect in these sinuses: y.e proper manner of giving
a discharge to it, or destroying it: only in ord.r to determine
y.e exact nature of diseases in the nose by the sight it is
necessary y.t the Light of the membranes, we cannot

examine it with the Light of a Candle, but turning it's patients head towards the Sun, you can see to the most distant parts of it.

Lecture 56th

You all know Gentlemen y.t y.e skin of e.d external Ear is supported by Cartilage: & besides y.e muscles connected w.th the head, y.e superior attolens auriculæ & there are a few very short & pale colord fibres w.ch are muscular & begin and end in the external ear: from it there is a passage inwards y.e outer half of w.ch is compos'd of y.e same materials as e.d external Ear: but the inner half in an adult is osseous: In a child the whole passage is soft & Cartilaginous: At the bottom of the external passage w.ch is lin'd by a fine membrane, we find wax or a bitter Substance like Bile inspissated: w.ch is separated from minute glands: This membrane is transparent & looks like a bit of y.e pleura or peritoneum when wetted w.th water Now this membrane has no hole in it: we find a large irregular shaped Cavity, w.ch Cavity is compard to y.e Cavity of a Drum, & therefore the membrane w.ch is found covering it is compar'd to the parchment of a Drum, & is nam'd membrana Tympani; Therefore upon inspecting we find no passage for Air in y.e Cavity of an Tympanum, but we find a direct passage into it, leading from the Throat, nam'd the Eustachian Tube & lies of y.e shape of a Trumpet w.th y.e small end towards the Ear, a connexion is made between y.e and the membrane of the Drum, by a curious chain of bones viz.t No. The Cochlia a curious Organ is turn'd round a Gland and has it's name from its resemblance to a shell of a snail: The chain of bones w.ch lay upon one another is not merely form'd by membrane but muscles are likewise connected

to'em: I never could find y^e^ external muscle w^ch^ has been mentiond as at y^e^ bottom of the meatus: but there are three things: one of 'em is deny'd by Valter: but it follows y^e^ course of the Eustachian Tube, & is connected by y^e^ malleus, w^ch^ I'll draw out a little: it lies parallel w^th^ a nerve, y^e^ branch of y^e^ 5^th^ pair, & passes thro' y^e^ Cavity of y^e^ Tympanum like a stretched Cord, and so call'd Corda Tympani. ——

Lecture 67^th^

Let us now consider y^e^ use of y^e^ several parts & their manner of opening, & first we shall consider y^e^ danger is guarded against, painted Instruments are hinder'd, from entering y^e^ external Cavities, to the membrane, partly by y^e^ protuberance w^ch^ y^e^ prominences call'd tragus, given to the passage, and partly by y^e^ inequality of y^e^ passage, but we can by pulling backwards the Cartilaginous part be able to see the bottom of y^e^ passage, & w^th^ y^e^ light of the Sun be able to distinguish y^e^ membrane of y^e^ drum: Insects are hinder'd from readily entering from y^e^ membrane of brains, by y^e^ sides of it, & y^e^ very viscid wax, w^ch^ is y^e^ principal purpose of y^e^ Glamen. — In like manner the internal passage to y^e^ Eustachian Tube is guarded, their is little fear of any food or drink being squeez'd into it by deglutition for y^e^ mouth is placed higher y^n^ y^e^ Vel. pendicul. palati and 'tis accurately shut by y^e^ elevator palati, & by y^e^ superior constrictor of the pharynx: next with regard to the particular parts of the Organ, beginning with the external: the Cartilage under the Skin serves to enlarge the Tube in w^ch^ y^e^ Tremor of the air is made: we find other Contrivances equally good & we observe a great variety w^th^ respect to shape in diff^t^ Animals, some of w^ch^ bear or are acutely y^n^ we do: but by attending to y^e^ shape & winding of y^e^ passage, we also y^t^ y^e^ sound reverberates as it throws into the meatus: and a N^o^ of animals assist their hearing by pointing the ear towards y^e^ sonorous body: whereas we are under y^e^ necessity of moving the whole head: & the direct Impression is made upon one ear only, & there is

no communication between the Ears as in a Bird which receives y^e direct impression upon both Ears at y^e same instant a Canal leading from the one to the other. The small muscles upon the Cartilages were also to give a greater tension, & to throw of the sound with an additional force, & within y^e meatus y^e sound is collected & encreached, & the winding passage, instead of lessening, increases it, just as a sound appears louder in a Concerted passage made by walls &c. if y^e passage is altogether straight: perhaps y^e sound is thrown by y^e sides of y^e passage to y^e middle of y^e Ear cavity, to the very place where the Bones are connected to y^e membrane; & the whole y^e chain of y^e sound is communicated to y^e membrane of y^e oval hole invisible. when at first sight we admired the shape of this Cavity, & the communication it has with the Cells of y^e mastoid process; we both conjectured y^e y^e purpose of collecting the sound was counteracted, by its being diffused in a Cavity of so great extent. But y^e sides of it are made of hard bone fitted for Tension, & y^e outlet is small, & we found a striking analogy between the Ear and y^e common Instrument y^e membrane resembling y^e parchment of a Drum, y^e Cavity within y^e Eustachian Tube, the Cavity and tube in y^e side, or reverberating y^e vibration what was said of them communicating with the nose, y^e thing in which y^e voice & sound is more melodious, & Dr. Sprey tells me of a Race he met with, where a wound in y^e Antrum maxillare produced a very considerable alteration in the voice another manner of communication has been suspected y^e y^e Sound has been communicated to y^e parts within, by y^e means of the Vicinity thro' the Eustachian Tube, owing y^e same gen^l Sympathy with the external, & we are apt to admit such a supposition: may be form further Theories: As y^e from the communic^n of pulsation agitates his voice better: his own voice making a direct impression upon his own Ear: Valsalva has an observ^n of y^e in a certain case when y^e mouth of the Eustachian Tube was obstructed, & he introduced a small tent to prevent y^e concussion of the Sides, y^e patient lost his hearing y^e: but I can't help

calling y.d shows w.t into Question, & denying any kind of truth in y.e supposition: For if you make y.e simple experim.t shut y.e external Ear, open the mouth, let y.e breath enter thro' the nose, & place a Bell before you y.t sounds loud, you are scarcely sensible of the sound, & if I put my watch in my mouth I am scarcely able to distinguish y.e sound of it: y.e Impression therefore is so inconsiderable y.t in speaking of y.t we need not regard it may be altogether overlook'd, & Valsalva is wholly mistaken, for the ear was on one side only, & why sh.d the patient have lost his hearing soon y.e stopping of one of y.r Eustachian Tubes: there are but two chief ways in w.ch we receive the Impression of sound, one thro' y.e chain of bones, the other thro' y.e membrane of y.e Tympanum, & the Air in y.e Cavity: There is another way w.ch has no general effect, y.t is Tremor of y.e bones of the head, & of the whole body: So in some persons in whom the external ear is corroded, & y.e whole chain of Bones perhaps destroy'd: distinguish sounds very loud in this way: viz. applying any tremulous substance to the Jaw Bones: as Talking of y.e prime of a Jack, you hear as it were a very loud sound: the common acc.n in y.e y.t y.d never are communicated here, viz. y.e Tremor is soon from one bone to another: but you'll also. y.t y.e sound is much more distinct, when the Tremor is communicated to the teeth of y.e upper Jaw, tho' 'tis the nerves of y.e under y.t are chiefly connected a branch of y.e 5.th pair being connected to the 7.th & that shows w.t may be applyd to practice w.th considerable relief: Thus if you want to convince a person dull of hearing, you take a piece of very hard wood y.t can have a Tremor easily communicated to it You apply one end to his forefront of the upper Jaw, & you take y.e other end into your mouth & speak: and he will apprehend what you are saying, tho' he is not able to hear a single Letter if the Bit of wood be removed so it is not communicated thro' y.e bones w.ch impress y.e nerves of the Ear as they receive y.e impression from y.e Tremor ably

in the other two ways: By receiving an impression in diff.t ways — perhaps we judge better of a sound if the Tumor is conveyd in one way only. — As I have denyd y.t y.e Eustachian Tube conveys y.e Tumor of y.e Air, we must confine its use to one purpose chiefly to supply to the cavity of y.e Tympanum, y.e elastic Air: Hopefully warmd before it reaches y.e very tender parts, of y.e internal ear: — Another purpose of it is perhaps to convey moisture avoided collected by the secretion within y.e cavity of y.e Tympanum, &c. may be necessary here, when the Air is admitted, for as y.e vesicles floating in y.e atmosphere are conveyd into it, so they again have a passage outlet, y.e only thing remaining is to determine y.e way in w.ch y.e impression is conveyd from y.e membrane of y.e ovalhole Tympani over to y.e portio mollis of y.e auditory nerve: for after bringing y.e nerve to receive y.e Tumor, we can give no further account why we judge the accurately of sound any more y.n we can explain y.e effect of y.e objects of sight have upon y.e retina: & y.e question y.t occurs here, is this, whether are we to say y.t y.e Tumor is communicated thro' y.e air filling y.e Cavities of y.e vestibule, semicircular Canals &c. or are these replete with water? Upon the whole, I am inclined to believe y.t y.e Tumor is communicated to water & thro' y.e water to the nerves. — &c. &c. I proceed to examine the nerves of the Spinal marrow, y.e structure of w.ch has been sufficiently explained. — We have seen y.t y.e spinal marrow is chiefly to be considerd as y.e production & lengthening out of the medullary substance of y.e Brain & Cerebellum, but upon cutting it transversely, a small proportion of Cortical & Cineritious substance may be observd ascending y.e y.e brain. — Next we have seen out of what y.e whole length of y.e Spinal marrow nerves in pairs and these are covered when they are about to go thro' the holes of y.e vertebræ by the Dura mater, & at y.t place there they is an enlargement: a Ganglion, a knot bigger than the thread of y.t form it, and we shall find y.t y.e nerves spread into anterior & posterior branches the anterior are the largest, and all of them communicate to the nerves above and below.

Lecture 58.th

We proceed to pursue the Subclavian branches from the Aorta with the accompanying veins —

Lecture 59.th

Lord Nugent. —

Lecture 60.th

We shall now consider y.r applic.n of what we have seen to practice & follow.d y.r order of y.r demonstration; we first trace y.e blood-vessels from y.r origin: You have seen 3 branches sent off from y.r arch of y.e Aorta, y.e first branch supplying y.e right Arm, & right side of y.e head, y.e second y.e left side of y.e head: y.e 3.d y.e left arm, & all y.e vessels situated y.e principal branch is more directly appro'd to y.e mouth of y.e ventricle of y.e heart coming off from the Aorta when it is about to make y.e turn: there are y.e force of y.e blood is broke by y.e turn before y.e other branches come off: — you all know y.t mankind in general prefer y.e right arm; now are we to find a connexion between so fact? are we to consider y.m as cause or Effect? This Circumstance is a very curious one, was it so far I know I suggested by my father? Why y.r men I've considered y.e fact, the men I am perswaded it is founded: for I've repeatedly compar'd y.e nerves of both arms, they are of y.e same size, & actly situated in y.e same manner: the only final cause of y.e preference is perfectly evident: y.t by exercising one arm more frequently we acquire much more dexterity: but we must find an effectual cause: we must endeavour to find somewhat y.t shd determine man to use y.e one and not y.e other, or y.e one original in preference to y.e other, for y.e y.s we proceed not much.

From reason, Children give the same preference: Motion does not precisely depend on the blood-vessels, but it does in a secondary degree, I've had occasion to obs y.e y.e nerves

of wt this Energy may successfully lay y^e^ quantity of Blood disposed along them: & we have seen in any man exposed in the Organ of Smell y^t^ we can well find another, now y^e^ trunk receiving y^e^ blood wth greater force, & in greater quantity, & taking its rise in a common Trunk, y^t^ existence is much less, without at all alledging y^t^ y^e^ right subclavian is occasionally enlarged larger y^n^ y^e^ left: the Trunk Blood runs thro y^e^ common trunk wth greater ease y^n^ thro y^e^ 1^st^ 2^nd^ and 3^d^ branches: there is less existence made by y^e^ sides of y^e^ vessels: & to compare y^e^ wth the Case of other animals, y^t^ notwithstanding y^e^ necessity they are under in walking to use y^e^ 2^d^ anterior extremities in exactly y^e^ same manner, yet in them there is a presence & 'tis a very difficult matter to force a Horse to walk with his left shoulder foremost, he naturally prefers y^e^ right fore extremity; & to carry it a step further: in examining Birds when a presence we have been hurtful & we have had recourse to y^e^ ground just as y^e^ cutting y^e^ smallest Bit of y^e^ wing: so that great care to suppose y^t^ y^e^ distribution of y^e^ Aorta, as allowing the blood to enter more freely to y^e^ right arm, & perhaps to return more readily from y^e^ arm, gives y^e^ presence, & y^t^ to stronger & therefore originally preferd, when we follow the Artery of the Arm wch at last ends in y^e^ arm: we find small branches sent off to the Thorax, upper part of y^e^ shoulder and lower of y^e^ neck, after wch y^e^ artery before under y^e^ Clavicle, & is properly named Subclavian, passing between y^e^ Clavicle & first Rib, & we can at y^t^ place readily distinguish y^e^ pulsation, we have thot of making an experiment y^t^ may be useful in a variety of cases to stop y^e^ blood in y^e^ subclavian Artery by a very slight pressure; I tried it on myself as well as on others & I put my thumb upon it, above y^e^ middle of y^e^ Clavicle & press downwards on y^e^ first rib y^e^ pulse ceases immediately Now suppose an accidental wound in any of y^e^ large branches coming off near y^e^ Axilla as in y^e^ internal Thoracic Arteries & the

Surgeon is not provided with Instruments to take up the Bleeding vessels, or an impossibility of applying y^e Tourniquet in y^e ordinary way, or if we are taking up y^e superior extremity at y^e joining of y^e humerus w^th y^e scapula &c. by making a compression here we prevent y^e great loss of Blood, and all we find necessary in y^e prosecution of y^e Thumb. — Following y^e artery a little further we find it got into y^e Axilla & there is protected by y^e pectoral muscle & latissimus Dorsi stretched across from y^e Trunk to y^e body of y^e humerus, when y^e artery receives considerable protection & y^e vein is much less wasted in pursuing y^e operation. Lower we find y^e Axillary glands connected to the artery by cellular Substance & when these are enlarged in a diseased state y^e must be viewed w^th y^e utmost caution in attempting to seperate them from y^e artery & y^e Surgeon is under a necessity of tearing them away w^th y^e fingers, instead of using a Knife, lower again y^e artery runs parallel with y^e os humeri where is now named humeral artery. — & after it has run about 3 Inches under y^e binding of the Elbow it divides it into y^e ulnar & radial branches. I have made various experiments with regard to these Arteries, I have tied the Trunk of y^e humeral artery in 2 places & cut between them Suppose about y^e middle: I then fix'd an injecting pipe higher up y^e place cut: & squirting in water, Air, & milk I filled all the inferior Branches, which is done even to the Elbow, may be practised any where in y^e other part of the humerus w^th nearly the same Success only a greater portion of y^e member need to be examined & care observed y^t I secure it in y^e most delicate manner It occurred to my Brother when an Aneurismal Sack had occasioned a constriction of the Tube of y^e Artery of y^e humerus near to the Axilla, y^t effect is the same as y^t of y^e Ligature: So if y^e Ligature had been made in y^e Patients life: he might have been saved: I don't mean to say y^t y^e Surgeon ought to have performed y^e operation, perhaps y^e dilatation might have been very slight, but it might have been tied above the

wounded place, wen from this Case it does not follow yt
any one might have been cured wth absolute certainty, tho'
the humoral Artery is tied to the height, yn. circulation must
have been gradual according to yt. Interception of yt. Aneurism-
mal Tumor, so the Lateral branches wd. dilate by degrees
but in Case of a wound yt. branches might not be sufficient
to convey yt. necessary quantity of blood, but instead of imm-
ediately proceeding to Amputation we'd. attempt to save
the Arm — Next this serves to shew yt. Incarnated Whit
an man frequently observ'd yt. Anatomists are aware of. Haller
obs. that they have not been so frequently shown as they are
described now instead of yt. I happen to have 7. or 8. instances
of yt. kind and unusual one which have been left a neglected to
be kept: A Surgeon ought to look for it, as in performing the
Operation of the Aneurism, we usually yt. the Two branches
may closely accompany each other, & so both may be taken
up, but if the Surgeon is aware of this the 2. branches may be
seperated with the greatest Care & yn. cause of the Operation yt
be found, tho' the supply is the same as when one of the
Arteries happens to be wounded: In some Cases they are after-
wards united by a large Canal: but we are to take it for
granted yt. the supply is made thro' yt. small and tortuous
ones each in yt. ball of yt. hand, & yn. necessity of large Anastomos.
is wt. in the Ball of yt. hand yt. part being more exposed to
compression: & yn. stagnation of the Blood in the vessels: —
One further Aneurismal ought to be observed yt. sometimes
happens when the Common division is made yn. arteries instd.
of remaining contiguous to each other, seperate & one of them
is subcutaneous: thus for there may be a danger of opening
an Artery instead of a vein, particularly we ought to be

, when we are ab.t to open the branch in the cruse of the Basilic Vein. —— All the considerable Arteries are accompanied by corresponding veins: There are more numerous than the Arteries: taken together are larger: but taken singly are smaller: for I don't find any vein as large as y.e humoral Artery; for ordinary there are accompanying it 2. or more veins & these frequently joined together & y.e whole crowded w.th valves Next beside the accompanying veins, you have seen a set of subcutaneous veins, w.ch are upon the whole larger y.n y.e deep veins & these likewise crowded w.th valves: notwithstand.g y.e They run upon the muscles: & we see numerous anastomosis between y.e deep & subcutaneous Vessels: All y.e Circumstances clearly confirming wt w.th reg.d to the use of y.e valves y.t they were to determine y.e blood to the heart: y.t Tho' y.e moderate Action of the Arteries & Muscles promotes y.e flow of y.e blood; in y.e veins; yet if y.t Action is greater, we stop the flow almost entirely, when we act with the muscles, y.e subcutaneous muscles veins immediately swell, & the blood being no longer able to get along y.e internal veins w.th freedom, hence in V. S. Surgeons direct y.e patient to move y.e fingers & if the make slow motions, we see y.e blood sometimes flowing into the Subcutaneous Veins; & I have known Surgeons alarmed imagin y.t they had opened an Artery: So the use of y.e is perfectly evid.t We let blood from y.e subcutaneous vein's not only from their Situation but size; Near y.e Elbow became y.e Skin is thinner There is at the outside y.e Cephalic Vein, upon y.e inside y.e branch forming y.e Basilic Vein: & between these the median Cephalic & median Basilic: Now if we regard the situation of the Arteries, alone w.th reg.d to y.e veins, & y.e Tendons, & suppose y.e + y.e Tendons are very sensible we c.d let Blood in y.e Cephalic a median Cephalic veins more readily: But if it shall appear y.t the Tendons have very little Sensibility

2/3.

That y^e^ danger of wounds; independ^t^ of y^e^ Artery depends
n arises from punctures of y^e^ Subcutaneous nerves, w^ch^ perform
y^e^ bleeding most frequently in y^e^ median Basilic, & any y^e^ vein is
of consid^le^ length tho' it crosses y^e^ Artery, you will always find
room for opening y^e^ vein with^t^ making y^e^ Orifice immediately
ove y^e^ Artery, it does not run so much longitudinally betwe
may keep at ½ of an Inch distant. — If y^e^ V.S. is done with a
Blunt Lancet from the fear necessarily had, we are in danger
of wounding the Artery: & let us now consider in what manner
it may be wounded, & the general effects of it, y^e^ wound is made
sometimes by the Surgeons missing y^e^ vein and cutting
the Aponeurosis from y^e^ biceps and the Artery: but for the
most part the wound to the Artery thro' the vein, he first goes
thro' y^e^ sides of y^e^ vein w^ch^ are thin and transparent, then thro'
the Aponeurosis of the Biceps & next thro' the Coat of the
Artery: we need not say whether all or part of y^e^ Coats are
wounded: but suppose it penetrates into the Cavity of
the Artery & that the wound is free, y^e^ blood is discharg^d
Inevallum, If we suspect this, we make a pressure on the
Vein with the Thumb, & at the same time make a mod=
=rate pressure above the Orifice, because a vein sometimes
bleeds downwards between its valves; we therefore apply
the point of the fore finger above the Orifice, & if the opening
is only into the vein we stop the effusion of the blood, but
if it is from the Artery, it bleeds more violently, because
the return of the blood in the vein being hinder^d^, 'tis thrown
with more force thro' the wounds. — But supposing
the wound in the Skin not opposite y^e^ Blood will run
under the Skin & be diffus^d^ in the Cellular Substance & it
may extend y^e^ whole length of the Arm, but for the most
part it happens y^t^ the Artery receives but a slight hurt w^ch^

the very point of the Lancat, & the blood is confind partly
by the Cellular Substance, but in a great number of Cases
by the Aponeurosis of the Biceps w.ch is wounded, as in y.
Quantity is discharg'd, this soon coagulates, & the blood is
confind, & we find a circumscribd Aneurism articall'd,
but tis a dilatation meerly of the Cellular substance with-
-out bursting till the Tumor resemble the true Aneurism, gains
somewhat of the same circumscribd shape, & the Contents
receive the Impulse from the blood, There is another way
title of which I've had two or three Instances, You'll
an Instance in the Essays published at London and one
occurd in our Infirmary, when the blood gets from the
Artery into the wounded vein: the Basilic vein was first
struck thro', then the Artery which occasiond an unison
-ual varix, the vein being dilated to consid.nable length,
and putting on the appearance which veins generally do
in a various state, In one Case of this kind there is
mention made of a branch joining the Artery and vein
at a distance, & the blood is suspected to run between
them in the Cellular Substance: But if ever the
Blood gets into the Cellular Substance: so as to run at
a distance, it will not readily enter the vein, but when
the vein near that attends the humoral Artery is
wounded along with the Artery, the blood gets into the
Vein, comes from thence into the Basilic, dilating all
the neighbouring veins from the Communication —
So I make no doubt but y.r very Gentleman in the least
acquainted with Anatomical Knowledge will always
be extremely wary in y.r common application of the Lancet in
Venesection. ——

Lecture 61. —

At our last meeting Gentlemen we considered fully y^e^ distribution of y^e^ blood-vessels, let us now turn our attention to y^e^ nerves. —
You recollect y^e^ Brachial & in gen^l^ y^e^ spinal nerves w^ch^ take y^r^ rise from y^e^ spinal marrow, y^t^ the begin by two distinct bundles of fibres an anterior and a posterior bundle. These come to be join^d^ together & are cover^d^ by the dura mater; but further where they meet there is a knot, an enlargem^t^ or as it is call ganglion, y^e^ nature of w^ch^ not entirely understood, & at present I avoid offering any conjectures concerning. From y^e^ Ganglion you have seen y^e^ branches sent off, & y^t^ all the Anterior branches are connected by arches w^ch^ represent y^e^ Arteries of blood-vessels but are just shape very essentially diff^t^ from them, are bundles of nerves ty^d^ together in one sheath. — Besides y^e^ communication w^ch^ y^e^ Cervical & spinal nerves have by their Anterior branches y^e^ next produces a nerve call^d^ accessory w^ch^ runs upwards into the head, comes out w^th^ y^e^ 8^th^ pair is again connected w^th^ y^e^ other Cervical Nerves, & lastly all y^e^ Cervical nerves are join^d^ to y^e^ great Sympathetic & intercostal. The gen^l^ purpose is to prevent y^e^ nervous Energy from being interrupted, From y^e^ Axillary plexus 4 Nerves of Branches are sent off w^ch^ are distinct & constant in their distribution: the large & deep nerves accompany y^e^ arteries so exactly y^t^ in demonstrating the Nerves, changing y^e^ word Artery for nerve and we find that the superficial & subcutaneous in a great measure accompany y^e^ veins one evident reason is y^e^ nature endeavours to guard ag^t^ accidents by lodging both in the safest places, but in every part of y^e^ body, where they will be equally protected in every part of the Organ, they run close to the Integuments, so y^t^ y^e^ one turns to receive nourishment & its energy from the other. The use of knowing their particular situation is evident as in treating various cases of Convulsion & Paralysis & in performing surgical Operations, y^t^ we may avoid them because they are never wounded or punctured without evident danger, & in proof of y^e^ we need only attend to the bad consequences from wounds of the small branches, & particularly the following

Incurvation proceed about the Elbow, you have all manner of instances, where patients from y.e operation have recd immediate pain, y.e part swell'd, y.e swelling spread sometimes to a great extent; y.e skin & parts under it become hard, discolord, y.e pulse become quick, y.e patient delirious, wanted rest, spoke inarticulately, & in sev.l instances y.e part after an appearance of Erysipelas, mortified, & in some cases the direst fatal effects, you viz. B. of y.e kind w.ch I have met with before you. — The gen.l history of y.e first is this a Gentleman aged 56. felt from a Horse but was not sensible of having received any injury, & found y.e use of both his limbs, and arms, However he was immediately to let a little blood, & so far from being sick w.th he did y.e ordinary business of the family & 4. or 5. days after rode out to a review; But he felt an uneasiness & stiffness about the Arm. — In y.e 2.nd Case, y.e patient let blood on acc.t of a bad cold & found himself easier sev.l days after till abt. the 5.th or 6.th Day. — In the 3. Case y.e danger was more certainly owing to the bleeding y.e in the two former: I shall first read the acc.t given by Dr. Robertson, & then subjoin an Extract from y.e Clerk of the Infirmary — The Man I mentioned was discharged about a year and a half he was let blood wantonly on acc.t of a few pimples on his face his Arm was swelled considerably, & remained this situation pretty constantly affected, y.e abt. 3 years before he was let in the same Arm, it became painful swell'd, & was attended w.th a dangerous fever so evidently the bad consequences proceeded from the Bleeding, & not of any disease in consq. of which y.e blood was drawn. The common & universal opinion of Surgeons is y.t all y.e bad symptoms proceed from wounding y.e Tendon of y.e Biceps, or of its tendinous Aponeurosis. Now instead of y.e we shall perhaps find y.t they proceed from y.e wound of the Subcutaneous nerves placed between the Skin & the Aponeurosis. Now it is of consequence to determine this point because if it be proceed from y.e wound of y.e Aponeurosis, y.e Surgeon may almost avoid wounding the Aponeurosis by using a blunt

pointed Lancet, but striking that to any considerable depth
Again if the bad Symptoms depend upon y^e wound of y^e subcutaneous
nerves, it may be impossible for the Surg^n absolutely to avoid bad
consequences, because the Situations vary in diff^t persons, & they are not
to be distinguished by the touch but they will happen less frequently
by the Surg^n avoiding y^e places where the largest nerves run; and
instead therefore in order to avoid y^e Tendons of the Biceps, letting
Blood in the Cephalic Vein, he will take upon y^e above y^e most danger
ous method let blood in one of these nearer y^e middle parts in y^e median
Basilic avoiding y^e places of the Tendons. D^r Haller & many other accurate
Anatomists Surg^ns whom he quotes have already wounded the
Tendons & Arteries of living Animals, not only without any bad conseq^ces
but the wounds & punctures made in them readily heald up again
And in consulting y^e writings of many Surgeons where they treat in
general of y^e manner of managing Tendons y^t are cut and wounded, &c.
they rate to be reund together, now y^is generally unnecessary, but nothing
more clearly shews the Inconsistency of Surgeons; this is a proof y^t
they have been tyed & reun'd together without any bad consequences
& I have had repeated occasion to see wounds made in various
Tendons of y^e body, and cannot but made without any bad Symptoms
being produced, I have touched them with a probe tho' in an inflamed
State, because the Skin afterwards heald over them, I have cut, scratched
& made large incisions into them, in the Case of matter being collected,
without y^e patients complaining. The same is done in every case of Aneurism
may no Aneurism happens without a puncture of y^e Aponeurosis of
the Biceps, & we make the Cure by enlarging the Incision.
On the other hand we have examples where similar Symptoms happen
at a distance from Tendons, & where Tendons have not been at all
injured, but where nerves nearly of the same size run under the Skin
I know examples of this sort in almost every part of y^e body, as
at the side of the finger where a slight puncture has produced y^e
same dangerous effects. I must mention a Case of y^e kind some years ago, a
Gentleman in Town punctured y^e side of his thumb by an extremely

small Splinter of a broken Wine glass, y^e^ wound was not larger than to admit of y^e^ point of a common small probe. The whole Arm swelled to the Shoulder, & Side as well as the Arm was vastly big again^st^ suppuration form'd upon high as the Elbow, & y^e^ Case & cause'd an Incision to be made thro' the Aponeurosis into the Interstices of the Muscles. — In a publication by D^r^ Haleim I find mortifications ensueing bleeding in the Ancle or near it, & in y^e^ wake an Amputation I find two Examples of it, in one Case y^e^ whole of the foot swelled, two of the Toes mortify'd And in another y^e^ whole foot mortify'd & dropt off, & in bleeding in the Jugular Vein trouble some consequences may in like manner follow, I met w^th^ a Case where a person had wounded y^e^ back of his Leg by a spike on the Board behind a Chaise, it had been only a little thro' the Skin, & when there was no tendinous Aponeurosis or round Tendon, by the time I saw him he had a Lock'd Jaw, & contractions of y^e^ muscles in various parts of the Body, & tho' the Symptoms were far advanc'd I proposed y^e^ an Incision sho^d^ be made thro' the Skin as deep as y^e^ Belly of the Muscles; but that was not agreed to & he died next Morning: I mentioned my notion of the Case y^t^ a nerve had been punctur'd, & upon examining y^e^ part found y^e^ Nerve swelled and discolour'd at the very place y^t^ y^e^ spike had entred. Let us now more particularly consider the Cases before us, & to these I can now add a great No^r^ of others. — I have seen 7 or 8 of these Cases w^th^ in so many years when the patients were in the utmost danger of losing their Lives and in 2/3 of em y^e^ bleeding was perform'd in y^e^ Cephalic Vein, at least 1½ Inch distant from the Tendon of the Biceps: In every one of y^e^ Cases y^e^ blood ran freely from the Vein in y^e^ 3 Cases before us y^e^ vein was not wounded on the back part and y^e^ Tendon of the Biceps was no way thickned or swell'd, but the swelling was confined to y^e^ Cellular Substance & Nerve. — In 2 Cases of y^e^ kind occuring in the Infirmary, I found the Tendon of the Biceps playing behind the Tumor on bending y^e^ Arm the Surg^ns^ were all convinced of y^e^ D^r^ Chambers who imagin'd y^t^ y^e^ danger arose from y^e^ agitation of the Biceps Tendon in such Cases, gave me leave to mention his Change of Opinion, & allowd y^t^ y^e^ Tendon of the Biceps was in no ways affected. — In all these 3 Cases I dissected

the subcutaneous nerves wch were swelled in the manner you see
ye veins were very considerably thickened; but the deeper parts were not
affected. In all of these Cases ye patient died without any mortification
coming on the part, they grew restless, ye pulse scarcely exceeded the No
90. in a minute they became delirious at times, but when rouzed
spoke distinctly & answered any question; they complained of pain
abt ye part, & of an odd sensation running up the Arm: I have myself
some kind of Idea of ye sensation from being bled in the Arm, some
years ago, & found for 2 or 3 weeks a very odd numbness & pain
mixed together. But in some other Cases ye part mortified, in one case
I was made acquainted of ye mortification was equal at ye ye Surgeon
did not choose to make the dissection. In sev. of the Cases ye patient
complained of pain in the very time of the Operation, & was convinced
ye ye Lancet had broke ye point remained in the Arm, but this is
by no means constantly ye Case. For in the Cases ye patient had a little
more pain yn is common but not to a very great degree, nay in every one
of the Cases before us there was not a principal trunk passing over
passing over the Orifice, only a small branch entered about ye vein, &
it was next to impossible to have it very exactly into the Orifice
because it came to be compounded wth ye subcutaneous cellul. substance
by ye hardness and inflammn. So it is beyond all doubt certain ye a
wound of ye Subcutaneous nerve can produce these Symptoms. —
There is no one Case shewing yt it proceeds from the London we
scarcely can imagine a Case yt occurs yt will prove it, It is not
enough yt it happens by opening ye median Basilic Vein over the
London: for if we find the same Symptoms from wounds made at a
distance, is it not probable yt ye others may proceed from ye same
Cause, or what proof can we give yt we have not wounded a subcut-
aneous nerve in ye passage into the London, & in two cases, where
ye dangerous Symptoms arose from a wound of ye median Basilic
there was no puncture made in the Aponeurosis. — Now after
determining ye place affected let us see what application
in practice it admits of.

1st We ought to avoid the large Subclavian cutaneous Nerves
not to draw the blood from y^e^ median Basilic w^ch^ is only accompany^d^ by
small branches of nerves, and in these Cases when y^e^ wounding the
small nerves was attended w^th^ large swelling & suppuration if y^e^ punctures
had been in the Cephalic Vein, and larger nerves affected like these
smaller probably the consequences wo^d^ have been more material.
When we recommend y^e^ median Basilic another difficulty presents it-
self from the Artery, but we can always find a place in that Vein
sufficiently distant, it is 4 Inch in length, so we can always find
a place where the Artery may be divided avoided. Next suppose y^e^ a
patient is struck w^th^ a very sharp pain in letting blood, we must allow
y^e^ arm to bleed w^th^ freedom to prevent Inflammation next we keep it
properly bent & supported, for the motion contributes much to the bad
Symptom. Next we watch y^e^ appearances, if y^e^ pain continues & the
part begins to swell, we wo^d^ enlarge the Incision & cut y^e^ cutaneous
nerve across, y^t^ y^e^ tension being taken off y^e^ Inflam^n^ may in a great measure
be prevented & gram amputation we see y^t^ y^e^ division of a large nerve is
less material y^n^ y^e^ puncture of a small one. Or suppose y^e^ pain not
acute but y^t^ if swelling comes on afterwards & more especially if there
is an appearance of a delirium, unless the patient is in a fever, where
y^e^ delirium is a natural consequ. of the disease: Two postponed y^e^ Incision
shd. be made in the nerve a little higher y^n^ y^e^ part inflam^d^; If y^t^ is lately
being done we are not to imagine y^t^ y^e^ bad symptoms can be taken off
by the Incision, but they will not be increased I have made y^e^ experiment
twice & in both cases the patient cured, while in other Cases where it
was not done even when the swelling was less considerable, y^e^ Patients
dyed, so probably y^e^ symptoms are alleviated by this means. But
when the parts are thickened & the neighbouring branches become to
be united & to sympathize, besides y^e^ inexplicable Sympathy y^t^ all
the parts of the nervous System have with one another we are by
no means to suppose y^t^ the swelling & danger may be altogether
removed. With regard to applic^ns^ no doubt but poultices & bolts are
especially proper, but it may be questioned whether digestive Spirit of
Turpentine & such very irritating substances, or Emollients are the best
I think y^e^ Emollients are most proper, but in the Tooth ach, instead of

vaum water, we relieve y.e pain by touching y.e nerve with an Ardent Spirit, perhaps the best way is to make the tryal immediately to the wound, but over the rest of the Skin to lay on an Emollient poultice or a discussing one, as of Saccharum Saturni: besides letting blood and exhibiting meat & Opium, w.ch may have their use, & from the Success w.ch y.e Tetanus is treated w.th Mercury if a coñs.t quantity be thrown in it may be of use, but Meat & Opium are the first of Internal remedies y.t we wo. have recourse to. ——

Lecture 62.nd

We proceed to consider y.e distribution of y.e nerves & Vessels on the containing part of the Thorax. —— And to make a few remarks upon these Vessels, you have seen them coming in diff.t directions in the containing parts, the Epigastric communicates freely with y.e Mammary &c. —— The Omission is intended to guard against Hæmorrhagies, but more material consequences have been supposed to attend y.e Communication, & parts &c. of y.e Epigastric with the Internal Mammary Dr. Boerhaave & Dr. Wyatt suppose y.t y.e Loss of Milk after delivery depends upon y.e communicat.n They tell us y.t im.y after delivery there is a great discharge from y.e uterus & in consequence of y.e mouths of its Vessels being so freely opened the Juice is deposited into all the other Vessels, so it is wo.t days before the Child at the Breast: But as soon as y.e contraction of the Uterus & the blood coagulating in the mouths of the Vessels, a small quant.y is circulated thro' the body of the Uterus, there is an increase of the momentum of the blood in the Epigastric Artery so a greater Quantity is sent thro' the Epigastric Artery to the Mammary w.ch occasions the flow of Milk: Now I apprehend y.t y.e is absolutely inconsist.t w.th Anatomical facts, & y.t we can't reconcile y.e Theory w.t y.e known & gen.l Laws of y.e Circulation of y.e blood. For if y.e flow of milk depended upon y.e Sphinct.r power of the Epigastric Art.y & y.t y.e force of the Heart was increased in this instead of finding y.t it only communicates w.th male branches w.th y.e Internal mammary Artery we shd. have found it to terminate immediately upon the

mamma; But the male branches are only joind and it
is a mistake that a single drop of the Epigastric Blood ever reaches the
mammary it is inconsistent with the Laws of the Circulation to suppose
it, are we to imagine that the blood runs from the smaller branches
of the Artery into the trunk. This never happens, unless when the
mammary Art. is taken up with a Ligature & this is one use
of the joining, that in case of an obstruction in the mammary Artery
there may be a supply. But in the ordinary course of the Circulation
it is absurd to suppose that any blood enters the breast by this way
the only effect is, admitting the last passes thro' the Uterus & the
men enters the Epigastric Art. & the blood will not passe downe
wards by the male branches of the mammary Art. as before.
But it is to be doubted if the Communication can have such an effect
for before delivery the uterus pressing strongly upon the descend.
Aorta, & upon the containing parts of the Abdomen will make a
great resistance to the descent of the blood by the branches of
mammary Art. When the increased momentum of the blood in
Epigastric can do, so that the force of the Circulation in the internal
mammary Art. is the same before delivery as after: may the
matter may be left to the decision of an Experiment. & I will venture
to allidge that if we were to cut thro' the uterus marked &
divide all the communicating branches, we will still find the flow to the
breast take place in the usual manner, therefore this theory must be
laid aside as altogether insufficient for the purpose & we must have
recourse to an explanation which depends upon very different principles.
Whatever Idea we entertain of the cause of the menstrual flux whether
we attribute it to depend upon agency or a partial plethora at delivery
the constitution has been in the habit of preparing blood both for the
Mother & Child, & the habit continues to do so for a certain length of
time, for the 8 days after delivery there is a great debility from the
the Vessels of the Uterus & the great discharge of blood but after this
stopped by the blood coagulating in their orifices, the uterus greatly
contracts & the vessels of the body have accommodated themselves to the

of y.e vessels they contain and as may Woman w.th Child has the Vessels immediately distended there is still remaining a considerable degree of fullness, and unless some outlet is given by the breast, by Suckling nature seeks an outlet some other way, y.e Woman sweats very profusely & is in danger of falling into some disease, as a fever &c we can conceive y.e necessity of y.e separation of y.e Milk. But further we might a priori conclude y.t nature nourishes y.e Child before delivery Digests it nearly in the same manner, they digest nearly of the same nature, y.t there is a Secretion in y.e Uterus resembling that made in the breast: and whereon y.e nourishing vessels are collected into glandular masses, as in Cows & Sheep we find a Pagan in Color and Taste resembling milk. In the human body, y.e vessels are not so collected but by this division upon the Uterus a similar secretion is made & when that Secretion comes to be interrupted & y.e vessels recover their Tone, now the flow is to the Breasts just as when y.e perspiration is stopped there is a flow towards the Kidneys, y.e Pagan y.t resembles y.t y.e mamma & if the Child is applyed, by the sucking y.e flow is better determined, & y.t independant of other causes, & y.e animals y.t formerly had young will bring again the Milk: we conclude therefore y.t as y.e vessels of y.e mother had been in y.e habit of preparing more nourishm.t y.n was necessary for herself during the 9.e Months of pregnancy, y.t this constitution for a certain time remains, & as y.e Secretion made in y.e Uterus resembles y.t made in y.e mamma when there is an interruption of y.e one Secretion there is an increased secretion in y.e other glandular Pagans.

Lecture 63.

With y.e Respiratory vessels we may be considered as y.e ground work of y.e Lungs — The Trachea is composed of membrane & muscular fibres & rings of Cartilage, w.ch are imperfect behind: this allows y.e food to descend in y.e Oesophagus, & y.e Circle not being complete, y.e Trachea in y.e respiration & formation of y.e voice allow it long & distensions more readily: when we follow y.e Trachea to its division into branches a similar structure takes place a

neat way thro' y^e^ Substance of y^e^ Lungs but as now there is
no reason why the defect thro' laxity in the partition shou'd segment
it into perfect portions of a Circle in the whole circumference of y^e^
Cells become membranous & thin terminate in Cells of a similar
texture so far as we may judge by the Eye: these ultimate branches
of the Trachea are not discernable as Dr Hales supposes but can be seen
with the naked Eye: the minute cells are found to communicate freely
with one another, so y^t^ if we blow Air into y^e^ smaller branches a much greater
portion of y^e^ Lungs is inflated, & from a single lobule we can fill y^e^ whole
Lobe: so I apprehend y^t^ every cell of the Lungs has not its corresponding
branch but are now numerous, & y^e^ Cells are so extremely minute y^t^
when entering into a Calculation we are surprized w^th^ y^e^ vast extent of
Surface w^ch^ may be nearly equal to y^e^ Surface of y^e^ walls of y^e^ house we
are now in, & y^e^ pulmonary artery has a very minute division every where
running nearly to y^e^ sides of the Cells. The Air in the Cells is confined
by a membrane proper to y^e^ Lungs & y^e^ membrane is more extensive y^n^
only from viewing y^e^ Lungs wⁿ they contract, for y^e^ division into Lobules
runs to a great depth; & these divisions of y^e^ Lungs into Lobules
seem to accommodate themselves to y^e^ Size of the Thorax, & allow every
part to be expanded in the most equable manner, & y^t^ their play upon
each other may be the easier & they may the more readily retract: you
see even y^t^ a Cellular Membrane enters between the Lobules; & y^e^ whole
covered over w^th^ the pleura with^t^ any Communicat^n^ It is strange to
observe w^t^ Haller y^t^ y^e^ Cells communicate w^th^ y^e^ common Cellular membrane
& Conveyance of Air must be the diffusion of the Air in y^e^ inter lobular
Cellular membrane, & from y^t^ over y^e^ whole body, & we wou'd be apt to
Emphysema & Anasarca in the Lungs y^e^ water making it way
to their Cavity: when the Lungs are taken out round we can indeed
by blowing in Air make it go into y^e^ Inter lobular Cellular
Membrane; & we are apt to imagine y^t^ when we do this by forcing
a breath y^e^ same violence is done to our own Lungs, but our Lungs
are prevented from over distension by the containing parts of y^e^ Thorax, so
that we can hurt Lungs y^t^ in Air were strong as y^e^ our own, therefore
in injecting y^e^ Thorax I have not been able to make injections pass into
the Cellular Membrane: so we may compare y^e^ Membrane as proper

the Lungs to y.e pia mater of the Brain whilst y.e pleura
is represented by the Tunica Arachnoides, it chiefly allows y.e lungs
to play upon the ribs as lined with a continuation of y.e same membrane
Now you listen to practical Authors treating of the Asthma &c. they say
the Cells of y.e Lungs are possessed of a truly contractile power
& they attribute y.e uncertainness of Suffocation depends upon the
contraction of y.e Cells of the Lungs: That y.e vessels entering into
the composition of y.e Lungs may be so far mechanically affected is to
be admitted, but there is no reason to suppose y.e y.e Cellular System is
truly muscular; we can't conclude so from its obvious Animals Shou irritated y.e lungs with very acrid liquor
without any immed.te subseq.t contraction: & in Asthma the suffo
cation depends very much upon y.e affection of the glottis, the
various affections of which are more frequently owing to the Lungs
than they ought; and whilst we admit y.e affection of y.e vessels of y.e
Lungs we must regard y.e change produced on the glottis &c. can be
unfolded in y.e most accurate manner — But to explain y.e Circulation
of the blood in the Lungs, you understand y.e less Circulation, y.t
is y.e same quant.y of blood passes thro' the Lungs in y.e same time as
the rest of the body &c. quant.y & velocity are nearly y.e same in the
pulmonary Artery as in the Aorta: the force however I conceive to be
very diff.t from y.e diff.ce of thickness in y.e two Ventricles in y.e Aorta
the force is 3. times greater y.n in the pulmonary Artery, But when
we consider y.e divisions made by y.e pulmonary Artery in y.e lungs,
they are by no means so extensive as y.e divisions made by y.e Aorta
& therefore tho' y.e force of the blood is greater in y.e Trunk of the
Aorta, y.n in the Trunk of y.e pulmonary Art.y y.e force of y.e extreme
Branches of y.e P. Art.y is greater y.n y.e force in y.e extreme branches
of y.e Aorta & as y.e circumstance depends an obvious y.t a wound
in y.e Lungs bleeds more violently y.n a wound of most of y.e bowels
belonging to y.e Aortic System — Comparing y.e force of the two
Ventricles we find y.e y.e thickness of y.e left ventricle is three
times y.t of y.e right; but y.e n.o of vessels of y.e Aorta are 15. times
greater; for y.e Lungs do not make above y.e 30.th part of y.e body
as y.e weight, now making an allowance for y.e earth of y.e Lungs

the last & extravasated liquor, & allowing & allowing y^t
y^e lungs are an finely vascular, y^e blood is title short upon a
filled y^t weighs 15 times as much, & there y^e vessels are numerous
in proportion to y^t weight. may I find y^t y^e N^os in equal portions
vacate, for I find upon injecting fluids y^t they pass more readily
from y^e pulmonary artery into y^e vein than, y^t in other places of y^e
body: this gen^l supposed y^t y^e veins are not in such proportion to
the Arteries in y^e lungs as elsewhere, but there is as much diff^ce as is
generally supposed, in y^e Aortic System many veins run under
muscles & bones where are Arteries: & y^e Cava is larger in proportion
to y^e pulmon^y Veins: there is likewise an inequality in y^e size of
the 2 sides of y^e heart, y^e right is originally larger y^n the left. &
perhaps y^e diff^ce increases w^th age or Cause, because of y^e unequal
resp in respiration, y^e blood passing w^th more diff^ty thro' y^e lungs
in y^e state of expiration y^n in Inspiration when y^e Vessels are drawn
more out into straight lines, & y^e pressure of y^e Air within y^e lungs
taken off. for y^e Air does not readily enter by y^e narrow
passage of y^e Glottis as to make y^e same pressure in Inspir^n
as takes place in expiration when the sides of y^e Thorax are drawn
in, & y^e passage of y^e Air being difficult thro' y^e Glottis, the
pulmon^y vessels come to be compressed. There is a minute division
of y^e blood vessels upon y^e Cells of y^e lungs w^ch appear very
when red upon y^e vessels being injected but there is no appearance
yet of glands for mucus. Yet a exhalation is made from y^e
extremities of y^e Pulmon^y Vessels of a matter y^t is pernicious to
animals; we are constantly throwing out a quant^y of effete Air
w^ch is mix'd w^th & carried off by the Air we breathe: Besides y^e
Pulmon^y Vessels, we find others small, but constant Arteries
deriv'd from y^e Aorta, y^e Bronchial, y^e N^os varying in diff^t
subjects; & they make a very intimate division thro' y^e substance
of y^e lungs at first we might imagine y^t they were accidental
& never Natural from y^e Aorta scattering itself on all sides
but we cannot doubt y^t material fun^s are convey'd by the

Vessels tho' it is diff.t to say what these may be, In like manner y.e Coronary Arteries of the heart are deriv'd from y.e Aorta only, & tracing these back y.r veins terminate on y.e right side, tho' we wo. have imagin'd y.t they wo. have gone into y.e left Auricle with y.e pulmonary, & in the Liver where we find a vast Quantity furnish'd by veins & forming a Vena porta, we shall find a branch constantly from y.e Aorta: now if it wo. appear y.t there are purposes necessary to be done in y.e various Organs w.ch the whole mass of blood, as vessels carrying it tho' these Organs are not fitted to execute; or y.t aqueate change is produc'd by a single circulat.n y.n at first sight we are aware of: it is generally supposed y.t y.e Bronchial Vessels serve for the nourish.t of the Lungs; but tho' I shall prove y.t y.e nutrition depends upon y.e Blood vessels, yet I cannot w.th a Certainty affirm y.e to be y.e purpose they serve, nor the less so y.t it is y.e only purpose. —

You have seen a No. of minute glands on the back of y.e Trachea y.t make Circles in the Rings of the Trachea & w.ch we dently shown out mucous we can w.th y.e Knife trace these glands into y.e larger Branches of the Trachea & we are to apply what we see there to y.e more minute branches, as they must have a very extensive distribution here as in other places, wherein y.e air has access or acrid Liquors are apply'd & w.ch require y.e separation of a mucous or sebaceous matter. — In some few diseases there is an appearance w.ch is supposed to be owing to an increased quantity of mucous, & y.t exud upon y.e Trachea & w.ch appears in the form of a membrane: but we may doubt whether it is owing to mucous, or if we are to consider it as a Crust form'd by an inflamatory exudation, just as if Scurf into y.e peritoneum or pleura there is discharg'd a Liquor w.ch gradually inspissates & forms a Crust of y.e Lymph.c p.t of the Blood & upon exposing the Crust in the Trachea to ardent Sp.t it gets a consid.le degree of hardness while we don't also see so great a change produced upon mucous by such an addition

In some of these diseases a few Authors have conceived y^e Cause as the Cause of y^e disease, but I do rather view it as the effect; & tho' we could remove y^e crust by a wash, I doubt if we cd. cure y^e patient, for y^e danger depends upon the Incrustation: I have had repeated occasion Children dying of the Croup & I found y^e passage for the Air was not intercepted by the membrane. — These membranes may originate from the Trachea & be a cause of Suffocation great uneasiness, & it may happen y^t collecting y^e shall stick in the Larynx & suffocate the patient but they are no more y^e cause of the disease y^n a furred Tongue in a fever is to be conceived as the Cause of the Fever.

Observe y^t all y^e matter above y^e Lungs passes to the right side of the heart, so y^e changes made upon y^e blood from y^e Lungs circulat^s don't depend upon a difference of mixture a parte, but upon the effect of the Lungs compressing & agitating y^e blood, & as somewhat discharg^d from y^e extremities of y^e Pulmonary Artery, w^ch reg^d. to the Colour of y^e matter in the Bronchial glands, in a young Subject we observe nothing of y^e Black matter: in an adult y^e color of the Lungs gradually changes from a brown to a black Color; & y^e same useful w^ch by separating a certain Substance gives y^e black color to y^e solid part of the Lungs, by making a similar secretion into y^e Cavity of the Trachea may give y^e same color to the mucous so y^e extremities of y^e Pulmon^y. Artery discharge by their exhalent terminations y^e black color & the bronchial glands giving passage to y^e absorb^t. vessels, receive y^e black tinge from y^e Lungs, y^e Trachea receiving y^e Color first & communicating it to the bronchial glands & as all y^e solid parts of our body are constantly undergoing a change the solid mass of y^e Lungs & muscles will be in some gradually assumed by y^e absorb^t. Vessels so y^e Color will also be communicated in y^t way; & y^e Color of the Lungs & of the

glands always connected, viz. Bronchial glands
have a single passage, viz. of absorption and receive their
Cells from the Lungs.

Lecture 62d.

Yesterday we considered the Lungs with y^e glands, y^e division
of y^e Trachea & it's termination in the Cells of the Lungs, y^t the
Cells seemed to communicate freely w^th each other upon y^e surface
as well as deeper in y^e Lungs, y^t y^e Cluster of Cells from the
Lobules & these y^e greater Lobes, & y^t y^e whole Cells are covered by
a Membrane w^ch in a contin^n of y^e pleura, that y^e Cells of the
Lungs are not to be supposed capable of Contraction because of
the difficulty of breathing in an Asthma, but y^t we are to refer y^e
to the spasmodic affection of y^e bloodvessels & to y^e contraction of
the Cells, & supposing y^e Lungs never were divided, tho' a great
Oppression & Anxiety w^d remain y^e asthma w^d not be violent.
After observing y^e gen^l distribution of y^e vessels & tracing our
attention to y^e glandular structure we observ^d y^t without a glandulous
Apparatus a secretion of a mucous nature is evidently made
on y^t account of fixed or mephitic Air makes a p^t of expiration
Dr Black shew'd y^e nature of this by y^e following Experiment,
he takes a Cent glass Tube a Syphon proves com. Lime Water
into it & draws y^e breath thro' the water w^ch produces no change
upon it but upon breathing thro' it again, grains of Lime abp^t
as what the Lime had lost in the fire is hereby restored: and
what is remarkable, y^t that Organ w^ch is intended to make y^e
discharge is most affected by it when it is applyd to it, we
receive y^e Air into y^e Stomach with impunity but it returns
upon y^e Lungs not without danger. Obs^d also y^t y^e Lungs have
no way or other not only to intimately mix, but to actuate by
Blood a something unseen, for I think it pretty certain y^t whilst
we throw out somewhat highly dangerous we at y^e same time

take in a somewhat of it is useful: I wd. suppose that ye very old supposition from ye Analogy of other Animals; if we throw a fish into water from wch. ye fish has been exhausted it dies in a short time now surely water alone is equally fitted for making an Impression upon the gills, as for washing of any thing hurtful mixd wth. ye blood I therefore suppose ye there is a vivifying Spirit somewhat useful to Respiration from ye external Air in Inspiration which by expiration we make a discharge of somewhat hurtfull. We next proceed to trace ye Nerves of the Thoracic Organs & 1st the Diaphragm or phrenitic Nerve wch. is a fit subject for experiments from ye length of its course We find ye the heart receives its supply from 13. Nerves at least may be added ye nerve of ye 6th. descend, we are not certain but there may be others of ye 6th. and enter into the substance of the heart, Tho' the whole we can discover of nature carefully guarding agt. ye want of a proper Energy, to withdraw from any Accident or Disease a part of ye face tho' be lost, it is better ye tho' the Organ ye nerve any one part tho' be rendered Paralytic; hence ye heart receives its Nerves from a No. of Organs & these are intermixd by ye intervention of Ganglia, a further Energy proceeding perhaps from these. From ye Convexity of ye Intestines of ye Organs upon wch. these Nerves are spent, ye danger of wounds in the Nerves of ye Abdomen is perfectly evident; if a convex. ye preservation of 'em are tyd ye Animal vomdies; & independant of ye danger wch. attends ye ligature or division of ye Nerves, we have reason to believe ye there is ye utmost danger to be apprehended when the 8th pair & Intercostal rum, upon their being expos'd to the Air, & an inflamation taking place, ye alone will be found often fatal: tho we are not rashly to undertake Operations here, as for ye Aneurism in the Carotid Artery, respecting ye small & ye it is in ye Surgeons power to tie ye Artery in 2 places. I have tyd ye Carotid communis & ye Animal survivd, but when any grt. Injury was done ye Animal died, & I found there never were in an inflamd state & united to the neighbouring Organs.

It is a point allowd in practice ye what is called ye pleurisy, the Inflamn. of ye Side, of ye contain. Pt. of ye Thorax, is attended wth. mountain

and a harder pulse, y^t y^e true peripneumony when y^e Inflam^n is in the substance of the Lungs, now we may in some measure explain these circumstances no doubt concur but without taking into Acct. y^e difficulty arising from y^e Inflam^n w^ch w^t y^e blood passes from the right Side of the heart to the left to affect the pulse was sufficient, we say we say y^t from y^e great number of nerves sent to the Side; its Sensibility is great. & y^e System is more irritated, Perhaps sur- ther one thing may have effect, y^t y^e proper Dorsal nerves are immediately connected to the nerves w^ch supply y^e heart, & tho' we don't say y^t y^e Sympathy depends upon the Connexion of the nerves in their progress, yet an inflam^n fixd upon a branch more readily affects y^e neighbouring branches y^n the distant nerves of the body. So I say y^t the hardness of y^e pulse, y^e quick pulse is owing very much to sensibility from these large nerves, w^ch see is y^e Cause of the pain. ——— So far we determine in gen^l but a question remains w^ch has been much agitated, whether are we to attain y^e common name of pleurisy, respecting y^t y^e pain, & y^e dangerous & often fatal Symptoms depend upon y^e Inflam^n of y^e pleura lining y^e ribs, or are we to imagine y^t y^e pain & danger depends upon y^e Inflam^n of y^e Intercostal muscles, & to say y^t y^e inflammation of y^e pleura alone can produce all these Symptoms? I apprehend y^t y^e last opinion will be found the most just, & y^t you'll observe y^t there is an undue weight committed by y^e practical Writers. You find y^e same persons exaggerating y^e Symptoms, y^t the reason to depend on an affection of y^e pleura as y^t part of y^e membrane lining y^e ribs; & diminishing y^e effect of it when it lines y^e lungs, since y^e pleura is common to both, how do we explain y^e diff. w^ch they themselves intend to find between an inflam^n seated in the one, or y^e other end of y^e same membrane? surely it is similar in its nature tho' not; We find 'em speak of y^e danger from the affection of y^e nerves entering y^e pleura, as if they were convided whereas it is impossible to demonstrate nerves enter the pleura: & we observe y^t y^e while substance of y^e lungs does not receive a nerve larger y^n one of the proper Dorsal nerves, y^e divisions of it therefore must be exceedingly minute; & y^e nerves of the pleura very small

And y.t was to be expected from considering y.e use of y.e pleura w.ch with respect to the Lungs is to give a strength to 'em, to confine the Air & prevent rupture: another use is y.t y.e Lungs in respir.n may play upon the ribs, y.e pleura is interposed to lessen y.e attrition; now do we perceive either from y.e one use or other any necessity for so vascular & highly sensible membrane cannot be interposed for either purpose. — I am ready to admit y.t the pleura has nerves, because it has usually w.th an acknowledg.t by the nerves, yet these are small & inconsiderable in No. y.t it is capable of Inflam.n & consequently may be the source of many diseases; but we are not to believe y.t merely y.e inflammation of y.e pleura is capable of occasioning fatal Symptoms, & y.t does depend chiefly almost entirely upon y.e affection of the nerves of the side w.ch are large & numerous, & w.ch it is not in our power to relax, & w.ch we cannot altogether restrain from moving: & when the pain is seated entirely in the Lungs, I do. allege y.t y.e patient will suffer y.e highest degree of danger when y.e Inflam.n occupies y.e deepest part of the Lungs, both on acc.t of y.e sensibility of the Trachea & of y.e distribution of y.e nerves from y.e 8.th pair, these y.e Infundibula & Vesicula is chiefly seated in the Trachea & y.e patient is most in danger when y.e inflam.n is y.e deepest within the Lungs — From considering y.e Structure of y.e Lungs we can understand the reason why y.t Organ more often than is y.e subject of diseases: & why when diseases happen y.e cure is practic.y difficult: They are continually drawn in w.th the Air Substances hurtful to life w.ch passe down into cells y.t are very minute & communicate w.th one another, by much winding passages y.t y.e most violent inspiration is thrown back w.th difficulty & perhaps nothing may be conveyed w.th y.e Air y.t is hurtful, y.e State of the Air may be such y.t it does not readily carry off the poison we are continually discharging from y.e Lungs, & if I am hurt by drawing in the condemn.d breath of other animals into my Lungs, an injury must arise if y.e Substances is not sufficiently carried off by my own & I make no doubt y.t y.e State of y.e Air may be such as shall not sufficiently convey y.e noxious Air & other poisonous matter from our Lungs & y.t y.e in time may lay y.e foundation of diseases. — Their continual extension & contraction in respiration & y.e violent

y^e veins to w^ch they are subject, & w^ch we can have the immediate effect of throwing out the blood may say y^t sound^s of disease ——— The acrid aliment is immed^y blended w^th y^e blood on the right side of the heart & first undergoes a circul^n in y^e Lungs & it is vain to pretend y^t y^e Chyle enters deeply into y^e circulation & is diluted & mix^d before it begins to be circulated so as to draw blood from Animals after they have taken food & have abound^d in Chyle swimming on y^e mass, so y^t it does not enter in so gradual a way & they may often suffer by y^e Circumstance: And all abound^g matter we shall see from y^e Lymphatics reach y^e Lungs before the rest of the body ——— We must also take into acc^t y^e velocity of the blood in the Lungs; y^t y^e same quantity passes thro' them as thro' the rest of y^e body, so y^t it must pass y^e w^th greater violence, w^ch must make us more subject to disease: we likew^e see y^e difficulty of making a cure when a disease has begun, from y^e spongy & tender nature of the Lungs they are easily corroded & destroy^d & even the out Coat in matter readily passes by the communic^n of the Cells, from a small part of the Lungs to a large; & in case of an ulcer the continual rate of Alternate motion must tear the sides of it & even^y when nothing contributes more to the healing of a wound than rest; & farther y^e discharge is made in the most disagreeable manner imaginable. ——— The Velocity too of the blood running in the Extremities of y^e Vessels of the Lungs must hinder y^e cure more difficult; just as ulcers in the Legs heal with difficulty & if we can hasten y^e cure by posture And here y^e noxious matter is found in from other Vessels upon the diseased organ, & we must take into acc^t a circumstance w^ch has often effect, that whatever absorbed matter is taken in from the Lungs is immediately upon or before there is any chance of an execution ———

Lecture 65.

Having considered y^e Structure of the Thoracic Viscera we proceed the descending Aorta w^th the accompanying Nerves & we begin with the Phrenic portion Viscera or bowels &c. viz. contain, or in any

hope used for y.e first part of y.e Chyle or Aliment we find
after y.e Diaphragm is supply'd in the usual manner by branches
from y.e Aorta & w.ch return y.e blood back again to y.e heart in y.e 3.
very principal ones Arteries sent off from y.e fore part of the Aorta: y.e 1.st
Coliac, whose large branches supply y.e Coelia or Stomach, the
other two run along y.e membranes of y.e Intestin.e Canal & are
thus four named Mesenteric; & they are distinguish'd by the one
arising higher y.n y.e other into y.e Superior mesenteric Art.y
they likewise send branches to the pancreas, omentum, y.e Spleen
& Liver. — The branches sent to the Liver return y.e blood in the
common way back to the Heart by the Vena Cava But all the other
branches, instead of returning y.e blood as usual, unite & form
one great Trunk or Vein w.ch enters y.e Liver at y.e Porta, & is
called Vena portarum. As soon as it gets into the Liver it y.e
like an Artery tho' the Coats are not of the thickness & consistence
of an Artery y.e distribution is altogether Arterious dividing
into minute branches w.ch we can't prosecute by dissection, &
from their Extremities y.e blood returns by other veins the
Vena Cava & hepatica. — We proceed to demonstrate
these Vessels.

Lecture XV.

We found y.t y.e Two Nerves composing y.e 8.th pair, after supplying
y.e Lungs run upon y.e Oesophagus in their descending course
they split into branches, & from y.e opposite sides of y.e branches are
united, y.e branching & joining is as y.e vessels, before we go down
to the Stomach, we find an anterior & posterior plexus, but we are
only to understand y.t y.e nerves are included in the same sheath
but without knots or ganglia being found, the remainder of y.e 8.th
pair passes from y.e back part of y.e Stomach to y.e Aorta & joins
it as soon as possible about y.e rise of the Coeliac Artery. Here we
shall quit y.e 8.th pair & shew y.e great Sympathetic: That nerve
runs down the Thorax, & is joined to the superior intercostal nerves
at y.e middle of the Thorax we find branches sent off w.ch uniting,
form a considerable nerve y.t is spent almost entirely upon the

dominal bowels, or named by the latter y^e^ names of plexus
uses, y^e^ rami of plexus take y^e^ same direction with y^e^ posterior br.
of y^e^ 8^th^ pair, & they are joined to each other across y^e^ Aorta at y^e^
same time they receive y^e^ 8^th^ pair: they^e^ B. nerves must about y^e^
Celiac Artery and at y^e^ meeting we find a prodigious enlargement
with^t^ any wd^t^ Name we use to express y^t^ it is a cluster of small
conglobate glands, & we find Ganglia, & from its appearance it
is called y^e^ semilunar gland ganglion from y^t^ nerves ascend
off to all the Chylopoetic Viscera, & as these scatter all y^e^ fibres
towards the diff^t^ bowels, there are others who call y^e^ Solar^is^
plexus Solaris, like y^e^ sun sending out radii to all sides. y^e^
nerves from it proceed along y^e^ Arteries, are conducted by membr.
a net work y^t^ we can't take for Cell^r^ Substance shows their name
from y^e^ Arteries they accompany as y^e^ plexus coliacus mesenter.
inferus &c.

Lecture 87.

We find y^t^ n^o^ plexus named semilunar in w^ch^ y^e^ nerves are conducted
is vastly large y^t^ we might have expected for, y^t^ something more
is done here y^t^ in y^e^ other plexus where we can trace the fibres
distinctly, whereas here we lose 'em, & with^t^ suspecting y^t^ there may
be somewhat added to y^e^ nervous Energy in y^e^ part as y^e^ same force
here is exerted diff^t^ from what y^e^ brain itself suppose, we find here
an intimate mixture & inosculation of all y^e^ branches running
downwards nature guarding against y^e^ total interruption of y^e^ nervous
Energy in organs y^t^ are necessary to Life: therefore it is better to lose
y^e^ 60^th^ part of y^e^ nervous Energy of y^e^ alimentary Canal, y^n^ to lose
total power of y^e^ 60^th^ part of y^e^ length of it, for th^t^ a paralytic
of a single fast of it take place, there will be an interruption to
y^e^ discharge of y^e^ aliment y^e^ action of y^e^ muscular Coat of y^e^
Alimentary Canal contributing in a very principal ways to y^e^
So we at present say y^t^ in y^e^ semilunar ganglion there is an
intimate mixture of y^e^ w^ch^ nerves & we may conclude, that nerves

derived from a number of sources from y^e intercostal con-
nected w^th all the nerves of the Spinal Marrow, & nerves from y^e head
but w^th reg^d to y^e blood vessels, y^e Vena porta in its divisions are
eminently in y^e Liver, y^t it requires greater force to push an In-
jection thro' them, y^n to push an injection from y^e pulmonary Ar-
tery thro' y^e Lungs — This Vessel is formed from Veins so is named
a vein but it performs y^e office of an Artery, y^e bile is chiefly
separated by it, & like y^e Arteries in other places y^e Div^s is separated
from branches &c. From y^e singular curve w^ch y^e blood takes here
y^e force w^ch regard to its circulat^n must be very consid^d broke, it
twice passed from y^e heart, & twice attempts to return before it
reaches it: we find y^t in y^e first circul^n y^e stroke of y^e heart to
the eye is last, & there is no pulsation seen in the Veins of y^e Ali-
mentary Canal may y^t in y^e other Veins & coats of the
Vena porta are as thin after they enter y^e Liver, as when they come
from y^e Stomach, so we need make no doubt, but these coats posses
a living power & muscular as well as y^e Arterial System: But
tho' y^e motion is languid, there we are exposed in y^t part of y^e body
more to stagnation & obstructions of various kinds y^t in any other
I can understand how people fall into complaints from w^t
of exercise, & if there is a disposition to dropsy from y^e laxity of
y^e solids & thinness of the fluids it will more readily shew itself
in y^e Sack of y^e Vena porta & in fact y^e ascites is more frequent
y^n any other species of Dropsies incepted. — Suppose y^t a Schirous
affects y^e Liver in a great part or in y^e whole of it, we see a double
Cause of Dropsy the difficulty w^th w^ch y^e blood passes thro y^e Liver
has y^e same effect as a Ligature upon all y^e vessels composing
y^e Vena porta: so a ligature upon y^e Arm brings on a Dropsy of y^e
whole Arm: and any hard Tumor compressing y^e veins of y^e Liver
may have y^e effect with^t compressing y^t y^e veins are y^e absorbents
by increasing y^e resistence to y^e Arteries, when more Lymph is thrown
out & in many instances y^e Liver from its weight & bulk may
press upon y^e thoracic Duct, &c, whilst y^e exhalat^s from y^e
Arteries is increased y^e inhal^s by y^e Lymphatics may be

minished at y^e^ same time. — In y^e^ alimentary Canal
this is receives y^e^ Aliment we find y^e^ blood vessels on y^e^ Stom^h^
Intestines every where Anastomosing, & becoming more & more
minute y^t^ with^t^ y^e^ assistance of Glasses they escape view altogether
& we can only obs. an uniform red Color. — Dr Young has dis-
cover'd y^t^ in Satures, y^t^ new tanned Smith, y^e^ liquor of Rhei Stomachi
& y^e^ brown of coagulating milk are a preparation for Digestion, &
y^e^ food we take in is dissolv'd only by a menstruum common
to all these changes. Thus fat is made into fat, Flesh into flesh, &
these parts, we find Anatomists every where as in y^e^ Veins &
Lacteals, these various Liquors in w^ch^ y^e^ blood must necessarily be in
some measure filtred for the performing y^e^ various, we may conjecture
y^t^ y^e^ blood is render'd more fit for y^e^ expulsion of the Bile in the
Liver, for instance, for completing some of y^e^ Arteries of y^e^ glands
some of which times & have Anastomoses, w^ch^ with the Chyle
such a separation must soon unravel. But y^e^ chief & most evident
intention is to guard agⁿ^t^ y^e^ danger of obstruction, some change of
base in y^e^ diff^t^ portions of y^e^ body & under the diff^t^ degrees of
retention or suspension in w^ch^ it continues y^e^ extremities have y^e^ blood
sent into em by y^e^ Lateral branches. — But we must attend to the
causes & effects of disease: & almost all y^e^ causes of disease that
Anatomists discover by dissection are such, at least y^e^ greater No.
of y^e^ y^t^ most frequently occur — 1^ly^ w^ch^ y^e^ w^ch^ concretions y^t^ we meet
with here, & w^ch^ are by no means a rare occurrence most often have
Lacteals, & we may suppose em in other where they seem to be want^g^
for we can imagine a fluid to serve as a menstruum w^ch^ may
after wards think y^t^ we can scarcely perceive it on cutting open
y^e^ Body. In order to give some Idea of one way in w^ch^ such Calculi
may be found I have chosen y^e^ ball taken from y^e^ Stomach of
a Cow, y^t^ are plainly compos'd of hair y^t^ are always of y^e^ same
color as those of y^e^ Animal, & these are found by y^e^ Animal
licking itself, y^e^ hairs are determin'd to y^e^ Throat by y^e^ rough^s^ of y^e^
mouth &c. & come to be collected in y^e^ Stomach. In like manner
we may imagine concretions formed within ourselves, but we

not to imagine y.t y.y is digested & fit for new substance
y.y Aliment also forms three conditions there may be such
attraction of y.e vessels to part of y.e aliment as takes
place in y.e vasa mesaraica. So within an Alimentary Canal
when y.e y.e encysted coats of Scarlatine, such conditions
as we call Stones, suppose are to form in y.e stomach they
rarely stop there till the come very low, & are most frequently
found in y.e great intestines partly in the beginning of y.e Colon
in y.e Caput Coli more frequently, or in y.e Caput Coecum Coli
here they are very much out of y.e Circul.n of y.e food, & y.e Pelvis
Coli is sometimes found at y.e same time of very considerable
size. — We may judge of y.e disease if a person with a running stomach
may very great weakness in y.e Stomach a thing subject to many
complaints has a frequent pain, if y.e is situated in one part
of y.e Intestines & remains there for a considerable time, if it comes
in an irregular manner, with y.e patient being able to find a cause
y.t no error is committed in diet; at one time perhaps y.e Pat.t has
been costive, at another Time there is a total stoppage & y.t made
mechanically by y.e ball blocking up y.e passage, soon after which y.e
is perhaps a great discharge of y.e Faeces, & y.t not without a great
deal of pain, & partly we distinguish a ball of y.e kind by y.e Pat.t
feeling a pain upon pressing upon y.e part, & we can discover a
remarkable hardness: if we find y.e has very much changing its place
or is situated where no solid bowel is to be found; were it under the
last ribs we might apprehend y.t it was y.e point of y.e Ileum in
a Schirrous State, whence if we find it at y.e side of y.e umbilicus
we may conclude it to be owing to one of these conditions: under such
such a suspicion y.e gen.l manner of treatment is obvious, we may
attempt to discharge y.e concretion by purgatives & under the
Intestines Clysters by oily medicines, give injections &c. But as and
upon y.e we are unable to say we may observe a few things.
1.st There is a possibility in certain Situations of getting it out
from y.e body with.t opening y.e Cavity of y.e Abdomen: I mean when
it is situated in y.e beginning of y.e Colon, in y.e Caput Coli y.e

y.e most usual place where these Concretions lodg'd are in another place where they very often stop, ascending some way y.e Concretion describes y.e great Arch of y.e Colon, but is apt to stop on y.e left side: now the Colon is only cover'd on the anterior part by y.e Peritoneum, & we may cut into it without cutting y.e Cavity of y.e Peritoneum, & dwelling all into y.e Abdomen, wch is attended w.th y.e greatest danger: merely by ye admission: next when a ball of y.e kind has stopp'd long in one place, by inflammation & irritation y.e Coats of y.e Gut are thickend, & y.e same cause acting, y.e gut is constricted, & tho' the diameter of y.e ball is not lessen'd greater y.n y.t of y.e gut, in consq.ce of y.e constriction in it, it comes to be impossible for y.e ball to pass; & then come to have a behaviour to the containing parts of the Belly, so if it is attended with pain we may cut upon it without opening y.e Cavity of y.e Abdomen and y.e Coats of y.e Intestine may be sew'd to one patient Dead of y.e kind y.e complaint had lasted for some years, was mistaken for a schirrous of y.e Spleen & was treated accordingly with many Acids: from y.e great hardness, y.e pain & distention Dr Wade was certain of a Concretion within y.e Intestines so gave only purgatives & Injections repeatedly, y.e stone was beat down into y.e Sigmoid flexure of the Colon & remain'd there 8 or 11 Months Dr Wade attempts to remove it from thence proved in vain. These inamuted Seeds of gooseberries were macerated by a Lady the History of the Case is y.t She complain'd of a violent pain & sickness at Stomach, y.e pain was seated at y.e place of y.e gall Bladder: Dr Pr. knew there was a deep yellow color in y.e Eye & all the marks of Jaundice: & had no doubt y.t it was owing to a Biliary Calculus in y.e Ductus. So directed to examine y.e Stools to discover y.e Calculus & y.e led to y.e discovery of these Concretions wch we found to the No.r of 8. or 1000. & y.e reason of casting gooseberries was owing to y.e Dr had collected into a Ball at y.e turn of y.e Duodenum & by their bulk, pressure and Irritation had occasioned y.e common Symptoms of y.e Jaundice so whenever we meet with such Symptoms, we shall at least endeavour to prevent any substances from lodging long in the Intestines by giving Laxatives. Next we meet w.th difft

kinds of worms. The Tape worm and y^e gelatinous worm
it have been imagined y^t y^e Tape worm was a Chain of Animals
totally distinct from each other, y^t (round worms supposed con-
nected by Tenacula, but by injecting y^e Tape worm I find that
there is a real communic^n between its joints as y^e joints
joints make but one animal, but every joint is at y^e same
time capable of living as being provided with a mouth. It may
been imagined y^t it is in a continual state of gen^n by such ad-
ditions to y^e number of Joints but we have no proof of this. —
Lumbricus resembles & totally diff^s from y^e earth worm
This is more easily expelled, but is more dangerous y^e former as
preys entirely upon y^e Contents, but on y^e Coats of y^e Intestines
eating great portions of y^e villous coat hereinded it gen^y stops
y^e Action arising from this greater hardness, but in some
cases these to are found eroded & perforated, we are not to
conceive y^t y^e perforation after death when y^e animal is unable
& wants to weaken, & we have instances when y^e worm has made
its way thro' the coats. — Next y^e Ascaris v^s Lumbricus is
only a young Lumbricus & not a distinct species, it has been
represented as having two heads as it breaks from y^e Corrugat-
ion occasioned by its being kept in spirits, but in shape it near-
resembles y^e Lumbricus & I have seen existing at the same time
Physicians have thought to kill these Worms by means of oils &
other medicines y^t would stop their breathing pores: but I can now such
not y^t the wound fill y^e whole intestine & can act with oil itself
not kill them; Oily Injections have brought away a vast quantity of
Ascarides but they were all living. In y^e Cave of Inverness y^t have
breathing pores y^e oil is an effectual remedy, there upon touching
y^e breathing holes of an Animal taken from y^e nose upon one side
it was made paralytic, & on touching those on y^e other side also
it soon died inevitably; & y^e way we effectually kill a common
Flea. — With regard to y^e gut: they may be twisted from a
sudden motion independent of y^e muscular. I have met with a Case
of this kind what they call of Bloody illness with alternate vomiting
of Feces: & upon opening y^e body, about a foot & more of the
Intestine. Ileum was found of a black color lying at y^e right

vide & I found y.t y.e appendix vermiformis had passed over y.e root of y.e mesentery & was entangled in y.e mesentery & under vide, & y.t was y.e cause of y.e mattter. when ch. was confined to y.e place, & y.e appendix was thickend & enlarg.d, & stuffed with mucus. now it is diff.t to conceive how y.e ch. take place & continue but I am certain of y.e fact. ——— When y.e intes. succenturiati happens it is well. y.t y.e vessels & nerves of y.e intestine must be equally affected & one part falling double within the other y.e place heals w.th difficulty, & y.e same difficulty occurs in y.e circul.n of y.e blood, & on y.t acc.t when it happens in ch. it is by no means to be consid.d as a thing without danger. ——— Next I shew you a case where a large piece of y.e gut was found by itself w.th all the coats & y.e patient survived. on the 6.th day there was evidently a creasing at y.e middle of y.e small intestine, & it a portion fallen double within another; in this kind of case, a total mortification may be produced in y.e portion y.t fallen down within, & thus it is discharg.d, while a connection of y.e extremities of y.e gut takes place, so y.t y.e separation is evidently of advantage to y.e part. y.e mechanical straitening being taken away. ———

Lecture 8.

We may judge of constrictions of y.e intestines but without being able to determine w.th absolute certainty abt them. If a patient have for a long time complained of uneasiness in a certain part of y.e Abdomen w.ch he is able to point out accurately; if he is costive & afterw.ds discharges a quantity of faces y.t are liquid, because when a constriction forms y.e part above is universally dilated so that in this case the bowels y.t have remain in a liquid state, & if they are found when y.t they are smaller y.t in a person in health, from y.e circumstance we may judge with probability. If y.e part labours under a constriction & y.e bowels be generally full of uneasiness near y.t part, a degree of fulness, & generally an unpleasant sensation ariseth, it can be distinguished w.th y.e hand. If any solid matter is taken it lies upon the stomach like a load. & it is generally vomited again, & y.e most

cooled subst. In can hear in jelly from a Calfshead, when the constriction is in y.e descending part of the Colon on y.e left side we may discover it from an obstinate costiveness seeming Now all the Causes as Constriction, hernia, Intus Suscepties, Constriction may occasion mechanically y.e Iliac, pain in y.e Abdomen, a distention of it, an obstinate costiveness &c. vomiting of faculent matter. — When a Cancer happens or an Inflam.n in a violent degree, we find y.e guts glued to each other & y.e neighbouring parts & sometimes y.e patient survives for a great length of time, tho y.e Coats of y.e Intestines are consumed — If an ulcer happens to be situated on y.e Coats of y.e Intestines give way a communic.n is made w.th y.e Cavity of y.e Abdomen, of w.ch I have seen instances, the Pus generally escapes first & gives y.e appearance of a real Empyema, & in some Cases y.e swelling is prodigious & effects y.e diaphragm to such a degree y.t y.e patient can hardly inspire. In such cases y.e guts are found agglutinated (11) against y.e back bone & y.e superior edge of y.e Intestine upon w.ch y.e Intestinal pus as a valve the return is prevented. — We must proceed to y.e Chylopoetic Viscera as there w.ch augm.ts naturally much — Omentum. It does not reach so low in Man as in Quadrupedes. — It extends an oil y.t is chiefly interposed between y.e out.t portions of y.e bowels & in y.e inner part some distills from y.e end of y.e Omentum to y.e bottom of y.e Cavity, & had it extended further y.e inferior part w.ch have been more y.n sufficiently supply'd, so one primary purpose of it is to prevent contentions, & to allow our bowels to slide & play with ease & facility in our motions, But as we to say with Boerhaave, Haller, & others following them y.t y.e oil of the Omentum is taken in by y.e veins & conveyd to y.e Liver to make a principal share in y.e formation of y.e Bile. I oppose y.t y.e opinion is to be altogether set aside, here we find conglobate glands, & then give a sufficient proof of it it is provided w.th valvular alimentis, so y.t y.e effused liquor are conveyd to the mesaic duct & not to the Liver: as y.e Omentum is copiously with its blood by small blood vessels only, a Surgeon may

cut off a portion of it in Rumia without much danger
& there is little necessity for tying up the portion for the
incision wch might destroy ye Momentum by drawing the
parts too close together, & shut the neighbouring vessels
We find ye Omentum subject to nearly ye same kind of
diseases, as ye Subcutaneous cellular membranes, &
particulary to Hydatoms; I shew'd you one yt affected ye whole
extent, & ye growth was so prodigious as to be attended wth
ye disturbing ye functions of ye Abdominal viscera, & that
so severe fatal; but when it is confined to a partic. place
it may be carried a gt. length a great number of years, & may
distinguish it wth an almost absolute certainty, we can perceive ye Tumor to slide, & play within ye abdominal
Muscles & upon ye surface of ye Intestines - with ye
Structure of ye PANCREAS. ye most common opinion is
it is ye principal Salivary gland in part, there is a resemblance of color, a similar division into lobes, ye coat of ye
duct, thin & transparent, very much resembling ye Coats of
ye inferior maxillary gland, for instance, & sometimes
concretions seen within ye ducts resembling ye other salivary glands; & ye agree perfectly in color & consistence, may
I further apprehend a resemblance may be pointed out, ye
Mercury affects these glands, in like manner as ye salivary
glands are affected, & have ourselves ye Diarrhoea wch
mercury produces is very much owing to an increased discharge
from ye Pancreas & when a pipe was fixed into ye duct of ye
pancreas by Dr Graaf, a liquor resembling ye saliva
was discharged from it. Tracing ye Arteries of ye Pancreas
these come from ye Splenic Arteries nearly at right angles
& it happens ye all salivary glands are usually wth Arteries
much in ye same manner, so ye ye direction never corresponds to ye assault of mercury upon 'em, wch was suppos'd to be
thrown into ye Mouth of ye Aorta towards the head, and to be
determined into these glands by ye direction of ye Arteries, &
ye pancreas was overlooked: but it is evident by ye effect of

Mucous here is to be explained upon ye very same principle
as ye formation of ye Saliva. —— —— we are next led to the
Spleen. wch appears like a clot of blood inclosed in a membrane
of no great strength thickness or toughness: we find Arteries in great
no: carrying a great proportion of blood into ye substance of ye
Spleen & there divided into very minute branches of veins join-
ing together to form larger veins forming a Trunk & terminating
in ye vena port. We can form no probable Idea of ye Spleen
yt ye it is subservient to the Liver, it has been a gen: notion
of the Spleen owing to the blood it had color but it is evident it does
not for we also find blood passing into the Spleen, & it has been
cut from Animals yt have survived Days months & years
after. ye blood always retaining its red color: but further
if ye Spleen was intended for ye formation of ye red blood why
is the blood sent from it into the Liver? why after performing
its office, does it return in its charged state into ye Aorta?
We may say yt ye Spleen is thrown in to break ye force of the
blood, as it is in ye 2d circulation yt ye bile is but seem
but in ye herbivorous Animals, where ye tract is longer &
more blood dispersed upon ye Alimentary Canal, we still find
a Spleen, tho' it wd appear yt some change wch we perhaps
shall never be able absolutely to ascertain is produced on the
blood in its passage thro' ye Spleen, that fits it for ye sepa-
ration of the Bile: & thus is ye Stomach drawn to believe
yt it is subservient to the Liver, tho' wanting to ye manner we
shall perhaps never fully understand.

Lecture 9.

We are now to consider ye structure, ye office & some of the
principal affections of ye Liver, you know ye 1st ye function
of it is to prepare & separate the Bile for ye use of digestion
wch I avoid at present entering upon partic: If we are to make
any remarks it will be, yt whilst ye bile promotes ye disol-
& assimilation of ye food, it irritates at ye same time the

Coats of y.e Alimentary Canal: & hence when the flow of it
into the gutt is any how obstructed, the fæces become
subject a stand from a variety of circumstances y.t favour
y.e Bile is chiefly made from the Vena portæ. But while I
allow this I assert that it is mean to suspect y.t a portion of the
Bile is deriv'd from the Hepatic artery for when we follow this
artery to the Liver, we find a branch sent to the gall Bl.
called y.e Cystic artery, & returning into y.e vena portarum not
into the Vena Cava. In y.e meantime I observ, that y.t y.e V. Porta
chiefly makes the Secretion of y.e bile & y.t the hepatic art. of the
whilst perhaps it performs further offices. — We are commonly
taught y.t the gall bladder receives the bile from the Liver thro'
the Hepatic & afterwards thro' y.e Cystic duct i.e. it descends
by the Hepatic duct, meets with more resistence in passing into
the Duodenum, in the empty state of the Gall bladder, y.t with
regurgitation into the bladder: so when there is any considr
resistence by Aliment or wind within y.e duodenum, & y.e gall
bladder is not fully distended, y.e bile passes upwards, & is lodged
there for a certain time & after remaining there it is forced
down whether by the pressure of the Stomach & action of the
external parts of y.e Diaphragm & Abdominal muscles, or by a
reproved action of its own coats thro' y.e Cystic, & thro' y.e common
duct into y.e Cavity of y.e Intestines; & y.t y.e Cystic & Hepatic
Bile have the same origin & only differ in consistence, because
by the Stagnation changes are made, y.e thinner parts are taken
away by the Absorbent Vessels; & besides there may be other
changes made in consequ. of y.e Stagnation, intestine changes we
we can't so clearly point out. — The late generally very accurate
Dr. Alkinus was of opinion y.t y.e Cystic bile was derived from
y.e Coats of y.e bladder, & he has mentioned two circumstances
wch seem at first sight to favour this: The observer y.t open the
inner part of the Gall bladder when slit open we find minute follic-
-les, wch he supposed to contain y.e bile, & y.t in them it acquired its
toughness & greater viscidity, just as in the Throat & Alimentary
Canal y.e mucus is inspissated, he further takes notice of y.e vena

wch differenced in many Animals in their Coverings & Conformation; as in Birds, where y^t of the Liver has a sweet taste while y^t in the Bladder is intensely bitter, so y^t their vasa some very essential difference), & further found y^t in Cystic & Hepatic ducts run parallel to each other, & open obliquely into y^e cavity of y^e Intestines wch is likewise a fact, without any communication in their course downwards, y^t led him back to the first in y^e human body & soon discovered when y^e Cystic duct was found distended obstructed by Calculi & vast a considerable q^ty of bile was found distending y^e gall bladder — Now to shew y^t with all these appearances of probability this notion is destitute of foundation: 1^mo. obs. y^t these follicles are indeed in the gall bladder but they are also very obvious in the other ducts, & they are particularly numerous in y^e Duct. comm. 2^do when we examine y^e Contents we find a clear mucous matter within the follicles, so y^t they are manifestly intended for a defence against an acrid matter, just as the bladder is covered with a q^ty of slime, wch in some diseases is discharged in great quantity. — With reg^d to the 2^do, they agree in colour they impregnating the hepatic bile, wch imitates y^e Cystic, so y^t all y^e changes may be accounted for from y^e effect of Stagnation and Absorption. When y^e gall bladder has been distended with bile & yet a stone found y^e Stone has been moveable & y^e Bile shaped the sides of the stone, & y^e Stone being pressed down into y^e duct acted as a valve just as a Cork within a Bottle. Stops y^e Liquor before it is found out of it. 3^tio we can point a vast n^o. of Cases where y^e Cystic duct being totally obstructed by a stone impacted into it, y^e gall bladder was found empty, y^e sides almost contiguous & cystic placed, a single instance of this kind is decisive, similar Cases to shew the fallacy of comparing Birds to Men. — And we may further remark as a point established in physiology y^t n^o. bile descends from y^e Liver by the hepatic duct, & passes by the Cystic into y^e gall bladder & returns again thro' y^e same duct & there is no impossibility in the slow being diff^t. & diff^t. times, we obs.

y.e worm moves in the very same way, y.t there is a surp.
at analogy between y.e conveyance of y.e two liquors — We see
for ex.e examples most of'm from the Liver of animals found in
large sacks, & within each of y.e large we find smaller. now this
appearance, tho' it occurs most frequently in the Liver, yet is
to be met with in various other places, but especially in y.e Abdominal
Viscera: Dr Pallas a late ingenious naturalist conceives y.t there
are animated bodies, w.ch opinion was first hinted by Dr Tyson
in the last Century; & I am perswaded upon y.e whole of this
idea is just, tho' in several respects he errs, as in calling y.e Tenia
Hydatides, he supposes y.t it is an animal somewhat like to
y.t in y.e Intestines & y.t y.e produces Hydatides but I never cd.
discover any connexion & I have started to doubt of y.t opinion, y.t
y.e tenia is constantly sending of new joints or adding to its No.
w.ch is very discouraging opinion for after we have separated
hundreds of joints it may still form new ones, but by killing
y.e joints we kill a part of the Animal, & there is no growth
again, we find clusters of round bodies within each other ad-
hering to y.e outer skin, w.ch I take to be y.e parts of y.e young
growing & y.t when they have acquired a certain bulk y.y separate
& y.e 2.nd having y.e same constitution as y.e first contains others
& so on ad infinitum, & it only remains to prove y.t they are
living animals, y.t we distinguish their motions, and are supported
& nourished by fluides found in some the Retinial System
We find also other worms in y.e liver w.ch we can as little explain
there is a species of worm found in Both y.t die of the rot, & I
have a strong suspicion y.t y.y. is the cause of the rot, as in man
they commonly y.e disease is more common — We find within y.e
gall duct a worm of a particular kind w.ch feeds on Bile: from
it's mouth branches are dispersed like y.e branches of an
Artery, & are all filled with bile, so y.t y.e mouth of y.e animal
is it's root, & y.e branches are propagated to y.e most distant part.
When y.e liver is in a schirrous state it is sometimes lessened
in it's bulk Dr Haen gives an instance of a schirrous liver
not bigger y.n first but for y.e most part it is bigger &

in y.e interstices of y.e vessels we find deposited a
calcarious like matter, & knots scattered unequally thro'
it. A surgeon can distinguish y.e Schirrous by laying y.r hand
on the edge of y.e Thorax, & palpating about the middle as we can
generally feel it under y.e Cartilago Ensiformis, y.e liver
is sometimes very great descending halfway to y.e umbilicus, and
even to y.e way between y.e umbilicus & os pubis & yet without
dropsy. Shd a suppuration happen in the liver a consequence of
inflammation, we ought to attend to all y.e possible ways in
w.ch y.e pus can be discharged. In a common suppuration of the liver covered
in its under part by y.e peritonæum, upon w.ch y.e bowels play
freely, & it only adheres to y.e containing parts by its ligamen-
tum y.e inflam.n being confined in y.e neighbourhood; by the
suppuration y.e liver is enlarged, descends under y.e edge of y.e
Thorax, & y.e Abscess strongly adheres to y.e peritonæum lining
y.e muscles, so if an opening is made under y.e edge of y.e Thorax
we get into the Cavity of the Abscess without opening y.e Cavity
of y.e Abdomen: but if y.e Abscess is within y.e edge of y.e Thorax
it may make its way thro' y.e diaphragm, & as y.e is almost
contiguous to the pleura, it being thickened & inflamed may
come to adhere to the viscus, & y.e matter eroding y.e may make
its way outwards, or into y.e lungs. We have many Examples
in practice when abscesses of y.e liver were finally discharged
by vomiting & stool, y.e matter may get into y.e Alimentary Canal
by y.e erosion of y.e biliary ducts, likewise into y.e gall Bladder
w.ch has been found distended w.th purulent matter, or y.e
y.e Abscess to burst into y.e Cavity of y.e Belly, y.e matter may
fall down into y.e pelvis & rotting it y.e urine may inflame
& erode it, & so get out of y.e body.

Lecture 70.

We shall next proceed to give some acct of y.e Jaundice.
This disease is generally first seen in the Eye, mostly on acct of
its whiteness, but in its progress it affects y.e whole surface
& tongue of y.e urine; & I have found on dissecting Animals y.t y.e
fat of y.e body, whether y.e oily part or membranous containing

, or both; I am somewhat uncertain but from the Colour of
e adipose Coat we readily distinguish y.e disease, may y.e tinge
communicated to the Bones deprived of their membranes, or y.e
Bile is mixd wth y.e earth of y.e Bones. Scarcely ever produce
y.e appearance. Sometimes it happens y.t y.e Bile becomes very
inspid in y.e gall bladder so as to pass thro' y.e ducts wth difficulty
I have known persons have labourd under that party.r one of Jaun
dice, & discharge Bile y.t was very thick assembling y.e yolk of an
Egg, & soon y.e discharge with.t any thing further being observ.d in y.e
Stools y.e disease have gone off. Or after getting into y.e common duct
it may stop in y.e passage thro' y.e Coats to y.e Intestines, but espe
cially at its orifice, the pressure however sufficient to impede y.e
Bile thro' y.e Cystic duct will in no long time carry it thro' y.e
common duct, & y.t a Jaundice from y.e cause cannot be very
lasting. — Next Calculi are a freq.t cause of y.e Complaint. They is
judged of from y.e disease coming and going in an irreg.r manner
attended wth sharp pain, They is a most freq.t cause of y.e disease
It is commonly imagined, & may take place even when the scales
have been found even upon y.e most narrow inspection of y.e
Cause & when it may be thought owing to chance. — For if the
Stone is of an irregular shape, in one position, y.e bile may pass
& in another it may be stopped y.e Stone acting like a valve. —
May it is possible y.t a soft Stone may pass thro' y.e ducts: oc=
casioning Jaundice & may be melted in passing thro, y.e Intest.
Tho' in general they are very diff.t of Solution & passage, So
y.e same Stone may occasion repeated paroxysms. A further
Circumstance is worthy of notice is y.t y.e Stones sometimes
increase very much in y.e intestinal Canal, & we may suppose
them to cause disorder there. — Next we find y.e flow stopped by
y.e swelling of neighbouring parts, as from a swelling in y.e
head of y.e pancreas, or of y.e Lymph.c glands in y.e Capsule
of Glyson, & others connected with them at y.e pancreas, Tho'
y.e last will seldom occasion Jaundice as y.e duct runs in
y.e hollow between y.e swelled glands, now after having the
Jaundice from pressure by neighbouring Organs in a chronic

state we can conceive it to happen from a retrograde
the liver pressing upon y^e ducts in their progress, stop-
ping y^e whole or a larger branch of y^e hepatic duct com-
municated by it. For tho' even stoppage of y^e excretory
ducts will have the same effect, thus far a distention of
y^e duodenum may produce it, merely wind pent up there may
produce it, & still more readily any solid substance or concre-
tion similar to those I shew'd you from y^e cradle of Goose bile.
Now these are the ordinary causes we discover from dissection
but physicians add spasm, they suppose y^e y^t. biliary
ducts can be contracted from their muscular nature & y^e flow
of y^e bile stopp'd, & in proof of this they obs. y^t Jaundice happens
after y^e bile of a frightful or viper, or in y^e yellow fever of y^e west-
Indies or it comes on from violent emotions of y^e mind, now I
am half doubting whether Jaundice ever arises from such a
cause, at least there is no room for supposing y^t arising in
y^t manner it will be permanent: I once or twice have seen y^e
limbs of persons bit w^th a Viper, & there was a yellowness but
it continued at y^e part & was plainly owing to y^e Serum of y^e
blood, & I do not find any clear proof y^t a bite of a Viper has
y^e had a diff^t effect; y^e yellowness may extend further, but
if it is first confin'd to one part, tho it spread over y^e whole
body it must still depend upon the same cause — Next the
Jaundice has follow'd violent fits of anger is beyond doubt, but
Calculi may have been lodg'd in y^e gall bladder, & by y^e agitations
attending y^e passion been thrust down into y^e duct, & in the
yellow fever we find by no means a stoppage of y^e bile in its
ducts, y^e person not only vomits & purges bile, but a great deal
is found in y^e duodenum & stomach, y^e flow is greater in
y^e Case, & y^e disease attacks y^e liver more readily y^n other
Organs & y^e Secretion is increas'd; & in proportion to y^e there is
an increased return, not from any Spasm, but there is a
greater absorption, & we never can obs. y^e smallest degree

of contraction in the gall bladder or Biliary ducts when ye
are irritated, nor can we discover ye muscular power by dissection.
So I doubt if they possess so much of ye muscular power as to
force ye bile out of ye organ in vom, & consider. stones have been
found in the Gall bladder sticking in the neck &c.

I think probable not altogether certain of ye Jaundice does
not depend upon ye Secretion being interrupted nay if we
interrupt ye Secretion all together a person will not labour under
Jaundice. — But ye bile is first expended & afterwards taken
up into ye blood, & am at first led to judge so from ye nature
of things — When am we to suppose those bilious particles proper
to the Bile to be found? in what part of ye body is ye blood
so changed as ye bile to become bile? We do not find ye bitter
parts in ye Chyle; & why should we suppose ye Chyle by ye
gen. Circulation acquires ye property, rather ye gall bladder
an organ entrusted for forming it, or at least for collecting it?
Why ascribe ye change to ye gen. System & not to ye liver
surely no good reason can be given: or, if by ye gen. circulation
ye Chyle can be converted into red blood, I have no doubt ye
various parts of ye Circulation contribute their share to this
purpose chiefly ye Lungs. If suppose a change I may say that
process can be produced upon it, some further change must
happen to it in passing thro' ye liver; ye blood is changed
into bile in ye liver in ye same manner as in other parts. Office of ye liver to make
the change as well as ye secretion — There are things further
ye Jaundice can't be accounted for if ye retention of fluids from ye
liver can be prevented: tho' a stoppage to ye retention be made
by tying ye Duct. Communic. Choled. if afterwards we can cut
off ye natural Communic. between ye Duct. Com. & circulating
System ye Jaundice will not be produced: so I shall conclude
for a moment ye Jaundice depends upon a stoppage of ye
Secretion, & a return of ye bile from ye Biliary ducts into ye
Circulating System, & ye want of ye retention can't occasion
it It only remains to determine ye passage by wch it can
return to ye mass. now to be more clearly understood I shall

draw y^e following rude sketch. The V. Porta y^e hepatic y^e
running Artery dividing into many branches some of w^ch
intended for circulation others performing y^e function. I do draw
y^e 2d part supposing on the 1st y^e vena Cava & y^e V. Porta hepatica
going into it, & all branches excluding y^e 2d & 3d the
portion y^e function of y^e bile & those on whom y^e 1st & 2d
Liver, there continued from y^e hepatic duct, from w^ch there are
no doubt abundant vessels, there are common & some of 'em at
least are lymphatic, answering to the thoracic duct. Now so
far if we were to delineate no other vessels we wd. suppose either
y^t y^e bile was hurled back again, forc'd in a retrograde way
into y^e V. portarum, or y^t y^e bile returned to the heart by the
Lymphatic vessels. But the most common opinion is totally
diff^t from either of these, that it is hurled back into y^e Vena
cava hepatica by branches of y^e vein supposed to communicate
w^th y^e Biliary ducts, in consequ. of y^e distention of the ducts
from a pressure upon them. Now I shall attempt to prove y^t
returns entirely thro' y^e Lymph^c vessels, i.e. by absorption only,
& shall endeavour to state y^e Argum^ts for y^e contrary opinion
in their full force. We are told y^t y^e Lymph^c Vessels wd. not
convey all y^e bile in so short a time: I wd. only obs. that y^e
Lymph^cs of y^e liver are very numerous, & wd. only compare
what may be supposed to happen in y^e Jaundice w^th what hap-
pens in y^e Lacteal vessels, y^t a great many P^cs of fluid taken
into ye Stomach & guts enter y^e blood very quickly. But what
kind of vessels are these, & what purpose do they serve in a
sound Animal? They can only say y^t they are y^e absorbent
branches of y^e red veins, & we have rendered y^e doctrine im-
probable in gen^l we must doubt of it in y^e strongest instance
But granting y^t they are natural absorbent vessels, we cannot
inject these by filling y^e ducts, as we can inject y^e mouths
of absorbent vessels elsewhere, & if it is admitted y^t y^e Lymph^c
vessels do also absorb we must admit at least y^t it may
be forced back thro' y^e Lymphatics as well as y^e veins; may

it is more reasonable to ascribe it to y^e^ Lymphaticks as well as the veins and y^e^ only reason to y^e^ contrary is an hypothesis which Dr. Hales, y^t^ when we inject into y^e^ hepatic duct, a colord matter whether milk y^e^ injection goes into y^e^ V. cavam hepatica, we see y^e^ vena cava. Now I admit y^t^ fact but know y^e^ explan^n^ of it; y^e^ injection first passes into y^e^ V. Port & it is more easy to make y^e^ injection from y^e^ V. Port into y^e^ hepatic duct & we more readily fill y^e^ Lymphatics of y^e^ Ven. Cav. hepat. now let us attend to what y^e^ Lymphatics perform in every part of y^e^ body; are we to believe y^t^ y^e^ Lymph^cs^ take off y^e^ watery parts, because y^e^ bile is thicker in y^e^ Gall Bl^dr^ this proves nothing many y^rs^ y^t^ y^e^ thin parts are more readily absorb^d^; but we do not y^t^ whole blood taken in by absorption is any part y^t^ constitutes y^e^ bile; & any part of y^e^ red blood when extravasated can be reassumed, why not y^e^ Bile. Animals grow lean by exercise; we see y^e^ whole gland called thymus obliterated in old people we see a continual change of y^e^ bones &c. But to reduce y^e^ matter to a plain experim^t^ I tied mention'd last Summer I shewd y^e^ Lymph^cs^ vessels upon y^e^ dissecting table to Dr. Young Dr. Black who had y^e^ curiosity to taste y^e^ liquor w^ch^ in every respect appeard perfect bile: & to prevent y^e^ supposition of any incubation I opend y^e^ body while it was blood warm But I conceive y^t^ we may bring y^e^ matter to the decision of an Exper^t^ If we tye y^e^ hepatic duct & Duct. com. chol. below y^e^ end of y^e^ thoracic duct there will be no Jaundice, whereas without tying y^e^ thoracic duct in a few hours y^e^ whole mass is tinged, & y^t^ y^e^ Exp^t^ does not always succeed is owing to y^e^ Duct having various terminations as I mentioned before in order to explain y^e^ chances of y^e^ communic^n^. I have opend y^e^ receptacle of y^e^ Chyle, & in cats y^e^ dogs and pigs y^t^ lived any time there was no Jaundice so I am inclined to believe y^t^ y^e^ disease depends upon y^e^ return of y^e^ Bile to y^e^ mass of blood by y^e^ Lymph^c^ System.

Lecture 71.

Having examin'd y^e Cellulosa Vasa we proceed to y^e organs of urine & generation in y^e male. — D^r Haller thinks the Kidney has little sensibility, & allows no sensibility to y^e urethra conceiving it to be y^e continu^n of y^e Tela vasa, inverted to y^e organs of gener^n upwards thro' thro' y^e urethra & backwards into y^e kidney But y^e perpendicular of nerves sent to y^e kidney is readily y^e same as to y^e other veiled viscera & y^e urethra seems to be of a muscul^r nature, perhaps a fibrous coat & in mail'd animals I have repeatedly excited an evident contraction of it upon irritating it w^th a knife, & I shewd y^e D^r Verschuir who was accustomed to such experiments, when on draw the finger along't it, it moves as distinctly as an Earthworm makes its motions from y^e upper to y^e lower end. — Land Stones in y^e pelvis of y^e Kidney give uneasiness, w^ch is increas'd by their descent into the urethra, & if other instances can be shewn whre y^e stone gave no uneasiness, this is nothing more y^n what occurs in highly sensible Organs, as y^e bladder of urine & gall — In y^e pelvis of y^e kidney they are more fix'd & when they have remain'd for a length of time the Membrane grows thick & in some measure callous, w^ch is a means of nature to rid herself of an evil w^ch she can't otherwise get free from — next attend to the vascular structure of y^e Bladder of urine, from y^e vast quantity of urine voided some have conceiv'd passages from the Stomach to y^e bladder of urine but consider y^e number of Bowels, y^e density of membranes: y^t we are subject to Vomitos, w^ch does not drain off; y^t in quadrupeds y^e bladder is higher y^n y^e Stomach: & Eustachius found y^t on tying y^e Ureters y^e bladder after some time was not more filled y^n when y^e experiment was made: all y^e urine descends from y^e kidney into y^e Bladder & from y^e size of y^e vessels we can account for y^e The Renal Artery compard w^th y^e primary Arteries from y^e Aorta will be found to const^e a 15^th or 16^th of y^e whole mass, so y^t in the space of a day y^e N^o of lb. of blood passes thro' y^e Kidney, suppose at every stroke of y^e heart 3j. of Blood is thrown into y^e Aorta, & y^t there are 60. such pulsations in a minute, 60. will pass thro' y^e Kidney in a minute so 3600. in y^e hour; so we can readily explain y^e plentiful secretion of urine y^t takes place when the blood is loaded with water. —

having y.e Arteries within y.e Kidney we obs.e a sudden division into branches, few of wch. communicate wth each other: An artem. obs.e a little necessary here is an Organ secretd in its place, And subject to muscular action. — In y.e small branches we find an appearance y.t is singular, & y.t was first discribd by Dr. Nuck, what he calls Lobuli arteriarum termini; I find it falsly alledgd, y.t there are a bundle of minute vessels but there is an enlargemt. of y.e branches of y.e Artery: but these are not they arteriar.m termini; there is another division of y.e Artery before it ends in the Vein, y.e Lobule is in y.e course of y.e Artery & is better injected from y.e Art.a y.n from y.e vein whether y.e Tub. uriniferi begin from these Lobuli I am not certain but I have & think seen 'em but y.e Kidney, we find y.n y.t there is a further division & y.t at length uriniferous ducts begin, wch join in y.e common way to form larger ducts, & in y.e Tubuli we observe wch are y.e mouths of y.e trunks of these ducts, y.e Tubuli terminating in such a manner as to supply y.e office of a valve, so y.t Injections are generally stopd at y.e termination of y.e Tubuli: From y.e great size of y.e branches compard with y.e Artery, when a Calculus forms it is apt to appear in the pelvis, & to increase to such a size y.t it can't descend, so y.t an operation has been proposd for extracting it But this can't be done with.t dividing y.e large branches of y.e renal vessels, & adding to this y.e depth of the part, an operation is by no means to be advisd. In some few cases the Stone has worked its way outwards, matter has been found, & the Opening of an abscess has been mistaken for y.e operation of Nephrotomy. — It is right y.t we shd. be aware of y.e kidneys nature: thus if we find a stone stopping the Ureter, & yet y.e function of y.e part preserved it may be owing to the Ureter being double: With regard to y.e morbid appearances we discover y.t when y.e kidney does not mortify in consequence of an Inflam.n Suppuration soon: we wd. conclude y.t y.e patient would run less danger from y.e disease y.n where matter forms in the other viscera because it gets a ready outlet: but y.e ulcer is constantly irritated by y.e urine wch. is plainly an cause why ulcers heal here very difficultly — Next it is subject to Schirrus & when y.e occurs in y.e whole of y.e Kidney it must be attended wth y.e very worst species of dropsy: If y.e Disease occurs from a Schirrus of y.e Liver it is found y.e milder parts of y.e blood & y.e water is coagulable by heat: But when y.e matter passing by the Urine is

is often wavated into y.e Cavities of y.e body most readily yielding to it Even in y.e ventricles of y.e brain, w.ch frequently in the Case it must be attended w.th y.e worst consequences, & where y.e obstruction is lower, y.e effects are nearly y.e same as when it is in y.e Kidney itself. — As a Calculus forming here is a frequent cause of Inflam.n in the Kidney I have a strong suspicion y.t an inflam.n here disposes to the growth of Calculi w.ch circumstances lead to y.t notion, some persons are more subject to Calc.s Concretions y.n others, & there is no doubt a constitution that disposes to it & this is chiefly in the Kidney & a marked change may be made by inflam.n w.ch gives that disposition: — It begins to be found long before the Urine is wholly wavated: I have known small particles of Calculi within y.e Tubuli & at y.e inflam.n is often evidently brought on by Calculi, so if they get cold, or are affected by intemperance there is an unavoidable of y.e Kidney & a discharge of Sand, & here y.e pain of y.e Kidney seems to be y.e consequ. of this want of secretion, so if we find persons affected w.th pains after y.e Inflamatory circumstances are gone off it may be proper to wash y.e Kidney by a course of diluent Medicines.

Lecture 79.th

We shall now attend to y.e situation of y.e Testes within y.e body with a view of judging of y.e use of the Spermatic Artery &c. so far before it terminates on the Testicles, some of late yrs. have made us y.t there is nothing singular in y.e length of y.e spermatic Artery, y.t it takes its rise from the place it meets to the Testicle of y.e Fetus, & is afterwards drawn out from necessity: now I apprehend y.e notion is to be rejected, for here I shew you the Spermatic Artery of a Ram, now also y.e vast number of Convolutions w.ch y.e makes in its descent to the Testicle: I find by a calculation y.t if it was drawn out to a straight line it wo.d measure about 20. feet & we find y.e y.e Artery is larger at the Testicle y.n at its origin notwithstanding it gives off a number of Branches, surely we cant

authors this to be made in vain we must conceive a change is made necessary for the preparation of the Semen, y.t y.d length of y.e Artery is of use in a manner y.t we can't specify how after veering y.t in other animals we are tempted to draw a similar conclusion w.th regard to it in man, where we have reputed to find it taking its origin halfway between its original place in y.e abdomen & its after place in y.e Scrotum, i.e. at y.e bottom of y.e Linea communis, so y.t same change is made in it's decent in the blood depending upon y.e unusual length & thus for we may admit a name applyd chiefly by y.e Ancients to the veins, calling 'em Vena preparata. — You have next seen y.t y.e vein have an uncommon proportion to the Artery, perhaps some further use is to be assigned from y.e numerous large veins favoring y.e return of y.e blood to the heart, & we shall somewhere y.t y.e vein is more apt to grow varicose y.n almost any other in y.e body I have seen a great N.o of instances of varicose in it. In some few one it is swelled to such a bulk as to obstruct y.e skin of y.e Scrotum so may be mistaken for a rupture or other complaint; but if we apply y.e hand to the Scrotum y.e swelling is unequal & it gives a ful diff.ce from y.e Hydrocele or any filled w.th water: Dr. Boerhaave supposed y.t y.e red blood did not enter the body of the Testicle but we can give a general reason for y.e ducts within y.e Testicle, & we find considerable arteries dividing minutely upon y.e seminal ducts. — Next with regard to y.e Seminal ducts. — You see y.t y.e bulk of y.e Testicle is very much owing to a N.o of Ducts convoluted: w.ch from injection we find to be hollow tubes; in examining y.e size of these & examining y.e gen.l Bulk of the Testicle: I find y.t if y.e whole Testicle were supposed to be composed of such tubes the length wo.d be nearly equal to 500 feet near to a mile in length: now we can't accurately determine how much y.e real Bulk of it depends upon y.e red blood circulating in y.e vessels, but it is evident y.t more y.n one half of y.e bulk is owing to y.e seminal Ducts & y.e length of these is not less y.n 3000. feet in each Testicle. — The next point is y.e N.o ducts entering into y.e Composition of y.e Testicles w.ch is not so very difficult

to be determined as might be imagined: because in the
Testicles there is a structure y^t is altogether unq^l we find a No
of small ducts joining into larger ones, in the glands, & these
form y^e duct continually increasing but how y^e ducts run par-
allel to each other without any less or greater or any division
of any y^e land or knot from w^ch they are deriv^d, we would only
attend to y^e and w^ch communicates w^t y^e Epididymus, & y^e find y^t
from each person distinctly 150. diff^t ducts: & supposing y^e y^t
mercury has not filled many more half, there are 300. such tubes
composing each of y^e Testicles wch each may be allow^d 10. feet in
length. These are very often convoluted in such a manner y^t
we trace y^e course with difficulty; & the blood vessels divide
upon y^e tunica & inform y^e substance in a particular manner. I
have seen a colour'd matter pass from y^e Artery into y^e tubes
but I am not certain but some small Arteries might have
burst & given y^e tinge, & we fill'd em with y^e utmost difficulty
The division of these convoluted & serpentine tubes, is not
only form'd by blood vessels according to Dr Albinus but
there are thin layers of y^e Tunica fibrosa or Albuginea which
slide in between dividing one bundle from another tho' not in a
regular manner as an orange is divided by septula, when these
tubes run to y^e upper end back from y^e of y^e testicle they become
straight: we find vasa recta y^t come out from 'em, & there they
communicate, as there is as Haller first accurately explain'd a rete
Testiculi. — y^e two ducts of y^e Testicle communicate, just with in
y^e Tunica Albuginea, just adhering to it, & we find a number
of vasa recta coming out & conveying y^e Semen into y^e Epididymus
so called by Haller vasa efferentia, y^e No from 12. to 15. or 18. after
running a little way become convoluted for y^e description of these
we are much indebted to Haller. — Now these coni vasculosi run
to form the beginning of y^e Epid^s & after some time they
all unite into a single Tube, for upon fixing a Tube w^t mer-
cury into y^e vas deferens, & cutting y^e Epidy^s transversely
beyond y^e middle: I find y^t y^e Injection runs out from one
orifice only & upon separating y^e coni Vasculosi I find y^t
they all unite into one duct: this at first is not larger

than a single hair from a horse tail but gradually becomes wider as we come nearer to y.d vas deferens & I find that this describes Twenty feet at least before it terminates in the Vas deferens. (320.

Lecture 73d.

After the Semen is separated from the Testicle it acquires its properties, in a quiet in a great measure by stagnation and Absorption in passing thro' y.e seminal Tubes & vessels. an uncommon No. of Lymph.c Vessels arising from the Testicles. — One wd be surprized to conceive by what powerful Semen can describe so long & intricate a Course, & we must approve y.t there Tubes possess a truely muscular or living power, we can't obs. y.e contractions as in y.e fibres, but the nature of the thing & y.e above. y.t y.e patients have been found to occasion swelling in the Seminal ducts lead to y.e suspicion & in the Dog kind y.e Copulation is tedious because y.e vesiculæ Seminales are waiting to the Semen is bro.t round in y.t time in the Testicles, & it must pass quicker y.n at other times & there must be a living power to convey it, y.e viz a Tunica shifting in some measure — By attending to y.e Epidydimis we distinguish a swelling in the ducts, from one in the Testicle or Chord: the principal part of the Chord enters upon the inner side of the Epidyd.s & is longer y.n the Testicle on y.t the bottom of it can be distinctly felt: we likewise on y.t y.e & lighter to wind of y.e Epidyd.s beyond it's middle may be intercepted the Course of the Semen on y.t account ought to be cautious not to puncture it in the smallest degree, & some time ago a Soldier was treated in y.e Infirmary, who had a small tube in the Scrotum y.t scarcely admitted y.e head of a pin from w.ch there was discharg'd a liquor w.ch was undoubtedly y.e seminal liquor, & if any swelling forms y.t can press upon a single turn of y.e duct y.e whole organ above will be affected, & if it begins at y.e lower end of the Epidyd.s unless it is speedily

removed the whole Epididymis & Testicles will be affected. —
Then an abdominal vascular canal unusually situated, which instead
of coming out from the other usual end comes out from the other
by the Structure after the Epididymis has been divided may prevent
an impassable Stoppage of the Semen, which may still pass on the
Vas deferens: it takes place perhaps in one person out of
3. or 10. the vas deferens runs down at the back of the bladder then
end in the Vesiculæ seminales which was first well explained by
Dr Hales. — This then suppose the Intestinum Cæcum, & part
of it pressed against each other, & the vas deferens coming down
against it approaches nearer to the Vesicula seminal. & is more
involuted: & add to the Intestin. cæc. a No. of Intestinula Cæca
which make containing the Semen, & add to the same to the
vas deferens the surface is greatly increased with a view of
adding to the qualities of the Semen. — perhaps the prostate
mixes its liquor with the Semen within the penis; but it is not so
essential as the liquor in the Testes, for in some classes of animals
as in Birds it is wanting yet the Structure of the Testicle is the
same as in man, & it is only of secondary use — there is a quantity
of mucous discharged for a defence against the urine. —
The only thing remains is the motion of the Penis, some as Dr
Whytt, I have conceived that it depends upon an unusual flow of
blood made from the Arteries from their Dilatations being
increased. — The common opinion is that it depends upon a diffi-
culty of the blood thro' the veins, & if the veins are tied up the penis
is in a certain degree distended. — The only difficulty is to
determine the means by which the stoppage is made, for they have
been imperfectly explained by Cowper who has been chiefly
followed, that the Vena ischiadica penis runs on the pubis &
the muscles press it; but they rather draw down the
penis & make a pressure against the Corpora Cavernosa.
The Vena Dorsalis penis is a muscular & contractile power
for it is added & thicker than the other veins; the principal
nerves passes away from the Artery in a very unusual

...anner within the Lacteales Vasi, & is opposed to the action
of these muscles wch are in action at that time; & some degree
of contraction in ye Coats of ye seminale Seminales may assist
in emptying em and more ye weight of ye urine may dispose
to the Reaction of the penis, & the blood being effused into ye
Cells may cause or really form the distention.

A Demonstration of ye Structure of ye Female organs fully
explaind concludes the Lecture. Resp. Manns.

Lecture 7th.

After what we have formerly remarkd upon this Subject it
only remains to trace ye changes produced by conception &
to endeavour to explain ye manner in wch ye fetus is nourish.
The rudiments of ye fetus is deriv'd from ye ovarium & in
proof of this a number of circumstances occur.

1st The Analogy of oviparous animals, you have already
ye Cud of yolk adhering to the back of a hen, ye fetus is
connected wth ye yolk & is carry'd into ye uterus by ye Tuba
resembling exactly ye Fallopian.

2d It has frequently been found ye if ye ovaria are exhibited
of ye animal is incapable of generating, may we observe
3d There is no conception if from a faulty Structure or from
disease ye uterine Tube come to be stopped.

4th The fetus has been found wthin ye Ovarium & Egg in ye Fall.
pian Tube.

5th We can always demonstrate a change in ye ovarium
following conception, we find at first a hole in it afterwards
a cicatrix upon the surface & on cutting into ye substance
an appearance totally different from what is found elsewhere
that is call'd Corpus luteum ye name borrowed from Quod
speaks what it is most remarkable, it is a yellow coloured
substance, with a cavity within, & having vessels entering it in
great number ye Nr of holes & cicatrices, is fully equal always
to ye Nr of Fetuses in the Case of Twins we find two corpora
lutea, & in ye multiparous Animals full as many as ye Nr of

...ency, sometimes more, some having passed an abortion
...died within the Uterus, or without conception y^t. change
...not made in the Ovarium. Dr. Wm. Hunter has found an appearance
...of Corpora lutea in the Ovaria of Sow thistles, beyond all doubt
...at the time of conception or imm^y. after the Fallop. Tube is applyd
...to the Ovarium, grasps it by means of fimbria: for however
...inactive there may be appear beyond all doubt y^e. end of the
Fallop. Tube is thrown like a net upon the ovarium. — In Bi. do
the end of y^e. Tube is large enough to take in y^e. Yolk, and do
pellucid y^t. we cannot conceive any thing muscular in it: but
it is certain y^t. it does grasp y^e. ovarium, that has been found
applyd to it in Animals after death. — In consequence of y^e.
application a change seems to be produced in y^e. ovar^m. at least
it is more probable to imagine this, y^n. to suppose first a change
in y^e. Ovar. than after application of y^e. Tube & y^e. change does not
happen when y^e. Uterine Tube is absent. — Now we proceed no
farr with absolute certainty, y^t. some thing comes from y^e. Ovar^m.
& is conveyd by y^e. Tube into the Uterus, but y^e. nature of y^e. some
what is by no means ascertaind: whether an entire vesicle
separates, containing y^e. fœtus with its membranes, & containing
all y^t. is necessary, y^t. y^e. ambiment of y^e. fœtus is perfectly
entire in y^e. female & is expelld by y^e. male, or if y^e. female furnish
so much y^e. nutriment of y^e. fœtus, experiments are still wanting
to determine this, whether from y^e. Ovarium a valid visible entire
is discharg^d or if it merely furnishes a liquor: y^t. one of y^e.
vesicles burst, & y^e. liquor mixd with y^e. male Semen forms the
fœtus, we need further experiments to determine y^e. point.
Next suppose y^t. y^e. fœtus is within y^e. uterus, when it acquires
its Bulk, before we explain y^e. manner of y^e. connexion, we
shall shew y^e. necessity of y^e. Circulation being diff^t. from what it is
in the Adult on two principal accounts.

1^st. The want of new pulmonation from y^e. collapsed state of the Lungs
y^e. whole blood cannot pass through them.

2^nd. Vessels are necessary for the nutrition, for making y^e. connexion
between the fœtus & y^e. mother. Now first let us attend more

particularly to y^e^ whole prospect to y^e^ foetus for there are
two things to negotiating them y^t^ require an explanation an explanation we readily conceive y^e^ reason of a passage from the
from y^e^ right side of the heart to the left: but why might not
the passage have been sufficient: why do we find a communication between y^e^ auricles, & another between y^e^ ventricles: a very
little reflexion will explain y^t^ suppose one communication
only, & also y^e^ consequences, suppose it between y^e^ auricles
in y^e^ case y^e^ left ventricle of the heart & left auricle wo. in y^e^
foetus have circulated more y^n^ the right for taking any proportion
suppose y^e^ y^e^ foramen ovale had transmitted ½. of y^e^ whole mass
then remains ⅔. to enter y^e^ right ventricle, but y^e^ left ventricle
wo. have rec^d^. y^e^ whole ½. from y^e^ lungs & ⅔. from y^e^ foramen
ovale: Hence y^e^ quantity in the wo. must be perfectly equal
after birth who have been very unequal. Again suppose
y^e^ foramen ovale wanting & y^e^ communic^n^ only between y^e^
pulmonary Artery & Aorta y^e^ whole wo. have entered the
right, but a considerable portion wo. have passed by y^e^ left:
Whereas supposing y^t^ y^e^ foramen ovale is nearly equal
in size to y^e^ Canalis Arteriosus; & y^t^ nearly equal to y^e^ two
Branches of y^e^ pulmonary artery, we perceive y^t^ both ventricles
in y^e^ same space of time circulate y^e^ same quantity of blood
& y^e^ same applies to y^e^ Auricles Hence y^e^ just proportion
is preserved between them. For of y^e^ whole mass ascending
thro' y^e^ vena Cava one third goes off, & two thirds remains for
y^e^ right ventricle: the left auricle again receives from y^e^ lungs
what entered y^e^ pulmonary branches, & had passed through the
foramen ovale i.e. ½. hence each of y^e^ ventricles circulates
⅔. of y^e^ mass. — For y^e^ purpose of communication we have
vein two umbilical arteries, y^e^ continuation of the internal
Iliacs, & these again joined together carefully to guard
against obstruction: when they reach y^e^ placenta they immediately divide into many: from y^e^ placenta a single vein returns
to y^e^ vena portae. From y^t^ Canal back to y^e^ vena Cava: but
y^t^ Canal the called vessel arising from y^t^ veins, is much
smaller y^n^ y^e^ umbilical vein, & supposing it proportioned to the
rest we wo. say y^t^ y^e^ whole blood returning does not enter the
Vena Cava but a considerable portion of it afterwards passes
[illegible] y^e^ [illegible]

thro' y^e liver: There is some difficulty in giving a reason for the joining of y^e umbilical vein, with y^e vena porta & of y^e again with y^e vena Cava: I do not find a satisfying acc^t of it, I see only way in general y^t it is necessary y^t some more blood should enter y^e vena portar. before birth y^e is mostly furnish'd by the Stomach and Alimentⁿ Canal y^t in an inert state, hence a portion is sent from y^e placenta into it, & y^e rest into y^e vena Cava by y^e Canalis venosus: But I suspect there is another reason: after birth these Canals are stopp'd; now without any tying of y^e umbilical Chord y^e blood acquires no in it: but how comes it y^t y^e Canalis venosus is shut, as also y^e foramen ovale & y^e Canalis Arteriosus, these accounts w^ch no physiologists have yet explain'd in a satisfying way because an material circumstance is constantly omitted. — Begin w^th y^e Canalis Venosus. — We are told y^t after birth y^e circulation is more rapid in y^e vena Cava y^n before, hence y^e blood can't enter from the Ven. port. into it. But is not the rapidity equally increas'd in y^e Ven. porta & how comes it y^t y^e blood does not pass from y^e vena Cava in y^e port.? neither can we ascribe y^e stoppage entirely to y^e action of y^e diaphragm, tho' by it descent pressure is made upon y^t Canal: but further y^e Can. Ven. takes its rise from y^e Ven. port. in an oblique manner, so y^e force increas'd in y^e ven. port. seems to compress y^e sides of y^e beginning of y^t Canal, whilst the descent of the diaphragm changes y^e direction a little, & at y^e same time adds to y^e pressure. & further we see y^t nature disposes y^t Canal when there is no further occasion for it: to contract at its origin. With reg^d to y^e stoppage of the two passages, by and down the blood enters the y^e lungs w^th much greater velocity, y^n thro' y^e rest of the System: y^e force of y^e left Auricle exceeding y^t of y^e right as much as y^t of y^e one ventricle exceeds y^t of y^e other, so y^e number of y^e Oval hole, w^ch is disposed as a valve by y^e repeated contractions of y^e left auricle is raised to remain contiguous to y^e sides of y^e foramen by degrees adhere, & with regard to the shutting of y^e Canalis Arteriosus it enters y^e descending Aorta in an oblique manner, & y^e force of y^e blood being much increased thro y^e sides of y^t Canal are pressed together, & thus I find in y^e first place y^e shuts & its disposition to contract we can assign no distinct reason for, further than that it is useful & therefore happens. — Further with regard to y^e Setaceous we find y^t it seems

in water y.t y.e fœtus in all parts may be equal & its
organs gaine equally: at y.e same time it is less injurious to
Uterus: & y.e weight of y.e fœtus within y.e uterus is next to
nothing, while at y.e same time external accidents are guarded
against. Next it is supposed by a third & whilst y.e chief
purpose of this is to make y.e communication, & answers the
very material purpose, it is generally tyed to y.e fundus of y.e Uterus
preventing y.e fœtus y.e bottom of the uterus, whilst it is in a very
tender state; & it determines y.e head undermost, because the
Cord is tied not to the very middle of y.e body but beyond the
greatest weight is towards y.e Head, so at all times y.e head of
the fœtus is undermost, whilst by means of the water & length
of y.e Cord y.e fœtus can especially in y.e after m.o readily
change its posture; & the communication is generally made at y.e
top of the uterus, because there y.e weight of y.e fœtus & the
water pushes it's against y.e principal vessels destined
for its nourishment: with regard to y.e vessels of y.e mother,
we have seen the Arteries arising as in the Male, having the
Spiramatic Art. we find it joined w.th y.e Hypogastric, and
numerous Anastomoses spread upon y.e substance of y.e
Uterus; & that they run in a Serpentine way w.ch is not on
account of y.e dilatation of y.e uterus y.e N.o of turns being
nearly as great in the last month as in y.e first; but y.e Anast.
-motic vessels to prevent obstruction, & perhaps y.e different
Pimento meeting were to prepare y.e blood: for y.e Arteries of y.e
Uterus are most unnecessarily convoluted, without supposing
some such purpose. Next it is said y.t in delivery a N.o of
these Serpentine Arteries are torn, & y.t y.e open mouths there-
of remain within y.e Cavity of y.e uterus, as from attending to
this we conceive y.e natural & original structure: that the
Art. terminate by open mouths within y.e Cavity of y.e uterus
and y.e termination of y.e uterus is y.e same as of y.e veins.
I dont know how y.e idea that exist in y.t y.e menstrual flux
is venous & y.t y.e veins are more remarkable after delivery
than y.e Arteries. But I see a sufficient N.o of Arteries to

to discharge y.t blood, & it is easily made at y.e same origin where y.e fœtus is attach'd, y.t both are involv'd by one Membrane: when we attend to the placenta we find between y.e two lamina: when we attend to the placenta we find between y.e two lamina: when we attend to the placenta we find between y.e two lamina

the want of Conception, & only taken place after y^t Ovum has grown to certain bulk, y^e connexion between ye two is gradually effected. ——— But qy. to y^e nourishm^t of the Foetus whether it receives it by absorption, or if there is a Circul^n between it & the Mother. For as to ye usual question whether it is nourish'd by what it receives thro y^e umbilical Cord or by swallowing y^e Liquor Amnii; there entering into y^e Intestines seem to have conceiv'd y^t y^e animal can have alike y^e connexion between ye by means of y^e Cord were wanting, y^e w^ch y^e Liquor Amnii is drawn from y^e vessels of the Mother. But in y^e Quadruped we can shew y^t the membranes of y^e Foetus are supply'd by y^e vessels from y^e Foetus y^t y^e Amnios is full of vessels w^ch arise from y^e umbilical vessels y^e Liquor amnii is a secretion from y^e Foetus. It has been alledg'd y^t hairs were found in y^e Intestines of a Foetus of y^e Ox whose skin w^ch was shewn y^e Liquor Amnii is swallowed but from y^e improbability of y^e thing, it wo. require some very clear expt to prove the fact, & perhaps it was only some filamentous substance y^t was mistaken for hair. — It only remains then for to enquire whether there is a Circul^n between y^e mother & Child or if y^e Child receives its nourishm^t by absorption. — The latter is y^e most gen^l but by no means y^e most just opinion. I am disposed to believe y^t there is a circul^n between y^e mother & Child. Tho' I can by no means give a clear proof of it. There existing y^e Circul^n obs. y^t in hedgehogs & some animals are nourish'd by absorption w^ch is true; but then it is absolutely necessary & the nourishm^t is prepared before hand; & therefore we see y^t as there is no such receptacle of prepar'd matter for aliment in the viviparous animals a circul^n is necessary. They say further y^t it is altogether inconceivable y^t y^e vessels of y^e Foetus & those of y^e Mother, w^ch they and doubt are originally detached w^ch meet so as to form anastomosed Canals. But we shew y^t y^e fact takes place in wounds y^e vessels of y^e Cicatrix unite or communicate from opposite sides; & y^t same may happen in the Uterus. — In Quadrupeds they tell us there is no

continuation of Canals for we perceive y^e glands of
appearing of a white colour containing milk, where as y^e
contains red blood, & upon throwing in an Injection, wash
away the first & But too much dependance is had to
the success of Injections, it is difficult to imitate every
common circulation as in y^e brain or Spleen, to make an injec-
tion passe from y^e Arteries into the veins we do not make an
injection passe from y^e arteries into y^e vein, nor can we make
it follow y^e circulation when y^e vessels are extremely tender
Besides how do we know y^t y^e arteries vessels are not con-
nected, & passing in y^e Quadruped there is no circul^n we
can't apply y^t to y^e human structure w^ch is very different.
In the Quadruped we find glands w^ch are destin^d y^t are in-
tended to prepare a liquor of a milky nature, & whether circul-
ated or not is capable of nourishing the parts in the
human body there is no such structure, Before proceed
from imagination; & we find only arteries divided and
far from having come to the Extremities
So upon the whole we must conclude y^t y^e most reasonable
& just opinion is y^t there is a circulation between the
Mother and Foetus.

Rule 76.

We shall now proceed to give some acc^t of y^e Venereal Disease
& shall know y^t y^e venereal poison is not convey'd by the Air, but
must be only when it is directly apply'd to y^e surface of y^e body,
may be y^t it from being volatile y^t it runs scarcely thro
we tho' apply'd to y^e round skin of y^e common hardness, when
it is apply'd to y^e softer parts as the glans penis, the Lips
the papillæ of y^e Breast, it then has its effects & it generally
occasions an Inflammation of y^e part before it enters the Con-
solution, but it may enter y^e thinner & tender parts of the skin
so as to taint y^e mass without occasioning Inflam^n & ulceration
When y^e poison affects exposing y^e outer surface of y^e glans
Penis there is an inflam^n generally attended with swelling a
pustle sooner than an Ulcer, from this a Bubo is afterwards
produced, & the other Symptoms of the disease.
Next we attempt to prevent the Chance making further

progress of Threatening Bubo. — You know y.t y.e poison in such cases is conveyd from the Glands by y.e Lymphatic vessels chiefly into the Bubo, y.t there is a translation of y.e Venereal poison from the Glands to the part affected & the heart, since y.e groin y.e ossa pubis, Glands & the Inguinal Cluster alone swell, sometimes there is a pulmus produced at the Top, producing an Oedema down the Thigh, seen remarkable in y.e Wholesome stain. — Now if we wd. reason abstractly upon y.e cure of a Bubo we wd. say y.t y.t being to bring it to a suppuration is y.e safest course because we discharge y.e poison already lodg'd in y.e gland, & in some measure prevent y.e further intercourse between y.e Glands & y.e System y.e matter being discharg'd at y.e opening But in this method Buboes are not used at present the Hope of time thereby y.e best way is deceiving it, & the most effectual way is by giving the patient mercury in such doses as to touch y.e mouth w.th y.e salt other medicines most readily discussive y.e Bubo & instead of rubbing y.e part with Ung.t Mercurial, at y.e same Time apply y.e Saccharum Saturn. poultice. — In treating Buboes when they come forward, a small incision made at y.e bottom of y.e sack containing y.e matter is sufficient: & after y.e incision we continue y.e Sacch. Saturn. poultice as before: After y.e poison has by passing upwards into y.e Thoracic duct, & into the adjacent veins been mixd w.th y.e mass of blood it lies quiet for some Time without producing any disorder, but the Consequences are sad, some weeks or more generally month, thereafter as y.e matter is evidently multiply'd before we feel y.e effect of it; by mercury we can prevent the fatal determination of y.e disease, w.ch preserve y.e mercury thereby upon y.e general mass. — The poison after floating in the mass for a certain time generally first appears about y.e Amygdala of the throat, if nothing is done to correct it next it readily affects y.e Skin, & generally in y.e hard part of y.e Cheeks y.e bones come to be affected &. & y.e periosteum of y.e bones first suffer & afterwards y.e bones come to be affected

generally upon the Surface of y.e hard bones or the
hardest parts of the soft bones most readily vesters &
in some Cases we find y.e the Joints are liable to vesters
In my practice we Modes of treatment I have frequently found
ulcers appearing in the Throat and swellings produced in
the side of the neck, but sometimes this y.e disease is neg=
lected and swellings of y.e Lymph.c glands dont appear
We may also further y.t there is no Case of Lues venerea cur=
able by mercury, w.ch cannot be cured by it in its mild form
for y.e is made into an Ointm.t and rubbed into y.e body
or made into pills & taken inwardly & y.e all Mercurial
preparations may be laid aside entirely & y.e want of
a cure is for a want of sufficient time y.e most
simple & safe Course is the Rubbing y.e mercury w.th Honey
& then baking it into a paste with bread: three grains
of mercury are sufficient for many or twenty to give in y.e
W.t Powder: & in a recent Case 3. 5. or 6. weeks will be suff.
icient & in a very inveterate one double the time: and it is
meant to be pushed further y.t to produce a slight soreness
in the Mouth: whether y.e medicine acts by a discharge
or without it is not certainly known, but we may say
a great deal on both Sides.

Let us next attend to y.e effects of y.e poison when y.e Urethra
vesters or when the Gonorrhœa. or it is inoculated
as it is produced. — Some are all without doubt owing to
the opinion y.t y.e Gonorrhœa & Lues Venerea are both distinct
Symptoms of the same disease a vesters occasioned by
the same poison — But how are we to imagine y.e poison is
conveyed into y.e Urethra? There is no difficulty in y.t y.e might
be imagined, but has produced various opinions, Some suppose
y.t the Lymph.c vessels are absorbent veins conveying the
poison from y.e Surface of the glands into y.e membranous
part of y.e Urethra: others conceive pores upon the Glans
like Sponge sucking it in, whilst the most common and
just opinion is y.t it enters at y.e extremity of the Urethra
for the Coats of the absorbent vessels is not inwards for

far from a Stranger y.t poison is carried outwards to the Inguinal Glands.—Now we must enquire y.t it enters at the Extremity of the Urethra, but without having a very distinct notion about it: I can't satisfy myself whether it enters like water or air between two glass plates or rather y.t y.e mucous of y.e urethra whilst y.e Coats of the penis are distended with blood, is pressed out at its extremity: & when the penis is detumified y.e viscid mucous remaining & y.e poison entangled with it, falls back in the passage. Animalcules have been found in the urine & Astruc did not enter to dispute it but now: but there were deposited upon y.e mucous hanging upon the nose w.ch by an effort of respiration was drawn up again: In some such way it enters y.e urethra.—Next let us consider y.e effect it has upon y.e membrane of y.e urethra.

1.st Is it distributed y.e mucous serves as a defence against y.e venereal poison I doubt very much whether we suffer more from the disease by mucous glands pouring out matter into y.e urethra, or less: I apprehend less: The mucous perhaps conveys y.e poison into the Urethra: but if we were to suppose these Glands wanting & y.e poison apply'd to the Urethra, we shd. have suffer'd more from the disease than we do, as in the measles, w.ch disease is said to have a determin.n to the mucous glands: I wd. rather say y.t it has a determination to y.e skin & parts of excernment matter, but y.e y.e parts, y.e nose &c. suffer less y.n they wd. do without y.e Mucus.—So the very tender & sensible Membrane wd. have been more injur'd without y.e mucous first with respect to the mucous organs as composing a part of the Urethra.—We find in any part of the body from irritation y.e Lymph is increased, as y.e tears, Saliva y.e mucus; & y.e venereal poison may have y.e same effect: so we explain the first effect, y.e increase of mucus from irritation. Afterwards it comes to be discharged from y.e Lacunæ of Inflam.n & y.e putting a Bougie into a wound person will

occasion a similar effect to a change when y^e urine has continued longer there is usually a yellow & greenish matter mixed with the clear mucous, & upon examining y^e liquor with y^e microscope you will see a vast number of globules But we are not to imagine y^t waters any thing of y^e Venereal Disease for y^e same succeeds from a mixed matter from irritation & has been this appearance in a Gleet: after y^e person left off y^e use of medicines Caswell without any bad consequence we it is only y^e effect of y^e inflam^n and irritation. — With time y^e poison is multiplyed in the Urethra in a manner w^ch it is by no means easy to account for whether y^e change be owing to y^e glands irritated in a certain manner & in consequence of a certain kind of irritation producing venereal poison; or whether y^t there is some chemical process, or some degree of fermentation it is not to impossible to say: if the mamma is sound & inflamed we find a cancerous poison produced, tho' there is no original cancer: whether the like happens in the Urethra, or y^t there is a chemical process is not easy to be determined: but y^e only useful practice, y^t it is multiply'd, w^ch every one knows, y^t it is a natural progress of the Disease, to assist y^e urethra both further & further backwards to its beginning, & y^t tho' it is first made over the prepuce yet by degrees & in a manner I do not pretend to explain depending upon the same principal as y^e original affection it goes deeper towards y^e vesica urinaria: and the use of y^e Urethra & Sphincter of the bladder. — & we find chiefly portions of the Urethra are evidently affected: we find Excoriations in a few places, w^ch are an obliteration of certain of y^e mucous Ducts: & the patient in making water finds a pain more in one place than another, & the using injections backwards assists to at that particular place, & introducing a Bougie has the same effect: & when a true fistula is formed, we are not to compare y^e affection of the membrane of the

urethra to the effects produced on the mucous glands in common. — In y^e Cure of the Gonorrhœa mercury is most certainly one of y^e most powerfull Antiphlogistics, & tho' the pulse is quicken'd by it it is not y^e Inflammation is diminish'd & in lieu of a Bubo or Chancre when there is an Inflam^n we can't discuss y^e Bubo more readily y^n by giving mercury. — generally as soon as y^e mercury is felt in the mouth the Inflam^n subsides in y^e Urethra & the Cure is compleated soon. — The last affection in consequence of Gonorrhœa is suppressing a swelling of the Testicle. — The Testicle is swell'd or assaulted from y^e Inflam^n in the Urethra & y^e in two ways. — First the swelling of the Urethra falls upon the mouths of the Seminal Ducts, prevents y^e discharge of the Semen. — Next y^e Irritation is communicated from the mouths of the ducts, just as when an irritating Substance is put into y^e mouth or thrown into the Eye, then is a discharge made from the Salivary or Lachrymal glands: In Confirmation of this as the Gonorrhœa naturally attacks y^e anterior part of the urethra first: & only by degrees going deeper. Seldom we the swelling of the Testicle produced by y^e most violent Gonorrhœa when recent: It is only when it has crept back to the mouth of the Seminal ducts. And I have seen it occasioned from ulcers of the bladder from stone & in consequ. of y^e Lateral Operation y^e new inflam^n occasioning it. & it is y^e beginning of y^e war descends from y^e Epidyd^s: y^e first swell^g & y^e swelling is gradually communicating backwards thro' y^e Epidyd^s & the Testicle now swells like y^e whole of the Epidyd^s is assaulted: & when the swell^g subsides I find y^e first falls in the End of y^e Epidyd^s: next the War descends, and gradually backwards to the body of the Testicle: y^e affection evidently proceeding in y^e manner. Now from this view we are led evidently to the Cure — Mercury is not more necessary in the Gonorrhœa y^n here

But a great attention is necessary to y^e Antiphlegis
tic Cures, on account of the delicacy of the Tortile &
violence of the Inflam^n w^ch have now made D^r Sa- into the
Urethra & sometimes there is a degree of venereal strangury
w^ch ensues to prove the same thing. ——— The method of Cure
is plainly this y^t as soon as the swelling is observ^d y^e Vein
out to be bled the quantity to be determined by y^e Constitut^n
in Applic^n: after drawing it slowly from the Arm, if the
Inflam^n continues & the taking a greater quantity judged
improper recourse may be had to topical bleeding, & we
ought to apply Leeches, not to the Scrotum in the beginn.
we shall vomit better if we apply the Leeches to the root
of the penis. & if we apply a poultice w^ch may be made
of Saccha. Saturn. ℈j. Aquæ ℔ß. with Bread & vinegar, in-
stead of confining it entirely to the Testicle let it also cover
the penis. & we may lay the warm Bath & Foment^ns
The patient is also to be laid horizontally, as the raising
the body must bring on considerable pain. ——— After the
Tumor has subsided, later begin to give mercury in small
quantity as there is a possibility of y^e matter of Gonor. be
into the blood notwithstanding we have not observ^d the
Intervention of a Bubo.

Lecture 76.

A Demonstration of the Glands & their Structure

We have now seen gentlemen y^e vascular Structure of all
the Glands & glandular viscera: It remains y^t we explain
y^e beginning of the several ducts & endeavour to determine
whether y^e Arteries communicate with them or not in the
same manner as y^e communicate w^th y^e circulating veins
& y^t their ducts only differ from veins in this y^t they end of
the duct does not terminate in the heart, & y^t y^e liquor differs
from the general mass: & whether a receptacle, bag, or follicle

be interposed. — Are we to imagine y^t a Branch w^ch by cluster and globule takes its rise from y^e Arteri & terminates in an ex-cretory duct, or y^t there is a bag or follicle interposed, into w^ch y^e Artery pours the Liquor: we shall now review what has been shown or intimated with regard to our glandular Organs: Begin. with y^e fatty bags, we observe w^ch y^t in exception of y^t y^e whole fat of Animals, not only y^e marrow w^ch was supposed to consist of round bags, but the fat is all divided into bags of a minute shape, painted with vessels, so y^t bags or follicles in y^e glandular Organs are perfectly indisputable: And the whole of y^e Tongue is made up with an injection of y^e bags or follicles given it y^e admirable, numerous Arteries running upon 'em: Next in y^e organs of generation particularly in y^e Ovarium we perceive round Vesicles filled w^th a Liquor, no doubt of y^e highest importance this vesicle opens at the Time of Conception & it is painted w^th Vessels — & we find in the Male long tubes forming y^e Testicle & y^t y^e Semen is deposited into these, & y^e communication of the Arteries w^th y^e tunica of the Seminal Ducts may be compared to y^e communication between y^e Arteries & ducts of y^e Intestines With regard to the Liver y^e divisions are so minute in this Organ y^t it is not to impossible to determine y^e 1^st beginning of the Biliary ducts because y^e lobules are very much in-terwined. But as we have it in our power to dilate the ducts we see y^e y^e biliary ducts begin likewise from very minute Bags, such as the naked Eye does no way's take in —

Lecture 17^th

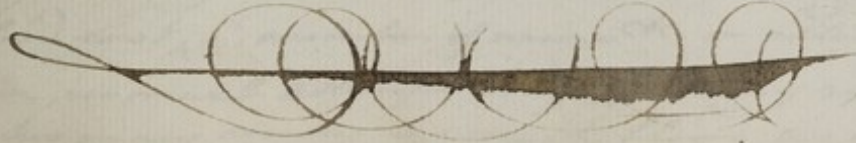
In our discourse on the glandular disquisition still remains I am afraid in my understanding y^e changes made in our blood by y^e glandular — And we can trace y^e and globules in their whole Course & yet we cant see how these are form'd from the food; it is effected by y^e general Circulation, but w^th regard to y^e particular manner we certainly dont comprehend it — In speaking of secretion we must include a variety of Circumstances; & first of all enumerating all

all y.e occurs to us, others still remain the effects of w.ch escape us. We see the Arteries of glands supplied in very different situations, at different to distance from the heart & y.e direction various greatly, some going off at acute Angles, others at right angles, next there is a great disproportion in y.e size of the Arteries compared w.th y.e Organs on w.ch they terminate; in their length &c. we cant but suppose that these various circumstances have great effect as the Coats of the Arteries are of different thickness. In the Liver the Secretion is made from blood y.t has undergone a circulation, & y.r force of which is more broke than in any other part of our body. So that long before the Blood comes near to the gland as to the ultimate termination a proper preparation is made for the Secretion: and we need not inquire chiefly w.th Ruysch that the Glands represent Sieves, y.t the Secretion and changes depend upon the ultimate terminations of the Vessels &.

Lecture 78.th

Having finished the Structure of the Chylopoetic Viscera and those of Urine & generation & remains that we examine some posterior Branches of the Aorta descend on the Trunk of the body, next we follow y.e Aorta divided a above the pelvis, discribed to the Muscles, & pursue the Vessels to the Inferior Extremities following the external femoral Artery with the accompanying Veins.

A Demonstration of the Nervous System.



Lecture 79th

You have seen that the Trunk of the Aorta within y^e. Abdomen is close to the Spine, hence y^e. swelling & Stroke of it are entirely outwards as y^e. in many persons, y^e. containing parts of y^e. Abdomⁿ being pushed backwards, we can distinguish y^e. stroke: and sometimes persons have been suppos'd to labour under Aneurism of the Aorta from this Circumstance, — Att y^e. fourth Lumbar Vertebra it divides into two equal Branches a Thing is nothing^g. found in y^e. distribution of y^e. vessels, w^ch. has determined us to prefer one Extremity to the other & in fact if by any accid^t. the right Iliac comes to be disabled persons, very readily learn to give y^e. left leg y^e. preference in performing the motions; & this may serve to confirm y^e. reason of y^e. preference mankind in general give to right Arm, y^e. particular division of y^e. Aorta has a sensible effect. — The Aorta runs outwards not in a direct line to the Thigh, but in order to avoid y^e. Cavity of the pelvis a considerable Angle is form'd, & y^e. blood meeting against the division with considerable force y^e. may explain what we find of, must after the beginning of the Aorta from y^e. heart y^e. division of it at the Iliacs, is most subject to diseases as Ossifications &. The principal Artery of y^e. Uterus is y^e. Hypogastric from its situation an Experiment have been proposed to make pressure on y^e. top of the Femoral Artery in order to prevent y^e. menstrual flux & I have accommodated to be done, but without being satisfy'd of the effect, as either missing y^e. Artery and applying the proper pressure. But it is evident y^t. y^e. pressure upon this Artery must increase y^e. momentum of y^e. blood in the Uterus, & in many cases at least promote y^e. discharge If by any accident y^e. femoral Artery shd. be wounded, we may not only save the life, but the Limb, Jones's Thigh amputating at the Top of the Thigh, w^ch. from y^e. Quantity of blood lost, y^e. number of nerves &. is attended w^th. y^e. utmost danger, so must attempt to tie y^e. Artery in y^e. future y^t. y^e. branches may convey as much blood as is necessary & going lower y^e. prospect of success continually increases because of the more numerous Anastomoses. Within

There are but few cases we have two or three cases of y.e kind when Ligatures prov'd successful, wive one in y.e London medical Essays, & 2.nd in y.e medical Commentaries I one quoted & told in an imperfect way by Hunter. As the Artery passes downwards to y.e ham it lies near to the Bone so can stop y.e blood by a Tourniquet by pressing y.e femoral Artery against the bone — Attend to y.e exact Situation of y.e Arteries in order to find one after Amputation: There is no difficulty in finding y.e Trunk of y.e femoral in the Thigh: But in the leg two of the Arteries are more connected to membranes; y.e Anterior Tibial is connected to y.e interosseous membrane in such a manner y.t Sanguine attention to detach it: y.e difficulty of passing this is such y.t y.e Surgeon sometimes ties the thread round y.e bone; but y.t includes y.e periosteum, & w.e threads of y.e muscles & as y.e nerves are divided but very minutely some of y.e Membrane may be taken in. — When we trace back the blood from y.e foot, we dis. y.e same gen.l structure as in the Arm only y.e deep seated Veins are larger & y.e outer of course smaller, from the great activity of y.e Superior extremity performing more varied motions, so y.e blood is more in danger of being stopp'd: & y.e deep veins don't divide into so many branches, but they are larger & therefore a Surgeon in performing Amputation will be under a necessity of tying y.e veins as well as the Arteries The nerves of y.e inferior extremities are very like those of y.e Superior ext.e I need not make many remarks upon them In y.e bending of the body forwards when a Stone descends thus y.e motion has been explained from y.e Ureter crossing obliquely y.e Anterior branches of y.e nerves in the Groyne N. B. y.t as y.e Cremaster muscle is thrown into Action, & drawn upwards: we are not to suppose y.t y.e Ureter can make any such mechanical pressure upon these Nerves. But first an irritation is communicated to the neighbourhood, an Inflamation is excited; & suppose y.e Hydraulic System detached from y.e nerves which not

shows any contraction of y^e^ Remedies, it is from
an instan.^t^ spreading immediately to y^e^ neighbouring
Organs & this situation in an instan.^t^ of y^e^ psoas muscle
chiefly produces some y^e^ ease of y^e^ patient finds in that
posture, by the parts being relax'd & not y^e^ muscle in
a spasmodic & convulsive action; for the patient can
tho' with pain extend y^e^ body before y^e^ psoas.
I need scarcely obs. y^t^ in all operations we ought to avoid
y^e^ Cause of these nerves, as much as possible & the
Surgeon is with y^e^ utmost care to detach y^e^ nerve from y^e^
ligature. - I met with a curious case of an injur'd nerve.
An Officer was wounded upon the outside of y^e^ fibula, the
knee buckle was drove in upon the place; from the time
of the accident he cou^d^ extend the foot fully, but it was not
in his power to bend it again, - again he could extend the
toes but cou^d^ not extend them again, It immediately
occurr'd to me y^t^ it was occasioned by the Trunk of y^e^ nerve
being caught against the bone; by drawing blood from
the part with Leaches and scarifying y^e^ part sometime
to Time & applying blisters he came to be relieved.
Going lower to shew all nerves: I need not warn you to
avoid carefully those that run upon the Sides of y^e^ Sheaths
of the Tendons. - In practice Surgeons commonly commit
an error as when they treat of y^e^ paronychia, because y^e^ Tendons
runs in y^e^ middle y^e^ Incisions are made in y^e^ Sides of y^e^ finger
now other things being equal let y^e^ Incision be made exactly
in y^e^ middle for at y^e^ side we are in danger of puncturing the
Nerve w^ch^ is as large as those near to the Elbow, I shew it is
next to impossible to avoid the nerve, next w^ch^ reg.^d^ to y^e^ nerves y^t^
accompany the Veins we can have no doubt of nerves equally
large; wounded in y^e^ inferior Extremities will produce Symptoms
equally dangerous as in the Superior.

Lecture 80.^th^

I find it necessary to give you some Idea of y^e^ manner
in w^ch^ some of y^e^ more powerful Medicines act upon the

Body of Animals viz. whether they assist in this
power only of y^e^ part to w^ch^ y^e^ medicine is applyd; or
whether they operate by entering first y^e^ alimentary & after^wds^
the Circulating System — and as y^e^ Experiments made have
been done upon Frogs, I shall give a description of y^e^ structure
of that Animal. — In y^e^ heart we find one Auricle only
& one ventricle; because y^e^ Lungs or air vessels are supply'd
from a Branch of the Aorta, abt. 1/3. of y^e^ mass of
blood passing thro' the Lungs. The Lungs are situated
not within a Cavity, but are within y^e^ Abdomen
only there is a passage leading from the Throat thro' the
Diaphragm into y^e^ Abdomen & Air vessels. In other respects
the Frog agrees with Man in general Structure, y^e^ brain
Cerebellum & Spinal marrow & nerves sent off and
dispersed in a similar way. The Aorta divides into two
branches, within y^e^ Abdomen again they are united, but y^e^
does not alter the general Curve. — It may be proper to
mention further, that this Animal, w^ch^ is very tenacious
of Life, after the Circulation is stopped by cutting out y^e^ heart
can move its body, walk on y^e^ floor for an hour and
upwards, if y^e^ blood be stopped in a single member only
y^e^ Femoral artery cut. I can move y^e^ Leg for 1/2 hour
& the Sensibility remains in the Leg after y^e^ Circulation
has ceased for 3. or 4. hours. When we cut y^e^ nerves of any
part as of the Posterior Extremities, altho' by doing so you
render y^e^ part immediately motionless & insensible, so y^t^
the Animal is not capable of drawing into it, no where
y^e^ Leg is injured in y^e^ most violent degree do by burning the
Foot, it does not express any marks of pain by making
a motion of y^e^ anterior part of the body, yet y^e^ Circulation
is seen in y^e^ membrane for upwards of a year, by y^e^ microscope
we visit to be seen and rapid in y^e^ minute vessels, & yet
there is no discovery of either Sense or Motion. Now let us

ou in what manner we may try y^e effect of remedies,
I endeavd to ascertain y^e way, some medicine, suppose
Opium, acts on the body in a wound state, I pound it into
the Stomach, injected it into the Rectum, & applyd it to the
Surface: & it is y^e same w^th all the ways provided we allow it
to remain long enough in y^e Animal in violently affected but
not killed by y^e external applic^n as certainly as by the
internal: if we pour the medicine into a deep cavity of y^e body
as within y^e peritonæum, or under y^e skin by making a hole in
it, y^e effects are much more violent & sudden, & y^e animal is
killed in a short space of Time. Now after obsvg y^e effects of dre
sev^l ways, y^e Circulation & nerves power remaining entire
I after y^t attempted to ascertain: how far y^e effects depend
upon y^e nerves alone or vessels alone & - First upon the nerves
I cut out y^e heart & applyd y^e Opium, in y^e way in w^ch the
Animal can be most violently affected, by pouring it into
y^e Cavity of y^e Abdomen: & found y^t in a very short space of
Time y^e muscles of y^e most distant extremities of y^e body
were rendered useless, a degree of motion remained but it was
convulsive & y^e animal was so weak y^t it was not able to
crawl from y^e place where it was laid; & it appeared w^th
y^t all the nerves of y^e body may be affected by an applic^n to a few
of them, y^t there is such a connexion among & somewhere
or other y^e single nerve injured brings all the others to suffer
in the most violent manner, & y^t there is a Sympathy
among y^e nerves. — But on pouring y^e Opium under y^e skin
of the Leg, in w^ch y^e Circulation was stopped contrary to expect-
-ation, I did not find y^t I cou^d communicate y^e Injury to y^e rest
of the System: y^e nerves in y^t part were indeed unhinged, as
soon as y^e Opium reached y^e muscles, all motion was at an
End, yet y^e Injury was not communicated to y^e rest of the
of the N. S. This opens a view y^t the accompanying vessels
in a manner we don't understand altogether fit y^e nerves
for conveying their impressions
remain sound at y^e beginning
no it is not w^th y^e Circulat^n
of the nerves there is more than

this in it. y.t y.e nerve depends upon y.e artery at the
beginning alone. I next cut y.e nerve of a parts. hartshead.
y.e Blood vessels save only. Sciatic nerve issuing from the
end of the Spinal marrow; To make sure work I divided
every thing but the bottom of the Aorta, y.e vena Cava and
probably y.e Lymph.c vessels running on their backs: yet
opium applyd to the hind extremities of y.e Animal influ-
=enced y.e whole body: & in no very great length of time is
not much longer y.t when y.e animal was altogether sound
So opium affects y.e body not merely by touching y.e nerves:
e.g. Taking Opium into our Stomach we can by no means
perceive y.t y.e whole influence depends upon y.e nerves of y.e
Stomach & y.t y.e others sympathize; but we may be assured
by opium entering the Lacteals & conveyd into y.e mass of
blood, not y.t in a mechanical way influences y.e Hydraulic
System, but the nerves of y.e Circulat.g vessels are affected. &
this thro' these all y.e others nerves: To shew in some measure the
possibility of y.t I must spend a useful near to y.e heart and
pound into it a small dose of y.e solution of Opium: as soon
as it touchd y.e heart, y.t Organ ceasd from motion: or I
cut thro' y.e Aorta, as spend it, to prevent y.e communic.n between
y.e heart & y.e rest of the body, then dipt in y.e ligatures a
few seconds y.e most distant parts were bet.r to sympa-
=thize, so y.t y.e nerves are affected in y.e most distant parts
by y.e affection of y.e nerves of y.e heart, so y.t Opium intro-
=duced by absorption in a great measure in y.e like manner
Or to shew more clearly again y.t are nerve influences y.e most
distant parts with.t conveyance by y.e circulat.g System I
may add another Experiment. — Laying bare y.e Sciatic nerve
of a Frog, & touching it with y.e most minute dose of Sp.t C.
y.t instantly deprived y.e nerve of its power: & I constantly
found y.t tho' y.e Animal be thrown into water & the nerve
was not yet in a day or Two thereafter it dies, & not of y.e mere
injury done to the Sciatic nerve, for when we burn it with a
hot Iron, or cut it thro' y.e parts of y.e nerve are soon reunited

yet we can scarcely know the first law: but if poison
goes deeper into the N. & yet whole N. S. comes to be injured this
view, now after considering these effects of opium I
need scarcely insist on the effects of ardent Spirits, or of fo
=ential Oils, as Camphor, only from the nature of the last,
we can shew that the whole is communicated to the most distant
Organs unchanged, & these organs put into water give the
taste to the water: so that the animal is killed in consequ. of
the absorption of these medicines, as well as by their direct
operation upon the nerves: or upon the whole we are very va=
=riously affected by medicines, as by the matter of diseases
acting upon our body; for besides topical medicines which
scarcely affect the parts at a distance, medicines by acting
merely upon a single nerve, this the nerves alone can affect
the whole System; or poison being circulated thro may have
the effect, & chiefly upon the nerves of the circulating System
further we find that some medicines have a topical determin.
an organ is more affected by it then another, all the rest
of the System however tho' not primarily, comes to be affected
in a secondary way, the heart. Organ primarily affected
exciting antipathy. These suppose may enter the lungs
& vessels, there feel its influence, the pulse is affected, before
it fixes on any organ, the venereal poison is killed flat
on the general mass: but in consequence of its attacking
a heart. Organ all the rest may come to sympathize. —
So the operation of medicines fermentation & multiplying in
the mass may be more complex than is generally apprehended.
Now after premising these facts we are better enabled to judge
of the nature of the nerves which we proceed more directly to con=
=sider — you know the origin & the manner of their course
That a nerve is the production of the medullary substance
of the Brain covered nearly with the same coats as the Brain
an inner vascular, a vascular being the pia mater: & an outer
sheath, either the same altogether or very like to the D. Mater
And we have seen that in almost every part without the head;

with y^e exception of Ganglia, y^t Thread of y^e nerves
are laid parallel to each other: we have seen on dissection
a very minute division of y^e nerves into threads; but applying
y^e microscope, we see y^t division carryd on as far as our
senses go, especially if we have recourse to y^e observ^n of Leuwenhoek
almost ad infinitum. — Now first we consider here, whether
y^e nerves are to be look'd on as solid Cords, like wires, and
by Tremor; or are we to suppose y^t they are hollow Tubes
conveying a fluid within them: or are we to imagine perhaps
y^t whilst they convey a fluid within, they in some other
manner vary how or other, conduct some other fluid y^t is still
more subtile? Now with reg^d perhaps to these several points, we
can only form some very gen^l Conjectures with^t being at all
able to determine ourselves: y^t most comon opinion rejects
y^e Idea of solid Cords, acting meerly by vibration, and
there are many circumstances w^ch concur to y^e notion: You
have seen y^t y^e nerves are extremely soft at their origin: if
they appear hard in their progress y^t depends evidently upon
their Coats; again when they come to ramify as in y^e Eye
or Ear we perceive y^t the Coats are laid aside: nay if y^e nerve
is not to be subject to motion or pressure, as y^e portio mollis
of y^e Auditory nerve y^t Coat are altogether wanting:
And we find so many nerves inclos'd in y^e same bundle, y^t
we can scarcely have any Idea of them communicated to one
without communicating it to others; we find no determin'd
proportional length & tension: on y^e contrary tension is
avoided, branches untyd down preventing y^e reg^r Tremor,
And what is stranger y^t all y^e, such an Idea is repugnant
to y^e gen^l analogy of animal bodies: wherever we perceive
fluids circulated, & cords cut out, there are tubulous, for
obs. y^t y^e most minute thread, y^e smallest nerve taken from
one Animal tyd around y^e nerve of another so as to compress
it, altogether interrupts its influence, so there is little
probability y^t y^e nerves if solid cords, operate by Tremor
on the contrary there seems to be y^t degree of probability

but no absolutely certainty y^t they convey a fluid.
We can determine nothing from looking at a dead nerve: we
can give no credit to those who pretend to have seen a fluid
distilling from a nerve; nor are we to reject y^e Idea because
it cannot be seen, since y^e nerves divide into parts so minute
& subtile y^t if they contained a fluid we could not render y^t
an object of sense: we might as well deny fluids to in y^e body
of a mite because before a microscope we dont see y^e motion
of them, and the nerves of y^e Eye for instance divide into
parts exceedingly minute, far beyond whatever we conceive
tile we made a calculation w^ch we can make w^th tolerable
accuracy. — If I can distinguish with y^e head of a pin at the
distance of 12. feet, y^e diameter of y^e figure upon y^e retina
is as much smaller y^n y^e head of a pin as y^e distance
from y^e pin to the Eye, is greater y^n y^e distance of y^e lens
from y^e bottom of y^e Eye: Entering into a Calculation in
this way it is easy to prove y^t pictures are sometimes
found y^e diameter of w^ch does not exceed y^e 20.000 part of
an Inch; Especially y^t picture in distinctness to y^e nerves:
because we can judge of its parts, y^t one part is more
round y^e another, so small as in the Retina y^e nerves are
y^e 50. or 100. part of an Inch in their diameter so that it is
impossible to perceive their Cavities or y^e fluid y^t conveys,
so as to judge from probability, or by reason upon it:
by comparing y^e Brain with other parts, or attending
to y^e phenomena of y^e nerves. — The Brain resembles
some of our glandular Organs in its appearance we
may compare it with y^e kidney, there is a vascular &
cortical Substance within y^t within y^e Brain what is
called medullary substance; & y^e same name has been
applyed to y^e tubular mineferous part of y^e kidney:
perhaps y^e nerves may be compared to y^e Tubuli mini-
iferi; or at least there is a distant resemblance betw^n
these Organs: & all the Organs y^t have y^e appearance
of blood distributed upon & y^e end out hollow Tubes
or ducts. Farther we observe y^t pressure upon the Brain
tho' not so much as to destroy its Substance: has been

mind to bring on convulsions of y^e muscles. —
That however is meerly a probable argument y^t something is
squeezd out: but it may be occasiond many ways, as
from irritation to a certain degree. But we know that
moderate pressure upon a nerve to lose its influence,
as when we sit upon the edge of a seat y^e whole leg
sleeps, & we remove the pressure we feel somewhat
getting into y^e member, notwithstanding pain: we are almost
afraid to raise off the seat, as if something had been
accumulated, & imp^t descended into y^e nerve, w^ch more
than common violence. But I say can a muscle and
y^e nerve running to it then cut y^e nerve across; y^e muscle
become inactive, but may be raisd into action by pressure
during it: but there is an other way by moderate pressure
upon the Nerve, if we press it in y^e most gentle manner,
without stretching it, we are sensible of a motion instantly
following, as if we had determind somewhat from the
nerve down into y^e muscle. So the most probable opinion
is y^t y^e nerves convey a fluid. Still however we are very
far from being certain of this, because very circumstance
may admit of some other explanation. & I only mention
it as more probable than any other opinion yet
formd. — How far we are to add to this, that whilst y^e
nerves convey within them a fluid, they are likewise
charg^d with some other without them or in their Coats
w^ch I shall consider afterwards. — Next to proceed
to their particular offices. —
They serve as has been shewn in general for sense &
for motion. They are said likewise to serve for nutrition.
That the two offices are most justly assign^d to them is
beyond all reasonable doubt, for y^e most simple ar-
guments y^t I have mentiond once, & again prove it. —
When we cut a nerve y^e Animal suffers no injury, no
pain, from irritating y^e member beyond the incision. —
In like manner y^t member loses y^e living principle

of the Animal, it have all further power upon the muscles
y.e animal has it not in its power to perform any motion
with the muscles of the part, supposing y.e Circulation to
continue much as before. — But are we likewise to suppose
that the nerves properly serve for the nutrition of y.e Blood
body — i. e. That y.e food we take in first enters y.e Absorbent
System; after the circulating System; from y.e part to
the nerves, & from the nervous system nourishes the several
parts, given to em their bulk, repairs their waste: Is this
to be our opinion? or are we to conceive y.t y.e nourishment
after being conveyed by y.e absorbent System into the cir-
culating, is immediately applyed for y.e growth of y.e parts
by our Senses? I shall submit this point, wch is evidently a
most simple Idea: will be found to be the just one, and
that the other is altogether to be rejected. I imagine we
find the clearest & most decisive arguments to prove this.
Let us examine the Arguments of those who imagine y.t y.e
nerves directly nourish y.e parts; & let us first be aware
that the Arguments employed by many ingenious men
in favor of this Opinion are to be view with Caution, because
they have it in view to substitute a particular System as
regard to the nature of y.e Energy, by wch nerve & motion are
performed. They must join in allowing a probability of
the Brain performs a secretion, therefore y.t y.e nerves con-
vey a secreted Liquor. But supposing y.t y.e is not sufficient
for nerve & motion, they wish to get rid of it & therefore
suppose that y.e is y.e use of y.e secreted Liquor from y.e brain
I shall now state the Arguments fully. — First they
observe y.t the Brain in very young animals is remark-
ably large. That beyond all doubt is true, y.t y.e brain &
nervous System bear a large proportion to y.e whole in a fœtus
than in an Adult. But not contented with this they proceed
one step further & assert; that y.e brain exists before y.e heart
Therefore y.t y.e Brain may nourish, or y.t it certainly does

nourishment of the appearance of its own size. Now I wd
be very loth to treat any opinion entertained & propos'd
by men of great ingenuity otherwise, as an absurd one; but
we can't consider this argument in any other view. It will
be found meerly an instance of a want of attention, & for this
plain reason, without any appeal to y^e very accurate facts
shewn'd by Dr Hales in prov^g the growth of the Fœtus, y^t most com-
=plete performance on y^t Subject y^t has ever appear'd, in w^ch
assume y^t all y^e parts are original, & y^t there is meerly an
evolution of them: or, without observing y^t other parts bear a
large proportion in y^e fœtus, y^e Liver, Thymus &c. Hales fairly
observes y^t y^e several parts, the Liver, Lungs &c. were invisi-
=ble in the first days, as well as the heart, but when they
became visible they were at once of a large size, &
were only invisible from their pellucidity, & that y^e heart
was seen at y^e end of the second day, when it once appears
large. Let us think to what strange opinions this would
lead us. All the parts at first are invisible from their ex-
=ceeding smallness, now I wd desire to know how they ever come to
be visible, and whence does the Brain accumulate its Bulk
Are there any other sources by w^ch nourishment can reach y^e
Brain, but by y^e vessels leading from the heart? how does
it nourish itself? not to enquire how it nourishes the other
parts. Or, what is Brain? does it only consist of medullary
threads; or are we to conceive it as consisting also of a
Cortical part & that vascular, with Membranes &c. Of
y^e former, we only say a part of the Brain pre-exists: how
is the rest afterwards added? I wish to find vessels communi-
=cating this y^e medullary substance. Surely we are led into an
absurdity in imagining that the Brain can grow, with-
=out a source of growth. Beyond all doubt then y^e heart
exists as soon as the Animal exists, & nothing can grow
without it, because all liquors are convey'd first to it.
It is next alledg'd y^t a palsy'd member shrinks in its
Bulk from y^e nutrition not being properly convey'd into it
by its nerves now this fact is much exaggerated, for

making a deduction for the edematous swelling, supposing it still smaller than it appears, yet the disproportion is by no means so great as has been alledged. I have kept Dogs 15. or 16. months after I have divided the nerves of the Extremities & there was no very great shrinking of the muscles, & what shrinking does actually happen may be accounted from the want of motion, from the muscles being kept long in one situation: In luxations fractures, &c. where the muscle is long without motion there is a considerable degree of shrinking. & this will much more readily happen, if to the want of general motion, of flexion & extension there is wanting that particular motion which the muscle immediately is the antagonist of the muscles possessed, & taking it in another view the returning Arteries of the part want the nervous Energy presently applyed. If we cut the nerves of the Salivary gland there don't presently the Secretion presently, & quantity of united Liquor is very much diminished. Now we imagine that if the Arteries possess the power of exerting the nourishment by this power will in like manner be impaired by the weakness of the nerves. So we may mistake a secondary for a primary effect that the do not immediately convey the nourishment but must assist the Arteries in making the secretion of the nourishing matter, as they assist us in making the Secretion of other Liquors

Lecture 81st

We had begun more particularly to determine the office of the Nerves. I observed to you that many eminent Physiologists following Boerhaave and others had supposed the nerves primarily used for nutrition. And in proof of this they pretend the Brain exists before the heart. This we found not only contradicted by the late experiments of Dr. Haller, who endeavours to shew that there is a mere solution of the vessels & organs: but the Idea when fully considered, is repugnant to reason.

We farther shewed with reg. to another argument they adduce the shrinking of paralytic members, viz. is not greater than might be suspected, when we admit the nerves actuated the Arteries: that in this case the want of due nervous energy operates in a secondary way only. We now proceed to shew

are mar decisive; and altho' as two theories are proposd,
One that the nourishment is from the nerves. The other that
it is from the Arteries. It might be sufficient to establish y.d one
in order to reject the other, Yet I find room for shewing first,
that the nerves do not primarily supply nourishment next it
is y.t the Arteries do. — First we find y.t y.e nourishment is
convey'd by y.e alimentary into the circulating system. Now do
we observe any peculiar determination of it from the heart to
the Brain? certainly not. But next do we find any appearance
in the fineness of the nervous fluid, w.ch is such y.t we are far from
being able to prove its existence, and the grossness of y.e alimentary
fluid? Do not we observe y.t the food by repeated Circulations
undergoes various changes, is converted into acid blood, and
into many other yearning Liquors, y.t acquire convertible
Alterations, in order to fit them for the several purposes they
serve; so we imagine that a sufficient change may, & could
be made for the purpose of nutrition also by the Arteries without
the intervention of the nerves. — Next let us attempt to
lay down some notion of what is meant by nutrition. — In
many Instances we can't separate the notion of nutrition
from Secretion pursued by the Arteries. The humours of the
Eye are supply'd by the Arteries, and y.t supply conveys to us y.e
Idea of y.e nourishment of the Eye. — In like manner don't we
consider a person who grows lean, is wasted as having been
deprived by nutritious parts? If again. he grows fat we conceive
new nourishm.t added, we can't separate the Idea of nutrition
and of Secretion into y.e different faculties. — So if we perceive a
young animal grow rapidly, y.e bones enlarge, we conceive
an addition of earth, a new nourishm.t added to the bones. —
And so various are y.e parts of the human body y.t we must
suppose the appropriations varied; and we find the variety in
other respects effected by the Arteries, the Saliva separated in one
Organ, the Bile in another; so we may suppose Anatomical
organ separates oil, another Earth, another Water. — applies
But the uniform texture of the nerves, contradicts to
y.e nerves

this Idea, we can't suppose y.t such a change is produced in the Brain, as y.t on nerves conveyd fat, another Earth, a 3.d water &c establish y.e Idea of a variety of fluids conveyd thro' our nerves. — But do we not observe y.t y.e repair of the waste bears a proportion to the Brain? In man it is larger y.n in other animals; but the repair of the waste in them is much quicker, nay, we find Fœtuses without the Brain, & in male y.e nerv.s parts of the body have been of the usual size and firmness; & take y.e body in its sound state, do we find y.t the parts, grow in proportion to the n.o of nerves? many of y.e most invisible Organs grow quicker than the visible: thus y.e growth of the Fœtus in the Placenta, where no Anatomist can observe any nerves, & make experiments upon the nerves, cut the nerves deprive y.e animal of its motion, y.t it neither professes sense or motion in y.e member, yet the parts is tolerably nourished, there is no remarkable shrinking, &c.a wo.d happen if nourishment were derivd only thro' y.e nerves. And what is more I find y.t whilst y.e Animal remains motionless & insensible the Circulation goes on fair, there is a repair of waste, & supply of any part cut away. if I crack y.e bone I find a luxuriant Callus produced, & an Argumentum Crucis I have given a deep colour to the Bones of Animals by feeding them with madder, without observing y.t y.e smallest tinge was communicated to the medullary substance of y.e Brain So the nourishment of the Bones, is not conveyd by y.t medium And the shewing y.t the nerves do not nourish furnishes many arguments y.t the Arteries do. — I repeat that the nourishment is mixd with the Arterial blood, is distributed uniformly by the Aortic & pulmonary Systems to all parts; we find changes made on the food, Arteries capable of varying & altering the fluids, And of performing all other Secretions: why make y.e Secretion of the nourishment an exception to the general rule? the same operation y.t applies water into the Cavity of the pleura, suppose or Adipose Cells between the fibres of the body, will apply it to y.e nerv.s

ts of the body, we are readily conceive that the
Absorbents do the one, as the other. But further How is the body
wasted? By the absorption of the veins: the veins take in
all the waste. Do not the Arteries correspond with y^e veins
in any other Circumstances? so as we find y^e absorbents
taking away the waste are we not to believe y^t they
correspond in carrying branches of the Arteries supply it?
We can't bring an experiment so decisive for y^e nutrition
of the Arteries; I mean of tying a large Artery & seeing the
effect. Because if the Blood is totally intercepted y^e part
mortifies; if there are Lateral Branches there can't be.
But after the humoral Artery is ty'd the member for a
considerable time shrinks, & we also in the Case of drains
or Issues y^t there is a shrinking in the neighbourhood. —
But we can in another way shew y^t the Arteries primarily
supply what is necessary. — After the nerves are divided:
Callus, the Loss of Flesh, of Skin, is supply'd by y^e Arteries
& we can trace the new Arteries into the new formed sub-
stance; the Arteries are numerous in Proportion of every
kind. But we then to say y^t an Artery can supply 2. or 3.
Inches of y^e Tube, but y^t afterwards it is not able to supply
the waste of it. So it is beyond all doubt y^t the nerves do
not primarily convey the nourishment, but that this is
done by the Arteries. — After what I have mention'd I
think it unnecessary to enter upon any other Argument
made use of by those who are of a contrary opinion. They
tell us that a rarified Liquor in the Brain is not fine
enough for nerve and motion, it must serve then for
nutrition. — I^dly. observe upon this y^t perhaps it is taken
for granted rather than proved; & if it is to be avoided how
far a rarified Liquor is fit for nerve and motion: But
granting y^t it do not perform nerve and motion I will
venture to allege y^t the person who shall prove y^t will
prove at the same time, y^t they do not convey a rarified

fluid. We are not to conclude therefore y.t it serves for nutrition, but only y.t the Brain does not rightly separate a fluid convey'd to it by nerves. — Hence arises y.t we confine the office of the nerves without the head, for sense and motion only, so far as we yet know, now let us consider each of these offices more particularly. Physiologists to inform us an improper term, speaking of nerves they call'em y.e only sensible parts that y.e nerves only perform sense. — But meaning to define with precision, we say only, That y.e nerves are so disposed in the body of an animal as to give it the sense of Injury done to the body, just as a blind man judges of objects by a staff; we are not to imagine y.t dreadful pain, y.t the principle within us, & in all animals y.t perfects y.e Brain, that they feel pain in the nerves, y.e nerve only gives the Idea; or renders y.e mind of y.e animal, seated near its origin, sensible of the Injury. It is material to attend to this because we perceive y.t from want of attention, some appearances perplexe us w.ch admit of a ready explanation. — If a man has had a Leg amputated and you irritate y.e end of the stump, y.e end of y.e Sciatic nerve, he feels pain but not in the thigh or stump, but in the toes, in y.t part w.ch y.e nerve naturally terminates in. And apprehend y.t in doing this he follows not merely a habit, but that such feelings are inherent in our very nature; & if the same experiment was performed in the Foetus, it wo.d be attended with the same effect. So Physiologists have used a term of Sensorium Commune, some part allotted y.e Origin of the nerves in w.ch feeling is exercised. Next y.e nerves enable us to act w.t our muscles & apprehend y.t by their Influence alone we perceive y.t power, and are to reject y.e notion of Haller, & apprehend it will be found y.t muscles have no vis insita. Haller supposes the muscle capable of contracting itself independant of the nerve. The Heart of a Frog beats an hour & more separate from y.e body And we can have no Idea y.t y.e nerves energy is lost from

the nerve into the muscle. But perhaps we can explain this in a different way. Do we better understand how the vis insita is excited than we do how the nervous energy is excited? We understand neither, but both equally well. — Next let us explain the following experiments, do not we find that whatever substance, applyed to the nerves & brain diminishes their energy, or deprives them of it, has the same effect upon the muscles, e.g. Opium deprives all the muscles of their power, applyed to the most distant nerves: & this same medicine brot into contact w.th the muscles with the heart, deprives it instantly of its power, if a single drop be suspended into the ventricle of the heart; it is not capable of the smallest contraction, & such substances as irritate the nerves, excite their power, never fail to irritate the muscles, add to this a further observation that when we cut a nerve we should deprive the muscle of the intercourse w.th the living principle; but if it possesses a vis insita independ.t of the nerve it should remain in full vigour for ever. But after I have destroyed the Sciatic nerve, & kept the animal a convid.le Time the muscles of the member were so inactive, that I could not be sensible of the smallest Vibration when irritated: and after all we are led by Haller into the strangest confusion, if we admit a vis insita, an independant power, not capable of receiving its direction from the nerve: & somewhat sent from the brain by the nerve into the muscle, giving the direction &c. And I do deny that the muscles are found from the nerves, or that we are to call in the moving Powers of the nerves following Boerhaave, there is no foundation for this. We must suppose the veins with new Forms which if they have new Forms any meaning, lead evidently to an erroneous one, For compare a muscle & nerve together we observe the muscles of the human body in all Animals are of a considerable degree of hardness, & firmness from their Office possessing toughness & strength, but the finely nervous matter is very, to all appearance inactive, I have slit the Coat of the Sciatic nerve with a Lancet, the fibres remained without the smallest appearance of motion. —

must compare y^e^ size of a nerve & of a muscle, shall we imagine y^e^ Crural muscle for instance, stand by a nerve like a packthread: & shall we grant that they divide into branches y^t^ even of w^ch^ is larger than the trunk; but that one thread is parallel to another: If this is the case y^e^ supposition of y^e^ are expanded into such a volume is inadmissible, and an Argument. Cæteris wo^d^ say, If y^e^ nerve be cut & y^e^ muscle be the continuation of it, y^e^ muscle sho^d^ shrink immediately afterwards: but muscles after a long time, deprived of the nervous Energy, remain nearly of the same bulk, we are to consider y^e^ muscles as machines, only influenced by the nerves, y^e^ mechanism of which, we are perhaps very much ignorant of: or to give some Idea of what I now mean w^ch^ regard to our ignorance of a muscle, & of its nature, & this Ignorance obliges me to use a gross comparison; but we may compare a muscle to a dry'd sponge, we throw water upon it & make it shorter, in like manner are muscles are capable of contraction, of being acted upon by the nervous energy; but are incapable of action without it; & we are by no means to fancy y^t^ y^e^ nerves form their very fibres. — The great difficulty is to be able to acquire an Idea of the manner in w^ch^ y^e^ nervous energy can produce its effect. On that head we must to say somewhat of the nature of this Energy. And particularly whether we are to imagine y^t^ it is derived in the manner of a vibration from the vesicles of y^e^ Brain, or else Cerebellum, or, y^t^ it is of a very different nature, viz. to the electrical fluid, or, to the fluid named by Sir Isaac Newton Ether: or, y^t^ it is some fluid very different from this, y^e^ properties of which we are perfectly unacquainted with. Of late years many Ingenious Physiologists, from not being able to conceive the manner in w^ch^ it is exerted, call it a watery fluid, w^ch^ performs nerve and motion, have adopted the Idea of an Etherial matter, or electrical fluid acting along our nerves. But perhaps a misapprehension has been the chief circumstance y^t^ has led many to such an error, a supposition or: in Haller's great work you will see y^t^ it has led him into such a supposition. — The first observes the frequency with w^ch^ our muscles vibrate, many times

in a minute; then our muscles resemble each other what ever power one we may apply to another, so suppose we act with a muscle in our foot, as of the great Toe, Haller calculates y^e^ distance of the Brain from y^e^ muscle, call it 6 feet, She finds in a minute a great number of vibrations performed by this muscle, hence he concludes y^t^ y^e^ nervous matter must pass with an almost infinite velocity. Now if Haller had only proved one circumstance true: his Calculation might have been very further: viz. That when y^e^ muscle vibrates y^e^ Energy, the fluid, call it whatever nature, comes from the Brain into the muscle: But he overlooks a Circumstance), y^t^ we may suppose, tho^ch^ does take place, That the nerve is full of its energy from end to the beginning: so y^t^ y^e^ velocity may be very inconsiderable instead of being great according to his Calculation: or to shew y^t^ the Calcul^n^ is by no means perfectly grounded, suppose I open the water pipe behind us, it comes at y^e^ distance of 6 miles and I might turn y^e^ stop Cock a number of times in a minute Am I to multiply these and determine y^e^ velocity of the water? & tho he and others shew y^t^ y^e^ nervous energy comes from its first source in every motion, these Calculations prove nothing. If any Injury is done to the Toe, y^t^ moment it is communicated now if the Energy is not in the nerve how is it communicated? It only proves upwards because it is full of it in its whole extent; or cut out the muscle with its nerve, and we find a vast number of Contractions are excited; and as we have endeavoured to shew y^t^ there is no vis inita, it follows that a very minute portion of y^e^ influence is sufficient for the purpose. So we have no proof from such arguments of any great velocity of the nervous fluid: & we find nothing which vicarted fluids are incapable of performing. — But next let us attend to further views, or facts. Can nerves & muscles operate by means of an electrical, or Ethereal fluid, what is the use of y^e^ Brain & Cerebellum? If we admit the Abp. Idea of secretion y^e^ use is obvious. Are we to compare the Brain to an Electrical Globe exciting this fluid? It is surely by a process

compaison, How next does this matter pass along y^e^ nerves? how is it prevented from communicating its influence from one thread to another? Why does it not escape from the nerves as y^e^ electrical fluid passes thro' y^e^ body? So far as they are loaded with a watery fluid, we do not find y^t^ they are more capable of conducting such a matter, than any other part of the body equally wet. If the Brain somehow or other excites the fluid by the blood moving thro' it, the man a person exercises himself, y^t^ he spends tho' he fatigued, now of this Energy being excited & collected, or how does a slight pressure upon the nerve stop y^e^ energy? tho' I make y^e^ pressure with any kind of substance, as with a nerve taken from another animal, tho'd round so as not to injure its texture, and the Energy totally ceases, or cutting it thro' altogether and replacing y^e^ nerves, bring y^e^ parts in contact, all influence ceases, On separating a member, and allowing time for the escaping of such a fluid, we still find y^e^ energy remains. Instead these of solving the old difficulties we seem to be adding to 'em. And tho' I am far from conceiving how any watery or rarified fluid performs the Office of the nerves; yet I conceive it as well as when we substitute some other very penetrating & elastic fluid: Do we conceive better of the Action of y^e^ muscles from a doing of Electrical fluid working upon it; or some other rarified matter? Or do not we suppose we y^t^ changes equally wonderful are produced by rarified fluids; y^e^ body it is form'd; y^e^ generation of animals depends upon it; we understand not how but we can't deny y^e^ fact So upon the whole, all we can say in this — That it is the most probable opinion, tho' far from being a probability next to certainty, y^t^ there is a fluid in the nerves, for less can we form y^e^ most distant Idea of y^e^ nature of y^e^ fluid, or of the manner in w^ch^ y^e^ mind of Animals operates upon it, nor is it reasonable to expect y^t^ y^e^ nature of it shall ever be understood: if it serves to connect y^e^ material & immaterial parts together, as we are ignorant of y^e^ nature of the mind, we shall be for ever ignorant of y^t^ chain by which mind and body are tied together. Having now spoke

of the chief offices of the nerves, & so far as experience will allow, of the nature of the nervous energy. For it is as much a point of sound philosophy to know where to stop as to know when to proceed. Let us next trace y^e nerves from their beginning to their termination observing y^e same method. — We begin then with the Coverings of the Nerves. The dura mater defends the Brain; & when the Nerves are sent off gives a covering to them; is produced with out the head with them; & somewhat of y^e same general nature with the Dura mater accompanies them in their progress, and this is evidently for their defence, that the dura mater in the same manner as to the nerves, as to the Brain within the head. We need no other proof of y^s than y^e analogy of y^e first pair with the second, y^e olfactory entering their holes in the nose needs no sheath, but y^e second pair passing to the bottom of the Eye, & exposed to the action of the muscles of y^t organ needs the sheath. So with regard to the 5^th pair consisting of two Branches, the portio mollis within the Os petrosum wants the sheath, whilst the other portion without it receives the dura mater, tracing a nerve to its termination as y^e Optic nerve into y^e Retina, y^e dura mater is again laid aside. So we are never to connect y^e office of the nerve with that of this Coat. — Next we must with a Coat of more consequence y^e pia mater w^ch covers y^e whole convex face of the Brain entering into all its convolutions, & from y^e membrane there are branches plunging into the Cortical Substance & y^t is connected to the medullary, & y^t we have no instance of a Cortical matter y^t does not produce medullary; or we find no medullary substance y^t can't be traced back to the Cortical. So we perceive y^t the Pia mater is a membrane of the utmost consequence to the Brain; & yet I do not know how it has happened, but no Author applies what he observes with regard to the Brain to the nerves in their progress, now it will appear y^t y^e pia mater is y^e whole extent of the nervous system furnishes to the nerves in their progress what it does to the Brain at their Origin: For y^e

We observe in the Spinal Marrow a Cortical Substance (360
a cineritious matter, now surely y^e Spinal marrow very much
resembles any of its branches dividing farther; so we may
look upon it as the principal nerve of the body; y^t whilst y^e
chief part in the production of the Brain & Cerebellum, an
addition is made of the new and Grugy or matter, and we have
reason to believe y^t y^e case is the same with any other nerve;
y^t as y^e surface of y^e Spinal marrow and y^e medullary part
is Cortical, so y^t every nerve is Cortical. Compare y^e white-
ness of y^e medullary Substance with y^e threads of y^e nerves
after they have left the Brain, they are of a brown ashy col-
our, the threads loose their whiteness, & appear to do so
after we have seperated, as much as can be done y^e pia mater
from 'em. Next let us remark y^e want of Brain in many
Animals being natural; and that in the human body
when the brain has been wanting, y^e same kind of state of y^e
nerves have been found, & not very much smaller y^n if y^e
Brain had existed; Away this gives some notion that, y^e
power we ascribe to y^e brain, may be in part supply'd by y^e
nerves, we feel only by a nerve what about y^e origin of y^e
Nerve, but a new and Grugy, mixed in y^e nerve can ac-
tuate a muscle; so let us attend to y^e effect w^ch stopping y^e
Circulation in y^e vessels y^t accompany y^e nerves has.
Attending to y^e common Idea of the nerves being drawn
from y^e brain, y^e stopping the Circulation should by no
means have the great effect observed of preventing
the nerves from communicating its influence backwards,
to the rest of y^e System: if the Femoral Artery is tied,
tho' we apply Opium to y^e inferior Extremities we are to
bring on the want of motion, it is not communicated
thro' y^e nerve, unless the Circulation is carried along w^th it,
so we shall be tempted to imagine y^t y^e use of y^e Pia mater
is much more extensive y^n is supposed, by y^e y^e vascular
coat serves more important purposes y^n y^e merely
conveying a nourishment to their Coats; so y^t diseases

of y.e nerves may depend more upon topical causes, & be more remedied by medicines applied to the part than we are taught to believe. In most affections of y.e nerves y.e disease can be traced to the head; but we may suppose considerable diseases to take place from y.e want of a due circulation along y.e nerves in their Course or progress: Next going deeper we find y.e medullary part of y.e brain very intimately connected with the Cortical. We find again y.e y.e nerves coming from y.e medullary part are evidently y.e continuation of its fibres. We can trace y.e threads of a nerve a certain way into y.e medullary substance of y.e Brain. But I suspect y.t we are by no means to conceive y.e y.e Brain serves only to form nerves for sense & motion; there are other latent and important functions performed, we wd. be inclined to think so from observing y.e various directions of the threads in the medullary substance, from y.e much greater Bulk of y.e Brain than all the nerves; we find many Bundles of medullary fibres directed to opposite sides of the Brain & not to y.e beginning of y.e nerves, in comparing different Animals together, we find upon y.e whole y.e y.e Brain & y.e degree of Sagacity vary in some kind of regular proportion. In man we find by much y.e largest brain proportion'd to y.e size of the body & y.e Quadruped y.e Brain is larger y.n in the Bird: in y.e Bird it is larger y.n in Fishes, therefore functions of which we are no ways acquainted & can give no explan.n are better effected by a certain modification of y.e brain, & y.e powers of y.e mind by y.e certain modification of it seem to be expanded: we can't help drawing a Conclusion of this sort from merely considering y.e more obvious Circumstances.

Lecture 82.nd

I have endeavoured to prove y.t the Arteries, not the Nerves, were primarily for nutrition: I therefore confined the offices of these; to two chief purposes, viz. to render no

sensible of injury done to the body, or of impressions made upon it; or to enable us to act with our muscles: But y.t within y.e head we are to view y.e medullary fibres of the Brain as one y.t further supposn of a medium betwen mind and body. We now proceed to trace y.r nerves from their Origin, to their termination & to observe the effect of connexion among them whether within or without the head. First then appears to be no room for imagining y.t y.e office of y.r Brain and Cerebellum are essentially different, y.t y.r one serves for the Animal, the other for the vital functions. For we find y.t y.e 1.st 2.nd & 3.d pairs are deriv'd from y.r brain: y.e 4.th & 5.th from the Cerebellum; but y.e 6.th others are deriv'd from y.r medullary substance of both intimately united. Next let us confine our view to y.e origin of a single nerve; in a few places we can perceive y.t y.e nerves are united to both sides of y.e brain. I remark this more particularly of y.e optic nerves, y.t in man as well as in other animals we can trace them to both sides, But if we are to judge from y.e dissection of most of the others we wd. suppose y.t they take their rise from one side only; yet plain obs. = vations seem to prove y.t almost all our nerves have a double Origin. For if y.e right side of the Brain be injur'd, from Hippocrates down to the present Time, it has been observ'd y.t both sides of the body are affected, & it is difficult to determine wch side suffers the most, or taking y.e in a general way, we find y.e origin of our nerves to be more extended y.n at first sight we are apt to suspect. — Next supposing them from the head and spine, in many places they are connected; & upon the whole y.r connexions are of 3. diff.t kinds. To begin with y.r most simple in y.r Axillary plexus, or in the nerves y.t are to supply the inferior extremities, there is a joining of two or more nerves into one bundle, y.e end y.e compose equall in size to those wch enter into it; after they have run some way they are again seperated, or more new ones formed. Suppose next y.t a couple of muscles are to be suddenly

with nerves, we find a division & it is in this way y.t each muscle receives branches from each of y.e nerves, or y.t the first nerve supplies y.e 1.st & likewise y.e second muscle and the second the same. — Another kind of connexion appears, for example in the face, we see nerves coming out of holes at a great distance from each other, and after spreading into threads these are connected together in a way, representing y.e Anastomoses of y.e blood-vessels: opening of y.e sheath &c. y.e same things seem to happen as in y.e former Anastomoses, at least so far as we can judge of minute nerves, there is a crossing of threads, & no interruption of y.e threads at their union: the intention of y.e is, y.t if by any accident a nerve in its progress happens to be cut or compressed, all y.e muscles in w.ch y.e nerve terminates may still preserve some share of y.e power. — But a third kind of connexion is by means of Ganglia. We find a number of nerves, as three between y.e Vertebræ, running together, & when they meet a gr.t increase of bulk or knot is produced: & from y.e opposite side of that we find distinct threads again went off, in some instances nearly of y.e same size; but in others larger y.n the threads w.ch enter, & more numerous in their appearance. And tracing y.e threads thro' on the change their colour & appearance in every respect. The ganglia are redder y.n y.e nerves, resembling the colour of a Lymphatic Gland, & it is as difficult to shew threads running parallel to each other thro' a Ganglion as to shew threads in a conglobate gland, y.e substance appears compact: So we are much at a loss to determine y.e nature and use of Ganglia. — I am inclined to believe y.t the threads of y.e neural nerves are here more intimately intermixed, y.n in the former connexions; & there may be other latent purposes w.ch they serve, such as have neither been guessed or conjectured: for the various opinions look into Hallers 4.th Work: Some Authors consider y.e Gangl.a as muscular Organs serving to push on the nervous fluid, whilst others consider

them as forming an additional nervous influence; these again suppose y^t a more intimate communic^n is made here, y^t y^e fluid is found out into certain receptacles, and again conveyd to all y^e branches: and of late years Dr Johnstone has at a great length endeavourd to prove that the Ganglia are interposd to intercept y^e power of our will, & thus serve to render certain motions of the body involuntary; such as that of the heart; because it is evidently unsafe to trust y^e management of y^t Organ to our discretion: But tho' this opinion is supported with Ingenuity, yet I find many reasons for rejecting it. He tells us y^t y^e Ganglia intercept y^e power of y^e will; & y^t altho' y^e Brain of an animal be wounded, y^e heart exercises its functions, & performs its pulsations as before. Now the statues remain for a considerable length of Time; yet if y^e Brain is destroy'd, tho' they frequently continue for a certain space of Time, y^e force is instantaneously so much diminish'd y^t y^e Circ^r ceases in y^e extremities of y^e vessels, plainly proving y^e immediate influence of y^e Brain on y^t Organ. But y^e distinction made of our actions into voluntary & involuntary is by no means proper. The action of y^e muscles are involuntary, we direct our arms to a certain object; but we have not y^e direction of of y^e muscles employ'd for y^t purpose. Next y^e Ganglia are not confin'd to muscular organs; we have seen 'em in many of y^e Glands and in many of y^e muscles, w^ch Dr Johnstone allows to be voluntary: and what overturns his System is, y^t every one of y^e muscles of the Extremities, & trunk of y^e body are supplied with nerves y^t pass thro' Ganglia; & being immediately versant in Anatomical Enquiries he has overlook'd this, y^t all the Spinal nerves, before they come to the Axillary plexus pass thro' Ganglia. But this leads me on to a more general point, to determine y^e Cause of Sympathy as it is call'd among our usual nerves; & y^e reason of variety in w^ch muscular motion is performd; whether it

depends mostly on mechanism, or is directed by a wise agent
Now let us consider Sympathy in the 1st. view, viz. an injury
is transmitted from one part of the nervous system to another
or to the whole system. — First we perceive 1st. if any organ of
the body is violently irritated and inflamed, 2d. irritation
spreads more readily to the neighbouring 1st & 2d. distant
Organs, owing to the Connexion wch. 3d. Hydraulic System
has with the nerves, 4th. one acting and reacting upon the
other: But next we must likewise admit 1st. if a Branch
of a nerve be violently irritated 2d. irritation or inflam. will
more disorder others contained in the same sheath than the
distant nerves of the body, & sometimes we must wch. explain
by examples of 1st kind tho' not very frequently; So if a tooth
be carious 2d. irritation extends along 3d. neural nerves: in-
-cluded in the same sheath, with 4th. & we find perhaps 5th. 6th.
irritation is in the investures of 7th. right side 8th. 9th. side will
more readily suffer pain & [illegible] inflammation than the
opposite side, nay it is evident 10th. there is some latent
Connexion in a mechanical way of 11th. nerves of one side of 12th.
body with each other producing remarkable effects: we've
frequent examples of Hemiplegia, where one side of 13th. body
is affected with palsy, whilst in the other 14th. neural a
power is preserved, wch. must be owing to some immediate
Connexion 15th. nerves of one side have about the Origin, or
in their progress. — Again we obs. a mutual Connexion of
all parts of nervous system with each other so when we
touch the Sciatic nerve with a drop of Spirits of Hartshorn
burning the nerve will not excite the Lumbrical: but 16th. slighter
applic.ns of this, will. So in the Case of a Bite of a Rattle-
-snake from 17th. connexion of 18th. nervous System all 19th. parts
sympathize. But does it follow 20th. 21st. variety of angular
motions of our body depend upon mechanism, whether from
22d. Connexion of the nerves in their progress or origin? to
explain the Question let us suppose an irritation applyed
to a particular Organ, suppose 23d. 24th. nerve is irritated by

by an acid Matter we sneeze in consequ. of y^t. now how are we to account for this action, w^ch. is abundantly complex? Answ. to say as generally has been done, y^t. we can trace y^e. connexion from the nerves of the nose to those y^t. regulate y^e. motions of the Diaphragm & Abdominal muscles, & from y^t. connexion are to explain y^e. action following y^e. irritation. Thus y^e. 5th. branch of y^e. 5th. pair sends y^e. nasal twig to the Nose; the 2nd branch of the same nerve supplies y^e. beginning of the great Sympathetic or intercostal nerve; or running down from the head is connected to the ves^l. Dorsal nerve, in its passage along the neck to the Phrenic, w^ch. regulates the Diaphragm &c.

But many arguments occur against such an explanation We have a sense of Injury before an action ensues, or if we are to consider this opinion in a general way, we find many objections arise against it, w^ch. I think it unnecessary to insist upon now, as such opinions are daily losing ground; and since I gave a Lecture upon that Subject Dr. White has published what may serve as a sufficient confutation of the common opinion. Let us take the arguments in a gen^l. view and instead of tracing 'em ab capite ad Calcem, a few gen^l. objections will suffice. — If a nerve when irritated immediately throws into action all others connected with it: when we irritate a nerve of y^e. face &c for instance, saying y^t. nerve has y^t. it may act more readily it sh^d. draw y^e. muscles inwards: but we act w^th. different muscles, pulling y^e. hair away, or how comes it y^t. the intermediate muscles, w^ch. w^t. the nerve in question is perhaps most connected are free from action? Why dont the several muscles of the face and neck act as violently as those of the Diaphragm & abdominal muscles or whence the inequality of their action? or why does not an irritation applyd to other Nerves, as a wound of the neck immediately produce sneezing, in like manner as y^e. irritation

of y^e^ nerve within y^e^ nose? may not we trace y^e^ sympathy in y^e^ same way? why does not y^e^ farther end equally influence y^e^ beginning? a y^e^ tracing y^e^ intercostal nerve thro' y^e^ body, y^e^ motions are varied according to y^e^ place; if the nose is irritated we sneeze; if y^e^ throat we vomit; if y^e^ irritation is within y^e^ breast we vomit, a within y^e^ breast, a if there is a want of something necessary to life, as in thin & and overheated air, our breathing is affected; but when with y^e^ air an irritating substance is conveyed into y^e^ stomach, we cough, so a similar irritation applyd to the same place produces a diff^t^ action, so with regard to y^e^ irritations &c. in y^e^ Abdomen, if it is in y^e^ stomach we vomit, if in y^e^ Guts purging is excited; if in y^e^ uterus, there is a certain effect, if it is in y^e^ rectum & vesica minaria, there is an effect of a different nature; & only y^e^ variety can't proceed from mechanical principles. — On the other hand y^e^ same regular motion follows, when we can trace no connexion Do not we act with the Iris tho' y^e^ irritation is applyd to the second pair at y^e^ bottom of y^e^ Eye: may not y^e^ Q. Ind^a^ sympathize, the Two Eyes move in an uniform manner w^ch^ if not from any connexion with y^e^ Optic Nerve. And we are all sensible y^t^ almost any action or impression first influences our mind, y^e^ living principle is roused & the action follows it. as y^e^ imagin^n^ in time of sleep, produces a similar operations when y^e^ stimulus is absent, how so it is said y^t^ we can't ascribe these regular motions, to mechanism & must give some different interpretation of the matter; So let us only review y^e^ principal actions in a very gen^l^ way, & also y^e^ reason of y^e^ effects Let us begin w^th^ those when y^e^ irritation is at a distance from y^e^ act^g^ organ. If an Animal hears a confus'd sound, he expands y^e^ Ear & directs it to y^e^ sonorous substance, & y^e^ motions of y^e^ Eye ball must follow those of y^e^ external; as we also y^e^ accuracy with w^ch^ the Eye adapts itself; or with w^ch^ y^e^ two Eyes meet to examine y^e^ same object, Or in sneezing, Coughing &c.

we perceive the motion varied according to y^e kind of irritat^n and effect w^ch y^e motion may have in removing it: If a quantity of Blood rushes into y^e Lungs, no action is so fit for allowing it to pass as inspiration, or if we have too small a quantity of y^e living principle from y^e air, or y^e air is too light, we inspire more frequently. If an irritating substance be contained within y^e Trachea, we cough, w^ch is a very complex action, but y^e most effectual for throwing out y^e offending Cause; if y^e Stomach is affected & it is necessary y^e irritating substance w^ch is also downwards, it is thrown back by vomiting, & y^e likewise is a very complex action, performed by means of nerves derived from very different sources, or if y^e acrid substance gets into y^e Intestinal Canal, y^e inordinate action of y^e is veiled. If y^e irritation is in y^e bottom of the Canal, besides y^e inordinate action of y^e Coats of y^e Intestines, we bring into play y^e pressure of y^e Diaphragm & abdomen muscles in a regular manner, pressing steadily and with considerable force. The same thing happens in delivery, and in assisting y^e bladder of urine to throw out y^e Contents, & to open its mouth. — If y^e bladder is irritated y^e motion produced is a gradual Contraction, diff^t from y^e contraction of y^e Intestinal Canal, w^ch plays backwards & forwards pushing down y^e food, bringing it back again, applying it to the receiving vessels and Absorbents. We have y^e power over y^e tho' the bladder is supplyed with nerves through Ganglia, we can stop y^e action of y^e bladder and in create it at pleasure. If we next apply a stimulus to the muscles of our Extremities, the muscles are thrown into action, while the arm is kept fast, and y^e injury kept applyed, y^e muscle vibrates, as the only way it can free itself: and this has led Physiology into to talk of muscles being disposed to contraction &, relaxation; they are in no shape disposed to that state. Dont we see y^e contrary in the Bladder of

of mine? They only perform that action wch is most fit.
We see the heart subjected to an alternate contraction and
and relaxation, as that kind of motion is most fit: the
heart throws itself into its utmost action in an instant;
because an action approaching to ye: nature is
necessary to drive ye: blood thro' ye: vessels, & ye: same contract-
ions in the bladder wd: have been hurtfull without with-
out any purpose being serv'd by 'em: so these actions are
regulated by a wise Agent and it only remains that we
determine the Agent. _____ In ye: Circumstances both
we fail, their views are greatly too limited. _ Shall wd:
perswade ye: our mind reasons upon all ye: actions,
& after holding consultation with herself, determines ye:
manner in wch they ought to be performd: whilst other
later Writers treating of ye: vitall & involuntary motions
wd: perswade us ye: these actions are dependant upon
our mind, but from a necessity not from a choice, ye: ye:
heart is stimulated, and the mind forced to interpose, otherwise
the heart wd: be burst thro' our ye: sternulus and contracts.
Now I think it perfectly clear ye: we can't reason upon ye: actions,
because we want data, we are ignorant of the facts, upon wch
reasoning cou: proceed: we are not born conscious of our
structure; & we can't be said to do anything from necessity
wch is beyond our power. Let us only take in a few actions,
where ye: operation will be allowd to depend upon some other
principle. An Infant ye: moment it is born breathes regu-
larly & in as proper a manner as an Adult, It sucks and
swallows regularly what it receives from its mouth, and all
this upon ye: first trial, as well as upon the last: By what
power can ye: be done? surely we wd: say by instinct, by this
we understand a power existd before we existd: Can we say ye:
our mind, ye: we ourselves possess a voluntary power over our
muscles, & yet are no ways conscious of ye: Nos or situations
of these: if we were Anatomy wd: have been an useless study;
but we know nothing of our muscles, we have no voluntary

power over y^e^ muscles; all our power is: y^t^ we wish to move a member in a certain manner, to say hold of something purpose; & we are conscious of y^t^ action & do it readily but we know nothing of y^e^ regulation of y^e^ muscles about it, it is done for us: so all muscular action is involuntary: Now shew any muscle in our body to y^e^ most able Physiologist: devise him to act with it; he can't do it; unless you take him y^e^ motion, then he wishes to perform y^t^ motion, & y^e^ action of y^e^ muscle follows the wish. — So the more we consider the actions of Animals, we find y^e^ greater reason to conclude y^e^ y^t^ Author of nature who made & created them continues w^th^ his unceasing Influence to operate upon 'em; not by partic^r^ but gen^l^ Laws, in such a way as is most fit to maintain them —

Thus I have given you such an account of y^e^ Newtonian System: & the Effects of it: as the fact leads us to, & might admit of useful application in Practice.

Lecture 26.

We have fully consider'd the gen^l^ & partic^r^ Structure of all y^e^ parts of the human body, excepting its cavities, viz^z^. y^e^ bones & parts connected with them, & Teeth: & seen y^e^ partic^r^ Structure of wch they make a detached enquiry: We are now therefore sufficiently prepared to proceed to the operations of Surgery. — In treating these I shall not think sufficient merely to shew y^e^ Instrum^ts^ prepar'd by others or y^e^ method of using 'em but I shall further endeavour to explain, y^e^ changes produced by y^e^ disease, where an operation can be of use, with y^e^ Symptoms & manner of distinguishing it: then I shall give y^e^ various Instruments & methods of others: & endeavour to point out y^t^ method w^ch^ is the fittest: for as I have said, an Operation of Surgery being nothing more y^n^ a piece of dissection performed on a living person: we are at liberty to reduce Surgery to Anatomical Rule: & seem natural

Consideration to connect y^e^ practice of it: The operations are so various y^t^ it wo^d^. be difficult to reduce them to distinct Genera & Species: nor perhaps wo^d^. such an attempt be very useful at the same time it is very well y^t^. we may avoid much the tediousness of repetition, y^t^. is to be found in superficial writings: It is not necessary first to treat of all y^e^. diseases of y^e^. Head, then of those of the Trunk: & so finish w^th^ y^e^ Extremities: since many diseases are common to all parts, both internal & external, & you find y^e^. manner of performing amputation in different parts, not connected together but detached in like manner tumors are treated: the diff^t^. operations for Dispersing y^e^ manner of letting blood from y^e^ vessels, whether y^e^ veins or Arteries &c. Now surely it is better y^t^. we consider at once all y^e^. diff^t^. kinds of Amputation: the Operations in consequence of Tumors whenever seated, &c. dividing them into Species. —

The parts & place of the body where we shd. begin is by means material. It signifies little whether we begin w^th^ the head: proceed to the thorax, & finish w^th^ the extremities; or whether we study Convenience, imitating y^e^ Demonstrations of y^e^ Subject we begin with y^e^ most ignorant parts first, w^ch^ y^e^ Abdomen proceed to the Thorax, then to y^e^ head: & finish w^th^ y^e^ extremities upon y^e^ whole, following y^e^ method y^t^ I have only did in the Anatomy, I shall first endeavour to explain y^e^ operations in the part of the body w^ch^ in y^e^ most apt to be changed by some length of Time we shall begin w^th^ y^e^ Cataract: then I shall follow y^e^ most common and convenient plan, beginning w^th^ y^e^ Abdomen, proceed to y^e^ Thorax, y^n^ to y^e^ head: & finishing w^th^ y^e^ Extremities; but always taking in one general view those Operations which are closely connected by Cataract

young.