

A treatise on a consumption of the lungs. With a previous account of nutrition, and of the structure and use of the lungs ... / [Sir Edward Barry].

Contributors

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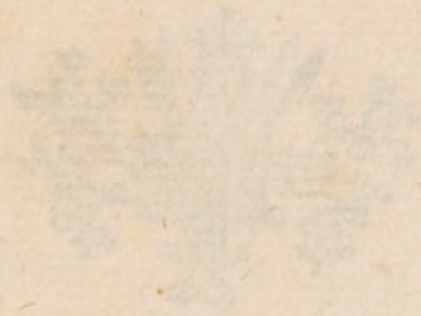
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TREATISE
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LUNGS.

WITH
A FULL ACCOUNT OF NUTRITION
AND OF THE STRUCTURE AND USES
OF THE LUNGS.

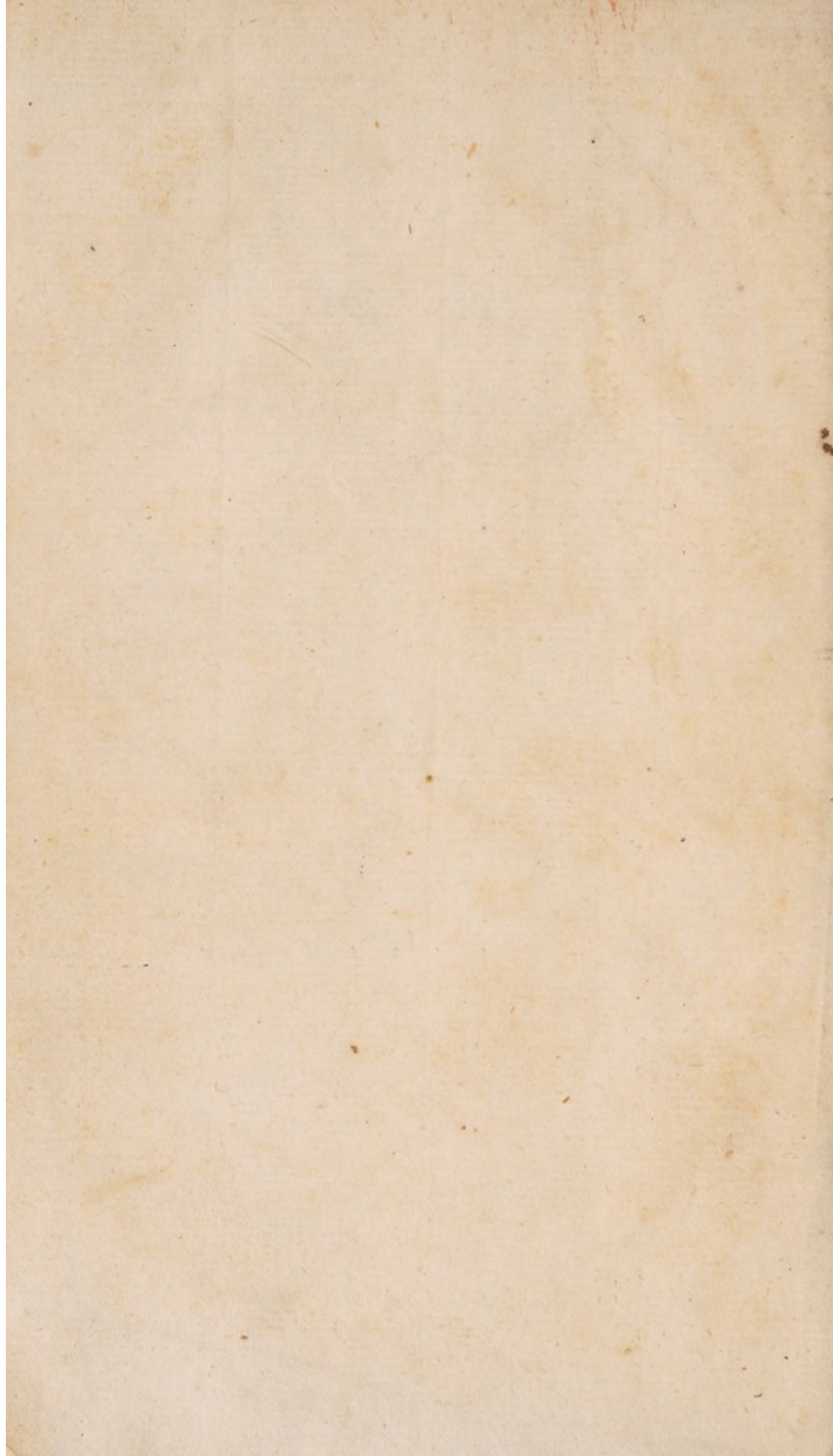
BY
GEORGE H. ARAY, M.D.

NEW EDITION, WITH ADDITIONS.



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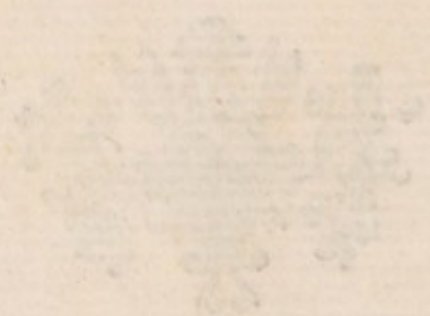


L O N D O N:

Printed for WILLIAM and JOHN INNYS,
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THE
CONSTITUTION
OF
THE
UNITED STATES

WITH
A
PREFACE
AND
A
TABLE
OF
CONTENTS
BY
JAMES
MADISON



NEW YORK
PRINTED FOR
J. O. W. D. O. W.



TO his EXCELLENCY

JOHN

LORD CARTERET,
BARON of *HAWNES*,
and LORD LIEUTENANT
of *IRELAND*.



WHEN Persons in the
highest Stations, like
your LORDSHIP, are
eminently distinguished for
making the Good of Man-

DEDICATION.

kind their peculiar Care, they have an undoubted Right to the Homage of all those, who, in a more humble Sphere, pursue that amiable End: While these, on the other Hand, lay Claim to, and think themselves in some Degree entitled to their Protection.

AND tho' this must often expose them to the impertinent Addresses of such who *but* impotently strive to promote the publick Welfare; yet to one of your LORDSHIP'S Candor, the sincere Intention will in some Measure supply the Place of more
suc-

DEDICATION.

successful Merit, and plead an Excuse for this Presumption.

THE Inquiries which have been made into the Structure and Use of the various Parts of Animal Bodies, have been always attended with great and diffusive Benefits. Several mechanic Engines owe their Origine to Hints first taken from small Machines of the same Form in a human Body; and some of the most curious Pieces of Art, and Productions of Nature, have been there discovered in a beautiful Miniature. SCULPTURE, and PAINTING, could

DEDICATION.

not have arrived to such a Perfection, unassisted with the previous Improvements in *Anatomy*: And the surprising Contrivances that have been observed in the Fabric of the Ear, have not a little contributed to make Music charm more powerfully. The great Resemblance that has always appeared between the Body Politic, and Natural, makes the latter particularly worthy of the Encouragement, and Study of the greatest Statesman. Thus *Mene-nius Agrippa*, by his famous Apologue deduced from the Structure of the Body, prevailed on the mutinous *Ple-beians*

DEDICATION.

beians to acquiesce in the Authority of the Laws. Had he been unacquainted with this Sort of Knowledge, the Republick, then in its Infancy, might have been destroy'd by civil Feuds, and *Rome* perhaps had never been the Mistress of the World. However, these Advantages, MY LORD, tho' very considerable, are by no Means equal to such as flow from a judicious Exercise of the *Art* of *Physic*; on which often depends the Safety of the best Patriots, and of such who are most capable of improving all other Arts, and Sciences.

DEDICATION.

SINCE then the due Cultivation of *Medicine* is of such Use to Mankind; since the most refin'd and elegant Enjoyments of Life grow insipid where Health is wanting; since, without it, we could not relish even *these happy Days*, nor have a true Flavour of the unusual Blessings we enjoy under your wise and auspicious Administration; permit me, MY LORD, to lay before You, this faint Essay in the *Art of Healing*. You make us every Day more in *Love* with *Life*, by making us every Day more
happy

DEDICATION.

happy in it, and consequently make the *Art* of *Physic* of still the greater Importance.

THE universal Reputation Your LORDSHIP enjoys in being skill'd in every Part of useful Knowledge, Your thorough Acquaintance with the Ancients, Your forming Your Mind (where You thought the Moderns imperfect) on their Model, the greatest of whom made it so much their Care to be versed in the *Art* of *Physic*, that it was even thought a necessary Part of a polite Education, make me believe I have chose the best
and

DEDICATION.

and truest Critic, as I'm sure
I have the worthiest Patron
of the following Sheets.

I am,

Your Lorship's

most Obedient,

humble Servant,

EDWARD BARRY.

T H E



T H E
P R E F A C E.



W H I L E other Arts and Sciences have been greatly advanced, and brought almost to a Perfection, the Progress of Physic has been so very slow, that for the Space of above two thousand Years it received but few real Improvements; but by the Labour and misapply'd Industry of its Professors

xii The P R E F A C E.

sors was loaded with Errors and involv'd in useless Intricacies.

THIS unhappy Fate of Physic, is in a great Measure owing to the Number of Sects, and deluding Hypotheses that have been admitted to explain the Causes of Diseases, while their Patrons have partially advanced whatever may gain Credit to their fatal Schemes, and have neglected the true Methods by which this Art may be improved.

*WHOEVER takes a just View of the Writings of former Physicians, and of the various Revolutions this Science has passed through, will find that little truly valuable has been added to it from
the*

The P R E F A C E. xiii

the Time of Hippocrates to that of Harvey, but what has been received from the divine old Man; and that the large Volumes of succeeding Authors have increased and swelled to such a Bulk, not by new real Improvements, but by Repetitions of what he wrote before, and applying a false Philosophy to his Observations: And even his Works, if purged from Errors, may be reduced to a smaller Size; for if his Notions of the Elements, and their Influence of Attraction, and Antipathy, Celestial Causes and Anatomical Errors, are excepted, which greatly enlarge the Bulk of his Writings; what remains consists of a small Collection of Observations, which are plain, and obvious to the Senses, and as they

xiv The P R E F A C E.

they are the constant Footsteps of Nature, will always retain that Esteem they have so long maintain'd, and continue to bear the severest Test of succeeding Ages.

T H I S great Author is most valuable for his exact Description of the natural Progress, and Event of Diseases. Aretæus Cappadox, and Rufus Ephesius, pursued the same Method. The former deserves particular Notice, for having been the first that reduced into Order, what Hippocrates published in a confused Manner : Galen likewise was very serviceable in collecting the Diagnostics, and Prognostics of Diseases, which lay scattered in the Writings of former Physicians ; but did
great

The PREFACE. xv

great Prejudice to Physic, in introducing the Peripatetic Philosophy, and thence explaining the Causes of Diseases: By this Means the Art continued unimproved, but was more involved in Fictions, and deceitful Chimæras; and whoever looks over the large venerable Sect of Arabians, Rhazes, Averroes, Avicenna, &c. tho' their natural Sagacity, and the Size of their Volumes, seem to promise no small Discoveries, will find they have only changed the Language of Galen and Aristotle, and have added little material besides a few Improvements to the Materia Medica.

ALL the succeeding Authors, to the Time of Paracelsus, were
Com-

xvi The PREFACE.

Commentators on Galen, and paid such an implicit Regard to his Notions, that his Text was quoted by them as decisive, and sacred; while the Name of Hippocrates (particularly among the chief of the Arabians) was seldom mentioned: But his Doctrine was at length revived in France by Hollerius and Duretus, and the Galenic Theory was violently overthrown by Paracelsus, who, when he was made Professor at Basil, ordered the Works of Galen to be publickly burnt.

CHYMISTRY being now introduced into Medicine, eased it indeed of a great Load of Errors, but soon substituted others more whimsical, and dangerous in their

The P R E F A C E. xvii

their Place ; for the succeeding Chymical Physicians, instead of observing the natural Progress, and Event of Diseases, regarded chiefly such Phænomena, as appeared in their Laboratory from Experiments tried on particular Bodies, and thence endeavoured to account for the Alterations which are produced in the finest Machine in the Universe, whose Motions are most regular, by Immechanical Ferments, Precipitations and Battles fought between Salts of an opposite Nature : And at length their Flights were so mad, and Enthusiastic, as to seek for a Medicine that would universally cure all Diseases, and make a human Body immortal, which unavoidably decays by the same Causes that

xviii The P R E F A C E.

support it. Chymistry is without doubt of the greatest Service to the Art of Healing, when kept within its proper Bounds, as from thence the Knowledge of the Properties of particular Bodies is attain'd; tho' in being misapply'd it has retard-ed its Progress: But this Art is now cultivated after a more chaste and useful Manner, which is in a great Measure owing to the Industry of the ingenious Mr. Boyle from whom it received large Improvements.

W H E N the Circulation of the Blood was discovered, the Theory of Medicine received new Alterations, and such surprizing Discoveries have been since made in Anatomy, that the most minute Canals
by

The P R E F A C E. xix

by artificial Injections and the use of Microscopes have been exposed to the Eye, and have shewn a more beautiful Harmony thro' the whole Fabric than was before imagined.

IT has been since evidently demonstrated that a human Body is a Machine Composed of Solids and Fluids ; that Health consists in having their Circulation free and undisturbed through such Canals, and Sickness in their Motion being prevented in some Part or other. The solid Parts are so formed as to be fit and appropriated either to retain, direct, alter, or separate such Fluids ; others are contrived as Mechanic Engines, by whose Form, Firmness, and Connexion, the Motion of such

B 2

Fluids

xx The PREFACE.

Fluids is likewise promoted, and the whole Frame is propt up and supported. On this Account it plainly appears, that the Effects which are produced in such a Machine, when in Health or Sicknes, can only be explained from its known Structure, and from Mechanic, Hydrostatic and Hydraulic Principles.

'TIS most certain that the Mathematicians have given the best general Definition of a Body; but from the General Principles of Matter, no one can deduce a Priori what are the peculiar Properties of any particular Body, and which distinguish one from another. The only way of attaining such a Knowledge is by making
Expe-

The P R E F A C E. xxi

Experiments, and by carefully observing the Phænomena ; and when such are taken for Data, and a Geometrical Reasoning is apply'd to them, we may thence arrive to the Knowledge of the adequate Cause of such Effects, and deduce useful and certain Axioms, which could not be attained without the Assistance of such a Calculation.

EVERY Part of a Fluid simply considered is a Solid, and therefore the Effects, which are thence produced by its Momentum and Motion, are to be explained after the same manner. Gravity, and Fluidity are the common Properties of Fluids ; their various Difference in Elasticity, Weight, Density, Fluidity, and Contact, are the

xxii The PREFACE.

chief Properties which distinguish one Fluid from another ; and can never be deduced from the General Principles of Fluids, but from particular Experiments on such Fluids.

A human Body is of the same general Nature of other Bodies, but particularly differs from them in being composed of various and different Machines, perpetually agitated with circulating Fluids of a particular Nature ; whence the Effects thence produc'd are various, but subject to the same Mechanic, Hydrostatic and Hydraulic Principles, as the general Effects produced from all Bodies whether Solid or Fluid ; if such Data are only made use of, which are not the probable

The PREFACE. xxiii

bable Fictions of a luxuriant Imagination, but such as are to be observed by the Senses : So that in applying Mathematics to Medicine, it is required, that the known Structure of the Parts of a human Body, the particular Nature of the Fluids, and the Effects produced in Health or Sickneſs ſhould be taken for Data.

FOR that any Cauſe ſhould be investigated after a mathematical Manner, it is requiſite, that the ſeveral Properties or Powers of ſuch a Cauſe ſhould be known, and then by comparing them together, the Knowledge of ſuch a Cauſe may be attain'd, which is adequate to theſe Properties or Effects when join'd together. But as the Pro-

xxiv The PREFACE.

*perties of such Causes, which produce Health or Sicknefs, are not known, but by the sensible Effects which they produce, it is moft neceffary, that with the Structure of a human Body, the feveral Functions and Effects, which are observable in a human Body when in Health or Sicknefs, muft be likewise carefully fearched into, and exactly described, before a juft and regular Notion can be formed of their Causes; and fuch Effects, when known, will have the fame Ratio to the unknown Cause, as in Geometry the Data have to whatever is fought for. On this Account, whoever is unacquainted with the Causes of Health, and its Effects, is moft incapable of explaining and curing Difeaſes, which proceed from
a De-*

The PREFACE. xxv

a Defect of such Causes as constitute Health: When the Hand of a Clock goes wrong, that Artist is only able to correct and alter it with Judgment, that understands the mechanic Fabric and Action of the several little Machines that make it point right.

I N the Pursuit of natural Philosophy, and in arriving to the Knowledge of the Causes and Cure of Diseases, the same Method must be carefully observed: Nothing in either Case is to be assumed, that is not evident to the Senses, nor any Thing that has appeared, tho' ever so minute, is to be neglected. To such Phænomena only a mathematical Reasoning is to be apply'd, not to false or dubious
Po-

xxvi The P R E F A C E.

Postulata, such as the unknown Velocity and Figure of Bodies, which, tho' supported by the justest mathematical Reasoning, will always prove more prejudicial than serviceable to Medicine.

IT has been greatly disputed, Whether the Empiric or the rational Method of Practice, founded on some Theory deserves the Preference? The Advocates for the former have justly observed, that so many contrary Hypotheses have been maintained by different Authors, to explain the Causes of Diseases, and their Method of Cure, that Physic has thereby received more Prejudice, and less real Improvement, than if it had been only assisted by Observations of the
natural

The PREFACE. xxvii

natural Progress and Event of Diseases, and the Effects of Empiric Medicines. But whoever justly considers how far the latter can only advance Medicine, will find that the Art must always continue obscure and imperfect without the Assistance of a true rational Theory, and that the most vigorous Part of a Physician's Life must be passed in a long, inactive Course of tedious Observation, before he can arrive at a sufficient Degree of Knowledge to make him capable of Practice. It is most certain, that both are equally necessary to make a compleat Physician; for whoever is unacquainted with the Observations of the Antients, and the regular Appearance of the Symptoms of Diseases, will find Mathematics of
small

xxviii The PREFACE.

small Service in the Cure of them ; and whoever is ignorant of the modern Discoveries in Anatomy, Chymistry and Mathematics, will be very uncertain in his Proceedings, and incapable of understanding the true Force of such Observations, on the Knowledge of which he so much depends : But a Theory founded on such certain Principles as have been laid down, is not subject to the precarious Fate of former Hypotheses, but will continue as lasting and useful as the Observations of Hippocrates.

FIXED on such a sure Basis, our Profession has at length raised her drooping Head among other Sciences, and within these few Years has received large Improvements

The P R E F A C E. xxix

ments from Borelli, Bellini, Pitcairn, Hygenius, Mead, Friend, Cheyne, and some few besides: But no one has so far advanced its Progress as the learned Boerhaave: By the Assistance of a full Knowledge of the antient and modern Discoveries, an unwearied Industry, and an uncommon Genius, he has already done the greatest Service to the Art of Physic, and seems to be most capable of bringing it nearest to Perfection. A great Part of the following Account of Nutrition was published in a Thesis some Years past when I studied Physic under him at Leyden. A languid consumptive Habit of Body probably fixed my Attention more particularly to this Subject at that time, and has in some Measure

xxx The PREFACE.

sure since engaged me to attempt to bring it to a greater Maturity; and I shall not think my Labour ill bestowed, if the Rules laid down prove as serviceable to others, as they have been to me. I have endeavoured to imitate (tho' very imperfectly) the Method of Reasoning which that great Man recommends, and with most willing Gratitude own my Self indebted to him for several material Observations, which I received in his private Course of Lectures.

THE following Treatise is divided into three Parts. The first contains an Account of Nutrition, the second a Description of the Structure and Use of the Lungs, and from this preceding

The P R E F A C E. xxxi

*ing Theory I have next endeavour-
ed to explain the various Causes
and Progress of a Consumption
of the Lungs, with a Method of
Cure deduced from these Principles.
No rational Account can be given
of this Disease without this regular
Method, for a Consumption in
general must always proceed from
a Defect of such Causes as consti-
tute Nutrition; and whoever is
unacquainted with the Fabrick, and
the several Functions of this great
Organ in its natural State and Vi-
gor, will be incapable of under-
standing the Causes of its Decay,
and the various Effects which are
thence produced.*

*W H E N a just Method is
laid down, every thing flows easily
and*

xxxii The PREFACE.

and distinctly from it. An affected Obscurity has been too often mistaken for deep Learning in Physic, and that Hypothesis has gained the greatest Applause which was most curiously wrought; but as its Beauty consisted in the elaborate Imitation of the nice Texture of a Cobweb, so its Duration was equally uncertain, and precarious. A clear Simplicity is the surest Test of Truth, and whoever considers the great Uniformity that is to be observed in the several Parts of a human Body, and the strict Analogy that is kept up between the greater and lesser Parts, will find that the immediate Causes of Diseases are more simple and plain than they are generally supposed to be; and that
their

The PREFACE. xxxiii

their great Difference and Variety of Symptoms are chiefly owing to their different Situation. How easie it is to account for a light Boil or Inflammation in the Hand? How few Symptoms are thence produced? But how greatly is the Scene altered, if the same immediate Cause produces such an Inflammation in the Pleura or Lungs? And its Termination into an Abscess, which gives Relief in the former Case, is in the latter attended with a various Train of Symptoms, and most frequently ends in Death. An Hæmorrhagia Narium often proceeds from the same immediate Cause as a fatal Apoplexy. The different Consequence is owing to their different Situation, for in one the

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Blood

xxxiv The PREFACE.

Blood from the ruptured Vessel has a free Discharge, in the other it lodges on, and presses the nervous Tubes, whose free and open Action is necessary to continue Life in a human Body. The great Art of a Physician consists in forming a just Notion of the Cause, and Seat of a Distemper; and when the Indications of Cure are deduced from such certain and evident Principles, 'tis an easy Matter by the Use of few and frequently plain Medicines to carry it off. This Assertion is not only agreeable to the strictest Reasoning, but is confirmed by experience; since the most happy Practitioners have been always remarkable for the Simplicity of their Medicines, while such who endeavour

your

The PREFACE. xxxv

your to explain Distempers from complex and immechanical Causes, such as Effervescencies, Precipitations, Alkali's engaging Acids, and use as wild a Farrago of Medicines, are as remarkable for their ill Success.

NATURE generally points out a Method of Cure in most Distempers; for such is the wise Contrivance of a human Body, that whenever any Part is oppressed and disordered, the whole Oeconomy is engaged in endeavouring to correct or evacuate whatever is the Cause of the Disease: And the Effects or Symptoms which are thence produced are often to be regarded as natural Remedies, not as an Enemy or Disease: The

xxxvi The PREFACE.

great Knowledge of a Physician consists in justly distinguishing when such Symptoms are to be suppressed, and when encouraged; for it is much more easy to check any Symptoms, (in which generally the chief Skill of Empirics is employ'd) than rationally to conceive from what natural Motions in the human System they are produced, and how far they contribute to its Relief or Prejudice. Sometimes the Force of such salutary Efforts is too violent or misguided, in which Case it is the Business of a prudent Physician to restrain or direct them to another Course: Sometimes they are so faint and languid, as to prove ineffectual, unless quickened and invigorated. The great Difficulty consists in
a pru-

The PREFACE. xxxvii

a prudent Direction of the Symptoms of a Distemper, which, if rightly managed, is often best conquered by its own Weapons.

THE Practice of Physic is become too much a Trade. A sullen Grimace, or an artful Address, with an unintelligible Way of talking suited to the common Vogue, often supply the Place of true Merit, and gain the Preference. As few are Judges of this Science, 'tis an easy Matter by such a Behaviour to gain the Character of a Physician, but nothing requires more Skill and Labour than justly to deserve it. Such a one cannot carelessly apply a Receipt to the Name of a Disease, but from a sufficient Know-

C 3

ledge

xxxviii The PREFACE.

ledge of the Structure of a human Body, the Use of the several Parts, and from an exact History of the natural Progress of Diseases, endeavours to deduce a right Method of Cure suited to the various Exigencies and Constitution of the Patient.





A
TREATISE
ON A
CONSUMPTION
OF THE
LUNGS.

PART I.

Of NUTRITION.



Human Body being composed of almost an infinite Number of *Vessels*, and *Fluids* circulating through them, is, from this very Condition of its Frame, subject to a constant Decay; for, since *Attrition* is the

unavoidable Effect of Motion, by which the strongest Bodies are at length destroyed, it is impossible, but that the *Vessels* of such a tender Fabric, if not constantly repair'd, must be quickly abraded by a perpetual *Circulation*.

No single Part has a constant Duration; even the most Solid is not exempt from this common Fate, but, like the rest, successively perishes, and is restored: It has been found, by repeated Observations, that all the *Hair* in the Body is renewed twice in a Year, the *Nails* every two Months; and even the *Thigh-Bone*, if broken, will unite by emitting *Fibres*, which acquire an equal Solidity with the rest in the space of sixty Days: The Surface of the Body, tho' ever so cautiously preserved, gives a quick Tincture to whatever is apply'd to it, which examin'd with the best Microscopes, (a) appears to be composed of the several

(a) *Leuwenhoek, Tom. 4. Epist. 43. p. 407.*

constituent Parts of the *Solids* and *Fluids*, which constantly exhale and perish.

THE continual *Abrasions* of the *solid Parts*, and the Losses which the *Fluids* sustain in respect of their *Quantity*, require a constant Repair, which is likewise made more necessary on this Account, that the *Quality* of the *Fluids* is so far altered, by being chiefly deprived of their *softest* and *most diluted Particles*, and by being agitated by repeated *Circulations*, that instead of continuing as fit for *Nourishment* as before, they at length become destructive, and acquire the Nature of a *mineral Poison*, whose *Malignity* consists in the *Gravity* and *Acrimony* of its *Particles*; for whatever is taken for *Nourishment* should be *specifically* lighter than the *Blood*, and the *Chyle* and *Milk* made from thence are still lighter; for, as (a) *Lower* observed, they float on the Surface of

(a) *De Chyle, ejusq; in sanguinem transitu & transmutatione.*

42 Of NUTRITION.

the *Blood* ; therefore the *Density* of the *Fluids* depends not on the *Nature* of them, but on the compressing Force of the *Vessels* ; and the longer they receive this Action without the Addition of fresh *diluting Particles*, the more *compact* and *heavy* they become ; and as the *Attrition* and *Heat* of the *Fluids* increase in Proportion to their *Density* and *Velocity*, the *saline* and *oily Particles* become thereby greatly *exalted*, and acquire such a degree of *Acrimony*, as must unavoidably in a short Time destroy the Body.

THE Truth of this Reasoning is confirmed by the following *Experiment*. If the Humours of a healthy Man are received in a Vessel, and agitated with a Degree of Heat equal to that which is natural to a human Body, they in the Space of six Days become entirely *putrid*, and in three Days acquire a very pungent *Acrimony* ; from whence it is evident, that the *circulating Fluids*, from the same Causes, receiving such a Disposition, (though a longer space of Time

Time is in this Case required) must quickly irritate, and destroy the tender *Vessels* of the Brain; and on this Account, such as perish with Hunger, are generally seized with a raving Madness before they die.

THAT Health therefore should be preserved in a human Body, it is necessary that the *Quantity* and *Quality* of what is restored to the *Solids* and *Fluids* should be exactly proportioned to the Strength of the *Constitution*, and the *Losses* sustained by the *Actions of Life*; if the *Quantity* of *Nourishment* be increased, tho' turn'd into good digested *Humours*, the *Body* becomes *Pletborick*; and into bad, indigested, and not rightly assimilated *Juices*, the *Body* becomes *Cachectick*; if the *Quantity* of *Nourishment* be diminished, an *Atrophy* succeeds; if its *Quality* be altered, and a vitiated *Humour* is received into the *Vessels*, a *Cachochymy* is thereby produced: This proportionate Restoration of the *Solids*, and *Fluids*, is what constitutes *Nutrition*, which as widely differs from *Repletion*, as Water poured on the Root of a Tree dif-

44 Of NUTRITION.

differs from the last elaborate Juice from whence the Fruit is produced.

HAVING thus made evident the absolute Necessity of a constant *Repair* of the *Solids* and *Fluids*, I shall now endeavour to trace our *Food* from the first *Passages* to the last; and to explain the different Changes it undergoes, till it is fit to become *Nourishment*, and farther to describe the *Manner* how it is performed.

ALL our *Humours* are produced from what we eat and drink, and all our *Solids* are composed of these *Humours*:
(a) There are no *Vegetables* whatever (except they be of a poisonous Nature) but what with plain Water will afford sufficient *Nourishment* to Persons accustomed to them; and daily Experience convinces us, that the Reverse of such a Diet, the greatest Luxury of Food, cannot prevent others from being sufficiently nourished; a human Body be-

(a) *Tulp. Obs.* IV. 10.

ing a Machine so admirably contrived, that it can assimilate the greatest Variety of Humours, and reduce them to a Temper like its own.

THE Food taken for Nourishment, before it is received into the *Stomach*, is greatly prepared by *Mastication*, which breaks and reduces it into smaller Parts, and mixes it with the *Mucus* of the Mouth, and the *salival Juice*, whose great Usefulness may be easily understood from its Origine, (being separated from the purest *Arterial Blood*,) and from the good Effects it produces by being frequently swallowed; for by that Means it greatly contributes to promote *Digestion*, and as by repeated *Cohobations* rises purer, and more fit for *attenuating* and *diluting* the *Aliment*; whereas such who carelessly discharge, by spitting, this useful Humour, are most commonly subject to *Indigestion* and an ill *Habit of Body*.

THE Action of the *Muscles* compressing the Food, in *Mastication*, is so strong,

strong, that (a) *Borellus* has computed their united Force to exceed 1350 Pounds; and to make it more effectual, the Mouth is furnished with several Teeth, to cut and grind the Food, with a Form variously suited to these Purposes, some sharp, others whose Surface is more large, with proper Eminences, where, when the Food is determined, by the successive Motion of these *Muscles*, it receives a more powerful *Attrition* and *Comminution*.

FROM hence may be explained the Observation of (b) *Hippocrates*, *Longævi plures dentes habent*. The Food in such Persons being generally well prepared; whereas such, who have bad or few Teeth, are from an imperfect *Mastication* more subject to indigested *Crudities*, *Obstructions* of the *Viscera*, with their fatal Consequences.

(a) *De motu Animalium*. Propos. 88. Tab IX.
Fig. 2.

(b) Οἱ μακρότεροι πλείους ὀδόντας ἔχουσιν. Lib. 2. Sect. VI.
Epid.

THE Food thus prepared by *Mastication*, and received into the *Stomach*, is there farther alter'd, and digested by the Heat of the *Stomach*, the Mixture of the *Juices* separated, or contained in it, the mechanic Action of its *Fibres*, and the compressive Force of the circumambient *Parts*.

THE external Coat of the *Stomach*, on its *convex* Side, consists of a great Number of *Vessels*; on its *concave* Side of longitudinal *Fibres* (which, when contracted, diminish its Length); next to this Coat lies that described by (a) *Ruysch*, which supplies the *carnous Coat* immediately under it, with a *lubricating* Moisture, that makes it more easily capable of Motion. The *convex* Surface of this *muscular Coat* consists of a *Series* of *orbicular Fibres*, which encompass the *Stomach*, after a *spiral* Manner, from the *upper Orifice* to the

(a) *Thef.* 2. Tab. V. Fig. IV.

Pylorus; (and by their Action diminish the Breadth of the *Stomach*;) the *concave* Part consists likewise of two *Orders of Fibres*, the first oblique, which contract the Bottom of the *Stomach* obliquely towards its back Part, and by that Means diminish its Length; the second *Order* are much longer than the rest, and lie *parallel* to the Length of the *Stomach*, embrace the whole *Pylorus*, and uniting at the back Part thereof, encircle its *upper Orifice*: The internal Coat of the *Stomach* is much longer than any other, but contained in the same Space; on which Account its *concave* Side rises into Furrows, and its Surface is likewise made more unequal, by several Glands which lye on its *convex* Side, and terminate in its Cavity, from whence a *mucilaginous Humour* is separated, which lubricates the *Stomach*, defends it from the *Acrimony* of the Food, and prevents it from adhering to its Sides. Several *arterial* Branches likewise terminate there, which perpetually exhale a thin diluting Fluid not unlike the *Saliva*. In the internal

nal Cavity there are two remarkable *Sinus's*, one at the *upper Orifice*, the other under the *Pylorus*, which is largest, and by that Means the Food, when propelled there, is prevented from passing off unprepared by its own Gravity.

THE Heat of the *Stomach* in a healthy Man is greater than the common Heat of the *Sun* in a Summer's Day; and, as it appears by *Experiments*, is more easily suited for the *Digestion*, and *Dissolution* of *Bodies*, than a much greater Heat; which, by carrying off the finer *Particles*, frequently *fixes* and *coagulates* what by a milder Heat would be *attenuated* and *resolved*: From hence it is evident, that if the *Stomach* be considered only as an inactive *chymical Vessel*, agitated with such a Degree of Heat, the *Aliment* received into it, *diluted*, and *mixed* with the *Humours* separated, and contained there, will be from thence greatly *attenuated*, and *reduced* into a more *soft* and *fluid Substance*.

THE *Comminution* of the *Food* is likewise greatly assisted by the *Air*, which is intimately mixed with it, whose *expansive Force*, when retained in a close warm Place, increases in Proportion to its *Heat*, and the *Pressure* on it; both which are in the *Stomach* very considerable, and by the *reciprocal Motion* of the *Diaphragm*, and of the *Muscles* of the *Abdomen* perpetually varied; by which Means the *intestine Force* of the *Air* mixed with the *Food*, is, from thence, successively *expanded*, and *contracted*, and more powerfully contributes to a greater *Comminution* of it, than one continued *Pressure*, though of much stronger *Force*.

HENCE appears the Reason why in some Time after a *full Meal*, (from this increased *Expansion* of the *Air*) the *Stomach* seems more filled, and oppressed, than immediately after it is finished.

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THE internal Coat of the *Stomach*, by being *rugose*, gives a necessary Delay to the *Aliment*, that it may not easily pass off *indigested*, but receive for a longer Time the Action of the *Stomach*, which is likewise by this *Structure* prevented from being at any Time entirely empty, some Remains of the former Meal being always retained between its *rising Furrows*; and being thence rendered very *active* and *acrimonious*, constitutes with the *salival Juice*, which is perpetually swallowed, a true *Ferment*, that most commonly promotes a *Fermentation* of the next *Food*, and in some Measure contributes to Digestion, by giving a greater *Attenuation* to the *Aliment* thus agitated: But such a *Fermentation*, though often begun in the *Stomach*, is never perfected there, from the Want of sufficient *Rest* and *Time*; for that a *Fermentation* should be finished, it is necessary that the *fermenting Bodies* should remain undisturb'd in the same *Vessel*, till their *intestine Motion* gradually ceases, which is prevented by

52 Of NUTRITION.

the *muscular Fabric* of the *Stomach*, which produces a farther Alteration in the *Aliment*, and perpetually expels the finer Parts through the *Pylorus*.

WHEN the *muscular Fibres* of the *Stomach* are contracted, its Capacity in *Breadth* and *Length* is diminished, the *Orifices* become more *closed* and *contracted*, the *Wrinkles* in the internal Coat approach nearer to a mutual Contact; by which Means the contained *Food* receives from every Part a great *Pressure* and *Attrition*, which powerfully contribute to attenuate, and reduce it into finer Parts. The Force of this *muscular Action* on the Food contained in the *Stomach* is very considerable, and with the concurring Force of the *Diaphragm*, and of the Muscles of the *Abdomen*, has been computed by (a) *Pitcairn*, and some others, to be equal to a Weight of 117088 Pounds, which

(a) *Dissertatio de motu quo cibi in ventriculo rediguntur ad formam sanguini reficiendo idoneam, & Epistola ad Pitcairnum quâ respondetur libello Astrucii.*

appears

appears to be incredible, and not justly calculated.

THE Force of this muscular Motion (*cæteris paribus*) increases in Proportion to the *Quantity*, and *Acrimony*, of whatever is received into the *Stomach*: On this Account, when it is too much distended by Debauches, it becomes most incapable of discharging its *Contents*, the *Fibres* being thereby irritated to a greater *Contraction*, which is always more particularly strong at the *Orifices*, than in any other *Parts*, the *Fibres* being there more closely collected, and compacted: Hence the greatest Anxiety often succeeds from too great a Debauch, (the *Stomach* from the strong Contraction of the *Orifices* being incapable of discharging the oppressing Load,) and continues, till at length the *distending Pressure* is so great, as to overcome the *Resistance* of either *Orifice*; by which Means it generally terminates in a *Diarrhæa*, or a *Vomitting*, but most commonly in the latter, the *Fibres* at the

54 Of NUTRITION.

upper *Orifice* being more yielding, and less compacted.

WHEN the *Stomach* is most contracted, either by the natural Force of its *Fibres*, or by being irritated by the strongest *Emetics* (as *Monsieur Chirac* and *Pyerus* have by Experiments demonstrated) its Capacity is never so far diminished, as to bring its opposite Sides to a Contact; (which was the Opinion of *Pitcairn* and some others) therefore the mechanic Action of the *Stomach* presses only on that Excess of *Food*, which is sufficient to distend it beyond its greatest Contraction: Thus if the *Stomach*, when most contracted, can retain six Ounces of *liquid Food*, then if twelve are received, it can only exert its pressing Force on the six Ounces, which will nevertheless be thereby in a great Measure communicated to the other Six.

THE *orbicular Fibres* chiefly contribute to give to the *Stomach* its *peristaltic Motion*, which is not equal in every Part,

Part, but successive, beginning at the upper *Orifice* and alternately continued to the *Pylorus*: From this varied *Contraction*, and *Relaxation*, the *Food* receives a more exquisite *Comminution*, than from a continued Pressure; and is thence likewise determined to the *Pylorus*, through whose contracted *Orifice* the finer Parts ouze out into the *Duodenum*, and the grosser remain in the *Stomach*, till by a longer Repetition of the same Actions, they are so far attenuated as to be capable of passing off the same Way: When the *Stomach* is so far emptied, as not to be distended beyond its natural Tone, the *Pylorus* becomes so open and flaccid, as to give an easy Passage to the *Food*, which is thence expelled by the *peristaltic Motion* of the *Stomach*, and the compressive Force of the circumambient Parts.

WE are to observe farther, besides the Alteration which the Food receives from the immediate Heat, and mechanic Action of the *Stomach*, it is most

conveniently situated between the largest and most warm *Bowels* in the *Body*, to receive the greatest Advantages of *Heat*, and *Pressure*; on its right Side the *Liver* is placed, whose *Heat*, from the great Quantity of *Blood* circulating through its *Vessels*, is very considerable; on the left Side lies the *Spleen*, the *Pancreas* under it, the *Diaphragm* above it, by whose *Heat* and *Motion* it is warmed, and agitated; before it is placed the *Peritoneum*, which by the successive Action of the *Muscles* of the *Abdomen*, gives a Motion to the *Stomach*, opposite to that which it receives from the *Diaphragm*, so that it lies as in a Press between them; behind it is placed the *Aorta*, the largest Vessel in the *Body*, whose *Heat* and constant Vibrations are very considerable. Whoever justly considers these powerful concurring Causes, will find them sufficient to account for all the Changes which the Food receives in the *Stomach*; for its Action is very different from what it is generally described to be, and is not capable of dissolving the solid Parts of

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animal or *vegetable Bodies*, but only consists in attenuating and expressing their fluid Parts. This is confirmed by repeated and obvious *Experiments*; for *Currants*, *Grapes*, or any other *Fruit*, or *Seed*, swallowed whole and intire, without chewing, remain so in the *Excrement*. From whence the Reason plainly appears why the *Stomach* it self is not dissolved by its own Action, of which it must certainly be in great Danger, were it formed so tender and soluble, and contained an active *Ferment*; or could it excite such a powerful *Attrition*, as might be capable of dissolving or grinding the solid Parts of such *Food* as is often received into it, and which have as strong a *Cohesion* as the Substance of the *Stomach* it self.

IT is certain that there are some *Animals*, whose *Stomachs* are so hard and callous, and the mutual *Attrition* of its Sides so strong, as to be alone capable of reducing and grinding solid *Food*: But *Digestion* in a human *Body* is performed after a very different Manner;

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neither are *Dogs* capable of dissolving any solid *Food*, or reducing *Bones* (as the common Notion prevails) into a white *Excrement* by the Action of their *Stomach*; for if they are given to them involved in any Morsel, and swallowed whole, they will be discharged unaltered with their *Excrement*: The white Colour which is often observed in the *Excrement* of *Dogs*, and which is in some Measure the Cause of this Error, is only to be seen when they have first gnawed the *Bones*, and reduced them into small parts before they have been swallowed.

MOST Authors that have endeavoured to account for the *Digestion* of the *Food* in the *Stomach*, have been so fond of some particular *Hypothesis*, as to reject the Opinion of others, which, tho' not entirely, has been perhaps partly true: Thus the *Galenists* have ascribed the Cause of *Digestion* to the *Heat* of the *Stomach*; the *Chymists* to a dissolving *Ferment*, and others to the *mechanic Action* of its *Fibres*, and of the circum-

circumambient Parts: Whereas neither of these Causes is alone sufficient, but all in some Measure concur to produce that Alteration, which the *Food* receives.

BASILIVS Valentinus was the first among the *Chymists*, that supposed *Digestion* was owing to an Acid dissolving *Menstruum*: *Paracelsus* received this Opinion from him: *Van Helmont* carried it farther, and asserted that the *Spleen* prepared this *Menstruum*, which was from thence conveyed into the *Stomach* by the *Vasa brevia*. *Sylvius* rav'd of his *Duumvirate*, and carried the *Colluctations* excited in the *Duodenum* from a Mixture of an *acid pancreatic Juice* and an *alkaline Bile* into the *Blood*, and endeavoured to account not only for *Digestion*, but for most Diseases and their Method of Cure, either from these *Effervescencies* being too *intense*, or too *languid*. These Notions prevailed for a long Time, and produced fatal Errors, till they were at length exploded by greater Improvements

ments in *Anatomy*, and *Chymistry*. *Lower* has most accurately described the Course of the *Vessels* distributed through the *chylopoietic Bowels*, and has shewn that the *Vasa brevia* receive a Humour from the *Stomach*, but convey none to it: And from the most exact Experiments it appears, that no *acid* or *alkaline Humour* is either separated in the *Stomach*, or in any other Parts of the *Body*; neither are such *Effervescencies* thence excited, either in the first Passages, or in the Blood. Whatever *Acid* is contained in the *Stomach*, proceeds from the Remains of the former *Food*, and tho' it frequently contributes to promote *Digestion*, yet it is by no Means absolutely necessary to it; and we find by Experience that *Elix. Propriet. Tart.* and *aromatic Bitters*, which contain a *volatile Salt*, and are of a Nature opposite to that of *Acids*, are often with Success given to create an *Appetite*, and mend a bad *Digestion*: And it is farther observable, that the *Humours* which are contained in the *Stomach* of the most

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rapacious *Birds*, and *Beasts of Prey*, have never an *acid* but a *saline* Taste.

THE *Aliment* thus prepared in the *Stomach*, and expelled into the *Intestines*, is farther *attenuated*, and *propelled* into the *Lacteals*, by the contracting Force of the *Intestines*, and the compressive Motion of the circumambient Parts ; and (from every Place it passes through, from the Time it is received into the Mouth, till it enters the *subclavian Vein*,) is perpetually diluted by the Mixture of the natural prepared *Humours* of the *Body* ; so that the least Part of that *Chyle* which enters the Blood, is composed of the Food taken for Nourishment : The Food is mixed with a mucilaginous Humour, and the *Saliva*, in the Mouth, in the *Oesophagus*, and *Stomach*, with Humours much of the same Nature : In the *Duodenum* with the *pancreatic Juice*, and the *Bile* ; which last is the most elaborate *Humour* in the *Body*, having twice circulated through the last Extremities of the *Arteries*, and thence
acquired

acquired such a *saponaceous* Activity, as chiefly contributes to attenuate the *Viscid*ity of the *Chyle*, and to give it an uniform Consistence: In the other *Intestines* it is mixed with a thin Juice exhaling from the Arteries, and a mucilaginous Humour separated from the *Glands*, described by (a) *Peyerus*: In the *Mesentery* passing through the *Lacteals*, and in the *thoracic Duct*, 'tis perpetually diluted with a great Quantity of *Lympha*; for as the *Vena cava* receives all the returning Blood, so the *thoracic Duct* receives all the returning *lymphatic* Juices of the *Body*, and may as well deserve the Name of *Vena cava lymphatica*, as of *Ductus Chyliferus*.

BESIDES the Causes already mentioned, it is propable that the *Chyle* is impregnated in the *Stomach*, and *Intestines*, with a great Quantity of *animal Spirits*; for there is an uncommon Distribution of *Nerves* to these Parts,

(a) *Paverga Anatomica, Exercit. 1 a.*

and much greater than seems sufficient for their *muscular Motion*; and it is more than probable, that the last Extremities of the *Nerves* terminate in several Parts of the *Body*, where they are dispersed, and perpetually exhale that elaborated Fluid. Hence appears the Reason why such as have a bad Habit of Body receive but an imperfect Nourishment from the most *concocted* and best prepared *Aliment*; the *Chyle* made from thence being soon tinctured and depraved by the natural *Juices*, which are mixed with it: And why such, who have fasted for a long Time, or have recovered from acute Distempers, if they take suddenly too great a quantity of Nourishment, are apt to fall into *Obstructions*, and particularly of the *Mesentery*; their *Fluids* being exhausted to such a Degree, as not to supply a sufficient Quantity to dilute and prepare the Chyle.

FROM this Account of *Digestion*, may be evidently explained the Causes which naturally excite or deprave the Appetite,

64 Of NUTRITION.

tite, what artificial Stomachics are proper to restore it, and their Manner of Operation.

HUNGER is produced by an uneasy Irritation of the *nervous Coats* of the *Stomach*: This Sensation is particularly excited when the *Stomach* is most empty, either by the *Attrition* of the *Rugæ*, which then approach more closely to a mutual Contact, or by the *Acrimony* of the *Humours*, which are separated, or contained in the *Stomach*.

THIS *Acrimony* has a various Origine; it is either separated from the *Glands*, and exhaling *Arteries* in the *Stomach*, and is then of a *saline Nature*, (on which Account *scorbutic* Persons are most commonly remarkable for having a great Appetite) or proceeds from the *acid* Remains of the former Meal, or from a Regurgitation of the *bilious Juice*, which, when the *Stomach* is empty, has an easy Admittance into the flaccid *Pylorus*; on this Account likewise
Persons

Persons of an *atrabiliarious* Constitution, in whom the *bilious Humour* is very active and pungent, have frequently the most voracious *Appetite*, which sometimes is apt to produce dangerous Effects, and to terminate in a *Fames Canina*.

THE Want of an *Appetite* is owing to the reverse of such Causes as naturally excite Hunger; and therefore proceeds either from a *Relaxation* of the *Stomach*, or from a Fault in the *Humours separated* or *received* into it.

THE *Humours* contained, or separated in the *Stomach*, deprave the *Appetite*, when either from an oppressing *Viscidities*, or a pungent *Acrimony*, they afford a painful or a disagreeable Sensation to the *nervous Coat* of the *Stomach*; thus tho' *acid* and *bilious Humours*, when contained in the *Stomach* not vitiated, and in a proper Quantity, contribute to excite an *Appetite* by giving an agreeable, tho' an uneasy Sensation; yet when their *Acrimony* is depraved, or too great, or the *Coats* of the *Stomach* too
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tender, the Irritation thence produced, by being increased, becomes painful; for the Causes of *Pleasure* and *Pain* differ only in a small Degree, and all Pleasure is attended with a *Stimulus*, which is so far uneasie, as strongly to prompt Persons so affected to destroy it, and when increased, and afterwards gratify'd, it terminates either in Indolence, or Pain. On this Account, the greatest *Appetite*, which is excited from long Fasting, turns at length to a nauseous Abhorrence of all *Food*, the *Humours* having thence acquired an exalted putrid *Acrimony*, which affords a painful and disagreeable Sensation.

WHEN the Want of an *Appetite* is owing to a *Relaxation* of the *Fibres*, such *Stomachics* are required, which by their *Astringency* can brace them up, and bring the *Rugæ* more closely to a mutual Contact and Attrition, and by being moderately warm, increase the Contraction of the *muscular Coats*, by encouraging a greater Influx of animal Spirits.

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THE Causes, which by *vitiating the Humours* give a disagreeable Sensation to the *Stomach*, are various; such as *nervous Spasms*, *Indigestion*, from a Relaxation of the *Stomach*, an *irregular Diet*, or a *particular bad Habit of Body*: When the *Stomach* is thus affected, *Emetics*, or *stomachic Purgatives* must be first used, to discharge the *viscid Humours*, or the uneasy *Stimulus*, and then such *Medicines* as are particularly appropriated to the first Cause of the Disorder: Thus, for Instance, *Assa fætida* may prove a *Stomachic* to some, which in others would excite a *Nausea*; *cooling Acids* are proper to quicken the Appetite of such, whose *Humours* are too hot, and inclined to *Putrefaction*; *Elix. Propriet. Tart. Sal Absynth.* which are of a reverse Nature, are most suitable to such, whose *Stomachs* abound with cold, ungrateful, *acid Humours*.

PUNGENT, *stimulating Stomachics*, ought never to be given when the *Appetite* and *Digestion* are deprav-

ed, without being joyned with such *Medicines* as strengthen the *Stomach*, and help *Digestion*; for they only afford a false destructive *Appetite*, and are soon blunted and absorbed by the Food which is taken; while the *Stomach*, by its languid Heat and Motion, and that of the circumambient Parts, is incapable of *Digesting* it: By this Means Crudities are collected, Obstructions of the *Viscera* are from thence formed, and what was designed for Nourishment, proves at length a most certain Destruction to the Body: On this Account the Custom of *Whetting* in a Morning has been so frequently observed to be attended with a fatal Consequence.

IN some Constitutions, where there is an universal *Relaxation* of the *Fibres*, and particularly of the *Stomach*, the *Nerves* are so sensible and tender, as to be easily irritated, and quickned by the Use of *pungent Stomachics*: But when the *Stomach*, by frequent *Debauches*, has been greatly distended, the *Fibres* are thence apt to lose their Tone, and
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to become *Paralytic*, and insensible of the strongest *Irritations*, which *stimulating Medicines* can excite: In such a complicated Case, *astringent, warm, pungent Stomachics* are required, which may brace the *Fibres*, and by their Heat encourage such an *Afflux of animal Spirits* to them as may make them sensible of the *Stimulus*, the Force of which would be otherwise eluded: Such a Method will prevail, (if the Disorder be not so far advanced as to admit of no Relief) especially if joyned with *Temperance*, which gives the distended Parts Liberty to recover their Tone, and with *Exercise*, which is the most excellent *Stomachic* and *Digestive*, as it powerfully contributes to promote the *Contraction* of the *Stomach*, and thence the *Attrition* of its *Rugæ*, by encouraging a greater Influx of *animal Spirits* into its *muscular Fibres*, and by increasing the compressive Force of the circumambient Parts.

THE Time, which is necessary for the *Digestion* of the *Aliment* in the first Passages,

ages, is varied according to the Nature of the *Food*, and the particular Strength of the *Constitution*: Liquids soon pass into the *Blood*, and the more solid the *Food* is, the longer Time is required. (a) *Waleus* from several Experiments concludes, that common solid *Food* in a healthy Man is in the Space of six Hours entirely discharged out of the *Stomach*, changed into laudable *Chyle*, and begins to flow into the *Blood*; and (b) *Lower*, assisted by his Experiments, shews, that in two Hours more, this *Chyle* is changed into *Milk*, and circulates through the *Vessels* in that Form; and in two Hours more, by the repeated Force of the *Vessels* acting on it, but particularly of the *Lungs*, is changed into *Serum*, which is that *animal Fluid* that contains all the Materials required for Nourishment.

Thus the *Lungs* are chiefly instrumental in preparing the *Chyle* fit for

(a) *Epistola 1 a. ad Barthol. de motu Chyli & Sanguinis.*

(b) *De Sanguinis Motu & Colore.*

Nourishment, and finishing the *second Digestion* of the *Aliment*; for the compressing Force of their *Vessels*, being particularly increased by the *Weight of the Air*, contributes to give a greater *Attenuation* and *Compaction* to the *Humours* contained in them, than in any other *Vessels* of the Body; and by the same *Pressure of Air*, the *Form* of these *Vessels* is likewise so altered, that the unprepared *chylous Humours* (which would otherwise be too gross to enter the minute *Vessels*, which are at length to be nourished by them) are obliged to circulate in the *pulmonary Vessels*, through *Passages* as narrow as the most minute *Capillaries* of the *Body*; for the (a) *Diameter* of a *sanguiferous Artery* in the *Lungs*, before it terminates in a *Vein*, is so small, as scarce to admit one *Globule of Blood* to pass through it without being compressed into an *oval Form*; but by the Force of the *Air* inspired, this

(a) Leuwenhoek *Tome. 2. p. 204. Tom. 3. Epist. 28. p. 219.*

Canal is from a *circular*, changed into an *elliptical* Figure; by which Means the *circulating Fluid* is obliged to move through Passages, which are by such an Alteration rendered much more narrow than before, since the *Diameter* of a Vessel decreases in Proportion, as it recedes from a *circular Form*: These *sanguiferous Arteries* likewise in the *Lungs* (as in all other Parts of the *Body*) end in *Arteries* which convey *Serum*, and these into more minute, which convey a *Lympha*; and since by the same Pressure of Air inspired, these minute *circular Canals* must be made almost infinitely less, by being forced nearer to a *plane* Figure; it from thence evidently follows, that whatever *Fluid* can circulate through them, must certainly be sufficiently prepared, and capable of entering the smallest *Vessels* in the Body.

By the Assistance of these several concurring Causes, the *Food* is changed into *Serum*, which, however variously examined, shews not the least Tincture of *Acid* or *Alkali*, but is of a mild, soft, glut-

glutinous Disposition, easily mixes with Water, and is almost free from either Taste or Scent; if warmed with a gentle *Heat*, it gradually dissolves away, and loses all its *Viscosity*, but if exposed to a Degree of *Heat* greater than that which is natural to a human *Body*, it becomes *coagulated*, and so solid that it strongly resists the Knife: *Spirit of Wine* mixed with it produces the same Alteration, with this Difference, that it continues then free from *Putrefaction*.

HENCE appears the Cause of the Blood's *Viscosity* in all *inflammatory* Cases, proceeding from an increased Degree of *Heat*; the *Blood* in the Beginning of such Distempers being often perfectly *florid*, and mixed with a due Proportion of *Serum*: Hence likewise appears the great Error of endeavouring to *attenuate* such *Blood*, by *stimulating*, *volatile*, *alkaline* Medicines and *Blisters*, which by increasing the *Motion* and *Heat* of the *Blood* must consequently increase its *Viscosity*. This Error is in some Measure owing to ascribing the common
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74 Of NUTRITION.

Properties of a *homogeneous* Fluid in general to the *Blood*, and the Alterations it receives from *mechanic Causes* acting on it, whereas it is *heterogeneous*, and endued with Properties only peculiar to this *Fluid*. It acquires a *Viscosity*, tho' of a very different Nature, either from too intense *Motion* and *Heat*, or from a *Circulation* too languid; in this last Case the *Globules* of the *Humours* receive larger *Superficies*, and become *specifically lighter*; in the former Case their *specific Gravity* is increased, and they are so compacted and pressed together, that they almost become solid, and unfit for longer *Motion*: The Want of this Distinction has been the Cause of great Errors in Practice; for the Method of altering each *Viscosity* is very different, and the Reason which is commonly given for the Use of *stimulating, volatile Medicines*, in an *inflammatory Coagulation* of the *Humours*, (that when *Blood* is taken out of the *Body*, and mixed with them, it does not receive such a strong, and quick *Coagulation* as otherwise) is the strongest Argument that can be offered against the Use

Use of them ; for then it is most evident, that the *Viscosity* of the *Blood* is intirely owing to the *Want* of sufficient *Motion*, as it is likewise in a *Leucophlegmatia*, a particular Sort of *Fever*, and several *chronic* Disorders, where such a *Method* is greatly serviceable ; but the Disparity is very great, when the *Viscosity* of the *Blood* proceeds from *too intense Heat* and *Motion*, and which must be unavoidably increased by such active Preparations.

HENCE likewise appears the Error of such who assert, that *spirituous Liquors* attenuate the *Blood* ; and likewise the Reason why such who are too much addicted to them are subject to *Obstructions*, *Polypus's*, *Palpitations of the Heart*, and *nervous Contractions*.

THIS coagulated *Serum*, distilled from a *Retort*, placed in a *Sand-heat*, by a Fire of the first Degree, affords a *Spirit* of a pale yellow Colour, impregnated with a great Quantity of *volatile Salt* ; the Fire increased to the second Degree raises

76 Of NUTRITION.

raises a *volatile, alkaline Spirit*, with a transparent, light *Oil*, of a golden Colour, and a fetid Smell: The last Force of the Fire raises a black, thick, fetid *Oil*; in the Bottom of the *Retort* remains the *Caput Mortuum*, a black Earth, light and spongy, which *calcined* in an open Fire becomes white and insipid; but cannot receive any farther Alteration, tho' exposed to the most violent Degree of Heat.

THIS *Serum* which is thus found by Experiment, endued with this Variety of Qualities, is that from whence all the *Solids* and secreted *Fluids* of a human Body are continually supplied and repaired.

THERE is no Solid but what is composed of smaller Parts exactly like the greater. (a) *Leuwenhoek* has discovered, that the *pectoral Muscle* of a *Flea* is the same in Form as the *pectoral Mus-*

(a) *Tom. 2. p. 31.*

cle of an Ox, and (a) that the largest *Muscles* in the *Body* are composed of smaller *Muscles*, which differ only in *Magnitude* not in Form. (b) *Malpighius* and (c) *Havers* discovered that the *Bones* consist of several *concentric Cylinders*, the same in Form, tho' gradually decreasing. The larger *Vessels* consist of smaller, and the minute *Vessels* which have been discovered, and appear to be incredibly smaller than the finest Hair, (d) are in Form like the largest. A *sanguiferous Artery*, before it ends in a *Vein*, is so small that it only admits one Globule of Blood, and throws off a *lateral Branch* whose *Diameter* is $\frac{1}{2}$ less than the last *Orifice* of the *sanguiferous Artery*: This is the *Origine* of the *serous Artery*, which after being greatly extended and ramified, before it terminates in a *serous Vein*, emits a *lateral Branch*, whose *Diameter* is $\frac{1}{2}$ less than

(a) *Tom.* 1. *part* 2. p. 46, 47.

(b) *Tom.* 2. 214.

(c) *Osteologia nova.* *Tab.* 1. *Fig.* 1. a. a. & p. 42.

(d) *Leuwenhoek* *Tom.* 2. p. 57, 58.

78 Of NUTRITION.

the last *Orifice* of the *serous Artery*: This is the Origine of the *lymphatic Artery*, which, after various *Ramifications*, ends likewise in a *lymphatic Vein*. The *Humours*, that peculiarly belong to these *Vessels*, decrease in the same Proportion; for a *Globule* of *Blood* is composed of six *Globules* of *Serum*, (a) and a *Globule* of *Serum* is composed of six *Globules* of *Lympha*. Thus far Discoveries have been made by the Use of *Microscopes* and *Injections*; and it is more than probable that there are several decreasing *Series* of *Vessels* yet undiscovered, that can no more be the Object of our Sight than *Air*, their *Humours* being so pellucid that the *Rays of Light* are transmitted, not reflected, from them; and their *Orifices* so small, that no artificial *Liquor* yet known can be injected: But it may be safely concluded, that the *Vessels* undiscovered are in Form like the largest, since so great an Uniformity is to be observed through the whole

(a) Leuwenhoek *Tom.* 1. p. 32. *Tom.* 2. p. 3.

animal Oeconomy, and such an exact *Analogy* is particularly kept up between the greatest, and the most minute *Vessels*, which can only be perceived by the finest *Microscopes*.

THE Quantity of the *Fluids* greatly exceeds that of the *Solids*: The Difference between a *fat* and a *lean* Man chiefly consists in a Collection of useless, inactive *Oil*, which oppresses the *Body* of the former; for such a one *emaciated* by a *Consumption* has still the same Number of *Vessels* as before, tho' more wasted and abraded; for he then retains the perfect Use of his Reason and Senses; and if any of the *Solids* by this *Consumption* were entirely destroyed, the *Vessels* of the *Brain*, as being most tender, could not escape: This great Disparity may be likewise hence confirmed, that of twenty five Grains of the *Brain* exposed to the Air, twenty four exhale, and only one Grain of Solid remains. Even the *Bones*, washed often with Water, and exposed to the *Sun*, lose nine Parts in ten.

ALL the *Solids* are *nervous*, and take their Origine from the *Brain*, for (a) *Malpighius* has observed, that the *Embryo* in the *Womb*, whose Form is like a Worm, and which first constitutes the *spinal Marrow*, is the *Basis* from whence all the *Solids* in the *Body* proceed. Five *limpid Drops* grow from it, which afterwards form the Lobes of the *Brain*, from which the two *Globes* of the *Eye* next appear; from the Middle of this *Carina* arises an incurve *Tube*, that has four unequal *Protuberances*, which by Degrees inclining to each other, form the *Heart*; from whose *Tendons* the *Vessels* take their Origine: All the *Glands*, *Bowels* and *Membranes*, are formed of these *Vessels* variously disposed; the *Bones* are formed from *Membranes* hardning by Degrees to *Cartilages*, and then to *Bones*; from whence it appears that every solid *Stamen* of the *Body* is *nervous*.

(a) *De ovo incubato* p. 70. ad 83.

THE gradual *Alterations*, which (a) *Ruysch* has observed in human *Embryos*, agree so exactly with the Observations which *Malpighius* has made on the Egg, that it seems very necessary first to shew how the small *Embryo* in the Egg is nourished, and what *Alterations* happen till the *Chicken* is produced, before a just Account can be given how *Nutrition* is performed in a human *Body*.

THE *Shell*, or outward *Integument*, proceeds from a *mucilaginous Humour*, separated from several *Glands*, placed near the *Anus*, which hardens by Degrees, the *Egg* being intirely soft three Days before its *Expulsion*; next to this lies a tenacious *Membrane*, which may be considered as the internal *Periosteum*, or the *Dura Mater*; under this lies another *Membrane*, more tender than the Former, like the *Pia Mater*. The

(a) *Thesaur.* vi. *Tab.* 2. *Fig.* 1, 2, 3, 4, 5. *Tab.* 3. *Fig.* 1, 2, 3, 4.

Egg has two *Angles*, the one obtuse, and the other more acute, the *Yelk* lying in the *Center*. Between this, and the *Shell*, the *White*, or *Albumen*, is placed, which is not a loose Fluid contained in one Cavity, but consists of several *Series* of *concentric*, thin *Membranes* gradually decreasing, like small *Circles* within a large one. Between each of these the *Albumen* is contained, in whose *Center*, between the obtuse *Angle* and the *Yelk*, the *Embryo* is placed in a small *Bag*, containing a single *liquid Drop*.

THE *Hen* broods on this *Egg*, and by her *genial Heat* the *White* next to her *Body*, contained between the first and second *Membrane*, begins to be attenuated, and to move by *Degrees* into the next, and the *Motion* and *Warmth* being continued, is by progressive *Undulations* propelled through the various *Series* of the *Albumen*, till it arrives at the small *Bag*, where it is received by the *Embryo* for *Nourishment*.

How

How great the Attenuation of this *Humour* must be, appears to any one who considers the minute Size of the *Animalcule* receiving it for Nourishment, a (a) *thousand* of which are scarce equal to a *Grain of Sand*: But this *Humour*, tho' already wonderfully attenuated, must be yet much more subtilized, before it is sufficiently prepared for *Nourishment*, and can circulate through all the decreasing *Series of Vessels*, which, tho' not visible, are *ichnographically* described in the *Embryo* (b) even of the most minute *Animal*; for as yet there is as great a Difference between it, and the last elaborate *Juice*, which nourishes the *Embryo*, as between the crude *Chyle* in a human *Body*, and that *Fluid*, which constantly evaporates by insensible *Perspiration*.

THERE appears to be no Difference between the *White* of the *Egg*, and the *Serum* of the *Blood*: For however

(a) *Leuwenh. Tom. 3. p. 368.*

(b) *T. 1. p. 8.*

84 Of NUTRITION.

variously examined, they afford in every Respect the same *Phænomena*, (a) and the Alterations, which each receives in being prepared for Nourishment, depend on the same Causes. The *Secretion* of the former proceeds from the *Heat* of the *Hen* sitting on it, and if the *Heat* apply'd to the *Egg* is greater than that which is natural to the *Hen*, it no longer remains fit for Nourishment, but becomes coagulated, neither will it nourish if the *Heat* be less; but if a just Degree of *Heat*, tho' artificial, be preserved, the *Embryo* will be thereby nourished, and brought forth. (Which Method has been successfully practised with Stoves in *Ægypt*. (b) After the same Manner, the Action of the Vessels produces the same Alteration on the *Serum* in a human *Body*, as the *Heat* of the *Hen* on the *Albumen* in the *Egg*; for when that is regular and equal, it dissolves to the greatest Degree of Fluidity, till it is capable of entering and nourishing the de-

(a) *Vid.* p. 39.

(b) *Plinii historia natural.* Lib. x. Cap. 54.

decreasing *Series* of *Vessels*: But whenever the Action of the *Vessels* on the *Serum* is increased, it acquires an *inflammatory Viscidity*; and as the *Humours* circulating in the last *Vessels* of a human *Body*, where *Nutrition* is chiefly performed, retain no longer a coagulating Quality, but are so fine as entirely to exhale, so likewise the *Albumen*, when prepared fit to nourish the *Embryo* by passing through the decreasing *Series* of *Membranes*, will by no Means coagulate, if exposed to any Degree of *Heat*. (a) Besides, the *Heat* of a healthy Man, measured by a *Thermometer*, is the same as the genial *Heat* of the *Hen*; and where there is the same Degree of *Heat*, we may safely conclude, there is the same Quantity of Motion: Therefore, *Nutrition* must be performed after the same Manner in each, for where the *Materials*, and the *physical Causes* are the same, so will their Effects be.

(a) *Boerhaave, de Motu Cordis. Propos. VI.*

THE *White* of the *Egg* alone gives *Nourishment* to every Part of the *Embryo*, unless some Exhalations, which proceed from the *Hen* or the *Air*, may in some Measure, perhaps, contribute to it: And that such subtle *Particles* fit for *Nourishment*, by that Means, come to the *Embryo*, is sufficiently manifest, because the *Chicken*, weighed immediately after it is produced, is heavier than the *White* was, whereas that alone is consumed, the *Yolk* still remaining entire. So neither from the *Serum* alone, in a human *Body*, is *Nourishment* obtained; for the *Air* is a common *Chaos* of all Sorts of subtile *Bodies*, perpetually floating in it; and it is more than probable, that among them there are several Exhalations from *Animals* and *Plants*, fit to afford *Nourishment*; and that such are received into the *absorbent Vessels* of the *Body*, is most evident from several *Experiments*, and particularly from *Observations* made on *hydropical Persons*, who are apt to receive a considerable Addition to their Weight in a moist Air, from the

the Water imbibed through their Pores; but there is no Water, as will hereafter appear, but what contains *Particles* fit for *Nourishment*.

THUS I have endeavoured to give a short Account of the Origine and Nature of our *Solids* and *Fluids*; which last, if rightly elaborated, always contain Parts fit to repair the perpetual Decays of the *Body*; it only remains now, more particularly to describe the Manner how this *Nourishment* is performed.

THE several *Canals* in a human *Body* have new empty *Interstices* perpetually made in them, which require a constant Repair, by being *abraded* by *Attrition*, the unavoidable Effect of *Motion*, and by being *distracted* by the pressing Force of the circulating Humours; for since all the Lines of a Fluid, moving in a conic Vessel from its *Basis*, to the Extremity of it, are parallel to the *Axis* of the *Canal*, all the Points of that *Fluid* (except that *Cylinder*, the *Diameter* of whose

F 4

Basis

Basis is equal to the last *Orifice* of the *Artery*) must necessarily move with a *Resistance* to their *Motion*, and endeavour to *extend* the Sides of that *Canal* according to its longer *Axis*; but all the *Vessels*, being *elastic*, resist and repel that *Fluid* with the same *Force*, and the *Pressure* of the succeeding *Humours* being too great to suffer its Retreat, it must unavoidably press against, and distend the Sides of the *Canal*; by which Means it will be likewise *widened* in every Point: But as its *Resistance* increases in Proportion to its *Distention*, such a superior *Force* is thence received from its succeeding *Contraction*, as is sufficient to propel, and continue the *Circulation*. From this *Action* of the *Humours*, and *Reaction* of the *Vessels*, depends that *Motion* of the *Blood*, which is observable from a dissected *Artery*; and which does not flow in a free equal *Stream*, but has a subfultory interrupted *Motion*.

THIS *Distention* of the *Canal*, by which Means the Parts of it are separated, produces the Want of a new Supply

ply more than the *Force* of *Attrition* in tender young *Animals*, and (*cæteris paribus*,) the less distant they are from their *Origine*, the greater the *Distraction* of the *Fibre* is ; but it is probable, that in the same Proportion this decreases, the *Force* of *Attrition* increases; for the more firm any *Body* becomes, the greater is the Difficulty to separate its Parts by *Motion*, and the more capable it is by the same Means to excite a violent *Attrition*.

HENCE it appears, that a human *Body* continues to grow, while the *impelling Force* of the *Heart* is greater than the *resisting Force* of the *Vessels* ; and remains at a stand, while there is an *Æquilibrium* between the *impelling Force* of the one, and the Resistance of the other. But as the *Vessels* gradually become more compact and solid, they begin in their Turn to get the better of the *Force* of the *Heart* , *Old Age* advances in the same Proportion, and (if the Expression may be allowed) the Man grows back again.

HENCE

HENCE the Defects of *Old Age* are first observable in the Loss of the finest *Animal* Faculties, for the *Vessels* destined for these Uses, as being most minute, are first compressed, a *Lethargic Indolence* seizes every Part, the *Vessels* gradually become more inflexible, till at length their *Resistance* is so great, and the *contracting Force* of the *Heart* from its *Rigidity* so weak, that it is at length incapable of expelling what it contains, and regularly desists from *Motion*. Such a one cannot so properly be said to die, as that he ceases to live.

HENCE it is evident, that a human Body is gradually destroyed by the same *Circulation* which supports it; that the more quick the Motion of the *Blood* is, the sooner Old Age will advance, and that (*cæteris paribus*) the Number of Years, to which all Men may attain, will be in a *reciprocal Ratio* to the *Velocity* of their Pulses. Thus allowing 70 or *f* Years for the common Age of Man, and 60 or *b* Pulses in a Minute for the common Measure of Pulses in a *temperate Person*,
and

and putting c for the Number of Minutes in a Year; then $c b f = 2209032000$ the Number of Pulses in his whole Life. But if another, by *Intemperance*, forces his *Blood* into such a Motion as may give 75 or z *Pulses* in a Minute, then $\frac{c b f}{c z} = \frac{b f}{z} = 56$ the Number of Years in which such a Person will run out the same Number of *Pulses*, which by the former Computation would hold to threescore Years and ten, by which Means he will finish his limited Number of Pulses or Years *fourteen Years* sooner than otherwise, and universally $z : b :: f : \frac{b f}{z}$.

HENCE it appears, how absolutely necessary *Temperance* is to prolong Life, without considering the several Accidents which an irregular Course is subject to, and which by bringing on *acute*, and *chronic* Disorders, frequently cuts short, and finishes the Age of Man long before its natural common *Period*; for tho' *Intemperance* should happen to be exempted from any sudden Danger, yet by quickning the *Wheels* of the *Machine*,
it

it must unavoidably hasten the Unraveling of the *Thread of Life*, which would otherwise be more slowly spun out to a greater Number of Years. This is not only agreeable to the strictest Reasoning, but is confirmed by repeated Observation; since such Persons who are most remarkable for their *Temperance*, who live chiefly on *Vegetables*, and use *Wine*, and an *animal Diet* sparingly, commonly live to the greatest Age. The great Lord *Verulam* (a) has observed of all Animals in general, that, *cæteris paribus*, such who have a cold Constitution live in Proportion longer than such who have a warm, active Temper. It may be observed likewise, that the Age of Man, which before the *Flood* was very great, when such Things were taken for *Food* which the Earth produced, quickly decreased when the Use of *animal Diet* was allowed.

THE same *circulating Force* of *Humours*, that destroys the Solids, repairs them; the one is successive to the other,

(a) *Historia Vitæ & Mortis.*

(if the *Humours* be well prepared :) For the *circulating Fluid*, by its Motion abrading a *Particle* of the solid *Canal*, may with the same *Force* immediately supply another ; and that abraded *circulating Particle* may be apply'd to a different *Pore*, and be again solid. This *Expulsion*, and *Re-application* of *Particles*, is perpetually continued through the whole *Longitude* of the *Canal* ; but at the End of it, this abraded *Particle* unavoidably exhales, and is lost : This *Exhalation* is constant in four Parts of the Body, where the Extremities of the *Vessels* terminate : *viz.* In every Part of the Surface of the Body. 2. In the large internal Cavities. 3. In the Glands ; and 4. Between the Surfaces of the contiguous *Vessels*.

EVERY *Vessel* is nourished, and abraded by the same *Humour* that circulates through it : The *Serum* alone circulates through all the decreasing *Series* of *Vessels*, but in the most minute, and distant, is more *attenuated*, and *subtilized* : The Sides of the larger *Canals* are

are composed of various *Complications* of small *nervous Vessels*, as a *Cable* is made of smaller *Ropes*, gradually decreasing, all which consist of small *Threads* of *Hemp*, variously twisted, and interwoven.

Nutrition is, therefore, most perfectly performed in these minute distant *Ramifications*, which compose the greatest Part of the *Body*, and contain the most elaborated *Juices*; and not only requires a just *Preparation* in the *circulating Materials* of *Nourishment*, but a due *Afflux* of *animal Spirits* to the *Vessels* which are to be nourished; for it is observable, that any Part of the *Body* quickly languishes and decays, if either the *Nerve*, or *Artery* which is destined to it, be destroyed: But however, this Inaptitude for *Nourishment*, which succeeds the Destruction of a *Nerve*, does not prove that the *animal Spirits* can repair, or increase, the solid *muscular Parts* of the *Body*; (for we find that *consumptive* Persons have frequently a large Stock of *Spirits*, and that fat Men

are

are rather remarkable for an *Inactivity of Mind*) tho' a free *Influx* of them into such Parts as are to be nourished is absolutely necessary: For the *Circulation*, and consequently *Nutrition*, not only depends on the *Force* of the *Heart*, but on the *vibrating Motion* of the *Vessels*, which is entirely owing to these *animal Nerves*, which take their *Origine* from the *Brain*, and closely encircling all the various *Ramifications* of the *Aorta*, afford that sensible *Energy*, which enables them to give a *Motion*, and *Apposition* to the Materials of *Nourishment*, which the *Vessels*, otherwise inactive, only contain, and supply.

THUS the *Ancients* with great Reason distinguished three Sorts of *Nerves*, *Animal*, *Vital*, and such as are principally designed for *Nourishment*; the two former proceeding from the *Cerebrum*, and *Cerebellum*, and are only the extreme Productions of the *Carotids* and *Jugulars*, as the others are the last *Ramifications* of the *Aorta*: They are all
equally

equally (a) *nervous* ; the *Humours* they contain are separated from the same *Blood*, and receive in a great Measure their different Properties, from the different Complication of these almost infinitely extended *Vessels*.

THE last constituent solid *Stamina* of a human Body are mere *Earth* ; for they are not dissolvable in *Water*, *Fire*, *Oil*, *Spirit*, or *Air* ; neither is the strongest Force of *Fire*, tho' ever so long continued, sufficient to destroy the *mechanick Form* of a *Hair* ; but these pure *elementary* Parts, by repeated *Attritions*, and *Comminutions*, are so attenuated, that they constitute part of the most *fluid Humour*, which enters into the most minute *Nerves* of the *Body* ; otherwise they could not nourish, if their Parts were not less than the *Orifice* of the most minute *Nerve* in the *Body*, which is to be nourished ; but all the large *Vessels* are formed from

(a) Vide pag. 40.

these small *Vessels*, and consist of such *Materials* as at first *nourished*, and increased their *Bulk*; but by a *chymical Analysis* resolved and separated, they yield nothing solid but *Earth*; therefore that which composed them, was only *Earth*. Thus *Moses* formerly pronounced that great Oracle of Truth, That *God at first formed Man out of Earth*: And hence in several Passages of the Poets Men are called Αὐτόχθονες, *Ter-rigenæ, Terræ-filii*.

THESE terrestrial Parts, which are the *Basis* of a human *Body*, have not of themselves a sufficient Attraction and Cohesion, to give it a proper *Solidity*; but receive this Advantage from an intermediate glutinous *Humour*, which is either *aqueous* or *oleaginous*; but by the repeated *Action* of the *Vessels*, as by frequent *Distillations*, is attenuated to the greatest Degree of *Fluidity*. Thus *Bones*, that have been exposed to the Air for the Space of twenty Years, contain half their Weight of Water, and when ready to moulder into Dust, recover soon their

Solidity, by pouring Water or Oil on them; for Water, mixed with several Bodies of a soft Nature, gives them the greatest Firmness; as it appears in that Sort of Clay, of which *chymical Vessels* are formed, by being mixed with Water, by the Assistance of which it hardens to such a Degree, that these Vessels cannot again be dissolved in Water, and resist the greatest Degree of Fire, better than any other Sort.

HENCE appears the Reason, why the *Vessels* are not dissolved by the circulating *Humours*: And why some of the *Solids*, as the *Bones*, are harder than the rest: The Circulation, being much weaker in their *Vessels*, than in any other, the *Abrasions* and *Recruits* are neither so great nor so frequent, by which Means they have more Time to harden: Thus *Vessels* formed from Clay are at first yielding and soft, and grow firm by Degrees.

ALL the Difference between the *Solids*, and the nourishing Parts of the *Fluids*,
is,

is, that the former are more at rest, and have a stronger Cohesion; and that the latter are more separated, and in perpetual Motion; for if a thousand small *Globules* be supposed to move in a proper Vehicle, through a *Canal* composed of the same *Materials*, tho' they are then to be considered as *Fluid*, yet if one of them should be pressed into a small Pore of the *Canal*, it stops there, and becomes solid; and by being at first prominent, sustains in that Point the whole Force of the circulating Fluid, which was before sustained by several Points of that *Canal*; (as is evident from the Doctrine of *Hydraulics*) by which Means it is soon fixed, and constitutes a *Particle* exactly like that which is lost.

HENCE appears the Reason, why Scars proceeding from the small Pox, or other Causes, perpetually retain the same Form, notwithstanding the Vessels are so often *abraded* and *recruited*. And how erroneous (a) *Keil's* Opinion is, who from

(a) *Tentamen primum, de Sanguinis Quantitate.*

hence imagined, that the *Solids* of the *Body* never received any *Decay* or *Addition*; and that *Nutrition* consisted only in adding to the *Fluids*, and distending the *Solids*: But if this were true, it must consequently follow, that the *Fibres* of a robust Man shall be weaker, as being more distended, than the *Fibres* of an *Infant*; and if he had ever observed, that the hardest Stone is at length made hollow by repeated Drops of Water, he could never have imagined that the *Vessels* in a human *Body* were so invincibly *strong*, nor that the Force of *Circulation* was so very *languid*. But this ingenious Gentleman seems in some Measure to fall into this Error, that he might from thence explain the Possibility of the *Resurrection* of the same Body. But cannot the Truth of this *Paradox* be more plainly deduced from the former Theory? Since it has been proved that the *solid* Parts of *all Animals* consist of the *same unchangeable Materials*, (a) and

(a) Vide pag. 37.

therefore not to be altered, even by the last *Conflagration*.

NUTRITION is scarce the same in any two different Persons; for it is varied according to the Difference of Age, Constitution and Manner of Living. Hence (a) *Hippocrates* observed that *Infants* cannot bear *Abstinence*; for the nearer the Vessels are to their first Origine, the more easily they yield, and are distended by the circulating *Humours*, and the greater Supplies are thence wanted to fill up the empty Spaces. Lean Men (*cæteris paribus*) wear faster, and require larger Recruits than fat Men, their Fluids being generally more *acrid*, and agitated with a greater *Velocity*; and for the same Reason, such as use Exercise, more than such as live an indolent Life; who are generally remarkable for having a weak *Appetite*.

NUTRITION is not equally performed in any two Parts of the Body,

(a) *Lib. 1. Aph. 13. 14.*

the Force of *Circulation* being different in every Point between the *Heart* and the last Extremities of the *Vessels*: Through every Part of the *Body* there is a peculiar *Circulation*, and but a very small *Quantity* of what passes through the *Heart* circulates through the whole *Body*. The quickest *Circulation* is in the *coronary Arteries*, distributed thro' the Substance of the *Heart*, which, allowing sixty Pulses in a Minute, is performed in $\frac{1}{3600}$ of an Hour. These *Arteries* terminate in three different Places, in the *Cavity* of the *right Ventricle*, in the *Cavity* of the *two Auricles*, and in the *coronary Veins*. The *Circulation*, which is next performed in the shortest Space of Time, is through the *bronchial Arteries*, which take their Origine sometimes from the *Aorta*, and from the *first, second and third Intercostal*: The next *Circulation* is thro' the *intercostal Arteries*, and then thro' the *Diaphragma*. The returning *Blood* from these several Places is for the most Part received into the *Vena Azygos*, near the *right Ventricle*; and it may be

be laid down for a *general Rule*, that (*cæteris paribus*) the nearer the Origine of the Artery is to the *left Ventricle* of the *Heart*, and its returning *Vein* to the *right Ventricle*, the quicker and stronger the *Circulation* is thro' such *Parts*, and consequently the *Abrasions* and *Recruits* are more frequent in such *Vessels* than in any other.

HENCE it appears, how erroneous (*a*) *Lower's* Conclusion is, who, from the given *Quantity* of *Blood* in the *Body*, and the *Quantity* passing through the *Heart* in such a Space of Time, would from thence determine, in what Space the whole *Mass of Humours* circulates through the *Body*; not considering that Part of the two Ounces, which are supposed to be expelled from the *Heart* every Pulsation, is propelled into the *coronary Arteries*, and returns in the $\frac{1}{375}$ of an Hour, allowing sixty Pulses in a Minute; and what Part of the two

(a) *De Sanguinis Motu & Colore.*

Ounces passes to the Extremities, requires a long Time to return. Before he could make a just Computation of this Nature, he must have known the Distance of every *Ramification* of the *Aorta*, and of its returning *Vein*, the *Quantity* of *Blood*, and the *Velocity* with which it circulates through each *Vessel*; but this seems impossible to be calculated.

Is not the Manner of *Nutrition*, and the Materials of *Nourishment*, the same in all *Animals* and *Plants*? And is not the Reason why all cannot be nourished by the same *Food*, owing to the different Strength of the *Vessels*, and of the circulating *Humours*, (by which Means what would afford Nourishment to one, is either too gross, or too soon carried off and dissipated by the other) rather than to a Difference of the *Materials* required? Since from the strongest *Animal*, to the most tender *Vegetable*, the Strength of the *Food* is always proportioned to the Strength of the *Vessels*, and circulating *Humours*; and that whatever is used for *Diet*, from the strongest *Food*,
to

to Water *depurated* by repeated *Distillations*, *chymically* examined, affords the *same terrestrial solid* Parts for *Nourishment*, tho' in a different *Quantity*.

Nothing more contributes to promote *Nutrition* than *Sleep* ; for then the *Humours* are generally supply'd with a greater *Quantity* of *nourishing Parts*, fit to recruit ; and the *Attritions*, and *Abrasions* of the *Solids*, are neither great, nor frequent ; for according to the *Laws of Motion*, the *Momentum* of the circulating *Fluids* decreases in Proportion to their Distance from the *Heart* , or first Cause of Motion : Neither is the Force of the *Heart* alone sufficient to continue the Motion of the *Humours* through all the *Vessels* ; for in the small distant *Canals*, the *Circulation* is chiefly promoted by the compressing *Force* of the *Muscles* ; but as this *Motion* in the time of *Rest* entirely ceases, and since no other *Motion* is continued but what is received from the *Heart*, it must in the decreasing *Series* of *Vessels* gradually grow more languid, till at length it almost

most ceases in the *last*, and most *minute Vessels* : Hence the *Circulation* must unavoidably be stronger in the larger *Vessels*, by which Means the *Chyle* by more frequently passing through the *Lungs*, and receiving more repeated *Alterations*, and *Comminutions* from the Action of this *Bowel*, is sooner changed into *Serum*, than if it could circulate through the more minute lateral *Vessels*, which could not act so strongly on it : Besides, the Heat of the *Body*, which at the Time of waking is greatly varied, is now constant and equal ; neither is there a Variety of *Pressure* in the *Vessels*, nor a disproportioned *Velocity* in the *Humours*, but these are fit to enter, as the others are to receive them. Hence the *Serum*, through the various progressive *Series* of *Vessels*, is gradually resolved into more *fluid Parts*, and the *Vessels*, that were before *abraded* by too violent *Motion*, are now gently *replenished* and *recruited*.

FROM this *Theory of Nutrition* it evidently appears, that all *Atrophies*, however

ever variously distinguished by *Morton* and others, proceed either from the *Humours* not being justly prepared for *Nourishment*, or from the *Vessels* not being disposed to receive them, or from the *Force of Circulation* being either too great, or too languid.

THE former will happen from an improper *Diet* being used, which will not afford *Parts* fit for Nourishment, but gives a wasting *Acrimony* to the *Fluids*; or from a peculiar *Weakness* in the *Organs* of the first or second *Digestion*, which prevents the *Serum* from being rightly *elaborated*: This may often proceed from any *Secretion* of the *Body* being increased, and continued beyond its just *Proportion*; for in such a Case the *Body* must languish and decay, not only from the *Vessels* being emptied and deprived of their *Juices*, but from being more incapable than when such large Supplies were not wanting of reducing the *Food* into *Nourishment*; for that cannot be performed without a just *Mixture* of the *natural Juices*: This
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is the Reason why any *Secretion* being prevented will sometimes produce a Decay. The natural *Juices*, being thereby often depraved, give the same *Tincture* and *Disposition* to the *Chyle*, when mixed with it, and by that Means render it unfit for *Nourishment*.

AN *Acrimony* of the *Fluids* (tho' frequently the Cause) is likewise the unavoidable *Effect* of a *Circulation* too active ; in which Case a Decay must be soon produced from the *Abrasions* of the *Solids* being increased, and from an Inaptitude in the *Fluids* to repair them. When the *Circulation* is too languid, *Obstructions* being from thence formed in the small *Vessels*, such as proceed from them must soon waste, and languish from the Want of an Influx of *Nourishing Materials* to lubricate and distend them ; and the finer *Secretions* from the same Cause being prevented, other *Parts* will be *overcharged*, and various Disorders thence excited. A Decay in each Case is produced from a different Cause ; the former

mer is generally attended with *hectic* irregular *Heats* ; the latter with a cold *Languor* in the extreme *Parts* ; tho' from thence *hectic Heats* are at length produced, the *stagnating Fluids* being rendred *acrid*, and the *Circulation* more active in such *Vessels* as are not *obstructed*.

As the *Causes* which produce such Disorders are various, so are the Indications and Methods of Cure, and may be easily deduced from what has been delivered. But, in general, no *Diet* is so proper to replenish a decay'd Constitution with kindly *Juices*, where the *Organs* of the first and second *Digestion* are impaired, as the *Whites* of new laid Eggs dissolved, and taken *Blood-warm*, in any convenient *Vehicle* : Nothing is more free from *Acrimony*, or more capable of correcting that Disposition in *consumptive Fluids* ; by its near Affinity to the *Serum*, 'tis most easily assimilated, and, by proper Exercise, immediately changed into *Blood*.

A remarkable Instance of this Nature I lately observed in one Mr. *Henry Allen*, a Master of a Ship, who had languished for several Months in a *scorbutick Dysentery*, and was *emaciated* to the last Degree. He received no Relief from the most powerful *Astringents*, but rather an Increase of his *Symptoms*. I advised him to take no *Nourishment* for three Weeks, but the *Whites* of new laid Eggs, dissolved in the *Decoct. alb.* prepared with *aq. Calcis* : By which Means, and the Use of *Ol. Amygd. dulc. Sperm. Ceti*, and such *soft Balsamicks* and *Anodynes*, tho' before despaired of, he was quickly restored to perfect Health.

THAT *Consumption*, which is called a *Phthisis*, can only proceed from a *Collection of purulent Matter*; from whence it is perpetually, by the *absorbent Vessels*, received into the *Mass of Blood*, wasting the *Solids*, and corrupting the *Fluids*. In whatever Part of the *Body*, either from an *Ulcer*, or *Abscess*, there
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Of NUTRITION. III

is a sufficient *Quantity* of such *Pus* collected, a *true Phthisis* will thence ensue; which is always proportioned to the *Magnitude* of the Ulcer, its *Situation*, and the *Usefulness* of the Part affected, to continue the *Functions of Life*.

External Ulcers seldom produce a *Phthisis*, because the Hand of the Surgeon can cleanse them from the greatest Part of the *purulent Matter*, which otherwise would be *absorbed*; yet when such are very large, or situated in spongy Places, and particularly in the *Breast*, after an *Amputation*, a mortal *Phthisis* frequently follows; and Books of Observations abound with Instances of this Nature.

HENCE appears the great Variety of Consumptions proceeding from a *Suppuration*, which might equally happen to the *Liver*, *Kidney*, or *Spleen*; or to any other *Bowel*: The Indications of Cure are always the same, peculiar Regard being had to the *Part* affected.

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THE designed Brevity of this Treatise prevents me, at present, from entering into a particular Description of these several *Distempers*; but as a *Phthisis of the Lungs* is most frequent and dangerous, and, in a great Measure, includes the Knowledge of all others, I shall treat of it in Particular; and after giving an *anatomical* Description of the *Parts* principally affected, and their Use, shall endeavour to give an exact Account of the various Origine, and Progress of this *Distemper*, through its different Stages, with the most rational Method of Cure, carefully deduced from *anatomical Observations* and *mechanic Principles*.





OF THE Structure *and* Use

OF THE LUNGS.

PART II.



THE *Lungs* are formed for a twofold Use, *Respiration* and *transmitting* all the *Humours* of the *Body* thro' them; and have peculiar *Organs* destined for these Uses; so that their Substance is chiefly composed of *aerial Tubes* and *sanguiferous Vessels*.

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114 Of the Structure and Use

THE *aerial Tubes* are divided into *four* Parts, the *first* is the *Larynx* or *Opening*, which gives a Passage to the Air, and is not only closed by the *Aperture* of the *Glottis*, as 'tis commonly supposed, but has likewise two *Muscles* belonging to it, by the Action whereof it can be so firmly closed, that thence it becomes capable of retaining the Air, and by its different Degrees of *Contraction* modulates and varies the Voice; the *second Part* is the *Trachæa*; the *third* where it begins to divide, and loses that Name, the Ramifications are then called *Bronchia*; the *fourth Part* constitutes the *Cellules* and *Vesicles*, discovered and described by *Malpighius*. (a)

THERE are also *four sanguiferous Vessels*, the *pulmonary Artery*, the *pulmonary Vein*, the *bronchial Artery*, first discovered by *Ruysch*; (b) and the *bronchial Vein*, the minute *Ramifications*

(a) *Malpig. de Pulm. Epist. I. 2. T. I. F. I, 2, 3.*

(b) *Resp. ad Epist. Anat. Problem. 6.*

whereof,

whereof, at length by gradual Conjunctions, form one *Canal*, which ends in the *Vena Azygos*. The *Nerves* which are dispersed through the *Lungs* proceed from the *Intercostal*.

THE *Trachæa* consists of five *Membranes*, the *first* is glandular, and is always lubricated with an unctuous Humour, separated from Glands, the Orifices of which terminate there, by which Means the Air is more easily capable of passing and repassing; the *second* is muscular, the *third* is vascular, the *fourth* is cartilaginous, which becomes finer the more it is extended, and is at last entirely membranous; the *fifth* is received from the *Pleura*.

THESE *Cartilages* are orbicular, and are connected by the muscular *Membranes*, intermediate between each *Cartilage*, and are by some called the *meso-chondrion Muscles*: By their Distension the *Trachæa* is lengthened, whenever the Neck is extended; and the Spring and Force of the *Lungs* is, in a great Mea-

116 *Of the Structure and Use*

ture, owing to their Endeavours of contracting themselves and bringing the *Cartilages* nearer to each other; when this happens in too great a Degree, a *nervous Asthma* is from thence produced.

THIS *cartilaginous Fabric*, as being most *elastic*, is very necessary to prevent a Suffocation from any external Pressure, to which this *Part* is so much subject. The *Trachæa* is not fixed to any *Part*, as most Anatomists assert, but is loosely connected; by which Means it is so easily capable of such a Variety of Motion.

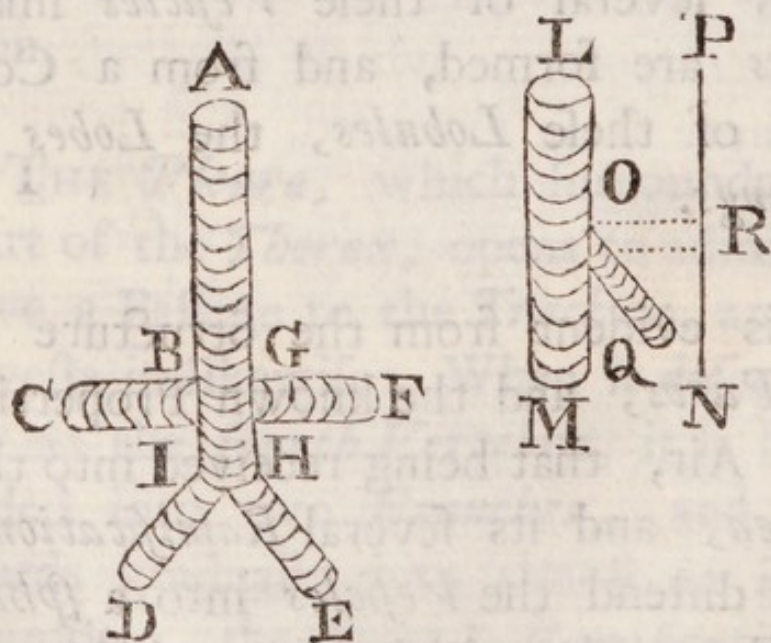
THE *Pleura*, which furrounds every Part of the *Thorax*, opens to admit, and give a Passage to the *Trachæa*, and then invests it likewise: When it descends as far as the *fourth Vertebra*, it is first divided into two *Branches*, and afterwards gradually into almost an infinite Number; the several *Ramifications* of the *Bronchia* go off at acute *Angles*, and the more they are extended, the more acute these *Angles* are: The orbicular

bicular *Cartilages*, which in the superior Branches are connected by a thin Membrane, (differing much in us from those in Brutes) become now compleat, tho' divided into distinct Processes, that when there is an Occasion, they may admit of a greater Distension. As they are more extended, they become gradually smaller; till at length they terminate in a fine Membrane, which is at the end of every Branch of the *Trachæa*, and by the Pressure of the *Air* is formed into a sphaerical *Vesicle*. From a Collection of several of these *Vesicles* small *Lobules* are formed, and from a Collection of these *Lobules*, the *Lobes* of the *Lungs*.

It is evident from the Structure of these *Parts*, and the known Properties of the *Air*, that being received into the *Trachæa*, and its several *Ramifications*, it will distend the *Vesicles* into a sphaerical Form, by which Means their mutual Contact will be diminished; the orbicular Capacity and Longitude of the *Cartilages* will be increased, and the acute

118 *Of the Structure and Use*

Ramifications will rise into *Angles*, approaching nearer to *right Angles*: This Alteration is most necessary; for by that Means a greater Quantity of Air is contained in a less Space than when their *Angles* were more *acute*; which may be thus demonstrated. Let A. B. be the *aspera Arteria*, first divided into *Branches* C. B. and G. F. which constitute the superior *Lobes*, and into others I. D. and H. E. which constitute the inferior *Lobes*. I say, that these Angles,



when the Lungs are inflated with Air, will be increased; for if L. M. is the Trunk from whence arises the Branch O. Q. let P. N. be drawn parallel to L. M.

L. M. it is plain, from the 35th *Prop.* of the first Book of *Euclid*, that the *Parallelogram* O. R. is equal to any *Parallelogram*, which is extended from L. M. to P. N. standing upon the same or an equal Basis: But the *Parallelogram* O. Q. is not extended to N. therefore the nearer it approaches to O. R. the more Air may be contained in a less Space.

WHEN these *Tabules* are therefore inflated with Air in *Inspiration*, the several *Ramifications* recede more from each other, through the whole Substance of the *Lungs*, and their Angles become larger; by which Means the *Lobes*, with all their various Branches, are then more erected.

IF the *Lungs* be placed in a *Vacuum*, and a Passage contrived to admit the external Air into the *Trachæa*, they immediately become greatly distended; but that still they resist, and endeavour to contract, is most evident from hence, because when the external Air is ad-

mitted, they instantly subside; or if they be suspended in the Air, they soon reduce themselves into a smaller Space than they possess in a human *Body*. This Contraction must be therefore owing to the natural Spring of the *Lungs*, not to the Air; for any *Body* suspended in an *homogeneous Fluid*, such as the Air, and receiving on all Sides an equal Pressure, cannot from thence receive any Alteration of its Figure; and notwithstanding this Resistance of the *Lungs* (which is owing to the Spring of the *Cartilages*, and the Action of the *mesochondrion Muscles*, intermediate between them) is much less than the Pressure of the Air; yet when, by the Assistance of other *Organs*, it is increased, and made superior to the distending Force of the Air, the *Lungs* must again unavoidably subside.

FROM these Experiments, the manner how *Respiration* is performed in a human *Body*, may be evidently demonstrated.

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THAT the Space between the *Lungs* and the *Pleura* is a *Vacuum*, and entirely void of Air, is sufficiently manifest from hence ; that the *Thorax* is perfectly formed in the *Womb*, and every Passage so exactly closed, that no external Air can afterwards gain Admittance ; and that the *Lungs* of an *Embryo* never receive any Air in the *Womb*, is plain, because they are then always filled with Water, proceeding from the *Amnios*, which is not expell'd till the *Fætus* passes through the narrow Streights of the *Uterus*, and *Vagina* ; its *Thorax* being thereby greatly compressed : And on this Account, the *Lungs* of an *Embryo* always subside in Water, which Disposition can never be procured to the *Lungs* of an *Animal*, which has once breathed, notwithstanding the Air is drawn off by an *Air-Pump*.

FROM hence, likewise, it is evident, that whenever the external Air is admitted by a Wound into each Cavity of

122 *Of the Structure and Use*

of the *Thorax*, and gives a Balance to the Pressure of the internal Air, the *Lungs* by the Assistance of their own contracting Force must immediately subside; but if such a Force be given to the Air entering the *Trachæa*, as might exceed the Pressure of the external Air, the Animal may be still kept alive, as (a) *Hook* by the following remarkable Experiment has demonstrated. He opened the *Thorax* of a *Dog*, and with a Pair of Bellows, and a Pipe, conveyed Air into his *Wind-pipe*: The *Heart* continued beating for a very long Time, after all the *Thorax* and Belly had been opened; nay, after the *Diaphragm* had been in great Part cut away, and the *Pericardium* removed from the *Heart*; and from several Trials made, it seem'd very probable, that this Motion might have been continued as long almost as there was any Blood left within the Vessels of the *Dog*; for the Motion of the *Heart* seem'd very little changed, after above an Hour's Time, from the first

(a) Sprat's *History of the Royal Society*. p. 232.

opening the *Thorax*, though he found that upon removing the Bellows, the *Lungs* would presently grow flaccid, and the *Heart* have convulsive Motions ; but upon renewing the Motion of the Bellows, the *Heart* recovered its former Motion, and the *Convulsions* ceased. He likewise adds, that tho' he made a *Ligature* upon all the great Vessels, which went into the lower *Parts* of its *Body*, he could not find any Alteration in the *Pulse* of the *Heart*, the *Circulation* it seems being performed some other Way. He could not perceive distinctly whether the *Air* did unite, and mix with the Blood ; nor did he in the least perceive the *Heart* to swell upon the Extension of the *Lungs* ; nor did the *Lungs* seem to swell upon the Contraction of the *Heart*.

WHENEVER the Action of the *intercostal Muscles* is strong enough to overcome the Resistance of the *cartilaginous Segments*, (a) which join the Ribs

(a) Vesal. 1. Cap. XIX. Fig. 3. B E. C A E. b. Fig. 7. P. u. x. y. z. a.

124 *Of the Structure and Use*

to the *Sternum*, and perpetually resist their Action, (by forming with them an acute Angle, which, when the Ribs are elevated by the Action of these Muscles, is forced nearer to a right Angle) the Capacity of the *Thorax* is thence greatly enlarged, a *Vacuum* is produced between the *Pleura*, and the *Lungs*, and the *Pressure* of the Air, being greater than the *Resistance* of the *Lungs*, distends them, till their *convex Superficies* is at Contact with the *concave Superficies* of the *Pleura*; and the Resistance of one is exactly equal to the Pressure of the other. But the Causes, which produced this *Dilatation* of the *Thorax*, are thereby so weakned, that its longer Duration is prevented; and *Exspiration*, or a *Contraction* of the *Thorax*, must unavoidably follow this full *Expansion*; for in the full Point of *Inspiration*, the Blood is so strongly compressed in the *Lungs*, which are then in a State of Rest, that it cannot pass with the same Freedom as before into the left Ventricle of the *Heart*; whence the *Influx* of the *nervous* and
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arterial Fluid into the *intercostal Muscles*, and *Diaphragm*, being diminished, the *muscular Action* dilating the *Thorax* in some Measure abates of its Force; the *Æquilibrium* is destroy'd, the Spring of the Cartilages overcomes and depresses the Ribs, by which Means the *Thorax* is contracted, and *Expiration* is performed.

THE Action of the *cartilaginous Segments*, joining the Ribs to the *Sternum*, is the only *Antagonist* the *intercostal Muscles* have; for they always resist the Force of these *Muscles*, endeavouring to raise them, and make their Angles larger. This *Fabric* was absolutely necessary, because *Respiration* is successive, and could not possibly be performed by *antagonist Muscles*; for as such, they must act alternately: But all the Nerves, design'd for *voluntary, muscular Motion*, have for the most Part the same Origine; and in the time of Sleep when *Respiration* is *involuntary*, there is an *equal Influx* of Spirits into all the Nerves; and consequently, all
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muscular Motion must be then *equal*, not *successive*; but these *Cartilages* perpetually retain their *Spring* and *Action*, even in a dead Body; (and whenever the *Causes* that dilate the *Thorax* cease to act, by their *elastic Action*, it is immediately depressed, and contracted;) and by this surprising *Mechanism* this *perpetual Motion* is sustained.

THE *Heart*, likewise, is a *Muscle*, whose *Motion* is *perpetual* and *successive*, while other *Muscles* are sometimes at Rest, and sometimes in Motion; and is so wonderfully contrived, that the same Cause, which destroys its *Contraction*, restores its *Dilatation*; and each, by this Means, is mutually continued; for the *conic Form* of the *Arteries*, and their *muscular Membranes*, supply the Place of an *Antagonist*: On which Account, whenever the *Heart* by its *Contraction* expels the Blood into the *Aorta*, by the Resistance which the *conic Form* of this *Vessel* gives to its Motion, it is repelled; and by that Means the *coronary Arteries*, which are dispersed

sperfed through the Substance of the *Heart*, are replenished with Blood, and its Nerves with Spirits, from the *Cerebellum* (for no Obftacle oppofes): But at the ſame Moment the *Heart* is thus fully contracted, the *Auricles* are relaxed, and diſtended with Blood ; by which Means the Cause of its Contraction immediately ceafes ; for the Motion of the *nervous Fluid*, that would otherwiſe continue to flow into the *Heart*, is now prevented by this Prefſure of the Blood in the diſtended *Auricles* ; for as (a) *Lower*, and (b) *Willis* have demonſtrated, no Nerve arrives to the *Heart*, but what paſſes through the *Auricles* ; ſo that when they are filled and diſtended, theſe *Nerves* muſt be *compressed*, and for that Moment (as when a Ligature is apply'd round them) the *Heart* muſt become *paralytic* from the *Want* of a ſufficient Influx of *animal Spirits*. Hence the *Auricles* no longer receiving any Oppoſition con-

(a) De Cord. ſitu & ſtructurâ. C. 1.

(b) Nervorum deſcriptio & uſus. C. XXIV.

tract, and evacuate the Blood into the *Heart*, which easily yields to it, and becomes *distended*; and at the same time it receives this Blood, (by receiving likewise the *nervous Fluid*, whose Motion is now free, and Blood into the *Coronaries*) it recovers a Capacity for a *succeeding Contraction*.

SOME have admired why the Motion of the *Heart*, and that of *Respiration*, is not performed in the same Space of Time; but it has been demonstrated, that the Action of the former depends on the successive Influx of the *nervous* and *arterial Fluid* into the Substance of the *Heart*, and on the Influx of Blood into its Cavity, which last only is derived from the *Lungs*, and which are capable of containing ten times the Quantity of Blood, which the *left Ventricle* of the *Heart* can contain. Hence in the full Point of Inspiration, when the *Lungs* are almost in a State of Rest, and its *Arteries* are so compressed that the Blood cannot freely pass into the Veins, the *Heart* is still supply'd with
Blood

Blood from the *pulmonary Veins*, which according to the former Computation, contain a sufficient Quantity to replenish the *Heart* five times. This is the Reason why, if the *Air* be strongly retained in the *Lungs*, the Motion of the *Heart* is perceived very sensibly languid after the fifth *Pulsation*.

THE Circulation of the Humours is quicker through the *Lungs*, than through any other Part of the Body ; for as great a Quantity passes through them in the same Space of Time, as through all the other Parts of the Body ; for all the *Arteries* receive their Blood from the *Aorta*, this from the left Ventricle of the *Heart*, and this from the *Lungs* ; therefore, if two Ounces of Blood are expelled from the Heart at each Pulsation, the same Quantity must necessarily pass through the *Lungs* in the same Space of Time ; otherwise a fatal *Pleurisy* would soon succeed : Therefore, if the *Heart* be supposed to contract sixty times in a Minute, *three thousand six hundred Ounces* of Blood

130 *Of the Structure and Use*

(according to this Computation) must pass through the *Lungs* in the Space of an Hour. And on this Account, when the *pulmonary* Artery is wounded, three or four Pounds of Blood are often evacuated in the Space of one Minute.

THE *pulmonary Arteries* receiving the *circulating Humours* divide them into as many different Parcels, as there are *Ramifications*, whose Number is almost infinite; these minute arterial *Ramifications* terminate in *Veins*, which, by Degrees uniting, become larger, till at length they end in four large Branches returning from the four different *Lobes*, which joining together form the *Sacus Lowerianus*. By this Structure the *Humours*, that were before separated in the *Arteries*, are afterwards intimately mixed in the *Veins*: Hence (a) *Malpighius* affirmed, that the chief Action of the *Lungs* consisted in *mixing* equally the *heterogeneous* Parts of the Blood,

(a) *Opera Anatom.* p. 325.

and that in a Drachm, or any given Quantity of the *Fluids* which circulate through them, there will be a proportioned Mixture of the several Humours contained in the Blood. (a) *Borellus*, opposing this Opinion of *Malpighius*, asserted, that the Action of the *Lungs* consisted in *separating* the *Humours*; the most exquisite Separation being performed, when the *Blood*, or any *heterogeneous Fluid*, passes from a large Tube through small Ramifications: But their Opinions, though very different, may be easily reconciled, being each of them partly right; for the circulating Humours, by the *Structure* of the *Arteries*, are *separated*, and by that of the *Veins* are again most intimately *mixed* together; and by this useful Mechanism, the new *viscid Chyle* received into the *Blood*, which otherwise would be apt to run into *Cohesions*, is attenuated, and all the circulating Humours are preserved in a just Degree of *Fluidity*.

(a) *Motu Animal. pars 2da. Prop. 108, & 109.*

THESE Advantages are likewise greatly promoted by the Pressure of the *Air* on the Vessels of the *Lungs*, being so perpetually varied, that they never continue of the same Form, for two successive Moments of Time: For in Inspiration their Expansion, and the Pressure of the Air on them, gradually increase, and in the same Proportion decrease in Expiration; and when the Air is retain'd in the full Point of Inspiration, its increasing Rarefaction still continues the Change; and since the Capacity of these Vessels is perpetually changed, the Figure of the Fluids must unavoidably admit of the same Alteration: And it is probable that by this Means the Humours pass through, and are prepared in the *Lungs* for all the different *Secretions* which are afterwards performed in the whole Body; for all *Secretions* are made from the same *Blood*, and in a great Measure receive their different Properties from the different Capacity of the separating Vessels; and since these Vessels from their greatest

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Capacity, which is *circular*, are gradually compressed and changed into a *Plane* Figure, they must therefore likewise pass through all the various intermediate Degrees.

IT is evident from what has been laid down, that the most necessary Functions of the *animal Oeconomy* immediately depend on the Influence of this *Organ*; and that likewise the *Heat, Colour*, and the most *material Properties* of the *Blood*, are chiefly owing to the *Lungs*.

FOR it is observable, that such Animals who want *Lungs*, as Fishes, are always *cold*, and the greater the Respiration (or the Action of the *Lungs*) is, the greater likewise is the Degree of Heat; for in an human Body the Force of Heat increases in Proportion to that of Attrition, and this to the Force of Circulation, which is as great through the *Lungs* as through all other Parts of the Body: Hence, in regard to the Force of *Attrition*, there is the greatest *Heat*, but in respect of the *Air* the greatest

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Cold;

134 *Of the Structure and Use*

Cold; the one is justly corrected by the other; for the Force of *Attrition* in these Parts is so very violent from the Pressure of the *Air*, and the Velocity of the *Blood's Motion*, that Health could not long subsist if it was not thus *moderated* by a proper Disposition of these Vessels in being so much *expanded*, and by an *opposite Quality* in the Air.

FOR the *Refrigeration* of any Body is proportioned to the *Expansion* of its Surface, and the *Density* of the *Medium*, (as Sir *Isaac Newton* has observed) and if any Body of a small Surface, warmed to a great Degree, is extended into a large Surface, and placed in a *dense Medium*, it will, from that Alteration, more quickly abate its Heat than otherwise: And for the same Reason, the Heat of the Blood in the *Lungs* must be much diminished, and moderated, by being *expanded* on a large *Superficies*, and exposed to the Influence of the Air, whose Heat, in the most warm Weather, is less than that which is natural to a human Body, and by being

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ing renewed every Inspiration, its *Density* is kept up in full Force ; for that which is expired, by being *rarified*, and warmed by the Heat of the Body, is not capable of cooling the Blood if received again into the *Lungs*, as fresh Air.

HENCE appears the Reason why Wind, which is only Air renewed, or a change of *Atmosphere*, is so cooling (not that in Wind there is any thing actually more cold than in any other Part of the same Air ; for the most sensible *Thermometer*, exposed to the Wind of a large Bellows, receives from thence no Alteration) the circumambient Air being soon rendered by the Heat of human Bodies, more *light, rarified*, and consequently less capable of *attracting* Heat from them, than such Air as is placed beyond their Sphere of Activity.

HENCE likewise appears the Reason, why the *vital Heat* is more strong, and lasting, in robust Constitutions, than in others, their Humours being more

136 Of the Structure and Use

dense, and their *Vessels* more *elastic*; and from thence not only capable of *exciting* a greater Heat, but of *attracting* and *retaining* it longer than weaker Bodies: For though *Attrition* excites Heat, by *collecting* that *elementary Fire* which is dispersed through every Part of Space; and though this *Collection* is proportioned to the *Elasticity* and *Velocity* of the Bodies in Motion, yet its *Retention* is always proportioned to the *Density* of Bodies.

(a) Sir *Isaac Newton* in his *Opticks* supposes, that not only the *Collection*, but the *Retention* of Fire, or Heat in any Body, depends on the *oscillatory Motion* of all the Parts of that Body which is warmed; he supposes likewise, that there is an *attracting* Force between the *corporeal Substance* and *Fire*, or the *Rays* of *Light*; and that when this Particle of *Fire* is in a perfect *Vacuum*, its Motion is very slow, but that

(a) *Qu. 5. p. 314. pag. 255.*

the nearer it approaches to any Body, the more it is attracted by it, and its Velocity is increased in the same Proportion, which is always greatest at the Point of *Contact*, from whence it is instantly repelled ; that from hence an Action and Reaction arise, which produce *oscillatory Motions* ; and that the Force of Heat continues in Proportion to the Violence and Duration of these *Vibrations* ; He supposes likewise, that these Rays of Light arrive to Bodies with an acute Superficies : But as these Notions were by no Means capable of a Demonstration, and as this *great Man* was prevented from prosecuting them farther, he proposes them to be inquired into, and examined by others ; and after the most cautious Reasoning on repeated Experiments, it appears, that (notwithstanding *elastic* Bodies are most capable of *collecting* Heat by *Attrition*, and that this is the chief Cause which excites Heat in a human Body,) this *Collection* of *Fire* in other corporeal Substances may be owing to other Causes ; But whatever the different Causes are,

138 *Of the Structure and Use*

are, which *determine* and *communicate* Heat to Bodies, it is always retained in such Bodies, not in Proportion to their *Elasticity*, but in Proportion to the *Quantity of Matter* and *specific Gravity* of such Bodies; for if *Gold, Mercury, Lead* and *Water*, are placed in the same Degree of Fire, their different Heat will be exactly proportioned to their *different Densities*; and no Bodies are certainly less capable than these two last, of exciting *elastic Vibrations*.

THE greater the *Density* of any Body is, the greater likewise is the Difficulty to *communicate* Heat to it, but when *communicated* it is the longer *retained*; whereas to Bodies of a reverse Nature, it is easily *communicated*, and as quickly goes off. This is the Reason why Persons of a weak Constitution, from a small Force of Heat are, for a short Space of Time, immediately flushed and warmed; for Weakness is nothing else but a *Relaxation* of the *Solids*, and a *Levity* in the *Fluids*.

NOTHING is more wonderful, and perhaps more difficult to explain, than the Heat of the Blood in animal Bodies; for the most violent Agitation of any other Fluid is not capable of producing so great a Force of Heat; but whoever considers the following Reasons will find them, I believe, sufficient to account for it. 1st, The particular *Elasticity* and *Spring* of the *Solids* of *animal Bodies*, their *Motion* perpetually changed, the *conic Form* of the *Arteries*, their *Ramifications*, the various *Motions* and *Repercussions* arising from hence, must all produce a more exquisite *Attrition*, than any artificial *Motion* can possibly excite. 2^{dly}, The *animal Spirits* in several Parts of the Body mixing with the Blood, which from the elaborate *Secretion*, their surprizing *Activity*, and the *Minuteness*, of their Parts, seem to be somewhat *analogous* to the *Rays* of *Light* or *Particles* of *Fire*. 3^{dly}, The *Density* of the *Globules* increased by being compacted by the *Action* of the *Vessels*, and their *spherical Form* containing the greatest

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140 *Of the Structure and Use*

Quantity of Matter in the smallest Space, make them capable of *retaining* their Heat the longer. 4^{thly}, By being *oleaginous* they are apt to receive and retain a greater Degree of Heat than other *Fluids*; for (a) Sir *Isaac Newton* has observed, that there is a peculiar *Affinity* and *Attraction* between *Heat*, or the *Rays* of *Light*, and *oleaginous* and *sulphureous* Bodies. 5^{thly}, This *Attrition* is performed in Vessels where no colder *Medium*, such as the Air, (or at least only its more subtle Parts) can intervene; for any warm Body placed in a *Vacuum* retains its Heat much longer, than if exposed to open Air, (its *Medium* being much more fine than common Air;) and if a perfect *Vacuum* could be obtained, it is probable that a *dense* Body, sufficiently heated, would perpetually *retain* its Heat. This, perhaps, may be the Cause of the perpetual Heat of the *Sun*, which, according to the best Computations, is the largest, and most

(a) *Opticks* p. 250.

denſe Body, of a *Form* almoſt *spharical*, violently warmed, and agitated, and placed in a *Medium* which muſt from thence be moſt ſubtle and fine.

THE bright purple *Colour* of the Blood is chiefly owing to the *Lungs*, but not by admitting *nitrous Particles* with the *Air*, as *Lower* and others have imagined; for it does not appear that *Air* is received into the *Blood*, or that *Nitre* can be any way ſufficiently *volatilized* to be univerſally mixed with the *Air*, and fit for this Purpoſe; for all *Nitre* is naturally a *fixed Salt*, neither by the Mixture of a *volatile alkaline Salt* (if it ſhould happen to meet with ſuch in the Earth) can it be rendered *volatile*; for from thence it only becomes *ſemivolatile*, and incapable of aſcending ſo high above the Surface of the Earth, as is generally ſuppoſed; the *volatile Spirit* of *Nitre* is likewise an artificial Preparation, and one of the ſtrongeſt Acids, and would be moſt pernicious to the *Lungs*, if received into them: Neither does this Opinion receive any Force

142 *Of the Structure and Use*

Force from the florid Colour, which the Blood acquires by being mixed with *Nitre*; for *Salt Armoniac*, *Salt Gem*, or common *Sea Salt*, will give the same Tincture to it. But it is evident from the Discoveries which have been made with *Microscopes*, that this Colour of the Blood is owing to the Action of the Vessels on the contained Humours; for (a) *Leuwenhoek* has given ocular Demonstration, that six pellucid Globules of *Serum*, compacted and joined together, form a *red Globule*, whose Colour is lost whenever they are separated, and cannot be again restored by being mixed with *Nitre* or any of these *Salts*: And as the Pressure of the Vessels in the *Lungs* is greater on the circulating Fluids than in any other Part of the Body, the *Globules* that were before separated, or imperfectly joyned together, are thereby compressed, and most exactly united; and from thence the Colour of the Blood, returning into the

(a) *Tom. 2. p. 3.*

left *Ventricle*, is much more bright and florid, than in the *right Ventricle*, before it received the Action of the *Lungs*.

WHATEVER is the different Nature of the Food received into the *Stomach*, the *Chyle* or *Milk* made from thence is always of a *white* Colour; and when more perfectly elaborated by the Action of the *Vessels*, and the Mixture of the other *animal Fluids*, is changed into a *red* Colour. This particular Alteration may in some Measure be illustrated from chymical Experiments made on *Milk*; for if this is mixed with any Thing of an *alkaline* Nature, and gradually agitated with a sufficient Degree of Heat, it assumes a *yellow* Colour, and from thence passes through various Degrees, till at length it becomes intensely *red*: And if the Heat be farther increased, it is changed into a *dark* Colour. Thus in a human Body, the *Chyle* and *Milk*, by being mixed with the other animal Fluids, which are of an *alkalescent* Nature, tho' not *alkaline*, and by being prepared by more just Degrees of *Heat*
and

144 *Of the Structure and Use*

and *Pressure*, are changed into a *yellow Serum*, and at length into *florid Blood*: On this Account a *sanguine* Complexion is almost peculiar to such who use much Exercise; while they who lead an inactive Life generally look *pale*; and in hot Countries, the Complexion of the Inhabitants is *dark*, and adust, their Solids being parched up, and their Fluids agitated with a stronger Force of Heat, than in a more moderate Climate.

THE Opinion of the Air being received into the Blood, has very much prevailed, notwithstanding there are several Arguments, which seem sufficient to prove the contrary. 1st, The external Membrane, that receives the immediate Contact of the Air, is lubricated with a mucilaginous, unctuous Humour, and such as Mr. *Boyle* has demonstrated, with the greatest difficulty, admits the Air to pass through it; (a) and Wa-

(a) *L.b. 2. chap. 13.*

ter, which seems to be a more subtle Body, will enter through Pores, which are impervious to Air. 2dly, Every Part of the *Lungs* seems to be carefully guarded against its Admittance, for it cannot enter through the Arteries, because the repressing Force of the circulating Fluid in these *Vessels* is greater than the pressing Force of the Air; for no Fluid (as the Doctrine of Hydraulics demonstrates) can enter a *Vessel* replenished with another Fluid, where the Resistance of one is greater than the Pressure of the other; and the Veins are so compressed every Inspiration, that no Admittance can be then expected of another *Fluid*, and in Expiration the pressing Force of the Air is directed a contrary Way: Besides, if the Air could obtain a Passage into the Veins, it must enter through every Vesicle, since one has not a more particular Privilege of admitting it than another; but as the Number of these is almost infinite, it must unavoidably follow, that in the *Sinus Lowerianus*, where they all terminate,

nate, there must be a very considerable Collection of Air, and being there agitated with the Blood, Bubbles must be thence excited; but nothing of this Nature can be observed with the best Microscopes. (a) 3dly, If Air be injected into the *Vessels* of any *Animal*, it soon proves fatal: It seems therefore improbable, that the common gross Air can be admitted into the Blood through the *Lungs*; and the Advantage which (b) *Borellus* assigns to the Blood, from the intermediate Position of the Particles of Air between the Globules of Blood, producing an *oscillatory, elastic Motion*, may be more justly explained from the Particles of Fire, which penetrate and enter all Bodies, both solid and fluid, which are thereby rarefied in Proportion to the Quantity of Heat, and the different Densities of such Bodies; and as it can be demonstrated, that the Force of Heat is scarce the same in any Part of Matter

(a) *Leuwenh. Op. Tom. 2. p. 37. 214.*

(b) *De Motu Animalium. pars 2da. prop. 115.*

for two successive Moments of Time, it evidently follows, that not only in the Blood, but in all other Solids and Fluids, there must be a *perpetual oscillatory, peristaltic* Motion.

THUS I have endeavoured to give a short and accurate Account of the *Lungs*, deduced from the anatomical Structure of the Parts, the Pressure of the Air, and the Properties of the circulating Humours; and from thence likewise may be explained the *good* and *bad* Effects of Air, which are observable in *pulmonary Disorders*, from the different Alterations of its *Gravity* and *Elasticity*; and what Air is most suitable to *consumptive Constitutions*.

THE *Gravity* of the Air, when too much increased, becomes pernicious; not that *Respiration* is thereby prevented, for in that Respect it may be performed where there is the greatest Excess of Gravity, because the Pressure is every where equal, the Force of the external

Air pressing the *Thorax* being equal to that of the internal Air distending the *Lungs*; but the Inconvenience proceeds from the Excess of its Weight on the Vessels, which are by that Means so compressed, and their Resistance made so great, that the *right Ventricle* of the *Heart* cannot propel the Blood through the *Lungs*, whence a fatal *Peripneumony* must soon ensue; but it seldom happens that the Gravity of the Air is so far increased, except from some poysonous Vapours, as to produce these bad Effects.

A *heavy* Air is most proper for such whose Fibres are too much relaxed, and whose Fluids are too much dissolved, (which is generally the Case of most consumptive Constitutions) and particularly for such *asthmatic* Persons, whose Disorders proceed from *spasmodic* Contractions of the *mesochondrion Muscles*, which by this increased Pressure are kept more forcibly distended; and who on this Account are always observed to
breath

breath more freely in such an Air: Therefore such Persons ought always to chuse a *serene* Air in a *low, dry, sandy* Soil, with an *open* Situation; for the most *serene* Air, as it appears by the *Barometer*, is most *heavy*, its Spring being then not weakned by the Interposition of aqueous Particles: In the next Place the Pressure of the Air is, *cæteris paribus*, as the Altitude of the superincumbent Column of Air; and *Marriote (a)* has observed, that if a *Barometer* be carried up to the Top of a very high Tower, the *Mercury* gradually subsides, till it is reduced only to the Weight of twenty four or twenty five Inches, as being then pressed by a shorter Column, and consequently a less Quantity of Air; and if it is carried down into a very deep Cave, or Mine, it gradually rises, as being successively pressed by a greater Quantity of Air. And *(b) Graves-*

(a) *Du Mouvement des Eaux. p. 2. discours 1.*

(b) *Introduction to Sir Isaac Newton's Philosophy. Part 2. p. 211.*

150 *Of the Structure and Use*

end has shewn this Alteration to be so considerable, that the *Mercury* subsides a quarter of an Inch in the *Barometer* by being carried a hundred Yards higher in the same Air; a *dry* Soil is most proper, because such exhales the least Quantity of Vapours, which are greatly prejudicial, not only as they diminish the Spring of the Air, but as they increase the Relaxation of the *Vessels*.

SUCH a Situation, tho' most eligible, is very difficult to obtain, for *low* Situations are generally *moist* and *confined*, by which Means the Advantages thence proposed are prevented, and are commonly attended with greater Inconveniences than *higher* Situations, which are so remarkably healthy, and so much esteem'd, because the Circulation of Air is more open and unconfined, and the full Vigour of its *Spring* is preserved in being so free from *Vapours*.

THE *Levity* of the Air increased to a great Excess, is immediately pernicious, because its Force is not then sufficient to overcome the natural *Contraction* of the *Lungs*: The nearer it approaches to this Disposition, the more improper it is for such to whom a heavy Air is necessary; hence on the Top of high Mountains such Persons are often apt to spit Blood, their Vessels being weak, and their Humours most easily rarefied from the Want of a sufficient Pressure. A *light* Air is most proper to such whose Humours are condensed, and Fibres contracted, who in a heavy Air are particularly subject to *inflammatory* Disorders.

HENCE likewise it is evident, how *Heat* or *Cold* by altering the Disposition of the Air affect the *Lungs* of consumptive Persons, as by the former it is always *rarefied*, and by the latter *condensed*.

THE Air by being rendered *moist* becomes less *elastick*, and incapable of penetrating into the finest Recesses of the *Lungs*, whence the *Vessels* are unequally distended and relaxed, and the Humours thereby less compacted: Hence Persons of a lax and leucophlegmatic Habit of Body are in such a Constitution of Air particularly subject to moist Coughs and Defluxions; the *pulmonary Vessels* at that Time being apt to receive a greater Quantity of Humours from their Resistance being diminished, and from their Relaxation being increased, are less capable of propelling them.

A *dry* Air is subject to the same Advantages and Inconveniences which proceed from an Increase of its *Gravity*; the same Effects are produced from different Causes; by the *former* the *Vessels* are made narrow from the Pressure on them, by the *latter*, from their own *Contraction* which is always diminished by a relaxing, lubricating Moisture.

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WHOEVER adds, to what is here mentioned, the Inconveniences which attend *Perspiration* being increased, or diminished, by these Alterations, may easily account for the several Distempers which proceed from the *various Seasons* of the Year, and *Changes* of the Weather; all which the *Divine Old Man* (a) has most accurately described.

(a) *Lib. 1. Aphorism.*





OF A
CONSUMPTION
OF THE
LUNGS.

PART III.



Consumption of the Lungs is a Wasting of the Solids, and a Corruption of the Fluids, proceeding from a Collection of *purulent Matter* in these Parts.

SEVERAL Diseases, which proceed from the same Causes, differ only in their Situation ; and the most certain Method of attaining to a Knowledge of *internal Disorders*, is by comparing them with such as are *external*, and of the same Sort ; therefore, the obscure Nature and Origine of *internal Ulcers* may be most rationally explained, from the sensible Causes of such as are *external* ; all which may be reduced to whatever Cause produces such a *Stagnation* of the *Humours*, as must *obstruct*, *inflame*, and then *suppurate* the Vessels ; or to whatever *dissolves* their *Continuity*, of which a *Suppuration* is the unavoidable Consequence : In this last Case, an Ulcer is formed without any preceding *Obstruction* ; in the former 'tis the *Consequence* of it ; and tho' the same *Effect* is produced from different Causes, the Indications of Cure in the first *Stage* of this *Distemper* are very different, and even in the last *Stage*, tho' the *Symptoms* are then the same, some Regard is to be had to the first Cause, which has laid the Foundation of this Disorder. FROM

FROM hence it appears, that the only Way to have an exact Notion of a *Phthisis* of the *Lungs*, the various Causes of it, and the Method of Cure, is to consider it as proceeding from previous *Obstructions* of the Vessels, or from a *Solution of their Continuity*: These Effects are produced from the same Causes in the Vessels of the *Lungs*, and on the Surface of the Body; for the Sharpness of an Instrument, and the Force given to it, which produce an external Wound, are exactly supplied in an internal *Hæmoptoe*, by too great a *Momentum* given to *acrimonious Fluids*.

As this seems to be the most natural *Division* of this Distemper, I shall, therefore, endeavour to account for its various *Origine* and *Progress*, as owing to any Cause, which in general disposes the *Humours* to form *Obstructions*, and peculiarly *determines* them to the *Lungs*; or to whatever gives the *Humours* such an *Acrimony*, and the *pulmonary Vessels* such a *Tenderness*, as
must,

must, if increased, *dissolve* their *Continuity*. From the Neglect of observing this regular Method, such confused Notions have been delivered of this *Distemper*, and Medicines of a contrary Nature so much commended by various Authors: But this Difference from hence may be evidently explained, and reconciled; for what is useful in one *Sort*, or *Stage* of this Disease, may easily prove destructive in another.

ALL *Obstructions* proceed from this general Cause, that the *Globules* of the *Humours* are larger than the *Capacity* of the transmitting *Vessels*; which is owing either to a Fault in the *Fluids*, (in being too *viscid*;) or *Solids*, (in being too *narrow*;) or to *both* Causes.

(a) IT is most evident from repeated *Experiments* and *Observation*, that the *Humours* in a human *Body* acquire a *Visciditv* (tho' of a different Nature)

(a) Vide pag. 34.

which gives them a less Aptitude for Motion, either from *too great Coldness*, or a *Circulation too languid*; or from *Heat and Motion too great and intense*; or from a *Mixture* of any *viscid Humour*; or of such as disposes them to a *Coagulation*.

WHILE the *Humours* are preserved in a just Degree of Heat and Motion, they continue most perfectly attenuated and fluid; but when they are entirely deprived of the Benefit of *Circulation*, the finer Parts soon become viscid, and the gross Parts coagulated; therefore, when an *inactive Life*, or any *internal Cause*, (by giving too great a Relaxation to the *Vessels* and *Bowels*,) prevents a sufficient Heat and *Circulation*, they will in Proportion acquire a *glutinous* Disposition, and thence become more apt to form *Obstructions*.

PERSONS thus predisposed, are in the greatest Danger, when this *Viscid*ity of the *Fluids* is encouraged, and determined to the Lungs, by a *moist, cold Constitution*

160 Of a Consumption

stitution of Air ; hence *Coughs* have been generally observed to be Epidemic at such a Season, (*a*) and immediately after frosty Weather, when the Thaw begins ; for then (as it appears by the *Mercury* subsiding in the *Barometer*) the Gravity of the Air being greatly diminished, the *Humours*, from the want of a sufficient *Pressure* in the *Lungs*, become less attenuated, and acquire a greater *Viscosity* ; which is likewise encouraged by the *Coldness* of the Season, and the universal *Relaxation* of the *Vessels*, which the same *Disposition* of Air brings on : In this Condition of the *Humours*, *Perspiration* will soon be diminished ; not from a *Contraction* of the *perspirable Pores*, as is commonly supposed, but from this *Viscosity* of the *Humours* ; for (*cæteris paribus*) this *Evacuation* is always proportioned to their *Velocity* and *Fluidity*, both which are in this Case deficient. From the same Cause the other *Secretions*, which are

(a *Hippoc. lib. 3. Aphorism. 13.*

performed in the minute *Vessels*, and therein most easily obstructed, will be likewise diminished: Hence the Machine becomes perpetually more loaded, and the whole *vascular Frame*, by being distended beyond its usual Tone, is *irritated* and *solicited* to a Discharge; which, according to the Laws of Fluids, will always happen where there is the least Resistance; by which Means, the *Lungs* of Persons, thus predisposed, must be unavoidably *oppressed*, and *obstructed*, as they receive a greater Quantity of such *viscid* Humours, than usual, from their *Residence* being *diminished*; and from the same Cause, are less capable of attenuating and propelling them.

HENCE *old Men* are particularly subject to *Catarrhs*, and *pituitous Obstructions* in the *Lungs*; for in such the Force of Circulation being very languid, their Humours thence acquire this *cold Viscidity*; and from the same Cause, not being determined with sufficient Force to the Surface of the Body, are

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more

more apt to be discharged by these Passages : Tho' to such Persons a *Cough* is seldom dangerous, their Vessels being firm, and compacted ; but more frequently becomes necessary, and serviceable to them, and by supplying the Place of Perspiration, and other obstructed Outlets, discharges such Humours, as would otherwise be quickly fatal to them.

THE *Humours* may likewise acquire a *Viscosity* from any Cause, which gives them a *greater Heat* than is natural to them, or which *dissipates* the *finer Parts*, and leaves the *gross* behind ; such as *hard Exercise*, *Drinking of spirituous Liquors*, *profuse Sweats*, &c. The Nature of this *Viscosity* is very different from the former, which proceeds from opposite Causes, and is generally attended with a soft, flaccid Habit of Body, a weak, slow Pulse, *Urine* pale, an Absence of *Thirst*, and all the *Symptoms* of a languid *Circulation* ; whereas such who have a *Predisposition* to this *Viscosity*, have their *Fibres*

bres more braced, and contracted ; their *Pulse* stronger and quicker ; their *Urine* more high coloured ; and are most particularly subject to Obstructions in the *Lungs* ; when this disposition of the *Humours* is encouraged, and determined to the *Lungs*, by being exposed to any external Cold, or by a suitable Constitution of *Air* ; such as frosty *Weather*, and when *East* or *North Winds* blow ; which, as *Hippocrates* (a) observes, likewise make these Disorders epidemic to some Constitutions ; for the same Disposition of Air, which by checking *Perspiration* frequently determines the *Humours* to the *Lungs*, makes their *Vessels* more apt to be obstructed, by giving them greater *Narrowness* than is natural to them : In such Constitutions, the *cutaneous* Discharge is not only apt to be diminished by the *Viscidities* of the *Fluids*, but by the *Contraction* of the *perspirable Vessels* ; by

(v) *Lib. 3. Aph. 5.*

which Means the *Quantity* of Humours being increafed, (a) their Motion and Heat, and confequently their *Viscidit*y will increafe in the fame Proportion ; for the *Globules* of the *Humours* from this increafed Heat, and Prefsure of the *Veffels* on them, become compacted, and preffed together, and adhere with a larger Superficies ; and their *fphærical Form* being thereby changed, they are lefs capable of paffing through the *minute Tubes* of the *Lungs* ; fince, by that Alteration, they take up a larger Space than before. And that fuch is the Difpofition of the *Humours* from this *Viscidit*y, is moft evident from Obfervations by Microfcopes.

In this Condition of the *Humours*, the *Veffels* of the *Lungs* are thence apt to be obftructed ; either that the *universal Vifcidit*y of the Fluids renders them more unfit for Motion, or that by their *increafed Velocity* fome *Globules*

(a) Bellini de febribus. Prop. 2da.

are forced into the decreasing Series of *Vessels*, to which they do not properly belong : For as the *Capacity* of the larger *Vessels* increases in Proportion to the Pressure and Motion of the circulating *Fluids*, the lateral *Orifices* of the *serous Arteries*, which take their Origin from them, must unavoidably admit of the same Alteration ; and be then capable of admitting red *Globules* to enter, which cannot so easily pass through, but are thence apt to form Obstructions, as the *Diameter* of these *Vessels* from their *conic Form* continually decreases. From the same Cause the minute *Lymphaticks* that take their *lateral Origin* from the *serous Arteries*, and the other *decreasing Series* of *Vessels*, are liable to *Obstructions* from *Globules* of *Serum* ; or of a *superiour Series* being forced into them.

Obstructions of this Nature are more easily produced, if Persons thus predisposed be suddenly exposed to *Cold* ; which not only contributes to bring on these Disorders, as it determines the

166 *Of a Consumption*

Humours with greater Force to the *Lungs*, by suppressing the *Perspiration*, but the Vessels likewise from the same Cause, receiving a sudden *Contraction*, more firmly retain the obstructing *Globules*, which might otherwise repass, or get through, if the Blood were kept warm, and the Vessels sufficiently dilated for some time, or by Degrees recovered their former *Contraction* and Capacity.

THE *Humours*, tho' otherwise rightly constituted, and in a proper Degree of *Fluidity*, may be altered and disposed to form *Obstructions*, by the Mixture of *viscid indigested Chyle*: This will happen when the *Organs* of the *first Digestion* are impaired, and not capable of converting the *Aliment* into laudable *Chyle*; or when, from a peculiar Weakness of the *Organs* of the *second Digestion*, it is not sufficiently attenuated, and elaborated into *Serum*, but still retains a *chylous Viscidity*.

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THE inconvenient Effects of this unprepared Viscidity of the *Chyle*, will be first perceived in the *pulmonary Vessels*, where by the known Laws of *Circulation*, it is quickly conveyed almost unchanged, and is generally more apt to form *Obstructions* than any other *Humours* in the *Body*; for these are greatly attenuated, and made more fit for Motion, having already circulated through the smallest *Capacity* of the *Arteries*; whereas the *new Chyle*, when first received into the *pulmonary Vessels*, is as yet unfit for such narrow Passages, and most disposed to form *Obstructions*, especially when unprepared, and attended with a greater *Viscosity* than usual. This *Indigestion* is the most common Cause of *Obstructions* in the *pulmonary Arteries*, attended in the Beginning with a *dry Cough*; and to which such as lead a sedentary, studious Life, are particularly subject; for whoever considers what has been delivered in the former *Theory*, will easily conceive, that notwithstanding our Food is exactly

prepared in the first Passages, how necessary Exercise is, especially, in weak Constitutions, to give a sufficient *contractile Force* to the *Vessels*, and particularly to those of the *Lungs*, that the *Chyle* might acquire a just Degree of Fluidity, and be at length assimilated into *Serum*.

THE *Vessels* of the *Lungs* may be disposed to form *Obstructions*, by whatever renders their *Capacity* too narrow: This may likewise be produced by various Causes; such as an *irregular Motion*, or too great an *Intenseness* of the *animal Spirits*, any *internal Acrimony* of the *Fluids*, which stimulates, and draws the Solids into greater *Contractions*; or by any *external Cause compressing* and *irritating* the *Vessels*; such as *arsenical* and *mercurial Steams*; a *bad original Formation of the Thorax*; for which consumptive Persons are often remarkable; For this Reason Coughs almost constantly attend Children subject to the *Rickets*, the Cavity of the *Thorax* in that Distemper being much contracted
from

from the irregular Form, and Depref-
fure of the Ribs, and from the *Diaphragm*
being forcibly preffed up by the Large-
nefs of the *Liver*.

HENCE it appears that feveral previ-
ous, *acute*, and *chronic* Diforders, by
either giving an *inflammatory*, or a *lan-
guid Vifcidty* to the *Humours*; or by
affecting the *Solids*; might contribute
to bring on thefe *Obftructions*; efpeci-
ally when determined to the *Lungs* by
a fuitable Difpofition of Air: And from
hence may be eafily underftood the Na-
ture, and various Origine of that *Con-
fumption* which is termed *symptomati-
cal*.

HENCE, likewise, it appears, that dif-
ferent Extremes in the Alteration of the
Air, (a) in being either too *moift*, or
too *dry*; too *hot*, or too *cold*; its *Gra-
vity* or *Levity* too much increafed, will,
by rendring the Veffels too much con-

(a) Vide Pag. 106, ad 111.

tracted,

tracted, or by disposing the *Humours* to become *viscid*, greatly contribute in Constitutions variously predisposed, to bring on, and particularly determine these *Obstructions* to the *Lungs*.

SOME Authors are of Opinion, that this *Distemper* is *contagious*, but have not rightly considered in what particular Cases only, and after what Manner it may prove so: For it cannot be communicated but from one in the last Stage of a *Phthisis*; neither then is the Contagion so sudden as in acute Diseases, but requires a longer Time to exert its Malignity; and generally a peculiar *Predisposition* in the Person that receives it: But when these Circumstances concur with sufficient Force, 'tis most certain, from undeniable Instances, that the Infection may be easily communicated; neither is the Reason of it very obscure; for by frequently lying with one in the last Stage of this Distemper, the soundest *Lungs* may be at length as effectually tainted, and the best disposed *Humours* rendered
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acrimonious, as by lying in, and breathing a *putrid Atmosphere*: And tis most evident from repeated Experiments, that the *absorbent Vessels* are capable of conveying a considerable Quantity of *Humours* into the Blood; especially when Sleep, and the Warmth of the Bed, by increasing their Relaxation, gives them a greater Aptitude to receive them; at the same Time the phthifical Person commonly discharges by Sweat the greatest Quantity of the most noxious, and acrimonious Parts of the *Humours*; and in some Cases the Steams arising from *malignant Ulcers*, or a *Cancer*, and immediately inspired with the Air into the *Lungs* of another, might after the same Manner, as *arsenical Effluvia*, be apt to irritate, obstruct and erode their tender *Vessels*.

THE Symptoms, and various Consequences of these Obstructions thus formed in the *Lungs*, are varied according to the *different Causes*, *Seat* and *Duration* of the obstructing *Humours*.

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THE more complicate the Causes are which produce these *Obstructions*, the greater is the Danger and Violence of the *Symptoms*; thus *Obstructions* are frequently owing to a *general Viscidity* of the Humours, and an *indigested Chyle*; for a Defect in the latter is apt to bring on universal Disorders of the *Fluids*; and an Indigestion may be likewise owing to previous Disorders in them: But tho' one Disorder is often the Consequence of the other; yet the original Cause is chiefly to be regarded, and may be easily distinguished, as the bad Effects of *Indigestion* are in the beginning perceivable in the first Passages, but of a *general Viscidity* in the *Fluids*, in the more remote Scenes of Action. When an eroding *Acrimony* is joyned with the *Viscidities* of the *Humours*, and the Vessels from any internal Cause, or from an original bad Formation, are *narrow and tender*, the Danger is in Proportion increased: Thus Persons of a weak Constitution, that lead a sedentary, studious Life, have not only a
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Disposition to form Obstructions from an indigested *Viscidty* of the *Chyle*, but all the other *Humours* from the same Inactivity are apt to acquire a *Lentor*, and from the *Intenseness* of their *Spirits* have frequently thence a peculiar *Narrowness* in their *Vessels*.

THE Seat of these Obstructions is either in the *pulmonary* or *bronchial Vessels*, and their *Lymphaticks*.

Obstructions formed in the *bronchial Arteries* are less dangerous than in the *pulmonary Arteries*, and attended with different Symptoms; for as the Extremities of the *bronchial Arteries* terminate in Glands, which are dispersed thro' the *Trachæa*, and its various *Ramifications*, Obstructions formed in them are thence generally attended with a moist, *pituitous Expectoration*, difficult Breathing, and apt to make a wheezing Noise: Persons thus affected complain in the Beginning, before *Expectoration* is free, of a tickling *Distillation* on the *Breast*; (different from that which proceeds

ceeds from an *Irritation* of the *Glands* placed about the *Larynx*.) This Sensation is caused by a thin, acrimonious *Humour*, oozing through the obstructed *Vessels*, which being *tense*, and by frequent coughing deprived of their defending *Mucus*, are thereby easily *irritated*.

Obstructions formed in the *pulmonary Arteries* can never be relieved by *Expectoration*; (unless after a *Suppuration* or an *Hæmoptoe*;) for as they have no other Termination but into the *pulmonary Veins*, they can only be carried off by a *Resolution*: Hence they are always attended with a *dry Cough*, a difficult *Respiration*, but without any *Wheezing*, a constant *Oppression*, and an *obtuse Pain*, which is perceivable in a full *Inspiration*: These are Symptoms of what we call *Tubercles*: And when the larger *Ramifications* of the *pulmonary Artery*, near the Heart, are compressed by these *Obstructions*, they are frequently attended with an unequal, and an intermitting *Pulse*.

THE *Seat* of these *Obstructions* may be likewise more particularly known, by the Force of the *Cough*, and the manner of *Expectoration*: Thus when the *Glands*, placed about the Origine of the *Trachæa*, are obstructed, and irritated, a simple *Catarrh*, and what is commonly called a *Distillation*, is only thence produced: The uneasy *Irritation* is first perceived in the *Parts* affected, and the *Expectoration* of the concocted *Phlegm* is performed with a *Hawk*, or a *small Cough*; but when the *Seat* of these *Obstructions* is in the *Lungs*, the *Irritation* is then perceived deeper, and the *Expectoration* is in Proportion more profound: Notwithstanding in this last Case, the *Glands* of the *aspera Arteria* will at length be abraded by frequent *Coughing*, and an uneasy Sensation likewise produced in them; whence the *Cough* becomes more frequent and violent; and on the contrary, the *Lungs* by frequent *Coughing*, excited from previous *Obstructions* in these *Glands*, being agitated
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and weakned, are at length apt to be affected after the same Manner.

Obstructions formed in the *pulmonary*, or *bronchial* Arteries, receive a quick Increase from the same Causes that first produced them: (a) *Lewenhock* plainly observed this Progress in the bruised Wings of a *Bat*, and in the Tail of a young *Frog*, and that the coagulated *Globules* obstructing the Extremities of the *Vessels*, if not removed by the propelling Force of the circulating Humours, received from thence a constant Addition; while the more fluid *Parts* either ouzed through the obstructed *Vessels*, or entered the *lateral Vessels*, and the more gross remaining, not only added to the *obstructing Matter*, but by pressing on the neighbouring *Vessels* disposed them likewise to form *new Obstructions*.

HENCE *Obstructions* of the *bronchial Arteries* are apt at length to produce

(a) *Tom. 2. Epist. 67. pag. 205, 206, 207, 208.*
Tom. 3. Epist. 119.

Obstructions of the *pulmonary Arteries*, and *vice versa*; for being equally ramified through the Substance of the *Lungs*, when the *Vessels* of either are much obstructed and distended, by pressing on the other they easily dispose them to form Obstructions: Hence in the Progress of this *Distemper*, the *Symptoms* are variously altered and increased; a *dry Cough*, proceeding originally from Obstructions of the *pulmonary Arteries*, being often at length attended with a moist, *pituitous Expectoration* from the *bronchial Vessels*; and from Obstructions first formed in the *bronchial Arteries*, latent Obstructions, and *Abscesses* in the *Lungs* have been at length produced.

THESE Obstructions, if not resolved, according to their various Nature and Disposition, have a different *Termination*.

Obstructions formed in the *pulmonary Arteries*, from an *inflammatory Viscidity*, joyned with an *Acrimony*, a quick

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178 Of a Consumption

Circulation, and a Tendernefs of the *Veffels*, foon terminate in a *peripneumonic Fever*, and thence a *Suppuration*: Whereas *Obstructions* formed from a *languid Vifcidty*, when attended with a *faline Acrimony*, and a flow *Circulation*, have that *Termination* from a more gradual *Eroſion* of the *Veffels*.

Obstructions formed in the *bronchial Arteries*, where the *Humours* are naturally *acrimonious*, or acquire that Diſpoſition by a Stagnation, owing to the Want of a free Diſcharge; where the *Veffels* are tender, and the *Circulation* active, terminate in an *Eroſion*, and an *Exulceration* of the *Veffels*, but not ſo ſoon as from *Obstructions* in the *pulmonary Arteries*.

WHEN theſe *Veffels* are ſtrong, and will admit of a large *Diſtention* without being deſtroy'd by it; when the obſtructing *Pblegm* is eaſily diſcharged, and not attended with an *eroding Acrimony*, a *humoral Aſthma* is produced, whoſe Violence will be increaſed by any
Cause

Cause that adds to the *Quantity*, accelerates the *Motion* of the *Humours*, or irritates the *nervous System*.

FOR whenever the Quantity of Humours (by the Prevention of any usual *Secretion* or *Evacuation*) is increased, the whole *vascular Frame*, by being distended beyond its usual *Tone*, is irritated and sollicitated to a *Discharge*; which, according to the Laws of *Fluids*, will always be determined to these *Vessels*, their *Tone* being destroyed, and their Resistance particularly diminished; and this Discharge will be most remarkably great, when the Quantity of *Humours* retained is most increased, and the external Pressure of the Air on the *Lungs* is most diminished.

HENCE these periodical *Fluxions* and *Suffusions*, so much taken Notice of by the Ancients, in Disorders of the *Breast*, and which generally happen at the different *Periods* of the *Moon*, but more particularly once a *Month*, may be easily explained; at which Time (as *Sanc-*

torius (a) has observed) the *Quantity* of Humours is greatly increased from the Want of a sufficient Perspiration, (and is commonly carried off by a more profuse Discharge by Urine than usual) which is generally deficient to such Men as are subject to these *Obstructions*, tho' as necessary to them as the *Lunar* Discharges are to Women: And how far the Pressure of the Air being diminished occasions a greater Afflux of *Humours*, than usual, to such *Parts*, the learned Dr. *Mead* (b) has evidently demonstrated.

WHATEVER increases the *Velocity* of the circulating *Fluids*, will likewise encourage a greater Afflux of *Humours*, than usual, on these *Vessels*; or whatever irritates the *nervous System* will in such Persons increase the *asthmatic Disorder*; as the Resistance of the *Lungs* is (c) thereby increased, and requires a

(a) *Medicina Statica*. Sect. I. Aph. 65.

(b) *Imperium Solis & Luna*.

(c) *Vide* Pag. 75.

stronger Force of Air to *distend* them; and as the *obstructed Vessels*, by the *spasmodic Contraction* of the Nerves, (which like *Net-work* surround all the *Vessels*) are from their pliable Weakness most easily compressed, whence the *impacted Humours* cannot so freely as before be discharged.

Obstructions, from a cold, indolent *Viscosity*, have a various *Termination*, according to the particular Nature and Consistence of the stagnating *Humour*; sometimes the *Glands* and *Vessels* of the *Lungs* have been so greatly obstructed by such inactive Humours, that the greatest *Part* of their Substance has been at length observed to be indurated and schirrhous; for when the *stagnating Humours* have such a particular Nature, they quickly acquire this *Induration* by being deprived of their fine *exhaling Parts*; and the *Vessels* likewise, which are propagated from such as are obstructed, must soon wither and contract from the Want of an *Influx* of such *Fluids*, as would lubricate and distend them.

(a) SOMETIMES the *obstructing Humour* is of a *calculous Nature* ; and tho' such *Concretions* are more apt to be collected in the *Joints* and *Kidneys*, yet where there is that general Disposition in the *Fluids*, they may be determined to the *Lungs* , or any other *glandular Part* in a human Body : Books of Observations abound with Instances of this Nature, and a remarkable Case is mentioned of one thus affected , who received no Relief from the repeated Use of the best resolving, and expectorating Medicines ; but by taking one Scruple of *Sal Mundaë* three Mornings successively, *expectorated* ten *Fragments* of a stony Nature, and tho' greatly oppressed, and

(a) Bonet. *Anatom. practic.* Tom. 1. l. 2. Sect. 2. Obs. 6. p. 684. obs. 14. p. 690. o. 30. p. 697. o. 34. p. 703. o. 53. p. 712. o. 76. p. 722. o. 89. p. 728. Sect. 7. o. 20, 21. p. 785. c. 32. p. 794. *Salmuth.* Cent. 1. obs. 14. *Jo. Rhod.* c. 2. o. 21.

Bonet. Tom. 1. Sect. 2. l. 2. obs. 126. p. 726. Sect. 3. o. 11, 12. p. 596, 597. Galen. l. 4. de loc. affect. Hildan. Cent. 1. obs. 25. c. 2. o. 29. *Trallian.* l. 5. c. 4. *Salmuth.* Cent. 1. obs. 7. *Plater.* lib. 1. obs. p. 180. *Zacut.* lib. 1. prax. admirab. obs. 95, 96. *Schneider.* lib. 3. de Catarrh. cap. 7.

emaciated before, quickly recovered after this Discharge (a).

ALL *fixed Salts* seem to be of the same Nature, and are active, and resolving, but cannot be depended on, with any great Prospect of Success, in such a Disorder. The sudden Relief received in this Case, was probably owing to the Strength of the Constitution, and the particular Condition of the *Glands*, which were then relaxed and easily disposed, by the Assistance of any stimulating Preparation, to give a Passage to these *calculus Concretions*.

HENCE the Distinction of a *Phthisis* into *acute* and *chronical*, and all the various and irregular Symptoms of this Distemper, and the different Appearances, that have been observed in the *Lungs* of *dissected* Persons, may be easily explained: And whoever considers what has been delivered in the former

(a) Bonet. Tom. 1. lib. 2. Sect. 3. Obs. 11. p. 598.

Theory, may evidently account for the *beginning Decay, Difficulty of Breathing* and *Cough*, which are the most constant Symptoms that attend the first Stage of these *Obstructions*; for it is evident from thence, that the chief Preparation of the Aliment, and the most *material Functions* of the *animal Oeconomy*, depend on the Welfare of this *Bowel*, and must unavoidably *languish* when thus obstructed; and by the same Means the *Æquilibrium* is destroyed, between the Resistance of the *Lungs*, and the Pressure of the Air, which being no longer capable of giving such a full and easy *Expansion* to the *Vesicles*, as when they were free, and pliable, *Respiration* becomes more *frequent* and *violent*: Hence, likewise, a *Cough* is produced, the Capacity of the *Vesicles* being rendered so narrow, and compressed by these *Obstructions*, that the Air in its Passage through them excites an uneasy *Attrition* and *Titillation*; and the *obstructed* Fibres being more *tense* than usual, must on a greater *Distention* (such as unavoidably attends a full

full Inspiration) be easily *irritated*, and drawn into these sudden *Contractions*; which are always more remarkably violent, when a stimulating *Acrimony* is joyned with the *Viscidities*: This mechanic Motion of *Coughing* may be justly considered as the kind Effort of the sensible Machine, which by such various, repeated *Concussions*, eagerly endeavours to shake off the uneasy *Stimulus*, and to *attenuate* and *dislodge* the obstructing *Humours*.

WHOEVER perfectly understands the Seat, Nature, various Causes, and Consequences of these *Obstructions*, thus described, will easily know how to apply a particular Method of Cure to each.

FOR as the Causes that produce this *Lentor*, and Disposition in the *Humours* to form *Obstructions*, and determine them to the *Lungs*, are various, so are the Indications and Method of Cure; but as a *Suppuration* is the general Consequence chiefly to be dreaded and prevented,

186 Of a Consumption

vented, the first and *general Indication* is to prevent their ending in a *Suppuration* (when there appears an immediate Danger from too great Distention) before a particular Method can be safely apply'd to the first Cause of the Distemper.

AN *Obstruction* terminates in a *Suppuration*, when the Force of Circulation, or the Quantity of the obstructing Matter *gradually* distends the *Vessels* to such a Degree as to break them; by which Means the *Vessels*, with the obstructing Humours, are by the Warmth of the Part gently dissolved, and mixed together, the finer *Parts* exhale, and the more viscid remaining form the *purulent Matter*.

THE Increase of the *Distention* is prevented by diminishing the *Quantity*, and *Velocity* of the circulating *Fluids*, and by proper *Revulsions* giving them a different Determination; hence *Bleeding* and gentle *Purgatives* are to be insisted on, till this Design is obtained, and the *Vessels* are no longer

longer in immediate Danger of being *dissolved*: By this Means not only the Danger of an immediate *Suppuration* is prevented, but the original *Obstructions* are in some Degree lessened; for by diminishing the distending Force of the *Humours*, the contracting Force of the obstructed *Vessels* is in Proportion increased; for in all *Obstructions*, as (a) *Leuwenhoek* has demonstrated, the reciprocal, contracting Motion of the *obstructed Parts* of the *Arteries* is destroyed, by being distended beyond their *Tone*, and are never carried off till that is restored: Another Advantage from these previous Evacuations is, that more Room is obtained for the plentiful Use of diluting, attenuating, and in some Cases active, stimulating Medicines, which cannot otherwise be given with the same Safety and Advantage.

W H E N *Obstructions* are owing to a Viscidity from too slow a Motion of the *Humours*, the Indications are 1st, To

(a) *Tom.* 3. *Epist.* 119. *pag.* 113.

188 *Of a Consumption*

resolve the impacted *Humours*. 2dly,
To invigorate the Motion, and attenu-
ate the Viscidity of the Fluids.

Evacuations are therefore to be cautiously used, unless there is an immediate Danger of the *Vessels* being inflamed, and *suppurated*, by being too much distended; for as this Disorder is in a great Measure owing to a Weakness in the *Vessels*, and *Bowels*, and thereby to a Circulation too languid, the original Cause of the Distemper is by *Evacuations* increased; neither are hot, volatile, attenuating, and active *Balsamics* to be used, without the greatest Caution, lest by giving too great Force to the circulating Fluids, the impacted *Humours* may be augmented, and more condensed, the *Vessels* more distended, and a *Suppuration* instead of a *Resolution* produced.

FLOWERS of *Sulphur*, Preparations of the *Millepedes*, Pills made of the resolving *Gums*, *Ammoniacum*, *Sagapenum*, *Opoponax*, *Myrrh*, with *Sapo-venetus*, *Terebinth*, and *Balsam Peru*.
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washed down with a Decoction made of *Lign. Guaiac. Sassafras. Fol. Chamæpyt. Hyssop, Scordium, Veronic, &c.* answer all the Intentions required in this Case; as they are *aperient, saponaceous, gently stimulating and resolving*, and by enlarging the Compass of the Blood's Motion, restore Perspiration, and the other *Secretions* to their just Proportions.

THE Operation of these Medicines, in this Distemper, is agreeable to the natural mechanic Efforts of the *animal Oeconomy*; for the Action of *Coughing* not only particularly attenuates the *Humours* obstructing the *Vessels* of the *Lungs*, but contributes to restore the obstructed *Secretions*, by universally determining the *Humours* with a greater Velocity to the Surface of the Body; for this Reason the Force of such Medicines must be carefully proportioned to the Distemper, and the various Exigencies of the Patient; for what are only endu'd with a sufficient Activity to be serviceable in some Cases, may
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190 Of a Consumption

by their too excessive Heat be prejudicial to others.

ON this Account I have carefully avoided running into a long Detail of Prescriptions, with which Books on this Subject are plentifully stored, being fully sensible that nothing is more dangerous than to depend on such general Forms; and that the best sort, which to one Person might be serviceable, may often prove destructive to another. The *Materia Medica* abounds with a great Variety of Medicines of this Nature, out of which several Forms may be easily composed, suited to the various Circumstances of the Patient; and whatever active Preparations are so promiscuously commended by various Authors in this Distemper, are only proper in such Obstructions as proceed from a *languid Viscidity*.

MILD *Sudorificks* are by some greatly commended in this Case, and are frequently found effectual; but tho' their Activity be greater, their Manner of Ope-

Operation is the same with the Medicines already mentioned, which may be easily made *Sudorificks*, if determined with greater Force to the Surface of the *Body*; for what promotes *Perspiration* in one, with a different, and sometimes with the same Management, will prove a *Sudorifick* to another.

THE Effects produced from *Sudorificks*, are sometimes more speedily effectual, than from Medicines which by the Mildness of their Operation only promote insensible *Perspiration*; but the Danger that attends their Use in exciting too great a Motion of the *Humours* is greater; on which Account they are scarce ever to be insisted on, but when these *Obstructions* are attended with such a languid *Circulation*, as requires the Use of the most active, *stimulating Medicines*, or when the Patient has a natural Disposition to such Breathings, and finds his *Lungs* relieved by that Evacuation.

EVACUATIONS ought always to precede the Use of *Sudorificks*, otherwise an *Hæmoptoe*, or an Inflammation, may be probably produced by attempting such a sudden Discharge, while the *Vessels* are full and distended; on this Account likewise *Opiates* are most conveniently mixed with them, as they assist their *Operation*, and allay any Tumult they might otherwise excite.

WHOEVER justly considers the Operation of *Issues*, which are by some Authors so much insisted on in *Obstructions* of the *Lungs*, and even in a *Phthisis*, will find they can afford but very small Relief: For they cannot be supposed to evacuate particularly that Humour which would otherwise fall on the *Lungs*, or to separate *corrupted Juices* from the *Blood*; and can be no farther serviceable, than in discharging from the common Mass of Humours a small Quantity of ferous, and lymphatic Juices; which, tho' otherwise most pure and well disposed, acquire the Nature

ture and Consistence of *purulent Matter* by Stagnation. However tho' they are but of small Service in Obstructions formed in the *Lungs* from any Cause whatever, yet it may be dangerous to close them up in such Persons who have been long habituated to them, and have weak *Lungs*, without substituting some other Evacuation in their Place; for the *Vessels* of such being accustomed to a particular Distention, may, even by this small Addition, be irritated to a Discharge of the superfluous Quantity on these Parts, whose Resistance is but languid.

THE Diet in this Case ought to consist of such Things as afford a light, easy Nourishment, fit to warm, but not inflame the *Blood*, such as white *animal Food*, and *Broth* made from thence; Butter Sauce, and most Roots are improper, as they increase the Viscidity of the *Humours*; *Asparagus*, *Water-cresses*, *Selery*, *Turneps*, *Horse-radish*, *Onions*, and (a) *Garlick*, are of a different Na-

(a) *Sanctor. medicin. statica. Sect. 3. Aph. 82.*

ture, as they attenuate, and greatly promote *Digestion* and *Perspiration*: Hence (b) *Swines-flesh*, (c) *Mushrooms*, (d) *Melons*, (e) *Cucumbers* and *Lettuce*, from their Coldness, and *Viscidities*, are particularly pernicious to such *Constitutions*: *Wine* diluted with *Water* is preferable for common Drink to any *Malt-liquor*, as this is more apt to relax the *Vessels*, and increase the *Viscidities* of the *Humours*.

WHEN the *Obstructions* are by these Means carried off, and all Danger of an *Inflammation* is prevented, Preparations of the *Peruvian Bark*, and *chalybeate Waters*, are of the greatest Efficacy, not only as they correct the original Cause by universally strengthening the *vascular Frame*, and attenuating any remaining *Viscidities*; but likewise contribute to prevent a *Recollection*, by

(b) *Aph.* 24.

(c) *ibid.*

(d) *Aph.* 25.

(e) *Aph.* 92.

particularly removing the bad Effects of these Obstructions : For tho' Obstructions are at first, in some Measure, owing to the *Capacity* of the *Vessels*, not being large enough, to afford a free Passage to the *Humours* ; yet in the Progress of this Disorder the obstructed *Vessels* become greatly distended ; and when the obstructing *Humours* are resolved, and carried off from this remaining Weakness, and their *Spring* being almost destroyed, they are apt again to be obstructed, from a Cause different from that which first produced this *Dis-temper*.

FROM a Neglect, or Ignorance of this Observation, Persons that have been affected with *Coughs* for some time, and have been relieved, are so easily apt to relapse into the same Disorder ; for as no *Obstruction* is carried off, till the distended *Vessel* recovers its reciprocal *tonic Motion*, so to prevent a *Recollection*, the same must be preserved, and too great a Distention of it prevented. Nothing more contributes to this than

Exercise, and particularly *Riding*: For then the Pressure of the Air, on *these* weakned *Vessels*, is much greater, than in a State of Rest; and increases in Proportion to the Velocity of the Body in Motion; for Air being an *elastic Body* re-acts with the same Force 'tis acted on; by which Means the weakned and distended *Vessels* are thereby sufficiently pressed, and strengthened, the contained *Humours* attenuated, and preserved in a just Degree of *Fluidity*.

HENCE it appears, that this Exercise, not only as it is attended with the least Expence of *Spirits*, but likewise from this increased *Pressure*, is preferable to any other *muscular Motion*, not attended with such a Velocity of the *Body*: And why such considerable Effects are particularly produced from it in this Distemper, is evident to such as consider, that the *Humours* of the Body receive their most material Alterations from the Action of the *Lungs*; and how that in a great Measure depends on the
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Pressure of the Air, whose *Gravity* may, by this Means, be increased to any Degree desired, and the bad Effects of such a Disposition of the Air, as frequently brings on these *Obstructions*, most effectually prevented.

THE Use of the *Flesh Brush* is likewise very serviceable, as it powerfully strengthens and cleanses the perspirable *Vessels*, and attenuates the *Humours* contained in the *Vessels*, on the Surface of the *Body*; which by their great Distance from the first Cause of Motion, and by being most exposed to external Cold, are particularly apt to become *viscid*: This Exercise was in the greatest Esteem among the Ancients, tho' since too much neglected, perhaps, on Account of its great Simplicity.

Coughs which attend old Persons from cold *pituitous Obstructions*, where the *Tone* of the *Lungs* is destroyed, and the other *Secretions* are diminished by the Weakness of the Circulation, and the universal Rigidity of the *Vessels*, are

198 Of a Consumption

scarce ever to be cured; but are best corrected by the Use of a soft, light, *aromatic Diet*, and Medicines of the same Nature. Wine mixed, or prepared with Honey, is preferable in this Case to hot Cordials, which exhaust the few remaining fluid Parts of their *Humours*, and increase the Dryness of their *Fibres*, which are already incapable of exerting their *Vibrations*, by being too parched and rigid.

WHEN the obstructing *Humour* is of a terrestrial, cold, *viscid* Nature, disposed to terminate in a *Schirrhus*, or a *stony Concretion*, *Mercurius dulcis* added in such a Quantity, as it may prove an Alterative to Pills made of the resolving Gums, and washed down with a strong *Decoction* of *Guaiaicum* is of the greatest Efficacy.

WHEN *Obstructions* are formed in the *Lungs*, from a *viscid* Disposition of *Humours*, proceeding from too great Heat and Motion, *Bleeding*, and cooling lenitive *Purgatives*, with *Anodynes* after their

their Operation is finished, are to be freely used and repeated, till all Danger of an *Inflammation* is prevented, and the Force of these *Obstructions* is diminished, by giving a different *Determination* to the *Humours*; which will at length totally yield to a careful Use of diluting, resolving and gently deterging Medicines; such as *Sperma Ceti*, *Stibium diaphoreticum nitratum*, *Sal Prunel.* pectoral Ptisans, and medicated Whey, prepared with Ingredients suited to these Intentions; such as *Fol. Agrimon. Pulmonar. Tussilag. Betonic. Parietar. Taraxac. Heder. terrest. Rad. Glycyrrhizæ*, &c. with Preparations of *Honey. Hot, volatile Medicines*, and active *Balsamicks*, are in this Case particularly destructive: The lightest animal Food is only to be allowed, and that but sparingly; a cooling *vegetable* Diet is chiefly to be insisted on, and for common Drink Toast and Water, or with a small Quantity of Wine mixed with it, and made gratefully acid with the Juice of *Sevil Orange*. This Method is to be continued while any Dis-

position to an Inflammation remains in the *Humours*, and at length a greater Latitude in Diet is to be gradually allowed.

PERHAPS it may be objected against the Use of purging Medicines in *Obstructions* of the *Lungs*, as being a Practice contrary to what *Hippocrates* has laid down, who in Disorders of the *Breast* (a) and in *dry Coughs* particularly, (b) forbids the Use of *Purgatives*: But tho' this Method seems directly to oppose the Words, 'tis agreeable to the Intention of this Precept; for whatever carries off the finer Parts of the *Humours*, and leaves the Gross behind, and consequently more disposed to form *Obstructions*, must be pernicious; and such was the Effect produced by hot, rough *Cathartics*, such as *Hellebor. Elixterium*, &c. which were only used in the Time of *Hippocrates*; which he therefore wisely forbid, as they increas-

(a) *Lib. de veratri usu. p. m. 611.*

(b) *De ratione victus in morb. acut. Sect. 4.*

ed the *Obstructions* by exhausting the finer *Parts* of the Humours, and, by their excessive *Heat* and *Acrimony*, frequently changed them into a *Suppuration*; but gentle, lenitive *Purgatives*, which are directed in this Case, as they produce contrary Effects, in attenuating, and cooling the *Humours*, must be most proper, and, in that Respect, agreeable to the Sense of the divine *Hippocrates*.

WHEN *Obstructions* of the *pulmonary Vessels* proceed from *indigested Humours*, the *Indications* are to restore the *impaired Digestions*, and to resolve the *impacted Humours*: The first *Intention* is answered by such *Medicines* as evacuate any remaining *Viscidities*, and by strengthening the *Stomach* and *Bowels* prevent a *Recollection*; hence gentle *stomachic Purgatives*, such as *Tinctura Sacra*, *Pil. Rufi Elix. pps. Rhubarb*, &c. are not only serviceable in this Respect, but by producing a *Revulsion*, diminish the Force of the *Obstructions*: All *Bitters* are deservedly esteem-

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ed for strengthening, and restoring *Digestion*, and attenuating cold, viscid *Humours*; which Effects they produce by imitating the *bilious Juice*, which is Nature's *great Digester*, and chiefly contributes to conquer and attenuate the Viscidity of the Chyle, and give it an uniform Consistence; for this Reason the *Bile* of *voracious Animals*, particularly the *Sea Pike*, made up into *Pills* with proper *Stomachics*, has often restored such, who have been in most languid Circumstances, from Indigestion, and Loss of Appetite, where the most elaborate *chymical Preparations* have been ineffectually prescribed: When the second Digestion is likewise defective, the *Peruvian Bark* and *Steel* demand a principal Place, as they particularly strengthen the first *Passages*, and invigorate the whole *vascular System*.

Emetics are frequently prescribed in this Distemper, as they answer several *Intentions*; and if at any Time, are then particularly proper, when these

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Obstructions are owing to *Indigestion* ; but whoever justly considers how far their Efficacy extends, and to what Inconveniencies they are subject, will be apt to prefer the Use of other *Medicines* to them. The only Advantage that can be proposed from the Use of Emetics, is that the first Passages, and particularly the *Stomach*, may be thereby relieved from any Load of viscid, indigested Humours ; and that by the universal Concussion which attends their Operation, the Fluids in general might be attenuated, and the Obstructions in the *Lungs* dislodged : The former *Intention* can be as effectually answered by the Use of gentle, stomachic *Purgatives* ; and the other by *attenuating, resolving Medicines*, which act with more Certainty, and less Danger : For notwithstanding the Operation of *Emetics* may safely, in some Cases, promote these Effects, where their Force is well proportioned, and the *Vessels* of the *Lungs* are strong, and not much distended, yet when their Operation is violent, or the *Vessels* weak, and distended, such an unnatural Straining of

of the *Fibres*, at the same Time the Humours receive a powerful *Momentum*, might very probably either promote an *Inflammation*, or an *Hæmoptoe*: On this Account (a) *Hippocrates* very justly disapproves the Use of them for consumptive Persons, τὰς δὲ φθινώδεις ὑποτελλομένης τὰς ἀνω (φαρμακείας.) And (b) *Tulpius* takes Notice of one affected with a *Distillation*, and a *Cough*, from pituitous *Obstructions* of the *pulmonary Vessels*, that by the Use of an *antimonial Vomit* was seized with a most violent *Hæmoptoe*, attended with an *Expectoration* of a large Piece of the *Lungs*, of which he immediately expired.

UNTIL the *Digestions* are effectually restored, and strengthened, the *Diet* ought to be of the lightest *Digestion*, and least inclined to *Viscidities*; such as before is recommended in *Obstructions* proceeding from a languid *Lentor* in the Humours: By this Means, the weak-

(a) *Sec. 4. Aph. 8.*

(b) *Lib. 2. Obser. 14.*

ned *Parts*, when disengaged from any Load, or Labour, will more easily recover a sufficient *Vigour* ; especially when assisted by suitable Medicines : *Exercise* is particularly proper in this Case, not only as it is serviceable in the Respects mentioned before, but as it peculiarly helps *Digestion*, and the *Secretion* of the *bilious Juice* (whose *Quantity* separated in inactive *Constitutions* is very small, unless promoted by *nervous Spasms*, and then its *Quality* is depraved) for the *chylopoietic Bowels* are scarce influenced by the grand Circulation, but are like a small, *separate Republick* in the *Body*, which is governed by peculiar Laws, and chiefly assisted by *muscular Motion*.

THE Indication of Cure, in *resolving* the obstructed *Vessels* of the *Lungs*, is answered in this Case by Medicines of the same Nature as are recommended in that languid *Viscidty* of the *Humours* ; particular Regard being had to the original Cause, which laid the first Foundation of the Distemper.

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WHEN these Obstructions are attended with nervous, and *hypochondriac Symptoms*, *Assa Fatida* added to the *resolving Gums* mentioned before, is of the greatest Service, and demands a principal Place. The Efficacy of this *Medicine*, in a great Measure, depends on the *fetid* and *disagreeable Smell* it affords; this is the Reason that makes the Use of it less frequent; the Practice of *Physic* being often rather calculated for the immediate Satisfaction than the real Benefit of the Patient: The Activity of its *Parts* corrected and retained, in a soft, gummy Substance, renders it in these Cases more effectual, and on several Accounts preferable to *volatile Spirits*, which by their excessive Heat are often of ill Effect, and apt to inflame: Whatever Relief is likewise received from them, is but momentary and transient; for the same volatile Activity, on which their Virtue depends, prevents it from being lasting, being quickly dissipated by the Heat of the Body: Whereas *Assa fatida*, by the
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peculiar Disposition of its Parts, gives a more lasting, and a more agreeable Determination to the Spirits; for no *Bodies* are so capable to affect our Nerves after an agreeable Manner, as those which consist of volatile Parts, the Activity whereof is tempered, and allayed, by the Smoothness of such as are *lubricating*, and *oily*: This Medicine is therefore not only serviceable in Obstructions of the *pulmonary Vessels*, as it gently *stimulates*, and *attenuates* the *Viscidities* of the *Fluids*, and most powerfully promotes (a) *Perspiration*; but by giving that agreeable *Disposition* to the *Solids*, enlarges their Capacity, by taking off the *nervous Contractions*, and *Spasms*, which in a great Measure render *Hypocondriac Persons* so particularly subject to this Distemper. In this Part of its Character and Operation, it is somewhat allied to (b) *Opiates*, but not subject to the same stupifying Inconve-

(a) *Sanct. Medicin. Statica. Sect. 3. Apt. 82.*

(b) *Vid. Mead's Essay on Poysons. p. 146, 147.*

208 *Of a Consumption*

niences ; and on that Account frequently gives Relief, where that Sort of Medicine is not only ineffectual, but of ill Effect to the Patient.

WHEN these *Obstructions* proceed from the saline Parts of the Blood, irritating and drawing the tender *Vessels* of the *Lungs* into narrow Contractions, that *Acrimony*, as it receives a various Origine, must be corrected by *Medicines*, particularly opposite to the Nature of it.

(a) IT is evident from the most exact *chymical Experiments*, that the *essential Salts*, in the Humours of a human Body, are in a natural State neither *fixed*, nor *volatile* ; but of a *semi-fixed* Nature, and become pernicious when this *neutral Quality* is altered, when they are inclined more to one Side than another, or when their *Quantity* is increased, and disproportioned to the other Principles of the Humours.

(a) Boerhaave. *Chemia Practic. Process.* 87.

WHEN the Circulation from any Cause whatever is rendered slow and languid, the *saline Parts* are not sufficiently actuated, and equally mixed with the oily *Parts* of the *Blood*, and from the Slowness of their Motion are apt to be separated by the *glandular Parts*, and to irritate and obstruct them: This *Constitution* of *Humours* chiefly prevails in such as lead an inactive Life, and feed much on an *acid, vegetable Diet*, which for the most Part contains a *fixed Salt*; but is more particularly encouraged by a *muriatic saline Diet*; for *Sea Salt* is of such a fixed Nature, and so intimately adheres to the terrestrial and oily Parts of the Blood, (especially where there is an universal Viscidity in the Fluids) that it cannot be disengaged and conquered, but with the greatest Difficulty.

IN this Case *artificial Lime-waters* are of the greatest Efficacy, and most powerfully contribute to correct the Acrimony of these Salts, and by the great

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210 Of a Consumption

Activity of their Parts to extricate and render them more *volatile*: For 'tis plain from chymical Experiments, that no Preparation gives such a volatile Activity to the *Humours* of a human *Body* as *Quick-Lime*; which Property it seems to take from the Particles of Fire which are intimately united with it: On this Account that *muriatic Acrimony*, to which Mariners are particularly subject, is most speedily eradicated by a Preparation of this Nature, taken in a Quantity suited to the Strength of their *Constitution*, and the Force of the Distemper: But must be directed with the greatest Caution; for if the Use of it be too much insisted on, after this Acrimony is corrected, it may prove as dangerous, as before it was useful, by giving a contrary Disposition, and a *caustic Activity* to the *Humours*.

WHERE the *saline Parts* of the *Blood* are too naked and volatile, the *Humours* dissolved, and inclined to Putrefaction, all Preparations of *Quick-lime* give a fatal Increase to these Symptoms,
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(and tho' *Sea Salt* be in this Case improper, as by its Weight and *Stimulus* it quickens the *Circulation*, yet there is no Danger of its being entangled in *Fluids* so dissolved.) This Constitution of Humours is natural to some, and most frequently attends such as are subject to a *Phthisis* from an *Hæmoptoe*, (as the former often attends such as are subject to a *Phthisis* from *Obstructions*) and is greatly encouraged by the exorbitant Use of an animal Diet, especially of such which is remarkable for the Delicacy of its Flavour, and most plentifully abounds with *volatile Salts*.

THIS *Acrimony* is best corrected by such *Medicines* as sheath the Asperities of these Salts, and restrain the Motion of the Humours: Such as Water, which passes through natural *Lime-stone*, or *chalky Ground*; such as the *Bristol Waters* afford, which widely differ from *artificial Lime-waters*: A *Milk Diet*, Preparations of *Snails*, and soft *Diuretics*, are particularly proper in this Case, as they correct the *Acrimony* of these

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212 Of a Consumption

Salts, and convey them off by the *urinary* Passages, which seem to be the most proper *Channel* for conveying these *Salts* out of the *Body*.

HENCE may be explained that Observation, (which is mentioned in the Philosophical Transactions of the Royal Academy of *Paris*, as obscure and surprizing) why a *Lixivium* of *Quick-lime* is given with so much Success in *scorbutic*, and other *chronic* Disorders in the northern Countries, but is found insufficient, and frequently destructive in the same Diseases, when given to such as live in *France*, *Italy*, and other Places that lie towards the South: This Difference in their *Constitution* is owing to the Difference of the *Climates* they live in; the Humours of the latter by the Warmth of their Climate are greatly actuated, and attenuated, whence the *saline Parts* already sufficiently active, by the Accession of any Cause that so much increases the Heat of the Humours, are easily *volatilized* and *exalted*:
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Whereas the *Fluids* of such who live in cold, northern Climates, are languid in their Motion, and the *saline Parts* are thence so involved in the *terrestrial* and *oily Parts* of the *Blood*, as to require the Use of such an active Preparation to disengage them.

WHEN the Causes that produce *Obstructions* in the *Lungs* are blended together, (as it frequently happens,) a more complicated Method of Cure is required; and may be easily deduced from that which has been delivered, which is particularly suited to all the various Causes of this *Distemper*; and chiefly consists in removing the *Obstructions* formed in the *Vessels*, and the evil Effects of them; and in restoring the usual *obstructed Secretions*, by correcting the original *Viscosity* of the *Fluids*. If either *Intention* be left unfinished, the Disorder will continue, or quickly return: And whatever *Medicines* are so promiscuously recommended in this *Distemper*, can only give Relief, as they contribute to answer these *Intentions*.

THE *Vessels* of the *Lungs*, when obstructed, can only be relieved by promoting a *Resolution*, or an *Expectoration* of the obstructing *Humours*. This last Relief can only be obtained in *Obstructions* of the *bronchial Arteries*, which terminate in the several *Ramifications* of the *Bronchia*: And *Obstructions* of the *pulmonary Arteries* can only be carried off by a *Resolution*, (unless after a *Suppuration* of them) as they terminate only in the *pulmonary Veins*. But tho' there be this Difference in the *Vessels*, and the Discharge, yet the *Medicines*, which are required to answer each Intention, have in every Respect the same *Qualities*, and Manner of *Operation*.

FOR that a *Resolution* of the *impacted Humour* in the *pulmonary Arteries* should be obtained, 'tis necessary that the *obstructing Humours* should be prepared for Motion, the *Vessels* sufficiently opened to give a Passage to them, and that they should be then *stimulated* to
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an *Expulsion*. The same Disposition must be exactly given to the *Humours* and *Vessels* of the *bronchial Arteries*, that they may be relieved by *Expectoration*. The only Difference is, that in the former Case, the obstructing *Humours* are expelled into the *pulmonary Veins*, in the latter, into the *aspera Arteria*.

HENCE it appears, that as various Causes may prevent either a *Resolution*, or an *Expectoration*, no *Specific*, or certain Form of Medicine, can be depended on; but must be always carefully suited to the particular Disposition of the *Vessels* and *Humours*: For the best *pectoral Medicines*, so greatly extolled by some Authors, can only be serviceable in some particular Cases; and operate after the same Manner as other Medicines, either by universally *attenuating*, *stimulating*, *incrassating*, &c. Thus *Hyssopus*, *Scordium*, *Majorana*, *Pulegium*, *Veronica*, Preparations of *Sulphur*, &c. which are so much relied on as Pectorals, are only serviceable

when the *Humours* have a languid *Viscidit*y, and the *Fibres* are inactive ; but prove ineffectual and dangerous, when the *Humours* are *acrimonious*, and the *Vessels* contracted : In which Case, *Pulmonaria*, *Tussilago*, and the softer Pectorals are required, which correct the *Acrimony* of the *Humours*, and relax and lubricate the *Vessels*.

IF any Thing can be reckoned a *topic* Pectoral, 'tis *Air* impregnated with such Vapours, as are fit to correct the bad Disposition of the *Lungs*. Thus, when, from a Weakness of their *Vessels*, they are subject to a frequent Suffusion of thin, acrimonious *Humours* ; a Fumigation of *Olibanum*, *Mastich*, and *Benzoin*, is the best, and most effectual Pectoral. But in the Use of this *Preparation*, particular Care must be taken that the *Lungs* are then free, and disengaged from any Load of *Humours* ; and that by *Diaphoretics*, or mild Sudorifics, the Course of the *Humours* be determined to the Surface of the *Body*. When the *Vessels* are too much contracted,

tracted, and the *Humours* to be expectorated, or resolved, glutinous, and viscid; an Evaporation of hot Water, with stimulating Herbs infused, is of the greatest Benefit.

W H E N *sulphureous*, or *arsenical Steams*, or the *Effluvia* of *Aq. fortis*, or *Sp. of Vitriol*, are received into the *Lungs*, (as it frequently happens to *Miners*, and such as are much engaged in *chymical Preparations* of these Bodies) most violent *asthmatic Disorders*, and *Peripneumonies* are thence produced. In this Case, the Vapour of *putrid Urine*, with *Sal Tart.* dissolved in it, and immediately received into the *Lungs*, is the most effectual *Pectoral*; the *acid*, corroding Particles irritating the *Lungs*, being thereby corrected, and changed into an innocent, inactive *Sal neutrum*.

Oily Linctus's, and *anodyne Medicines*, are most frequently prescribed in *Obstructions* of the *Lungs*, to remove and allay the Violence of the *Cough*: Which *Intention* they answer, not by
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diminishing the Cause of such *Obstructions*, but by taking off the inconvenient Effects produced from them ; for by frequent Coughing, the Inside of the *aspera Arteria* being abraded, and deprived of its lubricating, defensive *Mucus*, becomes thence so sensible as to be easily irritated by the Coldness of the Air, or by the *Humours* naturally separated there from the *Glands* ; which at first are so thin, as to be apt to irritate these tender, naked Parts ; but acquire that *mucilaginous Softness*, by remaining there for some Time, (the finer and more subtle Parts exhaling) so that whatever supplies an artificial Defence, or gives these too tender *Parts* such an Insensibility, that the Humours separated may remain there for some Time, without being deterged by Coughing, will obtain the Name of *Pectorals* : The *Syrups* and *Oils*, so much relied on in this Case, are only useful as they answer the first Intention : And the Relief they afford is so sudden, that their Efficacy cannot be imputed to their

their entering, or altering the *Mass* of *Humours*, and arriving at the *Lungs* by the common Road of *Circulation*. But by being gently swallowed, they give a fresh Defence to the Glands placed about the Top of the *aspera Arteria*: For as the Passage in this Place is most narrow, the Air, when expelled by violent Coughing, produces a greater *Abrasion* there than in any other *Parts*: *Opiates*, and *Anodynes*, as they answer the other Intention, are remarkable in relieving Coughs; for by rendring the *Fibres* less sensible, they elude the Force of these uneasy *Irritations*, which, by exciting a Cough perpetually, abrade the separated *Humours*; by this Means they have Time to acquire a soft and proper Consistence.

HENCE it appears, that these *oily Medicines*, in regard to the original *Obstructions*, are most pernicious; as they relax the Stomach, and increase the *Viscidities* of the *Humours*. And notwithstanding in *Catarrhs* and *Defluxions*, they abate the present Violence of the Cough

Cough by *lubricating the Glands* ; yet by relaxing, and giving them a less Resistance, they encourage a new Influx of *Humours*, and thence render such Disorders more obstinate. *Hypoglottids* formed of *Japan Earth*, *Sugar*, and *soft Mucilages*, dissolved in the Mouth, and gently swallowed, are preferable in such Cases to oily *Preparations* ; for they abate the Influx of *Humours* by restoring the relaxed Tone of the *Glands*, at the same Time that by giving them a soft Defence, they allay the uneasy *Irritations*.

Anodynes, joyned with proper *Pectorals*, and prudently administered, especially after *Evacuations*, are of the greatest Service : As they quiet any Tumult in the *Humours*, and contribute to prevent an Inflammation, by keeping the *Lungs* more free from frequent Concussions ; and promote an easier Discharge of the obstructing *Humours*, by giving them a proper Consistence, and by enlarging the Capacity of the *Vessels*.

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THUS I have described the various Causes and Effects of *Obstructions* formed in the *Vessels* of the *Lungs*; and how by a most rational Method, carefully suited to them, they may be carried off, and their *gradual Progress* to a *Suppuration* happily prevented. It remains now to explain, how a *Suppuration* is likewise produced from an *Hæmoptoe*; with the most probable Method of Cure in the last and most dangerous Stage of this Distemper.

THE Causes predisposing to an *Hæmoptoe* are various; but may be reduced to whatever gives the *Vessels* of the *Lungs* such a Tendernefs, and the *Humours* such a Force and Acrimony, as must, if increased, dissolve their *Continuity*.

THIS Predisposition generally consists in an universal Weakness of the *Solids*, and that volatile *Acrimony* and *Dissolution* of the *Humours*, which has been
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222 *Of a Consumption*

already described, (a) and is peculiar to such consumptive *Fluids*.

THIS *Constitution* to some is natural, and hereditary ; but may in others be acquired, by the intemperate Use of a *hot, aromatic, saline, or animal Diet* : Or by previous Disorders, which relax the *Vessels*, and deprive the *Blood* of its *oily and balsamic Parts*, and render its *Salts* too *active and volatile*.

A natural Predisposition to an *Hæmoptoe* may be easily distinguished by several Symptoms, which are peculiar to such consumptive *Constitutions*, viz. a long Neck, *Scapulæ* prominent like Wings, *Thorax* compressed, and narrow, a clear florid Complexion, the Cheeks and Lips painted with the purest red, the *Caruncle* in the Corner of their Eye, from its intense Colour, appears like *Coral* ; and all the *Vessels* are so fine, as to be almost *diaphanous* : Such

(a) Vide Pag. 165.

Persons are likewise most frequently remarkable for a Vivacity of Mind; and often complain either of (what is called) a *Distillation*, or of a *saline Taste* in the Mouth.

IN *Constitutions* either naturally, or otherwise, thus predisposed, whatever determines the *Humours* to the *Lungs*, with a Force greater than their Resistance, will immediately produce an *Hæmoptoe*. These Causes are various, such as a *hot, saline, aromatic Diet*, violent *Exercise* of the *Body*, particularly of the *Lungs*, Coughing, free Use of spirituous Liquors, strong *Passions* of the Mind, any usual *Secretions* or *Evacuations* prevented, &c. but in general may be reduced to whatever increases the *Acrimony*, *Quantity*, or *Velocity* of such *Fluids*.

WHATEVER increases the *Quantity* will likewise increase the *Velocity*, and Pressure of the *Fluids* on the *Vessels* of the *Lungs*; but if the *Liquids ingested* be of a hot Nature, such as spirituous Liquors,

Liquors, or if the *Humours* retained have that Disposition, their Velocity will be in Proportion increased : Hence all *sanguineous Discharges* prevented, such as the *Hæmorrhoids* in Men, and the *Catamenia* in Women, are most particularly apt to produce an *Hæmoptoe*.

HENCE appears the Reason, why an *Hæmoptoe* so frequently happens at that Time when the Body desists from growing. The Quantity and Pressure of the Humours being then more particularly increased, by not being expended, as before, in giving a constant Addition to the *Vessels* ; which are then likewise in more Danger of a *Rupture* by their greater *Resistance*, than when formerly they yielded to the Impulse of the *circulating Fluids*.

HENCE likewise appears the Reason, why an (a) *Hæmoptoe* seldom happens before the Age of eighteen, or after

(a) *Hippocrates, Lib. 5. Aph. 5.*

thirty five. For in the former Case the Impulse of the *Humours* is but weak, and the *Vessels* are pliable and yielding: In the latter Case, the *Fibres*, by repeated Motions, are compacted and made firm, and are thence capable of safely resisting the strongest *Impulse* of the *circulating Fluids*.

WHEN the *Vessels* of the *Lungs*, from any of the Causes before mentioned are *obstructed* and *distended*, whatever increases the *Velocity*, *Quantity*, or *Acrimony* of the *Humours*, may easily produce an *Hæmoptoe*. For the Weakness of a *Vessel* is always in Proportion to its Distention: And on that Account, such Persons have a constant Predisposition to an *Hæmoptoe*, not only from such a *Distention* of the *Solids*, but from that *eroding Acrimony*, which the obstructing *Humours* are by stagnating apt to acquire.

THE Seat of an *Hæmoptoe* is either in the *pulmonary* or *bronchial Arteries*; and may be easily distinguished, being

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attended with different Symptoms. For in an *Hæmoptoe* of the former *Vessels*, the Quantity of *Blood expectorated* is large, of a thin Consistence, and a florid Colour, without any Sense of Pain, and then the Discharge entirely stops for some Time. In an *Hæmoptoe* of the *bronchial Arteries*, the Quantity of *Blood expectorated* is but small, but continued for a considerable Time; its Colour is more obscure; its Consistence not so thin; and is attended with a Sense of *Pain* in the *Breast*.

THAT the Seat of an *Hæmoptoe* may be more particularly known, the Manner how *Blood* is discharged must be carefully regarded; for what is hawked up, comes only from the Palate, and the Vessels about the *Larynx*; what is spit up, from the Mouth; what is vomited, from the *Stomach*; from the *aspera Arteria*, by a small Cough, and more elaborate Hawking; and the deeper the Rupture is in the *Lungs*, the more profound and violent Cough attends the *Expectoration*.

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SOMETIMES an *Hæmoptoe* of the *bronchial Arteries* is preceded by a *Repletion*, and Sense of a greater Weight than usual, occasioned by a Retention of some habitual, sanguineous Evacuation; such as the *Hæmorrhoids* in Men, and the *Catamenia* in Women; and then proves serviceable, and is not succeeded by a Collection, or Discharge of *purulent Matter*; for in this Case there is no Rupture, or Disunion of the *Vessels*; but their extreme *Orifices*, which in their natural State always exhaled a lubricating Moisture, are now so dilated and widened, as to admit a Discharge of this *plethoric Blood*, after the same Manner as it is periodically evacuated by the *uterine Arteries*.

AFTER, an *Hæmoptoe*, particularly of the *pulmonary Arteries*, lying on the affected Side is apt to renew the Discharge, the *Vessels* being then more pressed and irritated: Sometimes the *Oppression* has been so remarkably increased by this Posture, as to hinder the Person from speak-

228 Of a Consumption

ing; but has been immediately relieved by lying on the contrary Side.

WHEN an *Hæmoptoe* has happened, the Indications are, 1st. to reunite the ruptur'd *Vessels*. 2^{dly}. to correct the *Acrimony*, and *Heat* of the *Humours*.

To answer the first *Indication*, *Bleeding* is to be plentifully used, and repeated, till the disunited *Vessels* are almost *collapsed* and thence *contracted*; and the Motion of the remaining *circulating Humours* becomes so languid, as to be incapable of widening and opening them again; but that the *Wound* should be thereby kept in such a State of *Rest*, as can alone dispose it to a *Reunion*.

To some perhaps it may seem unreasonable and dangerous, to take away such a Quantity of *Blood* from Persons already so weak and languid; but let such consider that a few Ounces of *Blood*, evacuated by the *Lungs*, will in the Consequence bring on a more dangerous Weakness, than a much greater Quantity

tity thus discharged ; for the former, by increasing the Wound and Cough, will in Proportion afterwards increase the Quantity of *purulent Matter*. And this succeeding Collection is so certain, and so constantly increases, and grows so large when the *Lungs* are agitated, and the *Circulation* is not sufficiently abated, that out of a great Number, few recover from an *Hæmoptoe* of the *pulmonary Arteries* ; tho' some surprizing Instances have been known of Wounds received in the *Lungs*, attended with such a great Effusion of *Blood*, that the Person thus affected has remained half dead, and without Motion for a long Time : And by being thus fortunately neglected, the Wound has reunited, and a perfect State of Health succeeded, which had been unavoidably lost, if he had been revived by cordial Medicines, which are most frequently given, tho' destructive in this Case.

COOLING anodyne Medicines, such as
Species Diatragacanth. frigid. Pulv.
Hali. Fol. Acetosel. Plantag. Flor. Pa-

pav. rhæad. Pentaphyll. rub. palustris. Rosar. rub. Semin. Acetos. Papav. alb. Hyoscyam. Rad. Urtic. Pentaphylloid. Argentin. Pimpinell. and soft smooth Balsamics, such as Fol. Tussilag. Pulmonar. Flores puri recentes Betonic. Hyperic. Paralyf. Alth. &c. prepared by Decoction, answer the second Intention; as they restrain the Heat and Motion of the Humours, and sheath up the stimulating Particles, that irritate the Solids into stronger and quicker Vibrations.

THE Tincture of the *Peruvian Bark*, made by Decoction in Water, and impregnated with some of the softer Pectorals, is of the greatest Efficacy, as it powerfully contributes to allay the Motion of the acid Fluids by giving them a more uniform Consistence, and by strengthening the Fibres, renders them less sensible of such Irritations.

THE Operation of these *Medicines*, is not *topical* but *universal*: Tho' several Authors are of Opinion, that an *Hæmoptoe* may be cured by proper specific

cific Medicines, which particularly exert their Efficacy on the *Vessels* that are disunited. But it is most evident to any one, who is rightly acquainted with the *animal Oeconomy*, that the stopping of an *Hæmoptoe*, is either the natural Consequence of the large Effusion of *Blood* which attends it, (the *Vessels* being thereby sufficiently emptied, and collapsed; and the *Momentum* of the *circulating Fluids*, from the same Cause being rendered slow and languid :) Or that these Effects are obtained by *artificial Evacuations*, and cooling, soft *Medicines*. For if *Medicines* that particularly exerted their Virtues on the wounded Part, could produce this Alteration, their Operation must consist, in either *incrasating* the *Blood* to that Degree, that it is no longer capable of passing thro' the *disunited Vessels*; or in giving them such a *Contraction*, as may prevent its Passage; or in answering both *Intentions*: But if it were in the Power of *Medicines* to give such a Disposition to the *Humours*, as might answer the first *Intention*; it must thence follow, that

the *Blood*, which cannot pass through the wounded Vessels, is likewise incapable of passing through the Extremities of the other *Arteries*, whose least *Diameter* is only capable of admitting one *Globule* of *Blood* to pass, and is always less than the *Diameter* of the wounded *Vessel*, and must therefore soon produce a fatal *Peripneumony*. If such Medicines answer the other *Intention* by their *astringent* Quality, equally circulating through the *Lungs*, before they could obtain that Effect in the wounded Vessels, they must produce the same Alteration in the Extremities of the *Arteries*; and thence likewise a *Peripneumony* must unavoidably follow: So that Medicines in this Case can only prove useful, as they produce the Effects before mentioned, unless such Persons have an Art of conveying the Efficacy of their *Medicines* particularly to the wounded *Part*, which is ridiculous to suppose. *Physicians* have probably fallen into this Error, because they observed that the *Discharge* of *Blood* generally ceases soon after the Use of their *Medicines*; but
this,

this, as I before took Notice, is the natural Effect of an *Hæmoptoe*; the *Vessels* being thence emptied and *collapsed*; and the Force of Circulation made very languid; for this Reason scarce one of a great Number dies of an *Hæmoptoe*, except in *acute Distempers*.

NEITHER doth the other *Class* of *Medicines*, which, from a mistaken Notion of their Manner of acting, are called *Balsamics*, prove serviceable in that Respect; for the Operation of *Balsamics* in the Cure of external Wounds, consists in affording a kind, soft *Medium* between the Air, and the Exhalations arising from the Wound; which by that Means being retained, a *topic Fever* is excited; whence the *extravasated Humours* are converted into a *laudable Pus*; which is the *Basis*, that connects the new, succeeding *Fibres*; this is the *natural Balsam*, and preferable to all others, which are most valuable the nearer they approach to this. And as a Wound ought to be but lightly covered with *artificial Balsams*, to answer this

234 *Of a Consumption*

this End; so the *Pus* must be always most gently deterged, or else the new tender Fibres are thereby destroyed. *Internal Balsamics* cannot be supposed to exert their Influence after this particular Manner; but their Operation consists in *sheathing* the *Asperities* of the *Humours*, whence they are rendered less apt to irritate; and in relaxing, and making pliable the Vessels about the *wounded Part*, that they may with the greatest Ease shoot out the new *Fibres*, which reunite the *Wound*.

HENCE it appears, that such *Medicines*, as are only proper in this Case, ought to be *easily penetrating* and *mild*; for if they be too *viscid*, they promote new *Obstructions* in the Extremities of the *Arteries* opening into the *Ulcer*. If they be not mild and soft, they excite, instead of allaying, a greater Heat. On this Account, hot active *Medicines*, such as *Bals. Sulph. Anisat. Gilead.* &c. are pernicious in this Case: And the Reputations they have acquired, is owing to the good Effects they produce, when
given

given to Persons of a full Constitution, whose *Lungs* are oppressed with cold *viscid Humours*: Where they not only act as *Alteratives*, in attenuating, but as *Diuretics*, in discharging them by the urinary Passages.

SUCH a Management of the Non-naturals is to be directed, as is most agreeable to these *Intentions*. The *Body* must be kept as much as possibly in a State of *Rest*, even Speaking is improper, (while the *Wound* is fresh) as the *Lungs* are particularly agitated by that *muscular Motion*.

A *Milk Diet*, carefully directed, is preferable in this Case to any other; as it is of a cooling, soft, nourishing Nature, requires scarce any Digestion, having already been prepared in the *Stomach* and *Bowels*, and passed through the *Lungs* of the *Animal* it is taken from; and consists partly of the natural *Juices* of that *Animal*, and the concocted *Juices* of *Grass*, and other *opening Herbs*; by which Means, it not only

ly answers in every Respect the *Intentions* required, as it is *balsamic*, and restrains too quick a *Circulation*; but seems specifically to correct that *Acrimony*, so peculiar to consumptive *Fluids*; which appears to be of an *urinous, saline* Nature; such as proceeds from a Mixture of *Salt Ammoniac*: This is confirmed by the Taste, the florid Colour, and acrid Dissolution of such *Fluids*; which this Salt, and *Sal marinus*, by being mixed with the *Blood*, can alone produce: And such an *Acrimony*, as it appears by chymical Experiments, is best corrected by *Juices*, which are of an *acescent* Nature, tempered with somewhat *oleaginous*: If Cows Milk be apt to render them *costive*, it may conveniently be mixed with a small Proportion of *Honey*, or exchanged for *Asses Milk*, which is more light, and opening, and less apt to curdle. *Breast Milk* is more natural, and in every Respect preferable to any other; especially if the Nurse be of a healthy Constitution, and feeds on a proper cooling Diet.

IF this Method be timely used, carefully continued, and suited to the Strength and *Constitution* of the *Patient*, many may be thereby recovered, that will otherwise unavoidably perish. But if *Bleeding* in a sufficient Quantity be deferred for a few Days till the *Ulcer* is formed ; it afterwards proves of no Service, but does rather hasten their Death. And nothing more certainly contributes to this, and is more fatal in the Consequence, than any Error admitted in *Medicine*, or *Diet*, in the Beginning. For whatever is mixed with the Blood, or taken for Nourishment, as it receives its chief Alteration from the *Lungs*, and arrives there almost unchanged, ought more particularly to be such as wants scarce any Preparation from them. And if it contains the least *Acrimony*, or *Crudity*, by either *obstructing*, or *irritating*, will unavoidably renew the *Hæmoptoe*, and increase the Collection of purulent Matter.

WHEN

238 Of a Consumption

WHEN this *Regimen* has been continued for the Space of two Months, or till all Remains of the Cough, and other Symptoms are carried off; gentle Exercise, and particularly Riding, in a free, dry Air, must be used when the Stomach is most empty, in the Morning and Afternoon; that the *Vessels* of the *Lungs* may be thereby strengthened: A greater Latitude in Diet is to be admitted by careful Degrees, always avoiding whatever might give too great an *Acrimony*, and *Velocity* to the *Fluids*. And by way of Prevention, every six Months, at the *Vernal* and *Autumnal Æquinox*, gentle *Evacuations*, such as *Bleeding*, and the most cooling *Purgatives*, as *Manna* dissolved in thin Gruel, with the Juice of *Sevil Orange*, must be used: This Caution is of the greatest Moment, as the Neglect of it has been fatal to many; for at such Times the *Pressure* of the *Air* being greatly diminished, (a) the *Humours* become turgid, and by pressing and distend-

(a) Vide Mead de imperio Solis & Luna.

ing the *Vessels* more than usual, are thence particularly apt in predisposed Persons to bring on an *Hæmoptoe*.

AN *Hæmoptoe* of the *bronchial Arteries* is not so dangerous as of the *pulmonary Arteries*; and is easily cured by moderate *Evacuations*, and the Use of a cooling, soft Regimen.

WHEN an *Hæmoptoe* proceeds from preceding *Obstructions*, the same Method is to be used to prevent the Return, and the bad Effects of it; particular Regard being had to the original Cause of the *Obstructions*.

IT remains now to describe this *Distemper* in its last Stage of an *Abscess*, or *Ulcer*, proceeding either from a preceding *Hæmoptoe*, or *Obstructions*; with the most probable Method of Cure.

WHEN either from a Neglect of a proper Method, the Use of improper Medicines, or the Violence of the Disorder, a difficult Respiration succeeds *Obstructions*,
or

or an *Hæmoptoe* of the *pulmonary Arteries*, attended with a dry, laborious Cough, increased after Eating, or Motion, a hectic Fever, periodically increasing with a great Anxiety generally towards the Evening, Night-Sweats, especially about the Neck and Breast, great Thirst ; and if Pain prevents lying on any but the affected Side, then these Symptoms plainly discover, that a *latent Abscess* is formed in the *Lungs*, either from a *Suppuration* of the *Vessels* that were before *obstructed*, or from an *Eschar* being grown over the *ruptured Vessels*, and the *purulent Matter* being thence retained. In the Progress of this Distemper, the Symptoms grow more violent, the *Body* gradually consumes away, most of the *Humours* degenerating into *Pus*, the *Eyes* become hollow, the *Nose* sharp, the *Temples* collapsed, the *Scapulæ* prominent like Wings, red *Pustules* frequently appear in several Parts of the *Body*, with the greatest Degree of Weakness, a hoarse Voice, Swelling of the Hands and Legs, and the Tragedy is generally finished by a *Diarrhæa*.

AN *Abscess* of the *Lungs* variously terminates, sometimes (a) it continues latent, and perpetually increases, producing a gradual Decay with the *Symptoms* now described : Sometimes (b) it breaks into the Cavity of the *Thorax* or *Mediastinum* producing a fatal *Empyema*. Sometimes (c) its Discharge is so sudden and violent into the *Trachæa*, as to produce an immediate Suffocation. But most frequently the Eruption is more gentle into this Place, when the Aperture is but small, and then becomes an open *Ulcer*, daily discharging by a Cough *purulent Matter*, whose Colour, and other Qualities are altered according to the Nature and Duration of the Abscess. Sometimes sweet and fetid ; its Consistence thin and *ichorose*, or *concocted* ; its Colour sometimes white, red,

(a) Bonet. *Anatom. Practic.* Tom. 1. Lib. 2. Sect. 7. Obs. 38. Obs. 74. Tulp. Lib. 2. Obs. 10.

(b) Bonet. *Anatom. Practic.* Tom. 1. Lib. 2. Sect. 6. Obs. 12. Sect. 7. Obs. 12. Obs. 20. Obs. 29.

(c) Tulp. Lib. 2. Obs. 10. Bonet. *Anat. Pract.* Tom. 1. Lib. 2. Sect. 2. Obs. 11.

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yellow,

242 *Of a Consumption*

yellow, livid, dusty, or variously tinged: The fatal Symptoms in the Progress of this *Distemper* are, in every Respect, the same as before described, except that the *Oppression* and Difficulty of Breathing are not so violent, neither is the *hectic Fever* so intense and constant; the *Lungs* being often relieved from a Load of *purulent Matter* by *Expectoration*, which in a *latent Abscess* had no other Way of being discharged but by being first mixed with the Blood.

AN external Wound, a *Peripneumony*, or a *Pleurisy* not resolved, but ending in a *Suppuration*, may likewise produce such an *Abscess*; for, in this Case, the *Lungs* most frequently adhering to the inflamed Part of the *Pleura*, are at length affected after the same Manner.

A Suppuration proceeds from an *Hæmoptoe* or *Obstructions* of the *bronchial Arteries* not rightly carried off, in a Manner somewhat different; for in the former Case an *Expectoration* of purulent Matter

Matter quickly succeeds the *Hæmoptoe*; in the latter the obstructing *Phlegm* by more slow Degrees acquires a Putrefaction, distends and erodes the *Vessels*. The more the Distemper advances, the greater Quantity of *purulent Matter* is mixed with the *Phlegm*, the *Hectic Fever*, Thirst, Night-Sweats, and other Symptoms increase in the same Proportion, and the *Catastrophe* is finished after the same Manner which before has been described; for when the *bronchial Arteries* are obstructed or suppurated, the *pulmonary Vessels*, by being compressed or eroded, are at length affected after the same Manner.

THAT Side which is *imposthumated*, or *ulcerated*, is more warm, and has a greater Sense of Weight than the other. Lying on the contrary Side often produces almost a *Suffocation*, the Cough and Oppression being thereby greatly increased. But by lying on the affected Side, the Sleep is more undisturbed, the *Pus* better concocted and more freely *expectorated*, and all the Symptoms are

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easier.

easier. This Alteration is owing to the *Circulation* being chiefly continued in this Case through the sound *Lobe*, which in that Posture is compressed, and the Motion of the *circulating Blood* thence obstructed, by the Weight of *purulent Matter* in the affected Lobe, pressing down the *Mediastinum*.

WHOEVER rightly considers the Nature of the *purulent Matter* contained, whose Acrimony perpetually increases, the great Quantity of *Blood*, and the Force with which it passes through the *Lungs*, the surprizing Tenderneſs of their Fabrick, all conducing to their easy Destruction, and that the most *material Functions* of Life depend on their Welfare, may evidently account for all the Symptoms and Effects of this Distemper. Among which, none is of greater Moment, and more taken Notice of, than the *hectic Fever*, (ſo termed becauſe it is *habitual* to the *Conſtitution*.) It has a various Origine, but in *phthiſical* Perſons is moſt frequently owing to the great Quantity of *purulent Matter* mixed with
the

the *Blood*: For when any *Body*, foreign or acrimonious, is mixed with the *Humours*, a *Fever* is thence excited; by which Means it is either *assimilated* or *expelled*: *Sweats* are generally the *critical Discharge*, which Nature attempts in *putrid Fevers*; and will in *phthi-sical* Persons be most profuse at *Night*, being then particularly determined there by the Warmth of the Bed, the Laxity of their Pores, and the great Dissolution, and imperfect Mixture of their Humours: (The *Lungs* being incapable of giving them a proper Consistence.) The periodical Increase of the *hectic Fever* is most remarkable in the *Evening*; the first *Digestion* of the *Food* taken for Dinner being finished about that Time, and the crude viscid Chyle, which then enters the *Blood*, soon obstructs and inflames the Extremities of the *Vessels* that open into the *Abscess* or *Ulcer*; whence a *Fever* being excited, the obstructed Parts are either *resolved*, or with the *Humours* contained, and stagnating in the *Cavity*, are reduced into *Pus*; which is the *natural Balsam*, that

can only connect the new succeeding *Fibres*; and as (a) *Hippocrates* has observed, cannot be formed without a *Fever*. By this *periodical Fever*, an immediate *Suffocation* from these constant new *Obstructions* is prevented, the *Pus* in the Cavity is concocted, and the *Humours* depurated, by critically discharging the *purulent Matter*, mixed with the *Blood*, and then the *Fever* ceases; but whenever there is a sufficient fresh Collection, or new *Obstructions* are formed, it returns again, and gives the same Assistance as before. Thus the unhappy Patient, by this unavailing Attempt of kind Nature, is successively relieved and oppressed, and gradually languishes away: Hence at length the Legs and Hands begin to swell; the Force of *Circulation* being very languid, and not sufficient to propel the *Humours*; which are particularly apt to stagnate in this Place from the Resistance of these *Vessels*, and being at the greatest Distance

(a) *Lib. 2. Aph. 47.*

from the first Cause of Motion. The *Thirst*, *Loss of Appetite*, *Falling of the Hair*, the *red Pustules*, and all the other *Symptoms*, may be easily deduced from the universal *Acrimony* and *Putrefaction* of the Humours; which at length being almost totally reduced into *Pus*, and not having any longer a sufficient *Momentum* to determine them to the Surface of the *Body*, are conveyed through the *mesenteric* and *cæliac Vessels*; obstruct and exulcerate them, become more fetid and acrimonious, and thence irritate and determine the Course of the remaining circulating Humours to these Parts; by which Means *Expectoration* is soon suppressed, and the *Tragedy* finished.

THAT *Phthisis*, which is *hereditary*, and proceeds from a Constitution inclined to that Distemper, is most commonly fatal. And such are scarce to be relieved but by such a Management as might prevent an *Hæmoptoe*: Whereas a *Phthisis* that proceeds from too violent Motion suddenly given to the

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Blood,

248 *Of a Consumption*

Blood, or from an external Wound, where the Fluids and Solids are in general well disposed, is more easily cured.

THAT *Phthisis* is particularly dangerous, which succeeds a Suppression of the *Menstrua* in Women, and cannot be carried off by any Means unless that natural Discharge be restored; (a) neither can the Progress of a *Phthisis*, from a Suppression of the *Hæmorrhoids*, be safely prevented but by an Aperture of them.

THAT *Phthisis* which proceeds from an *Hæmoptoe*, or preceding *Obstructions* of the *bronchial* Arteries, is not so dangerous, nor so quickly fatal, as from an *Hæmoptoe* of the *pulmonary* Arteries: In this Case, a Solution and Recovery may be expected, if the *purulent Matter* be soon, and totally, discharged, before, by long Continuance, it

(a) *Hippoc. Q. Prorrh.*

grows

grows putrid, and affects the *pulmonary Vessels*.

THAT *Phthisis* which proceeds from preceding *Obstructions*, or an *Hæmoptoe* of the *pulmonary* Arteries, is curable, if the *Abscess* breaks soon, and discharges easily by *Expectoration* purulent Matter, of a white Colour, well digested; of an equal Consistence, and free from Putrefaction; if the Fever, Thirst and Difficulty in Breathing immediately abate, if the *Excrements* be soft and well figured: But if the Fever still continues or returns periodically in a violent Manner, if the Appetite languishes, and Thirst increases, if the *purulent Matter expectorated* be of a pale, green, or livid Colour, not concocted, but pituitous and frothy, and a *Diarrhæa* succeeds, the Case is then most desperate.

THAT *Phthisis* which is attended with a Distention, or Hardness of the *Hypochondria*, is particularly dangerous; for such a Disposition argues a Defect in
the

the *chylopoietic Bowels*, and thence an Inapitude to repair the great Decays which are the constant Effects of this *Distemper*.

WHEN an *Abscess* is formed, the Indication is to *ripen* and break it as soon as possible; and thereby reduce it to an *open Ulcer*.

WHEN an *Abscess* is fully matured, the *Rupture* of it is to be determined externally into the *aspera Arteria*, (to prevent an *Empyema*) by macerating these Parts with the Vapour of emollient Herbs, and then by Exercise in a Chair, or Riding, and the Use of somewhat stimulating to promote *Expectoration*: For the *Lungs* thus disposed, being moved and irritated, the *Abscess* will most probably break into the *aspera Arteria*, where there is the least Resistance.

THIS Effect may be likewise obtained, by giving a gentle Vomit of *Oxym. Scillit.*

Scillit. and *Ol. Amygd. dulc.* after a previous Maceration.

THE following Forms of an emollient Vapour, and an *expectorating Mixture*, are composed of *Materials* most suitable to these *Intentions*.

℞

Fol. Malvæ.

—— *Bismalv.*

—— *Mercurial.*

—— *Parietar. āā* mij.

Farin. Sem. Lini. ℥ij.

Cum aq. decoct. vaporem excipe cum aere adducendo.

℞

Aceti Scillitici ℥iv

Oxymel. Scillit. ℥iij

Sal. Polychrest. ℥i

Aq. decoct. hord. ℥viiij

—— *Hyssop.* ℥iv

Bibat. ℥i omni horâ dimidiatâ.

WHEN

WHEN an open *Ulcer* is formed, the *Indications* are, 1st. To prevent the *Ulcer* from increasing, and to defend the Blood from the *purulent Matter* mixed with it. 2^{dly}. To cleanse and heal the *Ulcer*.

THE former *Intention* is answered by such Medicines, which are so light, and aperient, as easily to pass through the *Lungs*, without forming new *Obstructions* about the ulcerated Part; (which, being afterwards inflamed and suppurated, increase the *hectic Fever*, and universal Decay, and particularly enlarge the *Ulcer*) and by being *vulnerary* and *balsamic*, correct and soften the Acrimony of the *Humours*, and defend them from Putrefaction; for unless this bad Disposition of the Fluids be corrected, the *Pus*, which from thence is formed, must unavoidably partake of the same Nature; and rather contribute to erode, and irritate, than afford a kind natural *Balsam*, fit to sustain and connect the new succeeding *Fibres*; without which no *Ulcer* can ever be healed.

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THE following Medicines are fuitable to this Intention, *viz.* *Fol. Agrimon. Betonic. hæder. terrest. Scabios, Tussilag. Pulmonar. Chamædryos, Chamæpyt. Chærophyl. Capil. vener. Flor. Bellid. maj. Betonic. Verbasc. Hyperic. Altheæ. Rad. Glycyrrhiz, Bardan, &c.* and are best given in the Form of a Decoction, because in no other they can so easily pass through the *Vessels*, and communicate their Virtues to the Blood; and may in this Case be strictly called *vulnerable*; for a Decoction only deserves that Name, as it corrects any bad Disposition of the *Humours*, which prevents a Wound from being healed; and is, therefore, in other Cases, to be varied according to the different Constitution and Symptoms of the Patient.

Gum. Galban. Opoponac. Ammoniac. Myrrh. Mastich. Oliban. Sperm. Ceti, Sapo. Venet. Terebinth. &c. made up into Pills, and taken with such a Decoction, are frequently necessary: As they are opening, and prevent new Obstructions from
be-

being formed about the ulcerated Part; and in some Measure, likewise, contribute to answer the *second* Indication, as they gently stimulate and promote Expectoration.

THE *second* Intention is answered by the Use of such Medicines, as promote a Discharge of the purulent Matter in the *Ulcer*, by *Expectoration*; and of that mixed with the Blood by Urine; and by the Use of consolidating Purgatives, which contribute to re-unite the Wound.

ALL the former Medicines, as they are soft, and gently deterfive, contribute to answer this Intention. But the following are more active and powerful, viz. *Fol. Veronic. maris. Rutæ, Valerian. bortenſ. Hyſſop. Virgæ aureæ, Marrub. alb. Scord. Scabios. Puleg. Flor. Centaur. minor. Rad. Fœnicul. Petroselin. &c.* with Preparations of *Honey*, and the *Sea Onion*.

THE *Materia medica* abounds with a great Variety of Medicines of this
Na-

Nature , out of which several Forms and Decoctions may be easily composed in different *Menstruums* ; either in common Water, Milk and Water, or Whey ; according to the different Symptoms, and Constitution of the Patient. For when the *Humours* have a *saline Acrimony*, and the Quantity of *purulent Matter* is not great, and Expectoration is easy ; the more mild, *balsamic*, and gently deterging Decoctions are necessary : But where Expectoration is difficult, the *Ulcer* foul, and the Quantity of *purulent Matter* is great, more active stimulating Medicines are required.

NOTHING is of greater Service in this Distemper, than the constant Use of *anodyne Medicines*, such as *Syrup. de Mecon. Pil. de Styrac. Cynogloss.* &c. in a proper Dose, taken every Night going to Rest at an early Hour. How far Sleep contributes to the general Nourishment of the Body, and, by that Means, gives Strength to the Solids, and preserves a due Texture in the Fluids, has been already

256 Of a Consumption

ready shewn (a). But besides these Advantages, it is in this Distemper farther necessary: For by allaying the uneasy Irritations, which excite the Cough, they give Rest to the weak and wearied *Lungs*, and can alone give the *purulent Matter* that *balsamic Consistence*, so necessary to the Reunion of the ulcerated Part. For by this Means, what is expectorated next Morning, will be mild and well digested, which would otherwise be *ichorose* and *acrid*.

THE Shirt and Bed-Linnen of a Person thus affected, ought always to be carefully warmed, and dried before he goes to Rest; for being generally damped by the Remains of former Sweats, which by stagnating acquire a greater *Acrimony*, and being easily dissolved by the Heat of the Body, they compose a *moist, putrid Atmosphere*; which greatly contributes to their Uneasiness, and the Increase of the *nocturnal Sweats*.

(a) Vide p. 64.

No Nourishment is proper in this Stage of a *Consumption*, that is not light, cooling, and opposite to *Putrefaction*: For whatever is of a different Nature, will in this Case increase the Decay, notwithstanding in another it might be most nourishing: Hence all *animal Diet* is pernicious, because so apt to putrify, especially when exposed to a great Degree of *Heat*: And will thence more easily acquire this Disposition, when received into *consumptive Bodies*; where the Heat is not only very *intense*, but most of the *Humours* are inclined to *Putrefaction*, and some of them are actually *putrid*. For the purulent Matter expectorated from the *Lungs*, is generally fetid, or quickly becomes so by being thrown on warm Coals: In this Respect therefore whatever increases the Heat, increases the *Putrefaction*; (and *vice versâ*) and that all *Animals* are more apt to excite a greater Heat than *Vegetables*, is most evident from common Observation; and the Reason of this, seems chiefly to be owing to the

R Salts

Salts of *Animals* being *volatile* ; whereas the *Salts* of most *Vegetables* are of a *fixed* Nature ; and thence when received into the *Blood* remain inactive and quiet : Whereas the former by the Heat of the Body being *volatilized*, and made active, not only excite a greater Agitation in the *Fluids*, but stimulate the *Solids* to stronger and quicker *Vibrations*. This is the chief Reason, why *alkaline Medicines* in general increase, and *Acids* retard the Motion of the *Humours* : All the former containing a *volatile Salt*, and all, except a few of the latter, having a *fixed Salt*. Hence PROVIDENCE has wisely ordained, that such *Animals* as are most used in common Food, are tempered by feeding on *acid, cooling Vegetables* ; which in a great Measure contribute to preserve us from *Fevers*, and such Disorders as are the Effects of *increased Meat* and *Putrefaction* ; which *wild Fowl*, and such *Animals* as feed on *animal Diet*, are apt to produce, the *Salts* of these being much more naked and active, than of the former.

THE Inhabitants of these *Islands*, and particularly the better Sort, are in a great Measure so remarkably subject to an *Hæmoptoe*, and thence a *Phthisis*, from their exorbitant Use of an *animal Diet*, *high Sawces*, and *spirituous Liquors*; their *Solids* being naturally tender, and easily destroyed by the *Acrimony* and *Velocity* of the *Fluids*: And so few are recovered, because the same *Food* is often imprudently directed as a *Remedy*, which frequently laid the first Foundation of the Disorder. For *Jellie Broth*, *Jellie* of *Harts-horn*, and *Calves Feet*, so much esteemed by some for being *nourishing* and *balsamic*, are not only subject to all the Inconveniences of an *animal Diet* already mentioned, but (the *finer Parts* by long boiling being exhaled) are less nourishing than a *light Broth*; and by their great *Viscidities* are particularly destructive, as they thence increase the *Obstructions*, *Hectic Fever*, and *universal Decay*. The Mixture of *Wine* and *Acids* gives a grateful Taste to such Preparations, which

would otherwise be most nauseous : And notwithstanding the best Management, they are not only certainly pernicious, but frequently disagreeable to such Persons.

A *Milk Diet*, taken after the Manner before directed, answers all the *Intentions* required in this Case ; being of an *acescent Nature*, already digested, and prepared in the *Body* of the *Animal* it is taken from ; and is most fit to repair the great Decays of consumptive Persons, and recruit their exhausted Spirits ; for no Parts are more plentifully supplied with a greater Number of *Nerves* than the *Breasts* ; and as they are not expended on any *muscular Motion*, their Use most probably consists in supplying this *Juice* with a large Proportion of *animal Spirits*.

SOMETIMES this Diet is apt to disagree by curdling in the *Stomach* of weak Persons, that have a slow, languid Digestion, notwithstanding the greatest Caution is used to prevent it, by taking

king *Sapo Venet. testaceous Powders*, and diluting it with Water: For as some Part of the former Meal of Milk most commonly remains in their *Stomach*, it will there as certainly curdle and become *acid*, as if exposed to the Heat of the *Sun* for the same Space of Time, (the Heat of the *Stomach*, especially in *hectic Constitutions*, being at least equal to that Heat.) For which Reason it will unavoidably alter and give the same Disposition to what fresh new Milk is taken. But if the *Stomach* between each Meal is washed from any former Remains by something that is light, and not apt to turn acid, (such as the White of a new-laid Egg, dissolved Blood-warm in Barley-water; lightest Broth made from tender young *Animals*, which in this Case may be sometimes allowed, *Water Chocolate*, or a weak Tincture of the *Bark*) the next Meal of *Milk* will certainly then sit light, and easy on the weakest *Stomach*, to which before it was disagreeable.

EXERCISE in a *free Air*, and particularly *Riding*, is most serviceable in this last Stage of a *Consumption*: For by enlarging the Capacity of the *Thorax*, and giving a stronger Force to the *Organs of Respiration*, it greatly promotes *Expectoration*: And by giving a more compact and homogeneous Texture to the *Humours*, prevents in a great Measure the *Night-Sweats*, which not only proceed from the Mixture of *purulent Matter*, but from the Action of the *Lungs* not being sufficient to give the *Humours* a proper Consistence; Part of whose *Vessels* being now destroyed, and the remaining being weak and languid, stand in the greatest Need of this *artificial Assistance*.

THE *Medicines* and *Diet*, that I have here recommended, seem to promise the greatest *Relief* in this *difficult Distemper*; as they defend the *Blood* from the *purulent Matter* mixed with it, and are so mild and penetrating, as not to obstruct or irritate the *Lungs*
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in passing through them ; and are thence alone capable of allaying the *hectic Heats*, and the Increase of the other fatal Symptoms : 'Tis surprizing that the Nature of this Distemper has not hitherto been better regarded by practical Authors, since 'tis obvious to the most common Observation, that whenever the crude *Chyle* enters the *Blood*, the *hectic Heats* increase in Proportion to its Quantity and Viscidity ; and that few phthifical Persons die, before what they expectorate is perfectly putrid : Probably most of them have run into a Neglect of such a Method, and the Use of *alkaline Medicines*, (improperly called Sweetners of the *Blood*) from a Misunderstanding of an Observation of *Hippocrates*, *Acida sunt pectori inimica*. But this Precept has a Regard only to such acid Particles as are inspired into the *Lungs* with the Air ; such as the *Effluvia* of *Arsenick*, *Mercury*, *Sulphur*, &c. which are certainly most destructive : For no Medicines were so much used by *Hippocrates* in internal Disorders of the

264 *Of a Consumption*

Lungs, as Preparations of *Milk*, and his beloved *Oxymel*.

SOME Authors have esteemed an *Ulcer* in the *Lungs* incurable ; while others, running into a contrary Error, and depending too much on the Force of their Medicines, seem to be not sufficiently sensible of the Danger that attends it. But whoever considers the Structure of the *Lungs*, and that no *Ulcer* can be healed but with the greatest Difficulty, unless it be carefully cleansed, kept in a State of Rest, and that the *Humours* arriving at it be mild, and well disposed, may easily conceive why this Distemper is so difficult to cure, and is so generally fatal ; for the great Usefulness of the Part affected, (on whose Welfare the good Disposition of all the *Fluids*, and the most material Functions of Life depend) its Situation and constant Motion, powerfully contribute to prevent these Advantages : And the *Cough*, which Nature most constantly uses in this Case as the Instrument to discharge the *purulent Matter*, and cleanse
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the *Ulcer*, by its too violent Motion is apt to enlarge it, and increase the universal Decay : By this Means, that which by the natural Efforts of the *animal Oeconomy* is designed for the greatest Friend, frequently proves the most destructive Enemy.

THE Method which has been here described, obviates as much as possible these Inconveniences ; and will be attended with unexpected Success, if carefully observed before the Distemper be too far advanced, and the *Solids* and *Fluids* decayed and corrupted : But when from the Violence of the Distemper, or the Neglect of a proper Method, the Symptoms are so far increased, as to carry a fatal Aspect, and elude the Force of the most effectual Medicines, instead of amusing the unhappy Patient with false Hopes, and the repeated Use of *palliative Remedies*, or denouncing certain Death, it would be of the greatest Use, if a Method could be proposed, which, tho' dubious and painful in the Operation, may give the afflicted some Chance
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for their Life : *Præstat anceps quam nullum experiri Remedium.*

SUCH a probable Relief can only be expected by opening the Breast, where the most frequent Pain and Oppression direct the Situation of the *Ulcer*. And that no small Prospect of a Recovery might be expected in several Cases from this Operation, may be most evidently proved from what has appeared in the Dissection of such as have died of this Distemper ; especially when proceeding from a previous *Hæmoptoe* of the *pulmonary Arteries* ; in which Case, the Sides of the imposthumated or ulcerated Part of the *Lungs*, have been most constantly observed to adhere to the *Pleura* : (a) By which Means, as if carefully designed by Nature, the af-

(a) Vid. Bennet. *Theat. tabid. exercit.* 16. pag. 95. Fernel. *Consil.* 20. Willis *Pharmacœut. Rational.* Sect. 1. Cap. 10. Carol. Piso *de morb. a colluvie serosâ.* Sect. 3. Cap. ult. Tulp. *Obs.* 4. lib. 2. Bonet. *Anatom. Pract.* Tom. 1. lib. 2. Sect. 4. *Obs.* 9. Sect. 5. *Obs.* 2. Sect. 7. *Obs.* 38. & 39.

fectd Part is placed in a proper Condition of being thus relieved; and is kept more in a State of *Rest* than any other Part of the *Lungs*: So that nothing of Moment seems to prevent a Recovery, if the Operation be rightly performed; for the new *Orifice* effectually supplying the Place of the opening into the *aspera Arteria*, the *purulent Matter* may be safely evacuated, without the Inconveniencies that attend *Expectoration*, and the *Wound* most effectually cleansed and cured by deterging and healing *Injections*.

THAT *Abscesses* and *Ulcers* in the *Lungs* may be thus artificially discharged, is not only agreeable to the strictest Reasoning on this Subject, but has been confirmed by Experience. I shall only mention one Observation, which most remarkably confirms the Truth of what has been delivered. (a) A Soldier received a *Wound* with a Sword, pene-

(a) *Miscellan. Curios. Ani. 6ti. Obs. 41.*

trating through the *Ribs* into the Cavity of the *Breast*, from whence a small Quantity of *Blood* was externally discharged: The *Surgeon* who attended him, not considering the Consequence, quickly healed the *Wound*; which was succeeded with a *Cough*, *hectic Fever*, and a great Difficulty of Breathing: These Symptoms were particularly violent in the Night; and at length he *expectorated* by coughing a considerable Quantity of *purulent Matter*. In this decaying Condition he remained for some Time, till by the Order of a *Physician* the wounded Part was again opened by *Incision*, which immediately discharged a great Quantity of *purulent Matter* with as much Force as *Blood* flows from a *Vein*: The *Cough*, *hectic Fever*, and Difficulty of Breathing, by this Means soon abated, and by the Use of proper Applications the Person was restored to perfect Health.

'Tis not improbable, but that from this Wound, some extravasated Blood falling

falling into the Cavity of the *Thorax*, might have formed an *Empyema*, and increased the Quantity of the purulent Matter discharged, and the Violence of the Symptoms: But it is likewise most certain that the *Lungs* of this Person were ulcerated, and adhered in that Part to the *Pleura*; and that he must in all Probability have languished away, if not relieved by the *Aperture*. And tho' in this Case the *Physician* was plainly directed to that *Operation*, because immediately after healing the *Wound* such bad Symptoms appeared: And it was therefore obvious to conclude, that by the same Passage the *Wound* was received, its Effects may be most easily carried off: Yet when there is such an *Adhesion* from an *Abscess* or *Ulcer*, proceeding from an *internal Cause*, there is almost equal Reason to expect Success from such an *Aperture*; for the only Difference that appears in these Cases is that the former proceeded from an external *Wound*, but attended with a good Habit of Body; the latter from an internal Cause,

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and originally occasioned by a bad Disposition of *Humours*; which may be easily corrected by the Method here described.

WHEN the *Lungs* are *ulcerated* in various Places from *preceding Obstructions* or an *Hæmoptoe*, no Relief can be expected by this Means; but when an *Abscess* or *Ulcer* is formed from a *preceding Hæmoptoe* of the *pulmonary Vessels*, and the *Lobe* affected is not much destroyed, I see no Reason why it may not be performed, with at least as much Probability of Success, as in an *Empyema*; in which Case a Recovery may be expected, if the *purulent Matter* be not depraved by a long *Stagnation*, and has not given a *fatal Erosion* to the other Parts; especially if the *purulent Matter* thus discharged be of a white Colour, and of an equal Consistence; but if it be tinged with a red Colour, and is impure and fetid, or if what is discharged on the first Day has a deep Hue like the Yelk of an Egg, or if on the second Day it be
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of a thick Consistence, a pale, green Colour, and of a fetid Scent, the Case is then fatal. These *Prognostics* which always hold good in an *Empyema* (a) may with equal Reason be applied to this Case after *Incision*; and may be as justly formed before the *Operation*, as the Nature of the *purulent Matter* contained in the *Ulcer* is evident from what is *expectorated*, which in an *Empyema* cannot often be discovered till after *Incision*.

'Tis surprizing that this Method has not been frequently attempted, since it is founded on such plain and easie Reasoning from *anatomical Observations*; tho' I'm sensible there are several Obstacles that will always oppose it: For the quick Return of Ease, that successively follows the oppressing Anxiety which attends the *hectic Heats*, affords such a deceitful Prospect of a Re-

(a) *Hippoc.* 1. & 2. *de m.* & 7. *Aphorism.*

covery, that these unhappy Persons are scarce ever to be convinced their Distemper will be soon fatal to them. Neither are *Physicians* willing to hazard the Reputation they have gained, by advising an *Operation* that is esteemed so desperate; especially when others are never wanting, who out of Ignorance or a base Design would be apt to censure such a Proceeding. But 'tis most certain, that many *phthisical Persons* may by this Means be preserved, that will otherwise unavoidably perish: If the *Operation* be rightly performed, there is great Reason to expect Success, neither if it fails, can it be attended with any greater Danger, or much contribute to hasten their Fate.

THUS I have endeavoured, after the most plain and rational Manner, to account for the various Origine and Progress of this Distemper, through its different Stages: And without forming any deceiving *Hypothesis*, have
 shewn

shewn how a Collection of *purulent Matter* in the *Lungs*, can only proceed from *previous Obstructions* of the *Vessels*, or a *Solution* of their *Continuity*: There is no Disease perhaps, which, rightly to explain, requires a more universal Knowledge of the *animal Oeconomy*; and which hitherto has been described after a more imperfect, confused Manner. In this *Treatise*, I have proposed rather to lay down a right Account of this *Distemper*, than to examine the Errors of others: But however, I cannot well avoid mentioning the Author of a late *Hypothesis*, (a) which some may be more inclined to believe, since no less than *ocular Demonstration* is offered to confirm the Truth of it. This Person takes Notice, that *Ulcers* in the *Lungs*, when narrowly viewed with *Microscopes*, are covered with several *Insects*; and from thence concludes that they take their

(a) *Martin* on Consumptions, p. 50, 51.

first Origine from such *Animalcules*, which being inspired with the Air, fix their Situation on the *Lungs*, and erode and ulcerate the *Vessels*: And from the same irregular Way of Reasoning, these *Animalcules* have been by others supposed the Cause of several Distempers, and particularly such as are *contagious*: But these Appearances may be easily accounted for, as the unavoidable Effects, not the Causes of these Diseases: For it is certain, that there is almost an infinite Number and Variety of such *Animalcules* perpetually floating in the Air, whose chief Business consists in searching out a Place where they may find Nourishment, and a proper Situation for themselves and their young: But every living Part of a human Body has a perpetual Pulsation, which, tho' imperceptible to our Eyes, is sufficiently strong to give the most uneasy Motion to these *Animalcules* so minutely small, and entirely prevent them from fixing there for any Time: But as
there

there is no Circulation in any Part that is ulcerated, the Inconvenience of this Pulsation immediately ceases, and the *purulent Matter* sends forth perpetual Steams, fit to nourish them; and by being viscid and adhesive, makes their *Nidus* so secure, that the Motion of the *Vessels* under the ulcerated Part is not strong enough to dislodge them: After the same Manner, the Blasts of Trees and Plants, may be more rationally accounted for, than by bringing small *Animalcules* and their *Eggs* so many hundred Leagues to produce these Alterations. For there is a Circulation of *Humours* through every Part of Plants and Trees, and in their aerial Tubes a more remarkable Pulsation, which is sufficiently strong to prevent these *Animalcules* (perhaps more minute than such as are observed on *animal Bodies*) from having a fixed and safe Situation there: But whenever any particular Wind, or Alteration of the Air, by either giving a sudden Contraction to their *tender Vessels*, or

a *Viscidit*y to their *Juices*, produces a *Stagnation*, and thence a *Gangrene*, either in any particular Part, or in the whole, such *Animalcules* will quickly secure this quiet State and Nourishment:



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