Librum hunc cui Titulus,

THE

ANATOMY of Human Bodies,

Dignum censemus qui Imprimatur.

Tho. Millington, Præses.

Tho. Burwell,
Rich. Torlesse,
Will. Dawes,
Tho. Gill,
} Censores.

Dat. ex Ædibus
Collegii nostri in
Comitiis Censoriis
Aug. 6. 1697.

THE ANATOMY OF Humane Bodies EPITOMIZED.

WHEREIN

All the *PARTS* of Man's Body, with their *ACTIONS* and *USES*, are succinctly described, according to the newest Doctrine of the most Accurate and Learned Modern Anatomists.

The Fifth Edition, *Corrected and Inlarged both in the Discourse and Figures.*

By *THO. GIBSON*, M. D. Fellow of the College of Physicians, *London.*

LONDON,

Printed by *T. W.* for *Awnsham* and *John Churchill*, at the *Black Swan* in *Pater-noster-Row*, and sold by *Timothy Childe*, at the *White-Hart*, the West end of St. *Paul's Church-Yard*, 1697.

TO THE

READER.

INstead of *beſpeaking* the Reader's *Candour*, (as is common with Authors) I have the pleaſanter task of *boaſting* of *it*: for to *that* only is it owing, that this Book which deſerved not a *Second Impreſſion*, has now paſt a *Fifth*. And I hope thoſe who have been ſo kind as to buy off the *former*, will not reckon it for a Fault, that *This* pretends to be more correct and complete than they; for to have continued the known Errours and Imperfections thereof, would have been an Injury both to the Reader, and my ſelf: *To the Reader*, in obtruding acknowledg'd Errours, and concealing new Diſcoveries; And *to my ſelf*, in giving occaſion to be thought negligent in what I have taken ſo great pains in, and ignorant of what I know.

But my publiſhing this Book now a *Fifth* time in *Engliſh*, needs a better Apology than I can give: Only this I can ſay, That though it ſpeak Engliſh, yet none ſhall well underſtand it, that is a ſtranger to the more learned Languages: And therefore it diſdains the Converſation of Quacks and old Women, leaving them to meditate on the traditional Virtues of their Receipts, without offering to inſtruct them in *the Knowledge of themſelves*, of which their Ignorance and Impudence render them incapable in any ſenſe.

Its Ornaments indeed are in a great meaſure borrow'd, but it fears not the Fate of the *Daw* in the Fable, to be unplum'd and laugh'd at; becauſe they are not *furtivi colores*, ſeeing it ſtruts not in them as its own, but has every where the ingenuity to confeſs the true Owners, whom if the Reader deſire to know, it here preſents him with a Liſt of the Principal.

Adrian.

Adrian. Spigelius *de Humani Corporis fabrica.*

Isbrandi de Diemerbroeck *Anatome corporis humani.*

Thomæ Bartholini *Anatome.*

D. Williſius *de Cerebro.*

----*Exercitationes Medico-phyſicæ duæ*, 1. *De Sanguinis accenſione*, 2. *De motu Muſculari.*

----*De primis viis & de reſpirationis organis* in his firſt and ſecond part of his *Pharmaceutice Rationalis.*

Dr. Highmore's *Corp. hum. diſq. Anatomica.*

M. Malpighii *Epiſtolæ Anatomicæ de Cerebro, Linguâ, Tactûs organo.*

----*De viſcerum ſtructura*, viz. *Hepatis, Cerebri corticis, & Lienis.*

----*Exercit. de Omento, Ping. & Adip. duct.*

Nicolai Stenonis *Diſſertatio de Cerebri Anat.*

---*De Muſculis & Glandulis Obſervationum ſpecimen.*

----*De Glandulis Oris, & novis earundem vaſis Obſervationes Anatomicæ.*

Caroli Fracaſſati *Diſſertatio Epiſtolica de Cerebro.*

Dr. Lower's *Tractatus de Corde.*

Dr. Gliſſon's *Tractatus de Ventriculo & Inteſtinis.*

----*Anatomia Hepatis.*

Dr. Charlton's *Enquiries into Humane Nature in* IV. *Anatomick Prelections in the New Theatre of the Royal College of Phyſicians in* London.

Dr. Wharton's *Adenographia, sive Glandularum totius corporis descriptio.*

Lamb. Velthusii *Tractatus duo Medico-physici, unus de Liene, alter de Generatione.*

Dr. Harvey's *Exercitationes Anatomicæ de Cordis motu, & circulatione Sanguinis.*

----*Exercitationes de generatione Animalium.*

Casp. Bartholin. (*Thom. F.*) *Diaphragmatis structura nova.*

Francisci Stockhamer, *Doctoris Medici & Anatomici Microcosmographia.*

Laurentii Bellini *Exercitatio Anatomica de structura & usu Renum.*

Dr. Grew's *Comparative Anatomy of Stomachs and Guts*, subjoined to his *Museum Regalis Societatis.*

Anton. Nuck *de ductu salivali novo, saliva, ductibus Oculorum aquosis, & humore aqueo.*

Gualt. Nedham *Disquisitio Anatomica de formato fœtu.*

Joh. Conr. Peyeri *Parerga Anatomica & Medica*, viz. *de Glandulis Intestinalibus*, &c.

Joh. Conrad. Brunneri *Experimenta nova circa Pancreas.*

Dr. Mayow's *Tractatus quinque Medico-physici*, &c.

Regneri de Graef *Opera omnia.*

Johannis Swammerdami *Miraculum Naturæ, sive Uteri Muliebris fabrica.*

Joh. Alph. Borelli *Opus posthumum de motu Animalium.*

Frederici Ruyschii *responsiones ad D. Joh. Gaubium*,

Gaubium, & Joh. Jac. Campdomercum.
Dr. H. Ridley's *Anatomy of the Brain.*
Dr. Brigge's *Ophthalmographia, sive Oculi ejusq; partium Descriptio Anatomica.*
Dr. Cole's *Cogitata de secretione Animali.*
Dr. Croone *de ratione motûs Musculorum.*
Monſ. du Verney *of the Ears.*
Dr. Henſhaw's *Aero-Chalinos.*
Monſ. Perrault *Eſſays de Phyſique*, &c.
Steph. Blancardi *Anat. Reformata.*
Dr. Havers's *Oſteologia nova.*
Mr. Cowper's *Appendix to his Myotomia reformata.*

Theſe, I ſay, are the Authors which have chiefly adorned this *Book*, ſeveral whereof were not ſought to in the former Editions; and thoſe that were, have now (ſome of them) been much more liberal in contributing their Symbols to make it more complete.

As it is, if it may *aſſiſt the memory* of ſuch as are *well skill'd* in Anatomy, or *inſtruct* and *direct* the young *Beginner*, I have not miſs'd of my Deſign.

Farewell.

THE

THE CONTENTS.

Book II.

Of the middle Cavity called *Thorax.*

Book III.

Of the higheſt Cavity, or Head.

Book IV.

Containing a deſcription of the Veins, Arteries, and Nerves of the Limbs: with an Appendix of the Glands thereof.

Book V.

Containing a Treatiſe of all the Muſcles of the Body.

Book VI.

Of the Bones.

IV. *Of*

An *Appendix* to Book VI.

THE

THE
Introduction.

ANATOMY *is the artificial ſeparation of the Parts of the Body by ſection, inſtituted for the attaining to the knowledge of its Frame, and the uſe of each Part.* Anatomy what.

All animal Bodies of convenient bulk, are the *Subject* of Anatomy: But an humane Body is the primary, both becauſe its frame is more perfect and exquiſite than that of any other, and becauſe the Anatomiſt diſſects others, to the end only that by comparing thoſe with this, he may obtain a more accurate knowledge of it, the preſervation and cure whereof is the principal and ultimate *End* of Anatomy. *Its Subject, and End.*

This Art being ſo noble for its *Subject*, and ſo beneficial for its *End*; as many as have taken pains in cultivating of it, have deſerved very well of Mankind: for Skill therein, as it is very pleaſant and ſatisfactory unto all, ſo is it abſolutely neceſſary for ſuch as take upon them to adminiſter Medicin, or practiſe Chirurgery. But the *Minima* or ſmalleſt particles, whereof the parts of our Bodies conſiſt, being ſo very fine, that many of them cannot be diſcovered by the naked eye, and ſome deny to ſhew themſelves to the beſt Glaſſes that have yet been invented, 'tis no wonder that there have been and ſtill continue various Opinions concerning the nature of ſeveral parts, and conſequently of their actions and uſes, and the man-

ner and reaſon of them. But the unwearied diligence of ſome later Anatomiſts hath brought many things to light, wherein all Antiquity was miſtaken; whoſe diſcoveries, collected with the greateſt care, I ſhall inſert (with due commemoration of the Authors) in their proper places in this Treatiſe. Before our entrance whereupon, I think it neceſſary, by way of *Introduction*, firſt to explain to the young Student in Anatomy, what thoſe *ſimilar* parts are that the bulk of the Body conſiſts of; that when *diſſimilar* parts which conſiſt of them, are deſcribed, he may the better underſtand what is ſaid.

The Fabrick of the Body conſiſts of parts ſimilar and diſſimilar.

Similar parts what.

And firſt we muſt explain what is meant by *ſimilar* and *diſſimilar* parts. A *ſimilar* (otherwiſe called a *ſimple*) part, is that which though it be cut or divided into ſeveral pieces, yet they will be all of the ſame nature, ſubſtance and denomination with one another, and with the whole: as every portion or particle of a *Bone* (*v. g.*) is *Bone*. A *diſſimilar* (otherwiſe called a *compound*, and an *organical*) part, is that whoſe portions are neither of the ſame ſubſtance, nor denomination; as (*v. g.*) a *Finger*, which conſiſts of the skin, fleſh, bone, *&c.*

Diſſimilar what.

Of this latter kind of parts, this is no proper place to treat: And as concerning the former, the Reader muſt underſtand, that though they be called ſimple or ſimilar, 'tis not meant that they are *truly* ſo: (for there are none amongſt thoſe we term ſo, whoſe leaſt particles are not of different natures and kinds;) but that they appear ſo to the more ſuperficial and ſlight view of the Anatomiſt; and to diſtinguiſh them from the compound or diſſimilar parts, whoſe diverſity of ſubſtance the eye at the firſt glance diſcovers.

Theſe

Theſe ſimilar parts are commonly reckon'd to be Ten, *viz.* the *Skin*, a *Membrane*, *Fleſh*, a *Fibre*, a *Vein*, an *Artery*, a *Nerve*, a *Ligament*, a *Cartilage*, a *Bone*. Theſe are common to the whole Body, there being no diſſimilar or organical part which does not conſiſt of ſeveral of them. There are beſides theſe, other parts which may alſo be called ſimilar as to their ſubſtance; but becauſe they are proper only to ſome particular part, 'twill be more convenient to treat of them when we come to ſuch part: and therefore we ſhall omit to ſpeak of them here, and confine our ſelves to the parts mention'd. *Similar parts are Ten.*

I. *The Skin.* The word *Skin*, though in a large and vulgar acception it be applied to the Membranes of the Muſcles, *&c.* (as we commonly ſay ſuch a piece of fleſh is *skinny*) yet Anatomiſts underſtand it only of the outward integument or cover of the Body, which the *Latins* term *cutis*.

II. *A Membrane.* The word *Membrane* is a common appellation to all the coverings that inveſt the ſolid parts of the Body, or contain the fluid humours. Thus the Bones, Muſcles, Brain, *&c.* are cloathed with membranes; and the gall, humors of the eye, *&c.* contained in them.

III. *Fleſh, four ſorts of it.* *Fleſh* is an uncertain term, unleſs ſome reſtrictive explication be added to it, to limit its being meant of this or that particular ſort of fleſh; there being four ſorts of it, *viz.*

1. *Muſcular.* That of the *Muſcles*, which moſt properly bears the name; and comprehends all the red, ſolid (yet ſoft) ſubſtance, that the bulk of the Body chiefly conſiſts of; which ſhall be further deſcribed in the *fifth Book*.

2. *Viſceroüs.* That of the *Viſcera* or *Bowels*, *viz.* of the Liver, Spleen, and Kidneys, of which in the *firſt Book*.

3. *Membranous.* 3. *Membranous* flesh, that namely which is partly membranous, and partly fleshy, as the substance of the Gullet, Stomach, Intestins, Womb, Bladder, and the *Membrana carnosa* (so called) it self; of all which more afterwards in their proper places.

4. *Glandulous.* 4. That of the *glands* (or kernels.)

Glands of two kinds. The *Glands* in respect of their *conformation*, are usually divided into *conglobate*, and *conglomerate*; and these have a different *use* the one from the other.

1. *Conglobate.* 1. The *conglobate* are smooth in their surface, and are made up of one continued substance as it were: the *use* whereof is to separate the *lympha* from the arterial blood, and to remand it by the Lympheducts, either into the chyliferous, or sanguiferous vessels (only those in the Mesentery, as likewise those in the Breasts of Nurses, are thought to minister to the chyle, as well as to the *lympha.*)

2. *Conglomerate.* 2. The *conglomerate* are somewhat uneven in their surface, and consist each as it were of many lesser glands: and their *use* is, to separate from the blood, and also to elaborate and alter, several sorts of juices, and then by one or more proper ducts to convey the same into peculiar cavities. As the *Parotides* and maxillar glands convey the *saliva* into the mouth by their salival ducts, &c.

IV. *A Fibre.* A *Fibre* is defined by Dr. *Glisson* (in *cap.* 4. *de Ventric.*) to be *a body in figure like a thread, slender, tenacious, tensile, and irritable, made of spermatical matter, for the sake of some motion and strength.* They are of two sorts, *fleshy*, and *nervous*: The first constitute a great part of the Muscles, and are tubular, filled with a fluid (of which see more *Book* V. *Chap.* I.) and are the main instruments of motion: The latter (being also tubular, as some think) run through, and are interwoven

interwoven in the nervous parts, and are the principal organs of ſenſe: being otherwiſe called *membranous* fibres, when they are interwoven in Membranes.

A *Vein* is a ſanguiferous veſſel, whoſe larger branches in the habit of the body, eſpecially in the limbs, run next under the skin, and both there and alſo in the Venters (*viz.* belly, breaſt and head) ſerve to convey back again towards the heart, that blood which was ſent from thence by the Arteries into the reſpective parts. They are of a thinner ſubſtance and looſer texture than the Arteries: and of a like nature with them (only finer) are the milky veins that convey the chyle, and alſo the peculiar ducts that diſcharge the particular humors from the conglomerate glands; and ſomewhat finer yet are the Lympheducts that return the *Lympha* ſeparated from the arterial blood by the conglobate glands. V. *A Vein.*

An *Artery* is alſo a ſanguiferous Veſſel, and generally holds the ſame courſe with a Vein, but lies deeper. It can no where be ſeen in the ſurface of the body, but may be felt to beat in ſeveral parts at the ſame time with the heart; and its pulſe is chiefly indicative of the temper of the blood, but partly alſo of the vigor or defect of ſpirits. Its coat is ſtronger and more fibrous and denſe than that of a Vein. Its uſe is, to convey blood and vital ſpirit into all the parts, for their nouriſhment, and the conſervation of their innate heat. VI. *An Artery.*

The *Nerves* are veſſels taking their origine from the medullar ſubſtance of the brain (taken largely) and the ſpinal marrow, conveying thence animal ſpirits into all the parts, for their ſenſe and motion reſpectively. They are without any ſuch ſenſible cavity or humor flowing therein, as the Veins and Arteries have; and conſiſt of a double VII. *A Nerve.*

coat derived from the two membranes that cloath the brain, and a medullar ſubſtance contained therein. Their diviſions and diſtributions do not correſpond with thoſe of the Veins and Arteries, nor have they one common trunk from whence all the reſt are propagated, as thoſe have, but ſpring each from its particular root; unleſs one will call the *medulla oblongata* continued into the *ſpinalis*, a Nerve, and ſo make it the common trunk.

VIII. *A Ligament.* A *Ligament* is a part of a middle ſubſtance betwixt a Cartilage and a Membrane, appointed for the tying of ſundry parts together. Thoſe which tye the bones to one another are void of ſenſe, but thoſe that knit other parts together are (dully) ſenſible.

IX. *A Cartilage.* A *Cartilage* (or Griſtle) is of a middle ſubſtance betwixt a Ligament and a Bone. It is flexible, but inſenſible: and by the drying up of its moiſt glutinous particles, in age it often degenerates into bone: whence, in a great meaſure, is the ſtiffneſs in the joints of old men, moſt of the ends of the bones in their articulations with one another being tipped with cartilages, which in age alſo grow bony.

X. *A Bone.* A *Bone* is a very dry, cold and hard part, inflexible, void of ſenſe, affording ſtabiliment and form to the whole body. Some bones are more ſpongie and porous, and others more ſolid. Others again have large cavities, filled with marrow; others none. But of theſe, and all the other ſimilar parts, more in their proper places.

Thus much I thought good to premiſe by way of *Introduction*, to make the Reader more capable of receiving both delight and benefit in peruſing this Anatomical Treatiſe, to which I now proceed.

The

The First Book.

OF THE LOWEST CAVITY, CALLED ABDOMEN.

CHAP. I.

Of the Division of the whole Body, and of its Parts.

AN *humane Body* may be considered either *generally*, with respect to the *whole*; or *particularly*, with respect to each *part* of which it consists. *The Body considered in two respects.*

In its *general* consideration there are to be taken notice of, its external form or shape, its bulk, and its colour. But these Accidents being obvious to the eye of every man, as well as to the Anatomist's, are no proper subjects for our discourse. 1. *Generally.*

The *particular* consideration of it observes and describes the figure, connexion and composition or structure of each several *part*, and the great diversity of their actions and uses. 2. *Particularly.*

The *whole* Body is divided into the *Trunk*, (containing three *Venters*) and the *Limbs*. The three *Venters* *The division of the whole Body.*

Venters are the Cavities of the *Abdomen* or Belly, the Cheſt, and Head. The *Limbs* are the Arms, Thigh and Legs.

A part defined.

A *Part* may be thus defined, *viz. It is a bodily or ſolid Subſtance, cohering with, making up, and partaking of the life of, the whole, and ſerving for ſome function, or uſe.*

In this definition are implied theſe five things.

1. A part muſt be *ſolid*, whereby the ſpirits and humors are excluded.

2. It muſt *cohere* with the whole, that is, be not only contiguous, but continuous to it: and from hence alſo the ſpirits and humors are excepted, as only touching the ſides of the veſſels as they paſs along, being contained in them, but not united to them.

3. It (with others) muſt ſerve to *compleat* or *make up* the whole. Whence the Child in the womb is not to be reckoned a part of a pregnant woman, though it be knit to her womb by the Navel-ſtring (the *placenta* intervening) becauſe after delivery ſhe remains a perfect woman, as ſhe was alſo before conception.

4. It muſt partake of the *life* of the whole: whereby the nails and hairs are exempted, which have only a vegetative, but no animal life.

And 5. It muſt have ſome *function*, or *uſe*: ſo that preternatural excreſcencies, as Warts, *&c.* are not to be reputed parts, (being alſo excluded by the third head, as contributing nothing to the perfection of the whole.)

Having mentioned the *function*, and *uſe* of a part, it will be convenient to explain what is meant by them, and to diſtinguiſh them.

The function of a part what.

The *function* (or *action*) of an (organical) part, is *a certain effective or operating motion produced by it,*

it, from its own proper aptitude. And is either *private*, or *publick*. By the *private* action the parts only provide for themselves; but by the *publick*, for the whole animal. As for instance: The stomach by a *private* action converts the blood that is brought to it by the Arteries, into its own nourishment: But by its *publick* action, which is Concoction, or turning the food into Chyle, it provides for the whole body.

It is twofold, private and publick.

The *use* of a part is that assistance which the less principal parts afford to the principal one in performing its action. And it differs from the *action* of a part in *two* respects. *First*, In that those parts only are said to have an *action*, which operate; whereas many have an *use*, which act nothing at all themselves, but only accommodate and assist those that do act. Thus the Fat has no *action* of its own, but it is *useful* to cherish and moisten the Muscles, *&c.* that their motion or action may be performed more glibly and easily. *Secondly*, An *action* belongs to or proceedeth from the *whole* organ that operates; but every *particular* part that makes up the organ, hath an *use*. Thus the *whole* Muscle exerts its *action*, which is contraction: But the several *parts* of which a Muscle consists, have *each* of them their *use* to assist this action; as, the Membrane that invests it, is of use to inclose and contain its fibres, and to distinguish and keep it apart from other Muscles; the use of the Nerve is to bring it animal spirits; of the Artery, to supply it with blood, *&c.* But because the *action* of a less principal part, may be of *use* to further that of one more principal; as also because the *action* of *several* organs may conspire to *one use* (as the Muscles of the *Abdomen*, to the exclusion of the excrements) therefore *action* and *use* are often confounded, and used

The use of a part is what, and wherein it differs from the action.

uſed the one for the other by Anatomiſts; nor ſhall we every where in the following Tract diſtinguiſh them ſo nicely.

The diviſion of the parts.

The *parts* of the *body* have a *twofold* difference or diſtinction; the one from their *matter*, and the other from their *function*, or *end*.

1. From their matter.

In reſpect to the *matter* of which they conſiſt, they are divided into *ſimilar* and *diſſimilar*, of which we have treated fully enough before in the *Introduction*.

2. From their function, or end, viz. into organical,

In reſpect of their *function*, or *end*, they are divided into *organical*, and *non-organical*.

An *organical* part is that which is deſigned for performing ſome action. Such as are chiefly the *diſſimilar* parts; but yet ſome of the *ſimilar* may be alſo termed *organical*: as for inſtance, a Nerve, which conveys and diſtributes the animal ſpirits; and likewiſe the Arteries and Veins, which do the ſame to the blood.

and non-organical:

A *non-organical* part is that which has only an uſe, and no action: as a griſtle, fat, *&c.*

as alſo into principal,

Again in reſpect of their *function*, or *end*, the parts are divided into *principal*, and *miniſtring*.

A *principal* part is that which performs the moſt noble and principal action, and from which the actions of many other parts proceed, or are aſſiſted. Of which ſort are, 1. The *Heart*, which is the (diſtributing) fountain of vital heat, and nutritive blood, communicating both to all the other parts, by its continual pulſation. 2. The *Brain*, which is the fountain of the animal ſpirits, and ſo the Author of all ſenſe and motion. To theſe ſome add, 3. the *Genitals*, on which the preſervation of the *Species* depends; as on the other, that of the *Individual*.

A *ministring* part is that which ministers to or assists the principal: such as are the Stomach, Liver, Reins, the Hand, *&c.* And of these some are *necessary*, others *not*. *and* ministring.

The *necessary* are those without which a man cannot live. Such as are the Stomach, Liver, Lungs, *&c.* *The* ministring *are either* necessary, *or* not necessary.

The *not necessary* are such as contribute to the well-being, but are not absolutely necessary to the life of a Man: as an Hand, a Leg, simple muscular flesh, which in consumptive persons is almost wholly spent.

There are also other divisions of the parts of the Body, as into parts *containing*, parts *contained*, and the *spirits*, express'd by ὁρμῶντες, or *impetum facientes*, by *Hippocrates*.

Fernelius divides the Body also into *publick*, and *private Regions*. The *private* are such as the Brain, Reins, Womb, *&c.* The *publick* are Three. The first includes the *Vena portæ*, and all the parts whither its Branches reach. The second begins at the roots of the *Cava*, and ends in the small veins before they become capillary. The third contains the Muscles, Bones, and the bulk of the Body, and is terminated by the Skin. But this division is only of use in Medicin.

CHAP. II.

Of the Circumscription, Regions, and Parts of the Abdomen.

IN the former Chapter we divided the *Whole* Body into the *Venters*, and *Limbs*. Of which, because the Venters are more subject to Putrefaction,

faction, as containing parts that are very moiſt and flabby; whereas the Limbs conſiſt of parts that are more dry and firm, ſuch as the Bones, Muſcles and Tendons: I ſay, on this account, the Venters are uſually firſt diſſected, and of them firſt of all the *Abdomen* or Lower Belly that contains the Guts, which, of all other parts, are apteſt in a ſhort time to ſend forth noiſome ſmells, and to be offenſive to the Anatomiſt. We ſhall begin with *it* therefore, and in the ſecond place proceed to the middle Venter or *Cheſt*, and laſt of all to the *Head*: making each of theſe the ſubject of a particular *Book*.

Before we begin to cut open the *Abdomen*, three things are to be conſidered in relation to it. Firſt, Its *Circumſcription* or *Bounds*. Secondly, Its *Regions*. Thirdly, The ſpecial or conſtituent *Parts* of it.

The Circumſcription of the Abdomen.

As concerning the *Circumſcription* of it, its *upper* part is ſevered (within) from the Breaſt by the Midriff. In the *foreſide* it is bounded *above* by the *Cartilago enſiformis*, or the Heart-pit, and *beneath* by the Share-bones. On the *ſides*, by the ſhort Ribs, and *Oſſa Ilia*, or Hip-bones. *Behind*, by the *vertebræ* of the Loins, *Os Sacrum*, and the *Coccyx*.

Its Regions.

Its *Regions* are either *Anterior*, or *Poſterior*. The *Anterior* (which comprehends alſo the *Lateral*) is ſubdivided into three others, *viz.* the uppermoſt, middle, and loweſt.

1. *Anterior.*

The *uppermoſt*, which reaches from the *Cartilago enſiformis* to within three inches above the Navel, (parallel to the loweſt of the ſhort Ribs) hath three *parts*. Two *lateral*, which are called *hypochondria*, or *ſubcartilaginea*, becauſe they lie under the Cartilages of the ſhort Ribs. In the right *hypochondrium*

pochondrium lieth the greateſt part of the Liver, and part of the Stomach; and in the left, the Spleen, and a greater part of the Stomach. The third part is that which lieth *before*, between the two lateral parts, and is properly called *Epigaſtrium*, becauſe the (middle of the) *Stomach* lieth *under it*. In this part remarkable is the Pit of the Breaſt, which formerly has been uſed to be called καρδία, but *ſcrobiculus cordis* by the modern Writers.

The *middle* Region extendeth it ſelf from three inches above the Navel, to three inches under it. The *forepart* is that where the Navel is, from whence it is called *Regio umbilicalis*. The two *lateral* parts are called in Engliſh the *Flanks*; in Latin *Ilia*; by *Ariſtotle* λαγόνες, either from their *laxity* or ſoftneſs, or from λαγνία, *ſalacitas*, as if they were the ſeat of *Luſt*; by *Galen* κενεῶνες, becauſe being placed between the *Oſſa Ilia*, and Ribs, they are lank, and ſeem *empty*. They are called by Dr. *Gliſſon*, *Epicolicæ*, becauſe on each ſide, this Region inveſteth the lateral parts of the Gut *Colon*.

The *loweſt* Region is called ὑπογάστριον, *hypogaſtrium*. This Region reacheth from three inches below the Navel, to the *Os Pubis* and Groins, and hath three parts; two *lateral*, and one *anterior* or middle. The *lateral* are bounded by the *Oſſa Ilia*, ſo called, becauſe a great part of the *Ilium inteſtinum* lieth under them on each ſide. Beſides this, in the right lateral part are placed the beginning of the *Colon*, and all the *Cæcum inteſtinum*. In the left are contained the ending of the *Colon*, and beginning of the *inteſtinum Rectum*.

The *forepart* of the *Hypogaſtrium* by *Ariſtotle*, *lib.* 1. *Hiſt. animal.* 3. is called ὑπογάστριον, by ſome (in ſpecial) *Abdomen*. At the lower part of it is ſeated the

the *Pubes*, which in the adult or ripe of age is covered with hair; and on each side of this, the Groins, called βουβῶνες, or *Inguina*. Within this forepart of the lowest Region, are contained part of the Mesentery and small Guts, the Bladder, and in Women the Womb.

2. *Posterior.* The *posterior* Region is divided into two parts, the upper and lower.

The *upper* is called the *Region of the Loins*, reaching from the root of the Midriff to the top of *Os sacrum*, and contains within it the Kidneys, the *Pancreas Asellii*, and Centre of the Mesentery, the Receptacle of the Chyle, and the descending trunks of the *Cava* and *Aorta*.

The *lower* part of the hinder Region reaches from the top of *Os sacrum*, to the lower end of the Rump-bone or *Coccyx*. It is much broader above than below, and within it are included the straight Gut, part of the Ureters, and in Women the Testicles or *Ovaria*, &c.

Its parts. The *parts* of the *Abdomen* are *containing* (or outer) and *contained* (or inner.)

Containing. The *containing* parts are such as are either *common* to it with the rest of the Body; or are *proper* to the *Abdomen* alone.

and contained. The parts *contained* serve either for *concoction*, for *separation of excrements*, or for *generation*. Of all which in order, and first of the *common containing* parts.

CHAP.

CHAP. III.

Of the common containing parts of the Belly.

THE *common containing* parts of the Belly are five, the *cuticle* or *ſcarf-skin*, the *skin*, the *fat*, the *membrana carnoſa*, and the *common membrane* of the Muſcles. *The common containing parts of the Belly.*

The *ſcarf-skin*, in Greek is named ἐπιδερμὶς, ὅτι ἐπὶ τὸ δέρμα πίπτει, *becauſe it is placed upon the true skin* as a covering. It is as large as the true skin, and more compact; for the ſerous humour that in *puſtules* and bliſters ouzes through that, is ſtopt by the denſity of this. Yet it is full of pores, for the evacuation of ſweat, and exhalation of vapors. It has neither blood-veſſels nor nerves diſperſed through it, and therefore is void of ſenſe. 1. Cuticula, *or ſcarf-skin.*

It is bred of a viſcous and oleous vapour of the blood, raiſed and exhaled by the natural heat of the ſubjacent parts, and dried and condenſed by the external cold, as moſt Anatomiſts have taught; but Dr. *Gliſſon* thinks it to be a ſoft, ſlippery, viſcid and tranſparent juice (like the white of an Egg) iſſuing out of the capillary extremities of the nerves, which end in the outward ſuperficies of the true skin, where it is coagulated, and by its viſcoſity ſticketh upon it like glue; ſo that it can hardly be ſeparated therefrom by a knife, but may eaſily by a veſicatory. It ſometimes alſo almoſt wholly peels off in Scarlet or burning Fevers, and the Small-Pox; but a new one preſently ſucceeds it. *Dienerbroeck* thinks, it is bred neither of theſe ways, but has a ſeminal principle as well as the skin it ſelf, or any other ſolid part. But not ſo probably, ſeeing it has no ſenſe, and may be *Its matter.*

often

often quite loſt, and yet preſently regenerated: *all* which circumſtances agree to no part that has a ſeminal principle. And whereas he objects, that becauſe Infants when they are born have a ſcarf-skin, therefore it cannot be bred by condenſation, ſeeing there is neither cold nor drineſs in the womb, but on the contrary warmneſs and moiſture, which will hinder all condenſation; Dr. *Gliſſon* ſolves this Objection, by ſhewing how a Liquor may be condenſed or indurated two ways: the *one*, by ſeparation of the thinner parts by way of exhalation, which is properly called *deſiccation*, and this he confeſſes cannot happen in the womb; the *other*, by *coagulation*, that is, by ſeparating the more ſerous part of the matter from the thicker particles; which ſort of condenſation may take place well enough in the womb. See his *tract. de ventric.* &c. *p.* 11, 12. where he very clearly makes this out.

Some, from their obſervations by their Microſcopes, affirm the Cuticle to be ſcaly, like that of Fiſhes: But ſeeing it is ſo denſe as to contain the *ſerum* in raiſing of bliſters, (as well as for other reaſons) 'tis very improbable that 'tis of that texture, though perhaps its outer ſurface may appear ſo.

Uſes. The *uſe* of it is, Firſt, To defend the Skin, (which is of an exquiſite ſenſe) from external immoderate either heat or cold. In cold weather its pores are ſo ſtraitned, that the more tender parts lying under it are not too much affected with the cold: In hot weather by its compactneſs it hindreth too great perſpiration.

Secondly, To be a *medium* between the Skin and the object to be felt; for when it is rubb'd off, the true Skin cannot endure the touch of other Bodies without pain.

Thirdly,

Thirdly, To hinder the ſerous humour from iſſuing from the Arteries; for this we ſee to happen when the *cuticula* is rubbed off by any means.

Fourthly, To make the Body more beautiful; which it does by ſmoothing the aſperities of the true Skin, and inducing a comely colour of white and red. Whiteneſs is natural to this part, and the redneſs is owing to the blood that is affus'd to the outward ſuperficies of the true Skin: which being ſeen through the Scarf-skin makes that florid colour.

2. Cutis, or the true skin.

Next under the Cuticle lieth the *true Skin*, which is five or ſix times thicker than it. In Greek 'tis called Δέρμα or Δέρις, either from Δέρω to *flay*, or *q.* τέρμα, becauſe it is the *end* or ſuperficial *boundary* of the body.

Its Colour.

It is naturally *white*, as other membranes: but in living and healthful perſons, and ſuch as live in a temperate or ſomewhat cold climate, from the afflux of the blood toward it, and the colour of the ſubjacent parts, it is of a reddiſh roſie colour. But in thoſe that live under the Æquinoctial Line and in exceſſively hot Climates it appears black: Not but that both it ſelf and alſo the Cuticle are truly white in them, as they are in the Europeans; but, as *Malpighius* probably conjectures, it appears of that hue from the blackneſs of that mucous and reticular body which lies betwixt it and the Cuticle, of which more by and by.

Matter.

It is made up of *nervous fibres* very cloſely interwoven one with another, and of a *parenchyma* that fills up the interſtices and inequalities thereof. That it has ſuch a *parenchyma* may appear by this, that when a Sheep-skin (for inſtance) has been ſome while ſteept in water, one may

with an ivory knife or the like ſcrape a great deal of mucous ſlimy matter off it, whereby it becomes much lighter, thinner and in ſome meaſure tranſparent, as we ſee in Parchment. Moreover, according to *Malpighius*, it is beſet with innumerable pyramidal *papillæ*, whoſe heads jet out of its ſurface, but are covered by the Cuticle: which *papillæ* he is inclined to believe to be the ends of the Nerves perforating the skin, and not raiſed from the skins proper ſubſtance. And amongſt them, he ſays, there is ſpread over the ſurface of the skin, a certain mucous and *reticular* body with holes in it for the emerſion of their heads, and alſo for the paſſage of the Sweat-veſſels. Theſe Sweat-veſſels ariſe from the glands that the skin is every where beſet with, and convey out that ſweat that is ſeparated from the Arteries in the glands.

This *reticular body* of *Malpighius*, *Frederick Ruyſch* (in his anſwer to *Gaubius*'s firſt Letter, p. 10.) ſayes, "cannot be ſeen without optick inſtruments, and can hardly be ſhew'd by the vulgar and common way of diſſection, much leſs can the *pyramidal papillæ*; particles, which the Profeſſors of Anatomy in their diſſections are wont to take no notice of, although they are to be reckon'd ſo neceſſary to be known and ſeen of the Students of Phyſick, that they are by no means to be neglected in anatomical adminiſtrations, eſpecially private ones. Of the *reticular body* and of the *pyramidal papillæ* you have his Figures in the firſt *Table* of this Book.

Difference of thickneſs. The Skin in the Forehead and Sides is thin, thinner yet in the palm of the Hand, but thinneſt of all in the Lips: In the Head, Back, and under the Heel it is thickeſt. It is thinner in Children and Women than in Men; and in thoſe that live in

in hot Countries, than thoſe that live in cold. And this (as *Spigelius* obſerves) is the reaſon why thoſe that are born in cold Countries, when they come under the Æquinoctial Line, are often taken with Fevers, becauſe that great heat that is there excited in the Body by the outward air, cannot exhale through the too thick Skin; but being retained induces a preternatural heat, and ſo a Fever.

It is full of *Pores*, as well as the *cuticula*. For thoſe who deny them, oppoſe not only reaſon, but ocular demonſtration. The paſſing of Quick-ſilver through a Sheep-skin evidences this; and Mr. *Boyle* has tryed the ſame in a piece of the skin of a Man's arm. And any one may ſatisfie himſelf by an ordinary Perſpective, or but a good pair of Spectacles, of the ſame. For if when he is ſweaty, he wipe off the ſweat from the tips of his fingers, he may plainly ſee freſh ſweat iſſue out by the pores, and ſtand in little drops. *Pores.*

It is of a moſt exact *temperature*, neither too cold nor too hot, that it might the more accurately judge of the temperature of tangible things. Its *nervous* part, which is naturally cold, is attemper'd by the heat of the arterial blood that flows continually for the ſupply of its parenchymatous part: and its *parenchyma* is not heated too much by the afflux of the blood, becauſe it is lodged amongſt ſo numerous cold nervous fibres. It has very many both capillary *Arteries* and *Veins* diſtributed through it; as alſo abundance of *nervous* twigs, which endue it with a moſt exquiſite ſenſe. *Temperature, and veſſels.*

As for the *hair* that in many places grows out of the skin, we ſhall defer our diſcourſe of it, till we come to treat of the hair of the Head, in Book III. chap. 2. *Hairs.*

Action. Its *action* is ſenſation or feeling. Which action is chiefly performed by thoſe fore-mentioned pyramidal *papillæ* which *Malpighius* by the Microſcope has obſerved to ariſe out of it, in greater plenty in ſuch parts as are of more exquiſite ſenſe, as the palm of the hand, ſoal of the foot, *&c.* but in leſs, in ſuch as are of a more dull.

Uſes. Its *uſe* is, Firſt, to cloath the whole Body, and defend it from the injuries of the weather, *&c.* Secondly, To be a general vent or emunctory to the Body, by which all its exhalations may fitly tranſpire. Which whether it be done only through its pores, as moſt Anatomiſts have affirmed; or alſo through its very ſubſtance, as Dr. *Gliſſon* has of late aſſerted, is a controverſie hardly worth the inſiſting on.

Laſtly, In ſeveral places of the body to put forth and nouriſh the hair, for the fence and ornament of the reſpective parts.

3. *Fat.* Next under the Skin lies the *Fat*, which is commonly taken to be a covering diſtinct from the *membrana carnoſa* that lies under it, having the name of *membrana adipoſa* given it; but Dr. *Gliſſon* reputes it only a part of the *carnoſa*: for he ſays, that membrane in its outer part is full of membranous cells, which are fill'd with a yellowiſh fat, ſomewhat like as the cells in the pulp of an Orange are filled with its juice. *Malpighius* ſays, "The Blood-veſſels are expanded "like the boughs of trees, every where through "the membrane that lies under the Fat, and the "membranous cells full of fatty globules hang "upon their ends, like leaves upon the boughs of "trees. The cells are of almoſt an oval figure, "and are like the lobules of which the Lungs are "compoſed, or rather like a conglomerate gland.

"They

"They are knit to one another by the mem-
"brane out of which they are formed. And
"through the ſame membrane and cells, he ſays,
"do not only capillary Veins and Arteries, but
"*ductus adipoſi* alſo run, which ſwell with fat,
"eſpecially if they be beheld in an Animal newly
"kill'd. Whether theſe veſſels, *adds he*, propa-
"gated through all the fat that is placed in the
"circumference (or *ambitus*) of the body, flow
"from the Caul, as from their root, ſenſe has
"not as yet diſcover'd: But ſeeing the Caul is
"knit to the back, as to the centre of the whole
"body, it does not ſeem unlikely but that they
"may be propagated into every region of the bo-
"dy, by means of the *membrana adipoſa* that is
"extended over all: as we obſerve of the Lym-
"pheducts, though they want any notable and
"common trunk." Thus far he.] Whether we ſhould call it *Fat*, or the *fatty membrane*, is not worth the while to diſpute: nor much matters it, whether we repute the Fat, and ſubjacent membrane, for one or two integuments. Let every one enjoy his opinion. For my ſelf, I chuſe rather to diſtinguiſh them, and conſider them apart.

Its definition.

Fat is defined to be *a greaſie ſubſtance, bred of the oily portion of the aliment and blood, condenſed by cold.*

Situation.

In Men it is *placed* next under the skin, and that all the Body over, except in the Lips, the upper part of the Ear, Eye-lids, Cod and Yard, which have no fat at all; and in the Forehead, where the skin cleaveth cloſe to the carnous membrane, as alſo according to ſome, in the Temples. It is collected in the cells before-mentioned, and according to the common opinion is bred of an oily portion of the blood ſweat-

ing like a dew out of the Veins, and afterwards concreting: but according to *Malpighius*, the *vasa adiposa* are the conduits of its matter, as shall be further shewn in Chap. 5. of the *Omentum* or Caul.

This Fat is properly called *Pinguedo*, whereas that of the Caul, &c. is called *sevum*, Suet or Tallow. And they differ in this, that *pinguedo* is easily melted, but not so easily congealed; whereas *sevum* is not easily melted, but is easily congealed. Besides, *pinguedo* is not brittle, but *sevum* is.

The *uses* of it are these; First, It defendeth the Body from the external air.

Secondly, It preserveth the natural heat.

Thirdly, It furthereth beauty by filling up the interstices of the Muscles and wrinkles of the Skin; whence very lean people for want of it look shrivel'd and deformed.

Fourthly, By filling up the empty spaces between the Muscles, it rendreth the motion thereof more glib and easie, (so it do not abound too much) and keepeth all the parts from driness, or breaking. Hence it besmears the extremities of the Cartilages, the jointings of the greater Bones, and the Vessels that they may pass safely.

Lastly, *Malpighius*, rejecting all these uses as primarily intended, thinks the principal use of it, whilst it is mixed with the blood, is to be a continual *pabulum* (or food) of the natural heat, whereby the vital flame (and consequently heat) is perpetuated. Also to mitigate the acrimony of the blood, and join and unite the saline particles thereof so as that they become assimilable to the solid parts for their nutriment, serving to those particles as oil to colours in painting, or lime to stones in building. When it is separated from

from the blood, and collected here or other where, he is inclin'd to the common opinion, that in case of famine it passes into the nourishment of the body. But as to its more ordinary use when collected in particular parts, the Reader may find it where those parts are treated of.

The *Carnous membrane* is only *properly* so called in Brutes, in whom it is truly *fleshy* and muscular, so that by means hereof they can at pleasure move and shake their skin which is contiguous to it, no fat intervening between them: But in Man, seeing it has no carnous fibres, or *parenchyma*, it is very improperly termed *carnous*. We shewed just now Dr. *Glisson*'s opinion to be, that it is not truly distinct from the *Fat*, but the Fat is a part of *it*: and upon account of the fat that adheres to it, he thinks it deserves the name of *adiposa* rather than *carnosa*. Only in the Forehead and Neck it looks somewhat fleshy, and therefore may in those places with better reason be called so. *4. Membrana carnosa.*

The *uses* that we ascribed to the *fat* agree also to this membrane, *viz.* to defend the body from external cold, and to preserve the natural heat, *&c.* yea it serves also to sustain and strengthen the vessels that pass betwixt the skin and muscles between which it is placed. Some make this membrane the seat of that *horrour* or shivering that happens in the beginning of Ague-fits, supposing it to be of exquisite sense, and that it is then twitched by sharp humours. But I think that symptom rather proceeds from the like affection of the membrane next under it, which is *Its Use.*

The *common membrane of the Muscles.* This is spread over all the body (except the skull, according *5. The common membrane of the Muscles.*

ding to ſome) and is knit by fibres ſomewhat looſely both to the foregoing that lies above it, and to the proper membrane of each Muſcle that lie under it. It is very thin, but ſtrong: It is not yellow like the former, but whiter and more tranſparent.

Its Glands. Dr. *Havers* in his *Oſteologia nova*, p. 199. ſays, "he has obſerved the ſame ſort of glandules in this "membrane, as thoſe which occupy the membrane "that lies over the Joints in all that part which "has none of the large Glands: and amongſt ma-"ny of the Tendons there are ſeveral of the larger "Glands, or the leſſer glandules conglomerated "into the form of Glands. So that he dare be po-"ſitive in this aſſertion, that the common mem-"brane of the Muſcles is every where glandulous.

Uſe. Upon this ſuppoſition, the *uſe* of this membrane muſt be *not only* (as has hitherto been taught) to ſerve as a common bag to contain the Muſcles in, and to help to keep them in their proper places: *but alſo* to moiſten and beſmear the ſubjacent Muſcles and their Tendons with a mucilaginous liquor, which lubricates them, and ſo makes them more glib and pliable in their motion.

CHAP. IV.

Of the proper containing parts.

The proper containing parts of the Belly. THE *proper containing* parts are the *Muſcles* of the Belly, and the *Peritonæum*.

1. Of the Muſcles. As to the *Muſcles*, ſeeing we have aſſigned a particular Book (*viz.* the fifth) for the deſcription of all the Muſcles of the Body, we ſhall refer the Reader thither for theſe of the *Abdomen*, where he may find them fully deſcribed *Chap.* 17. and

and at preſent content our ſelves with only naming of them. There are *five* pair of them: The outermoſt are the *Obliquely deſcending*; the next, the *Obliquely aſcending*; the third, the *Recti*; the fourth, the *Pyramidal*; and the inmoſt, the *Tranſverſe*. All which being removed, the *Peritonæum* appears next.

The *Peritonæum* or inmoſt inveſting coat of the Belly commonly called its *Kim*, (derived from κεἰνω, from its office of *encompaſſing*) adheres *above* to the Midriff, *below* to the Share-, and Flank- or Hip-bones; in the *fore-part* firmly to the tranſverſe Muſcles, but chiefly to their Tendons about the *Linea alba*; *behind* to the fleſhy heads of theſe Muſcles looſely. The end of this connexion is both for its own ſtrength, and that it may the better comply with and ſerve the Muſcles in their compreſſion of the Belly. 2. *The* Peritonæum.

Its *figure* is oval; and its *ſubſtance* membranous. The inner ſuperficies of it, which reſpects the Guts, is ſmooth, equal, and ſlippery, bedewed with a kind of watery humour ſteaming or exhaling from the parts contained in the *Abdomen*: but the outer ſuperficies, whereby it cleaves to the aforeſaid Bones and Muſcles, is rough and unequal. *Its figure and ſubſtance.*

As for the *origine* of it, *Fallopius* will have it to proceed from the ſuperiour and inferiour *plexus* of Nerves of the *Abdomen*; for from them it cannot be ſeparated without tearing. To him Dr. *Gliſſon* aſſents. Some derive it from the Ligaments by which the *vertebræ* of the Loins, and of *Os ſacrum* are knit one to another, eſpecially from thoſe of the firſt and third of the Loins, becauſe it is there thickeſt. *Diemerbroeck* denies it to have any origine at all, other than the firſt ſeminal matter out of which it was formed in the *Origin.*

womb,

womb. But that is only its *material* principle, and hinders not but that it may have (according to Dr. *Gliſſon*'s diſtinction) a principle or origine of *continuation*.

Duplicity. It is *double* every where, but appears ſo to be chiefly about the *vertebræ* of the Loins, and in the *Hypogaſtrium*. For in the former place between its membranes lie the *Vena cava*, the *Aorta*, the Receptacle of the Chyle, and the Kidneys; and in the latter, the Bladder, and in Women the Womb.

Perforations. *Above*, where it adheres to the Midriff, it has three *foramina* or holes; the firſt on the right ſide, whereby the aſcending trunk of the *Vena cava* paſſes; the ſecond towards the left ſide, for the Gullet (with the Nerves of the eighth pair inſerted into the upper Orifice of the Stomach) to deſcend by; the third behind, by which the great Artery or *Aorta*, and the intercoſtal Nerve deſcend, and the *ductus chyliferus* aſcends. *Below*, it has paſſages for the ſtreight Gut, for the neck of the Bladder, and in Women for the *vagina* of the Womb; alſo for the Veins, Arteries and Nerves that paſs down to the Thighs. *Before*, in a *fœtus*, for the umbilical Veſſels, to paſs in and out by.

Proceſſes. It has two remarkable *Proceſſes* in Men placed before, by the *os pubis*, on each ſide one. They are certain oblong productions of its outer Membrane paſſing through the holes of the Tendons of the oblique and tranſverſe Muſcles, and depending into the Cod, there beſtowing one Tunicle on the Stones, and containing them like a bag. There are alſo two Proceſſes in Women, but they reach only to the *Inguina* or Groins, and terminate in the upper part of the Privity, or the fat of *Mons Veneris*. The inner Membrane

Fig. I.

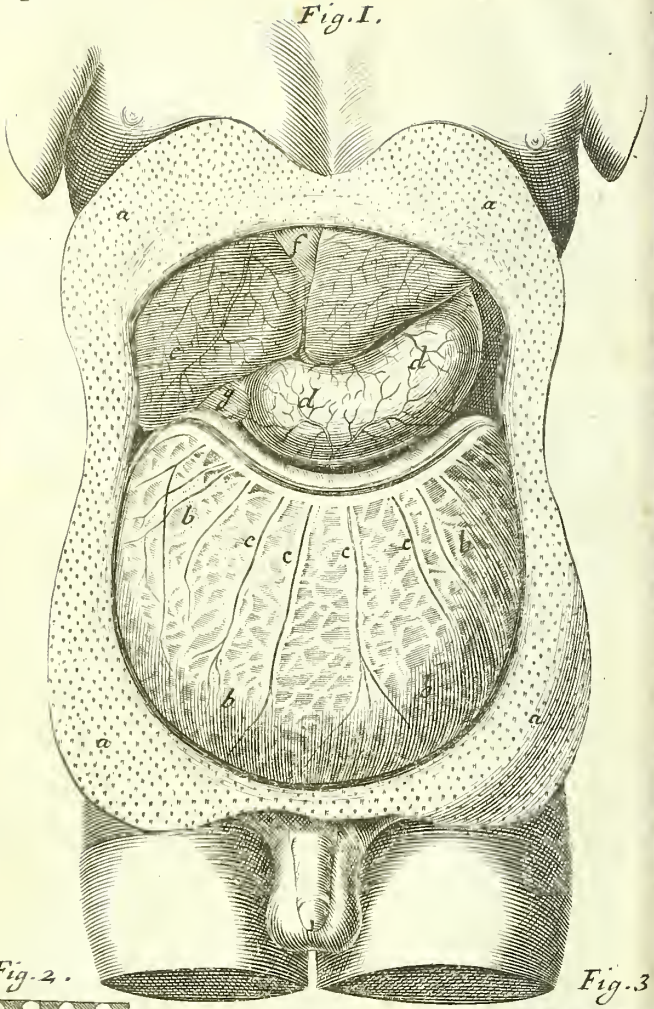


Fig. 2.

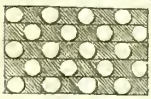
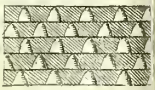


Fig. 5.

Fig. 4.

Fig. 3



brane of the *peritonæum* (in Men) reaches but to the very holes, through which the Proceſſes deſcend, which it makes very ſtrait; but being either relaxed or broken, the outer gives way, and ſo there follows a Rupture, either the Caul, or the Guts, or both falling down thereby into the Cod. By the holes of the Proceſſes there deſcend in Men the Veſſels preparing the ſeed, and the Muſcles called *Cremaſteres*; and by them aſcend the Veſſels bringing back the ſeed. In Women there paſs by them the round ligaments of the Womb, which after ſpreading themſelves and growing jagged, are either joined to the *Clitoris*, or elſe terminate before they come at it, in the fat of *Mons Veneris*.

It has *Arteries* and *Veins* from the Mammary and Epigaſtrick, and from thoſe of the Midriff, or the Phrenick. It has ſlender threads of *Nerves* from the pairs of the *Vertebræ* of the Loins chiefly. *Veſſels.*

Its *uſe* is to aſſiſt the equal and orderly contraction of the belly for the expulſion of the excrements, and by its ſmoothneſs to prevent the Guts being hurt by the circumjacent parts. Its ſeveral other more private uſes may be obſerved in the foregoing deſcription of it. *Uſe.*

And thus far of the parts *Containing*.

TAB. I.

Fig. 1. ſhews the parts *contained* in the *Abdomen*, which appear to the firſt view after all the containing parts are removed.

aaaa *The Skin of the* Abdomen *turned back, whoſe inſide is fatty.*

bbbb *The* Omentum *or Caul.*

cccc *The Gaſtro-epiploïck veſſels.*

dd *The Stomach.*

ee *The Liver turned ſomewhat up, that the Stomach may be the better ſeen.*

f *The broad ſuſpenſory ligament whereby the Liver is faſtened above to the Midriff.*

g *The Gall-bladder which is ſeated in the under or hollow ſide of the Liver, but here appears through the Liver's being lifted up.*

Fig. 2. *ſhews* (*from* Ruyſch) *the true delineation of* Malpighius's reticular *and* ſubcuticular body, *as it appears by a microſcope.*

Fig. 3. *ſhews the pyramidal* papillæ *in like manner.*

Fig. 4. *ſhews the reticular body about as large again as its natural bigneſs.*

Fig. 5. *ſhews the pyramidal* papillæ *likewiſe twice as big.*

CHAP. V.

Of the Omentum.

Of the parts contained in the lower Belly.

THE parts *Contained* miniſter either to *Nutrition*, for the conſervation of the Individual; or to *Procreation*, for the conſervation of the *Species.*

Nutrition being an aſſimilating the Food taken, into the ſubſtance of the parts; before this is done, it undergoes two changes, firſt into *chyle*, and then into *bloud.*

All the Organs of *Chylification* are included within the *Abdomen*; but of *Sanguification* not ſo.

The principal Inſtrument of *Chylification* is the *Stomach*;

Stomach; but the *Caul*, *Guts*, (especially the *small*) *Pancreas*, &c. are assisting to the Action.

The principal Instruments of *Sanguification* were heretofore supposed to be the *Liver* and *Spleen*, upon a presumption that all the Chyle went to the one or other directly from the Guts: But since it has been discover'd that none of the *venæ lacteæ* pass to them, but that the whole Chyle is conveyed into the common Receptacle, and from thence directly by the *ductus thoracicus* to the Heart, they are discharged from the task of sanguification; though it cannot be denied, but they contribute to the refining and perfecting of the Bloud already made.

Both the Chyle and Bloud have their *Excrements*, the chief whereof are both separated from them, and conducted out of the Body by parts contained in the *Abdomen*. Those of the Chyle are the *fæces*, collected in the thicker Guts, and evacuated by stool. Those of the Bloud have been taught to be two, *viz.* choler and the serous humour. Choler is separated by the Liver, and is received the thinner part of it by the *vesica fellea*; but the thicker by the *porus bilarius*. But it is not purely an excrement, seeing it has a considerable use within the body, as will appear in *chap.* 11. *of the Liver*, and deserves not that name any more than the juice separated by the *Pancreas*. The serous humour is separated by the Kidneys, and from thence conveyed to the Bladder by the Ureters, to be pist out.

The parts ministring to *Procreation*, are the *Genitals* both in Men and Women.

After the *Peritonæum* is ript open, the part which lies uppermost is the *Caul*. In Greek it is called ἐπίπλοον from ἐμπλέω *innato*, because it seemeth *The Caul. Its names.*

ſeemeth to ſwim upon the Guts. In Latin, *Omentum*, from *Omen*, becauſe the Soothſayers uſed to divine by it; and otherwiſe *Rete*, or *Reticulum*, from its contexture, which is *Net-like*; whence alſo in Engliſh it is commonly called the *Net*.

Subſtance. It is *compoſed* of two *Membranes*, betwixt which the Veſſels run, and the Fat and Glands are placed. They are very thin, and, where the Fat hinders not, tranſparent.

Figure. For *ſhape*, it is compared by Dr. *Gliſſon* to a Woman's Apron, when the lower part of it is turn'd up and tuck'd under the girdle. For it conſiſts of two Leaves, whoſe upper edges are knit to different parts; but its bottom is continued, and is like the bottom of a Satchel, to which it is alſo compared by ſome.

Connexion. I ſay its two upper edges are *knit* to different parts: for that of the *fore* Leaf, beginning at the little Lobe of the Liver (which it involves) adheres to the under or hollow ſide of the Liver, to the *duodenum* and *pylorus* (ſomewhat towards their fore-ſide) to the bottom of the Stomach, and to the future of the Spleen. That of the *hinder* or *inner* Leaf is continued from the former, and paſſing from the Spleen backwards, returns towards the right ſide again, by the way adhering to the *Pancreas*, to that part of the *Colon* that runs under the Stomach, to the Back, to the *duodenum* (ſomewhat towards its back-ſide) and at laſt is joined or continued to the fore Leaf at the aforeſaid little Lobe of the Liver. As for its bottom, it is knit to no part, but hangs looſe upon the Guts, reaching commonly a little below the Navel, but ſometimes to the very bottom of the Belly. Sometimes it falls down out of its place, and deſcends into the Cod, which kind of Rupture is called *Epiplooccle*; and other times when the

the Navel has been burſt, it has jetted out and filled the ſame, as in the *Omphalocele.*

It is commonly ſaid to have a double *origine*, namely, its fore leaf to ſpring from the Stomach, and its hinder from the *Colon.* But ſeeing both theſe have their outer Coats from the *Peritonæum*, and that the Caul it ſelf cleaves alſo to it at the back, it is moſt reaſonable to draw its riſe from thence. Whence deſcending to below the Navel, it turns up again, and aſcending to the Stomach, cleaves to it; and ſo may more properly be ſaid to end, than to begin there. *Riſe.*

Betwixt its Leaves or Walls there is formed a notable *cavity*, which ſome very weakly have deſtin'd to divers uſes; whereas it reſults onely accidentally, and was not framed by Nature for its own ſake. "For (as Dr. *Gliſſon* reaſoneth) "whilſt Nature is ſollicitous about providing a "fit deputy (and that membranous) for the Me-"ſentery, and ſtuffing it with fat, through which "Veſſels may be carried to the Stomach, Liver, "Spleen, *Pancreas* and *Colon*, and whereby ſhe "may join all thoſe parts after a due manner; "and moreover whilſt ſhe takes care that it hang "down looſely, and beſmear both the Stomach "and Inteſtines with its unctuouſneſs; and in the "mean while be every where continuous to it "ſelf: I ſay, whilſt ſhe diligently propoſes all "theſe ends, if ſhe will obtain them, ſhe muſt "needs make the Caul hollow as it is above de-"ſcribed, and its propending part muſt needs "imitate the bottom of a pouch.] *Cavity.*

The *Omentum* aboundeth with *Veſſels* of ſeveral ſorts, but ſuch as do not properly belong to it, or terminate in it, but are carried through it to other parts, from which they are moſt of them denominated. We ſhall begin with the *Arteries*, and *Veſſels.* *Arteries.*

and tranſlate hither the account that the above-named Doctour gives of them, and alſo of the Veins, which is very exact. "Its *Arteries* are "propagated from the *Cœliaca*; or rather, its "inner Leaf, near its origine, receives and up-"holds this Artery, (as ſoon as it ſprings out of "the *Aorta)* betwixt its Membranes. It is divi-"ded into two branches, the *right* and *left*. The "*right* being joined to the *vena Portæ* in the *Pan-"creas*, and fenced with the Membranes of the "*Omentum*, is carried into the hollow ſide of the "Liver: but it firſt ſends forth theſe branches; "the *pyloricus*, to the hinder ſide of the right ori-"fice of the Stomach; the *arteriæ cyſticæ gemellæ*, "the *epiploïs dextra*, a portion whereof is diſpen-"ſed to the Gut *Colon*; the *inteſtinalis*, carried "to the *duodenum* and beginning of the *jejunum*; "the *gaſtro-epiploïs dextra*, which is diſtributed "into the bottom of the right ſide of the Sto-"mach——The *left branch* of the *cœliaca*, called "*ſplenicus*, is greater than the *right*, and being "included within the Membranes of the hinder "Leaf of the *omentum*, is carried directly left-"ways under the bottom of the Stomach to the "future of the Spleen. In its paſſage it ſends "forth many branches: *Upwards*, *one* notable "one called *arteria gaſtrica*, which ſpreads it ſelf "through the bottom and ſides of the Stomach, "and its upper orifice, where it gets the name "of *coronaria*; alſo a *ſecond* called *gaſtro-epiploïs ſi-"niſtra*, whereof one portion is diſperſed into "the bottom of the left part of the Stomach, and "both its fore and hinder parts, and the remain-"der is ſpent on the fore Leaf of the *omentum*; "it ſends forth a *third* alſo, that famous branch "called *vas breve arterioſum*, which is inſerted "into the left ſide of the left or upper orifice of

the

" the Stomach. *Downwards* alſo it ſhoots forth " ſome branches, as the *epiploïs ſiniſtra*, which be- " ing divided into two rivulets waters partly the " hinder Leaf of the *omentum*, and partly the " *colon* it ſelf; alſo another little branch which is " wholly ſpent on the left part of the hinder " Leaf of the Caul.

" The *Veins* that anſwer to the ſaid Arteries 2. *Veins.* " riſe almoſt all from the *ſplenick* branch; the " trunk of which Veins, after it is joined with " the ſtem of the ſplenick Artery, puts forth " branches exactly anſwering and proportioned " to thoſe of the ſaid Artery; and all the bran- " ches of both Veſſels are diſpenſed to the ſame " reſpective parts, and are denominated from " them, ſo that 'twould be needleſs to ſtay longer " on their diſtribution: onely the branch that " goes to the right or lower orifice of the Ven- " tricle, called of ſome *pyloricus*, takes its riſe " from the trunk of the *porta* before 'tis di- " vided.

It has but very ſmall *Nerves* proceeding from 3. *Nerves.* the intercoſtal or ninth pair: which, as the Veins, accompanying the Arteries and having the ſame names, we ſhall not take the pains to trace.

But beſides theſe Veſſels formerly known, *Mal-* 4. *Vaſa* *pighius* thinks that he has diſcovered a new ſort, *Adipoſa*, which he calls *ductus adipoſi*, and will have to nouriſh and encreaſe the Fat, diſcharging the Arteries and Veins from that office. He ſays, " they are ſo very ſmall that they admit not a " ligature, from whence one might diſcover their " nature; *viz.* whether they be hollow, that " that the Fat might be propagated by them as by " pipes; or whether they be only like filaments " or ſmall threads, along which the fatty parti- " cles drill. But he inclines to think, they are

" hollow like Veins. He confeſſes, that he could " not yet diſcover by the Eye from whence they " take their riſe, though he has endeavoured to " find it out in many, and thoſe divers, ſorts of " Animals; but thinks it probable, that they ei- " ther ſpring from the Spleen, or from the Sto- " mach, or from the Glands. The reaſons why he ſuſpects they may ſpring from the *Spleen* are, " That there is a notable Vein ariſing from the " Spleen, that ſends abundance of ſlips all through " the Caul, and the Spleen in all Creatures is " placed in the Center of the Caul: And that " there are abundance of fibrous Bodies diſcern- " able in the Spleen, that run through its Paren- " chyma from one Membrane to another, and " have no communication with the Blood-veſſels. " Theſe, he ſays, ſo far as he could perceive, are " cloſely knit to the Membrane of the Caul that " enters the Line or Suture of the Spleen with " the Splenick veſſel; and ſeeing it appears not " as yet, whether they be hollow, or of what " origine they are, or what uſe they ſerve for, " one may reaſonably doubt whether they be not " the firſt root of theſe *ductus adipoſi*, or at leaſt " have communication with them. As for their " riſe from the *Stomach*, this may be ſaid, That " the Caul has a notable connexion with it, be- " ing knit ſtrongly to it through its whole " length, and receiving Blood-veſſels from it. " That in ſome Fiſh there grows a notable Mem- " brane from the bottom of the Stomach, that " has Veſſels differing from the ſanguineous. " And he thinks it not unreaſonable to ſuppoſe, " ſeeing in the Stomach, and in the Inteſtines " that are continued to it, by means of the at- " trition and exquiſite ſolution of the Food, the " particles of it acquire ſuch a liberty, that thoſe

" that

" that were originally in it being let loose, or " by a new mixture and mutual adaptation being " shaped and conglobated into a new nature, " have new motions and actions; I say, seeing " by these means there may not want matter for " propagating of Fat, it will not be improbable " that there are proper Vessels also for the pro- " pagating of it, and conveying it to the parts. " The third part whence these Ducts may arise, " are the *Glands*, into which, later Anatomists " have observed lacteal Vessels to be carried. " The Glands themselves (he says) contain " much Fat, from whence it is that they are so " luscious to the taste; and he thinks it pro- " bable, that the Glands are either the Fountains " of Fat, or at least are a *medium* of its propa- " gation.] Thus that curious Person. But whe- ther there be indeed such peculiar Vessels, I can- not affirm, having never been able to discover them by the naked Eye, or by such Glasses as I have made use of.

Dr. *Wharton* in his *Adenographia*, *cap.* 12. de- clares, That he has observed some *venæ lacteæ* arising out of the bottom of the Stomach, (*Die- merbroeck* says, from the beginning of the *jejunum*) which are received into the *omentum*, and being inserted into a pretty large Gland, do from thence spring again, and are carried obliquely down- wards, crossing the right end of the *pancreas*: One would think, saith he, at the first sight, that they enter'd into the *pancreas*: but they do in truth pass by it, and make towards the common receptacle of the Chyle, into which they empty themselves. 5. Venæ lacteæ.

The same learned Physician does in the same place give an account of two *Glands* that are na- turally found in it. One *greater* near its being *Its Glands.*

joyned unto the *pylorus*, and into this it is that the *lacteæ* are inserted; another somewhat *less* placed towards the Spleen; and this he has observed sometimes double, triple, yea manifold. Preternaturally it has sometimes many more.

Fat. The last part of which the Caul consists, is its *Fat*, which is not spread equally all over it, but is gathered there chiefly where the Vessels run; the spaces betwixt being only membranous. It is collected in little membranous Cells, included betwixt the two investing Membranes, and its matter is derived from the Blood-vessels according to the common opinion, but according to *Malpighius*, it is communicated by the *ductus adiposi* before described. The fore leaf has more fat than the hinder; and the upper part of the fore leaf that is knit to the Stomach, is the fattest of it. In very fat persons this part grows to a great bulk; but in consumptive people there is little left besides the Membranes and Vessels; and * *Peyerus* writes that in all hydropick persons that he ever dissected, (and he has dissected very many) the Caul was always extenuated and putrid.

* *Meth. Hist. Anat. Med. p.* 97.

Its uses. The *Uses* of it are these: *First*, it cherisheth the internal heat of the lower part of the Stomach, and of the Intestines. Which appears by the Story that *Galen* tells of a Fencer, who being wounded in the Belly, and the Caul being taken out, afterwards when the Wound was healed up, felt great coldness upon his Belly, so that he was forced to wear Woollen upon it. Yet *Riolanus* affirms from his own observation, that such as have had the Caul cut out, have found no prejudice by it to their concoction.

Secondly, It ministreth nourishment to the parts in

in a long want of food, its fat being received into the Veins, and mixed with the mass of blood.

Thirdly, Like the Mesentery, it serves to convey safely the Vessels to other parts, as to the Stomach, *Colon*, *Duodenum*, Spleen, *&c.*

Fourthly, It keeps the outer Superficies of the Guts moist and glib, that they may the better perform their Peristaltick motion.

Fifthly, It serves also to knit loosly together the Stomach, Liver, Spleen, *Pancreas*, *Colon*, and *Duodenum*. This connexion was to be loose, because the Stomach and Guts are sometimes distended, and sometimes empty, and accordingly take up more or less room; but yet it is not so loose, but that it is some stay to them, and partly hinders them from departing out of their places.

CHAP. VI.

Of the Gullet.

THE Caul being removed, the *Stomach* offers it self next to examination: but seeing the *Gullet* is as it were the Pipe or Funnel to it, though that be seated in the *Thorax*, and so should be considered in the next Book; yet because of its relation to the Stomach, being but an appendage of it, we shall treat of it here, before we proceed to that. *The Gullet.*

It is called in *Greek*, στόμαχος, *quasi* στενὸς καὶ μακρὸς, because it is *narrow* and *long*: As also οἰσόφαγος, ὅτι οἶσι τὸ φάγημα, because it *conveys the meat* to the Stomach. *Its Names.*

It is an organical part, round and hollow, beginning at the root of the Tongue behind the *larynx*, *Origine and descent.*

larynx, (which part of it is called *pharynx*) and descendeth from thence directly between the Windpipe and the *vertebræ* of the Neck, and the four first *vertebræ* of the *Thorax*, upon which it resteth; but when it is come to the fifth *vertebra*, it giveth way to the descending trunk of the great Artery by bending a little to the right side; afterward accompanying the Artery down to the ninth *vertebra*, there it turns a little to the left again, and climbs upon the Artery; and by and by about the eleventh *vertebra* it passeth through the Midriff, a little on the left side of its nervous Centre, at a hole distinct from that of the great Artery, and is inserted or continued unto the left Orifice of the *Ventricle*.

Substance. It is *framed* of three *Membranes*: The *outmost* is common to it and the Stomach, and is very thin, being endowed only with membranous Fibres, and those very slender. Some derive its Origine from the Midriff, others from the *Pleura*, others from the *Peritonæum*, and others lastly, from the Ligaments of the *vertebræ* of the Neck and Breast upon which it resteth. "All which "Opinions (according to Dr. *Glisson*) may be "true, if they be intended only of an origine "of continuation or connexion, seeing it is conti- "nued plainly to the three first, and knit to the "last: but none of them is true, if they be in- "tended of a sustaining, or maintaining origine, "or of a principle of influence. The second or *middle* is fleshy and thick, and consists of two ranks of fleshy Fibres, which ascend and de- scend obliquely, (spiral-wise) and do mutually intercussate or cross one another, so as that the Fibre which before it meet with another to intersect, did lie underneath another, rides upon that which it intersects, and so continues upper- most

moſt till it come to a ſecond, under which it paſſes again, and ſo on by turns. The third or *innermoſt* is indued with ſlender ſtreight Fibres, and thoſe only, as ancient Anatomiſts have taught; but Dr. *Willis* affirms it to have Fibres of divers kinds, and thoſe diverſly woven one with another. It is wholly nervous, ſaving a certain woolly or downy ſubſtance that cloaths its inſide. It is continued to that Membrane that covereth the Mouth, Jaws and Lips; and (according to Dr. *Willis*) it deſcends three Fingers breadth below the Mouth of the Stomach. From its being thus common to the Mouth, Gullet and upper orifice of the Stomach, proceeds that great conſent among theſe parts in Vomiting, *&c.*

Veſſels. It hath *Veins* in the Neck from the Jugulars, in the *Thorax* from the *vena ſine pari*; but where it is joyned to the Ventricle, it hath ſome twigs from the *ramus coronarius*, which is a branch of the *vena portæ.*

It hath *Arteries* in the Neck from the *Carotides*; in the *Thorax* from the intercoſtals, and in the *Abdomen* from the *ramus cœliacus coronarius.*

Nerves it hath from the *par vagum* or eighth pair.

Glandules. It hath four *Glandules*; two in the Throat, which are called *Tonſillæ*, or Almonds, common to it and the *Larynx*, which ſeparate a mucous or pituitous humour to moiſten them. (Their deſcription ſee in *Book* II. *chap.* 14.) Other two it hath near its middle, on its out- and back-ſide, about the fifth *vertebra* of the *Thorax*; namely, where it gives way to the trunk of the *Aorta*, and turns ſomewhat to the right-ſide, or at that place where the *aſpera arteria* is divided into two branches. Theſe are as big, each of them, as a Kidney-bean, and of the ſame ſhape: but ſome-

times there are more than two, and then they are leſs. They are ſoft and fungous: and their uſe has been reckoned to be for the ſeparation of a juice to moiſten the Gullet. But Dr. *Wharton* rejects this opinion, becauſe there appears no excretory Veſſel that might convey the liquor that is ſeparated in them, to within the Gullet. However though ſuch Veſſel do not appear, yet it is more probable that they ſerve for that uſe, than for that which he aſſigns to them, *viz.* to draw out from the *lympha* that runs through them, that juice which is more mild and fit for nouriſhment, for the uſe of the Nerves that are faſtened to them; or to depoſite the remainder into the common chyliferous duct by a Pipe which he ſuppoſeth there muſt be, but does not deſcribe.

Uſe. The Gullet ſerveth as a Conduit to convey Meat and Drink by from the Mouth to the Stomach: for theſe being turned down into the Throat by the Tongue, all the Membranes of the *pharynx* are relaxed for the reception thereof, and preſently the ſame are ſqueezed down the Gullet by the conſtriction of its middle coat, and the Muſcles of the *pharynx*. But concerning its action, and in what manner, and by what help ſwallowing is performed, ſee more fully and particularly in the fifth Book, *Of the Muſcles*, chap. 12.

CHAP. VII.

Of the Ventriculus *or Stomach.*

The Stomach. Its Names. THat part which we term *the Stomach* in Engliſh, in Latin is called *Ventriculus*, without any addition, to diſtinguiſh it from the other Ventricles,

Ventricles, which have always some other word added to determine the signification, as *Ventriculus cordis*, *ventriculus cerebri*. In Greek it is called γαστὴς, and κοιλία, (from its *cavity*) as also καρδία, which last name is given chiefly to its upper Orifice, which has a notable consent with the Heart from their community of Nerves, (both being supplied by the *par vagum*:) and hence a pain here, is called *Cardiaca passio*.

In Man it is but *one*: but such Quadrupeds as chew the Cud, especially all that are horned, have *four* Stomachs; the first whereof is called μεγάλη κοιλία, in English the *Paunch*; the second κεκρύφαλος, in Latin *reticulus*; the third ἔχινος, *omasus*, in English the *Feck*; the fourth ὄπυσον, *abomasus*, in English the *Read*. Such Fowl also as live upon Corn have two Stomachs; the first membranous, called *ingluvies*, the *Crop*; the second carnous, called *ventriculus carnosus*, in English the *Gizard*. Betwixt these two some name a third, called *echinus*, but it seems rather a passage only betwixt these two, than it self a distinct one. But this is not a place to be particular as to the differences of number or shape, &c. of the Stomachs of several Animals, having designed only a succinct Anatomy of Man. But the inquisitive may satisfie themselves in the learned Dr. *Charleton*'s second Prelection before the College of Physicians, entituled *Historia Ventriculi*; or more fully in the ingenious Dr. *Grew*'s *comparative Anatomy of Stomachs and Guts*, published with his *Museum Regalis Societatis*. *Number.*

It is *seated* immediately under the Midriff, which when it is too full it bears against, and so causeth a difficulty of breathing, by hindring the motion of it. In the forepart on the right side, it is covered with the hollow side of the Liver; *Situation.*

on

on the left side it is touched by the Spleen; its backside upon full feeding bears against the *vena cava* and spine; to its bottom length-ways is the Caul knit; the backside of its bottom resteth on the *Pancreas*, and the foreside on the *Colon*; all which further its heat.

Bigness. The *bigness* of it is commonly such, as is capable to receive so much food at one time, as is sufficient for nutrition. When it is emptied, Dr. *Glisson* says, that it hardly weighs an hundredth part of the whole Body; so that 'tis a wonder so small a part should cook for the whole. It is less in humane bodies than in Brutes, considering the proportion of their bodies. It is commonly less in Women than in Men. They who have wide Mouths, have large Stomachs.

Figure. It is longish and pretty round, very much resembling a Bagpipe in shape. It hangs cross the Body; and its two Orifices, by which the Meat is received in from the Gullet, and let out into the Guts, stand higher up than its middle, so that its upper part makes as it were the concave of an half-moon. It is more capacious on the left side than on the right.

Connexion. Its left or upper Orifice is continued from the Gullet, by the means whereof it is knit to the Midriff; and its right or lower Orifice is continued to the Gut *Duodenum*. Its bottom in the whole length of it has the upper edge of the fore-leaf of the Caul adhering to it, by whose mediation it is joyned to the Liver, Back, Spleen, *Colon* and *Pancreas*.

Substance. The *substance* of it is membranous, that it might admit of distention and contraction. It consists of three *Membranes*. The *first* or outmost is *common* to it and the Gullet, and is derived from the *Peritonæum*. But yet it is not wholly

wholly derived from thence: For as Dr. *Gliſſon* argues, Seeing this coat is fibrous, and the *Peritonæum* is not; its Fibres cannot be owing to that, ſeeing *Nihil dat quod non habet.* Theſe Fibres (being nervous) are ſtreight, running from one orifice to the other, and encompaſſing both its bottom and ſides in their whole longitude. Near the orifices and towards the bottom of the Stomach, they are far thicker than in the ſides, inſomuch as there they ſeem in a manner carnous and motory. They croſs at right angles the carnous ones lying next under them, as ſerving not only to cover them, but to bind them faſt, and to hinder them from ſtarting out of their ranks.

The *ſecond* or middle coat is *proper*, and fleſhy, and conſiſts of two ranks of fleſhy Fibres, (with a *Parenchyma.)* The outer rank are the more numerous, and are *tranſverſe*, running croſs or round the Stomach; and under theſe lie another rank, which (as Dr. *Willis* affirms) upon the top of the Stomach run ſtreight from the left orifice to the right; but the remainder of them tend along each ſide of the Stomach obliquely forwards toward the bottom, and meet one another there.

The *third* or inmoſt is likewiſe *proper*, but is nervous. On its inner Superficies it is lined with a downy ſubſtance, (as the inmoſt of the Gullet alſo is) ſomething like Velvet, which appears very plainly after a light boiling of the Stomach. Dr. *Willis* thinks this downy cruſt to be a diſtinct coat from the Nervous, becauſe after dipping the Stomach in hot water, it may be eaſily ſeparated from it: And when it is ſo ſeparated, becauſe on its outer Superficies, which adheres to the Nervous coat, it is beſet with abundance of

ring-like

ring-like Glands, he calls it the *glandulous* coat. When this is removed, the truly Nervous coat appears, which is endued with all ſorts of Fibres, but the ſtreight are moſt numerous. There run abundance of Blood-veſſels along it, which terminate in its inner Superficies that adheres to the glandulous coat. So that 'tis probable, the mouths of the Arteries may diſgorge ſomewhat into the Stomach through the glands in which they terminate.

Beſides theſe Membranes with their Fibres, the Stomach hath alſo a *parenchyma*, eſpecially its middle coat: but it is not ſanguineous, but of a peculiar ſort. That it has a *parenchyma* is plain; for without one how ſhould the inequalities, that ſpring from the texture of the Fibres, be filled up? Or whence ſhould all that ſlimy ſtuff come, that thoſe who make ſtrings for muſical Inſtruments, ſcrape off from the ſmall Guts? Doubtleſs that can be nothing but this *parenchyma* we ſpeak of, ſeeing after ſuch ſcraping they have loſt nothing of their ſtrength, which they owe to the Fibres and Membranes. And 'tis apparent that the ſubſtance of the Guts and Stomach is the ſame. Some think this *parenchyma* to be almoſt wholly glandulous.

Orifices. It hath two *Orifices*: Of which the *firſt* is on the left ſide, and is called the *upper*; not becauſe it is ſituated higher than the other; but becauſe the Meat enters into the Stomach by it, as it goes out by the other, which is therefore called the *lower*. This is wider than the other, becauſe the Meat is only groſly broken by chewing when it paſſeth through it; whereas it is diſſolved into a liquor (called Chyle) when it paſſes out by the other. It is called in Greek καρδία, *cor*, from whence the region of the Stomach under the

the *cartilago enſiformis*, is called *ſcrobiculus cordis*, or Heart-pit; and hence alſo the pains which happen in it, are called καρδιαλγία, and καρδιωγμοὶ, becauſe there is a great conſent between it and the Heart, by reaſon that they both of them derive their Nerves from the eighth pair; ſo that one being affected primarily, the other muſt ſuffer by conſent. It hath orbicular Fibres, that the Meat and Drink being once received within the capacity of the Stomach, it might be exactly ſhut, leſt fumes and the heat ſhould break out to the hindrance of Concoction, and annoyance of the Head.

The *other* is ſeated on the right ſide, and by the Greeks is called πύλωρος, *janitor*, or door-keeper, becauſe as a *Porter*, it makes way for the *Chyle* to deſcend to the *Duodenum*. Here the inmoſt nervous Coat is very full of wrinkles; and the middle, which is carnous, as every where elſe, ſo here alſo hath two ranks of Fibres; firſt tranſverſe or annular, to ſtraiten this paſſage, or ſhut it upon occaſion; and ſecondly ſtreight, *viz.* ſuch as running length-ways do gather up and draw the reſt of the Stomach towards this door, for the diſtribution of the Chyle after it has been ſufficiently concocted in the Stomach. And on the contrary, when theſe Fibres begin to be contracted at the other end, they often draw the *pylorus* towards the left Orifice, as in Vomiting: And when the Convulſion is continued further, the *Duodenum* is drawn upwards, and thence the Choler and Pancreatick juice are pumpt up as it were into the Stomach. The beginning of the *Pylorus*, where its Coats are thickeſt, Dr. *Willis* calls its *antrum*.

It hath *Veins*, firſt immediately from the *trunk* it ſelf of *vena portæ*, and this is *pyloricus ramus*; *Veins.*

ſecondly,

ſecondly, from the *branches* of the ſame, and ſo from the *ramus ſplenicus* thereof it hath *gaſtrica minor*, and *gaſtrica major* (the largeſt Vein of the Stomach) from whence *coronaria* ſpringeth; *gaſtro-epiploïs ſiniſtra*, and *vas breve*: and from the *ramus meſentericus*, before it be divided, it hath *gaſtro-epiploïs dextra*. All theſe Veins, (as the reſt of the whole Body) ſerve only to convey back again (towards the Heart) the remains of the arterial Blood which in the circulation is not ſpent on the refection and nouriſhment of the part; though ſome learned modern Anatomiſts think, that beſides the arterial Blood, they receive ſome of the more ſubtile part of the Chyle for its readier conveyance into the maſs of Blood, and thence draw a reaſon of the very quick refreſhment that hungry and faint perſons receive by eating or drinking.

Arteries. It hath its *Arteries* from *ramus cœliacus*, which do accompany every Vein, and have the ſame denomination with them. Moſt Anatomiſts are now of opinion, that theſe Arteries do not only convey blood to the Stomach for its nouriſhment, and for its warmth to help its Concoction; but that they empty out of themſelves through the Glands of the Stomach, a certain ſpirituous liquor into its Cavity, which being joyned with the reliques of the Chyle that ſtick in its downy Coat, make that juice which is called the *ferment* of the Stomach, which contributes more to the diſſolving the Aliments than the *heat* of it, which the Ancients made the main Inſtrument of its action.

Nerves. It hath *Nerves* from the *par vagum*, (Dr. *Willis*'s eighth pair) whoſe trunks paſſing down (below the pneumonick branches) by the ſides of the Gullet, are each divided into *two branches*, the

outer

outer and *inner*. Both the *inner branches*, by and by bending to one another grow into one, which paſſing with the Gullet through the Midriff goes on the *outſide* of the orifice of the Stomach, and ſpreads it ſelf in its *bottom*. *The two outer branches* in like manner inclining to each other unite into one, which deſcending to the Stomach by the *œſophagus*, and arriving at the *inner ſide* of its orifice, there turns back and creeps through its *upper part*. The *inner* and *outer banches* as they come one on one ſide, and another on the other ſide of the upper orifice of the Stomach, ſend forth many ſmall twigs, which mutually inoſculating make there a net-like *plexus*. From this *multitude* of Nerves interwoven in the Mouth of the Stomach, proceeds that great conſent betwixt it and the Head. (So that in any great concuſſion of the Head there follows a Vomiting, and from the foulneſs of the Stomach the Head-ach, *&c.*) Here at this upper orifice, from the ſame reaſon, is the ſenſe of Hunger moſt urgent. Into the bottom of the Stomach are ſome twigs inſerted that ſpring from the left *Meſenterical branch* of the Intercoſtal Pair.

There are alſo ſome *Venæ lacteæ* which ſpring out of the bottom of the Stomach, whoſe paſſage from thence to the Common Receptacle, we deſcribed before in Chap. 5. from Doctor *Wharton*. Venæ lacteæ.

Now as to the cauſe of *Hunger*, omitting ſundry opinions about it, I ſhall give but that one reaſon of it, which *Diemerbroeck* thinks the moſt probable, and thus expreſſes: "It is cauſed from fermentaceous (or diſſolving) particles partaking "of acrimony, bred of ſpittle ſwallow'd and "other ſaltiſh or acid things eat or drunk, which "ſticking to the coats of the Stomach, and "brought *The cauſe of Hunger.*

" brought to ſome acidity by it, or remaining " in it after the Chyle is ſent off, affix'd to its " inmoſt wrinkled Membrane (eſpecially about " its upper orifice) moleſt it by their twitching, " which twitching being communicated to the " Brain by the Nerves of the eighth pair, an ima- " gination of taking meat is excited to aſſwage " that troubleſome corroſion.] He that doubts of the truth of this opinion, may find it evinc'd at large in his *Anatome corporis humani*, cap. 6. pag. 39, *&c.*

The action of the Stomach. Chyle.

The *action* of the Stomach is *Chylification.* Now *Chyle* is a pretty thick white juice like Barley-cream, made out of the aliments taken; the manner whereof is well expreſt by the ſame Author. " While the meat is chewing in the Mouth, it " is mix'd with the *ſaliva*, which not onely ſof- " tens it, but endows it with a certain fermenta- " tive quality, unto which contributes alſo the " drink, (whether Beer, or Wine, or ſome other) " which often contains in it acrimonious parti- " cles and fermentaceous Spirits. The Stomach by " the help of its Fibres embraceth cloſely the " Meat thus chew'd and ſwallow'd, and mixeth " therewith Specifick fermentaceous juices, " bred in its inner Coat, and impregnated with " the *ſaliva.* Then by a convenient heat there " is made a mixture and eliquation of all; for " that the fermentaceous particles entring into " the Pores of the Meat, do paſs through, agi- " tate and eliquate its particles, diſſolving the " purer from the craſs, and making them more " fluid, ſo that they make another form of mix- " ture, and unite among themſelves into the re- " ſemblance of a milky cream; after which, to- " gether with the thicker maſs, with which they " are as yet involv'd, by the conſtriction of the " Stomach

fig. 1.

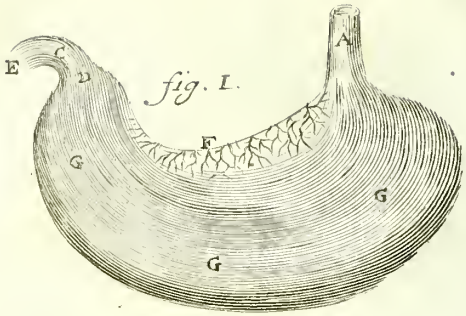


fig. 2.

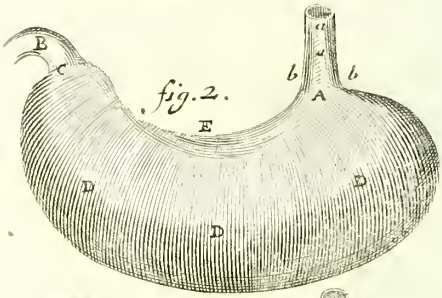


fig. 3.

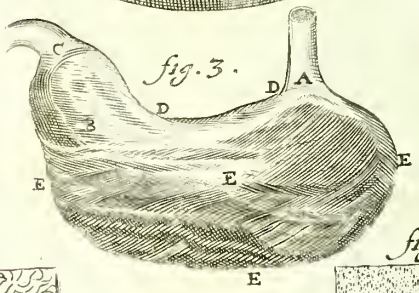


fig. 4.

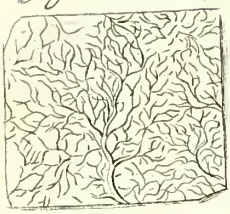
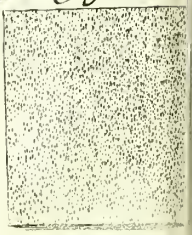


fig. 5.



" Stomach they pass down to the Guts, where " by the mixture of the Bile and the pancreatick " juice, they are by another manner of fermen- " tation quite separated from the thicker mass, " and so are received by the lacteal Vessels,] as the thicker is ejected by stool. This seems to me a very rational account of Chylification, and of the *ferment* by which it is chiefly performed; unless there ought to be added another Ingredient to compose the ferment, *viz.* the Air, whose particles are plentifully and intimately mixed with the Meat in chewing, and swallowed with it. See farther of the action of the Stomach in Dr. *Charleton*'s third Prelection before the College of Physicians, *Sect. 6. p.* 112.

Tab. II. *Represenleth the several Coats of the Stomach with their Fibres, from Dr.* Willis.

Fig. 1. Expresses the outmost nervous Coat of the Stomach, whose nervous Fibres running length-ways of it, cut the outer carnous ones that lie under them, at almost right angles.

A *The Gullet, in whose outer Coat all the nervous Fibres descend streight, crossing obliquely the carnous ones that lie under them.*

B *The mouth of the Stomach.*

C *The* Pylorus *with its* antrum D. *and a portion of the* Duodenum *continued from it* E.

F *The upper part of the Stomach, where the Blood-vessels appear very numerous.*

GGG *The nervous and slender Fibres running length-ways of the Stomach from one Orifice to another, and further each way.*

Fig. 2. Shews the Stomach divested of its utmost

nervous Coat, that the outer or convex Superficies of the middle Coat with its carnous Fibres may appear.

A *The mouth of the Stomach into which the Gullet* aaa *is inſerted, and which the circular carnous Fibres* bbb *encompaſs, ſhutting it upon occaſion by contracting themſelves.*
B *The* Pylorus *with the* Duodenum *continued to it.*
C *The Orifice and* antrum *of the* Pylorus, *both which, the circular Fibres, when they are contracted, ſtraiten, and ſeem to ſhut.*
DDD *The circular Fibres encompaſſing the Stomach depthways.*
EEE *The top of the Stomach, where theſe Fibres ſpringing, whilſt they are contracted draw towards it the whole bulk of the Stomach very much ſtraitned.*

Fig. 3. Shews the Stomach turn'd inſide outward, that the downy Cruſt with the wrinkles and folds may be ſeen.

A *The left Orifice of the Stomach.*
B *The* antrum *of the* Pylorus, *in which the Coats are thicker.*
C *The right Orifice to which the* Duodenum *is continued.*
DD *The top of the Stomach betwixt the two Orifices.*
EEEE *Its ſides, end and bottom, in which the downy cruſt of the inmoſt Coat, with the wrinkles and furrows therein, are expreſt to the life.*

Fig. 4. Repreſents a piece of the nervous Coat, in which, the downy Cruſt being removed, its inner or concave Superficies appears, with a very thick branching of Veſſels.

Fig. 5.

Fig. 5. Shews a piece of the downy or glandulous coat, in which its outer Superficies, that cleaves to the nervous Coat, appears very full of Glandules and the mouths of Veſſels.

CHAP. VIII.

Of the Inteſtines, or Guts.

THE *Guts* are called in Latin *Inteſtina*, in Greek ἔντερα, ἀπὸ τῶ ἐντὸς εἶναι, from their being placed *within* the Body. *The Guts. Their Name.*

They are oblong, Membranous, hollow, round, diverſly twiſted, continued from the *pylorus* to the *podex*, for conveying the Chyle, and the excrements of the firſt concoction. *Figure.*

They are *knit* together by the Meſentery, by which and by the intervention of the Caul, (part of which adhereth to the beginning of the *Duodenum*, and the middle part of the *Colon*) they are tied to the Back, and fill the greater part of the Cavity of the *Abdomen*. *Connexion.*

They are of a membranous *ſubſtance* like the Stomach, thinner in the ſmall Guts, and thicker in the great; and the nearer they come to an end, the thicker they are, as the lower end of the *Colon*, and the *Rectum*. *Subſtance.*

The *length* of the Guts is about ſix times the Party's length whoſe they are. They are thus long (and winding) that the concocted Aliments paſſing out of the Stomach, by their long ſtay in the Guts, might the more commodiouſly be fermented by the admixture of the bile and pancreatick juice, and ſo the more ſubtil chylous parts being ſeparated from the thicker maſs, might be the better and more leiſurely driven into the *Length.*

narrow Orifices of the lacteal Veſſels, partly by the proper periſtaltick motion of the Guts, and alſo by the impulſion of the Muſcles of the *Abdomen* moved in reſpiration. And hereby two great inconveniences are avoided; the one of eating almoſt continually, which would have follow'd from the Chyle's not having time enough to have its particles ſeparated and diſtributed, before it would have arrived at the *anus*, whereby the Body muſt needs receive but ſmall ſuſtenance from any thing eat or drunk; the other (for the ſame reaſon alſo) of having almoſt a continual need of going to ſtool; as happens to ſuch voracious Animals as have a ſtreighter paſſage from the Stomach to the *anus*.

Coats. They have three *Coats* like the Stomach. The *outmoſt* is *common*, and is derived from the *Peritonæum*, but mediately; for in the *Duodenum*, and that part of the *Colon*, which runneth under the Stomach, it proceedeth immediately from the membranes of the Caul, which is knit to thoſe Guts; and in the *Jejunum*, *Ileum*, the reſt of the *Colon*, the *Cæcum* and *Rectum*, it proceedeth from the Membranes of the Meſentery. It is all over beſmear'd with Fat, and is truly nervous.

The other two Coats are *proper*. The *outer* of them, being the middle of the three, is carnous. It has two ranks of moving Fibres, one lying under the other; The firſt and inner rank is annular or tranſverſe, which encompaſſing the whole cavity of all the Inteſtines in very cloſe order, is inſerted into the hem or ſelvedge of the Meſentery as into its Tendon. The other rank is of ſtreight Fibres, which being ſpread above the former, and cutting them at right angles, reach along the whole length of the Inteſtines; and their Tendon ſeems to be the outmoſt coat, which

which being wholly nervous, or as it were tendinous, is wrapt about the whole rank of these Fibres.

The *innermost* is nervous, although it seem to be fleshy, by reason of the crusty substance with which it is lined. This lining is called by *Pecquet* a spongy *peristoma*, by *Bilsius* a woolly *mos*; it serves as a Filtre for the Chyle to transcolate through in order to its entrance into the *venæ lacteæ*; and besides, it hindreth excoriation, which might be caused when sharp humours pass through the Guts. Some (as particularly Dr. *Willis*) take it for a distinct coat, and call it *glandulosa tunica* or *villosa*; being altogether like that of the Stomach, which is described in the foregoing Chapter, and having the same use with it.

This Membrane in the small Guts, especially the *Ileum*, is full of wrinkles, to stay the *Chyle* from passing too soon; which wrinkles are caused, for that this inmost coat if it be sever'd from the former and the wrinkles stretcht open, will be (according to *Fallopius*'s observation) thrice as long as it. And the same Membrane is expanded in the *Colon* into little cells, for the slower passing of the *fæces*. These wrinkles in both are called by * *Kerkringius*, *valvulæ conniventes*. It has all sorts of Fibres, and contains the mouths of all the Vessels both sanguineous and lacteal, which are cover'd with that spongy crust before-mentioned.

* Kerk. *obs. Anat.* xxxix. p. 85.

What was said of the *Parenchyma* of the Stomach in the foregoing Chapter, may without repeating it here, be applied to the Guts likewise.

Many late Anatomists have observed abundance of *Glands* to stick in this inmost coat, (besides those which make Dr. *Willis*'s glandulous coat) but they have been treated of by none, I *Glands.*

think, ſo exactly as by *Peyerus*, who has writ a ſmall tract of them, and deſcribes them thus. "They are very ſoft and delicate as to their ſubſtance, *he ſays*, ſo that if one handle them ruggedly, they are eaſily ſqueezed and defaced. "They cannot be ſeen on the outſide; but if one "ſlit open the Gut lengthways, and thruſting his "finger againſt the outſide, preſs the inſide out "by the ſlit, and hold it to the light, they plainly appear like little teats, with each one a "ſmall pore in its top toward the cavity of the "Gut, as their baſes or backſides have bloud-veſſels, (and as he ſays, Nerves too) inſerted into them. If one preſs with his finger on their "backſide, there will iſſue out of their pore a clammiſh humour. There are but very few (ſometimes none) of them in the *Duodenum* or *Jejunum*, but they are moſt numerous in the *Ileum*, eſpecially towards its lower end, and they are "chiefly on that ſide of the Gut that is oppoſite "to the adheſion of the Meſentery. Where they "are, they are not ſingle, but a knot or cluſter "of them together, whence (as alſo from their uſe) he reckons them in the number of *conglomerate* glands. They are thus in knots in the "ſmall Guts; but in the *Cæcum*, *Colon* and *Rectum* "they ſtand ſingle, but are larger than the other, "with every one a pore in it likewiſe. Theſe "are almoſt as big as a Vetch (and of the ſame "ſhape) but thoſe in the ſmall Guts are but about "the bigneſs of Millet. He thinks the office of "thoſe in the *ſmall* Guts is to ſeparate a double "ſort of liquor, *viz.* a ſubviſcid and glutinous "*ſerum* from the Arteries, and a nitro-aereous "ſpirit from the Nerves, (according to Dr. *Mayow*'s opinion) "which two being mixt toge-"ther make a fermentative liquor for the per-

"fecting

" fecting of chylification in the Inteſtines. But " thoſe in the *thick* Guts, *he ſays*, ſerve for little " elſe but to ſpue out a clammiſh humour, by " means whereof the Guts are fenced againſt the " hardneſs of the excrements, *&c.* and alſo the " particles of the excrements themſelves are " thereby glued together, as it were, into a due " conſiſtence. Yet he ſuſpects there is ſomething " of a nitro-aereous ſpirit alſo mixed with this " humour, and thinks it moſt probable that the " *flatus* in the *Colon* owe their origin thereto.] Thus he.

As to their *Veſſels*, the *Veins* ſpring from the *Porta*, but not all of them from the ſame branch: For the *duodenalis ſurculus* is ſent into the *Duodenum*, and the *Hæmorrhoïdalis interna* to the left part of the *Colon* near its ending, which running downwards from thence under the *Rectum* is inſerted into its end or *anus*; as the *dexter meſentericus* is ſent to the *Jejunum*, *Ileum*, *Cæcum*, and the right part of the *Colon*. *Epiploïs poſtica* is inſerted into the middle part of the *Colon*, which marcheth acroſs under the Stomach. Beſides theſe, a ſprig from the *ramus hypogaſtricus* of the *Vena cava* is ſent to the Muſcles of the *inteſtinum Rectum*, which maketh the *external hæmorrhoidal*. *Veins.*

The *Uſe* of theſe Veins inſerted into the Inteſtines the Ancients thought to be, both to carry venal bloud to them for their nouriſhment, and alſo to receive the Chyle out of them and carry it to the Liver there to be turn'd in bloud. As to the firſt uſe, 'tis certain (by the circulation of the bloud) that theſe Veins carry nothing to the Guts; but the blood that is in them, is all received from the Arteries there, to be carried back towards the Liver, and ſo to the Heart: but as *Their Uſe.*

to the latter, there are ſome learned Anatomiſts that ſtill think, though the greateſt part of the Chyle is received by the *venæ lacteæ*, yet that ſome part is ſuckt in by theſe Veins, that it may be more readily conveyed into the maſs of bloud. But this opinion is exploded by others as learned and more numerous, who deny any ſuch office to them, to whom I ſubſcribe.

Beſides theſe ſanguineous Veins there are another ſort of Veins inſerted (more or fewer) into all the Guts, called *Lacteal*, but of them we will treat in a diſtinct Chapter.

Arteries. The *Arteries* ſpring partly from *ramus cœliacus inteſtinalis*, partly from both the *meſentericæ*. To the *Duodenum* and the beginning of *Jejunum*, a ſprig is ſent from the right *ramus cœliacus*: but to the reſt of the *Jejunum*, to *Ileum*, *Cæcum* and the right part of *Colon*, *meſentericus ſuperior*; to the left part of *Colon*, and to the *inteſtinum Rectum*, *meſentericus inferior*. This laſt, paſſing along the *Rectum* to the *Podex*, makes the *internal hæmorrhoidal* Arterie, as ſome branches from the *arteria hypogaſtrica* make the *external*. Laſtly, *epiploïs poſtica*, which riſeth from the lower part of *arteria ſplenica*, (which is the left branch of *arteria cœliaca*) is ſent to the middle part of the *Colon*, which lieth under the Stomach.

Their Uſe. Their *Uſe* is to convey nouriſhment and warmth to the Guts; and when the Body is morboſe, to carry thither the impurities of the bloud, upon a purge taken, or critically, ſo to paſs out by ſtool. Yea, 'tis very probable, according to *Peyerus* his opinion before-cited, that ſuch Arteries as terminate in the glands above-deſcribed, do ſpue out through them into the Guts, even in a healthful ſtate, that ſlimy humour that bedaubs the inſide of them.

Nerves

Nerves they have from the inferiour ramifications of the *Intercoſtal* or ninth pair. The *Duodenum* hath ſome twigs from the upper branch of the *ramus meſentericus* called *ſtomachicus*, which go alſo to the *Pylorus*. All except the *Rectum* have many twigs chiefly from the *plexus meſentericus maximus*, and ſome alſo from other Meſenterical *plexus* of the Intercoſtal pair; but the *Rectum*, with the lower end of the *Colon*, receive ſlips from the *plexus Abdominis infimus* or *minimus*; and the utmoſt extremity of the Intercoſtal is inſerted into the *ſphincter ani*, whither alſo paſs three or four that ſpring from the bottom of *Os ſacrum*. *Nerves.*

Theſe Nerves ſerve for the feeling, and for the periſtaltick or worm-like motion, of the Guts; which though it be obſcure and ſlow, yet becauſe it is continual, it had need of ſo great a number of Nerves or nervous fibres as are beſtowed on the Inteſtines. Now this motion is in ſome meaſure performed by the oblique fibres, but eſpecially by the tranſverſe, whereby what is contained in them is driven from above downwards: unleſs it happen that the motion be inverted, as in the Iliack paſſion, in which they drive their Contents from below upwards. *Peyerus* thinks that even in a natural ſtate (at leaſt in the ſmall Guts) this motion is reciprocal, the contractions of the fibres being carried ſometime upwards, and ſometimes downwards; to the end that both the fermentative liquors may by this agitation be the more intimately mixed with the chylous maſs, and alſo the chyle the better diſtributed into the Lacteal veſſels. If it were otherwiſe, the deſcent of the chyle, he thinks, would be ſo haſty, that every one would labour under the *cœliaca affectio*. And he quotes from *Wepfer* an Inſtance in an humane *The periſtaltick motion.*

mane body, and alledges his own obſervation in all his diſſections of Creatures alive, for the confirmation of the truth hereof. But the learned and curious that would be further informed about the periſtaltick motion, may conſult Dr. *Gliſſon* in *cap.* 15. of his Book *de ventriculo & inteſtinis*, or Dr. *Charleton* in Sect. 3. of his third prelection before the College of Phyſicians. As for that other *Uſe*, which *Peyerus* aſcribes to the Nerves, of tranſmitting a nitro-aereous ſpirit through the Glands into the Guts, which mixing with that humour that is ſeparated from the Arteries makes a ferment for the perfecting of chylification in the Inteſtines, the Reader is at his diſcretion what opinion he will entertain of it.

The diviſion of the Guts. Though the Guts be one continued Body from the *pylorus* to the *anus*, yet from the thickneſs of their ſubſtance, as alſo from their magnitude, figure, and variety of office, they are diſtinguiſh'd into ſeveral by Anatomiſts, and firſt into *thin*, and *thick*.

The differences between the *thin* and *thick* Guts are thus ſumm'd up by *Aquapendent*: "The "*thin* or *ſmall* are placed above, are long, equal, "round, rolled about in wreaths, full of wrin- "kles, interwoven with innumerable Veins, and "Chyle is found in them: On the contrary, the "*thick* are placed below, are ſhort, anfractuous, "without twiſting wreaths, and endued with "fewer Veins; and the wrinkles or folds in the "Guts are expanded, and there reſult from them "certain receſſes or cells, and the *fæces* are found "in them.

The thin. The *thin* poſſeſs the umbilical region and *hypogaſtrium*; and in reſpect of their figure, ſituation, longitude and plenty of lacteal Veſſels, they are

are divided into three, *viz.* the *Duodenum*, *Jejunum* and *Ileon*.

The first is called *Duodenum*, because the Ancients thought it to be *twelve* inches long. But being chiefly vers'd in the dissection of Brutes, they were thereby deceived; for though in Sheep, for instance, it be of that length, yet in Man it is but about four fingers. It is continued from the *pylorus*, from whence turning backwards and downwards it reaches to the middle of the greater and right end of the *Pancreas*; and is none of it knit to the Mesentery, but to the fore-leaf of the Caul. It is thicker in its Membranes than the two following small Guts, but its passage (because streight) is straiter than theirs. Towards its lower end, (sometimes higher, sometimes lower) it has most commonly two ducts leading obliquely into it; first the *ductus choledochus communis*, by which the bile from the Liver enters this Gut; and secondly a little below this, *ductus pancreaticus* (otherwise *Wirtsungianus*) by which the pancreatick juice passes hither from the *Pancreas* or Sweet-bread; though these two ducts are sometimes joined into one, and both open by one mouth into this Intestine. 1. Duodenum.

The second is called *Jejunum*, or the hungry Gut, because it is for the most part found empty; partly by reason of the multitude of milky Veins that enter it; partly by reason of the fermentation of the acrimonious choler with the pancreatick juice, which are both poured in just before its beginning. In length it is about eight feet. It beginneth on the right side, under the *Colon*, where the *Duodenum* endeth, and the Guts begin to be wreathed; and filling a good part of the umbilical region, especially on the left side, it is continued unto the *Ileum*, from which it may be distinguish'd 2. Jejunum.

distinguish'd first by its emptiness, secondly, by its greater number of Veins and Arteries, from which it looks reddish; thirdly, from the nearness of the folds or wrinkles of its inmost coat one to another, which are but about half an inch distant, whereas in the *Ileum* they are a whole inch or more; and lastly, from the thickness of its coats, as being thicker than those of the *Ileum*.

3. Ileum. The third is called *Ileum*, ἀπὸ τῆς εἱλέσεως, *à circumvolvendo*, from its many turnings and windings. It hath thinner membranes than the two before-going. It is seated under the Navel, and filleth both the *Ilia*. It is the longest of all the Guts, for in length it containeth above twenty feet; but it is the narrowest of all, for it is but about a finger's breadth in diameter. It hath fewer wrinkles than the *Jejunum*, and lesser; about the lower end of it they scarcely appear.

At its beginning it is distinguished from the *Jejunum* by all the four particulars above mentioned; and it is easily distinguishable from the *Cæcum* or *Colon*, being not joyn'd to these by a streight duct, but transverse. For the *Cæcum* and *Colon* are so united as to make one continued streight Canal, whose lower side the *Ileon* ascending pierceth, and into the latter whereof its inner Coat hangs loosly the length of half an Inch at least, making the Valve it self of the *Colon*, and is the limit that divides the *Cæcum* from it.

This *Ileum* oft falls down into the Cod, whence such a Rupture is called Intestinal. And in this Gut happens the Distemper called *Volvulus* or *Iliaca passio*, wherein there is often vomiting of the dungy Excrement. This Distemper is caused herein, either when one part intrudes into another, or when the Gut is twisted and twined like

like a Rope, or when it is ſtuff'd with ſome matter that obſtructs it: or laſtly, when it falls out of its place into the *ſcrotum*, as was noted before. And thus much of the firſt ſort of Inteſtines, *viz.* the *ſmall* or *thin*.

I have once and again made mention of the wrinkles in the inſide of the *Jejunum* and *Ileum*, which by modern Anatomiſts are called *Valvulæ conniventes*. Theſe happen from theſe Guts inmoſt Coats being much longer than the two other; for hence it muſt needs ever and anon wrinkle or bag out, and where it does ſo, ſtraiten the paſſage, by which means the Chyle deſcends more ſlowly, and thereby the Lacteal veſſels have the more time to imbibe it. *Their valves.*

Now follow the *inteſtina craſſa*, the *thick* or great Guts; they are three in number alſo. *The thick Guts.*

The firſt is called *Cæcum*, τυφλὸν, the *blind* Gut, becauſe one end of it is ſhut, ſo that the *Chyle* (or *fæces* rather) both goes in and comes out at the ſame orifice. In Man it is about as thick, and but half as long, as your larger Earthworms ſtretched out at length; only its mouth that opens towards the *Colon* is pretty large. It owes its origine rather to the *Colon* than the *Ileum*, and ſeems to be as it were an appendage to it. It is bigger in an infant than in a Man. It is not tied to the Meſentery, but being placed in the Cavity of the right *os Ilium*, by its end it is joyned to the right Kidney, the *peritonæum* coming between. In ſound perſons it is generally empty. In four-footed Beaſts it is always full of Excrements. Apes have it larger than a Man, Dogs larger than Apes; but Conies, Squirrels, and Rats, largeſt of all, if you conſider the proportion of their Bodies. Its uſe is very obſcure in Men, being ſo very ſmall and commonly 1. Cæcum.

commonly empty. But in grown *fœtus*'s, or Infants new born, it is full of Excrement, for which it ſerves as a Store-houſe till after the birth that they go to ſtool. And in ſuch Animals as have it large, (according to Dr. *Gliſſon*) it ſerves for a Bag or ſecond Ventricle, wherein the prepared Aliments may be ſtored up and ſo long retained, till a richer, thicker, and more nutritive juice may be drawn from them.

2. Colon. The ſecond is *Colon*, κῶλον, either *quaſi* κοῖλον, *cavum*, becauſe it is the *holloweſt* or wideſt of the Guts; or elſe ἀπὸ τῦ κωλύειν, *ab impediendo*, becauſe it *detaineth* the Excrements. It hath its beginning at the *os Ilium* on the right ſide, and aſcending by its Spine it arrives at the right Kidney; to which parts it is annex'd by a membranous connexion. From thence bending leftways it creeps under the Liver by the Gall-bladder, (which tinges it there a little yellowiſh) to the bottom of the Stomach, to the whole length whereof it is tied by the mediation of the fore-Leaf of the Caul, as it is knit alſo to the *Pancreas* and Loins by the mediation of the hinder Leaf. Then it comes to the lower part of the Spleen, and is knit to it. Then touching the left Kidney, and adhering firmly to it by Fibres, it comes to the left *os Ilium*; from which deſcending by the left Groin to the *pelvis* it embraceth the bottom of the Bladder behind on each ſide. Afterwards it aſcends upwards by the right Groin near the place from whence it firſt took its riſe; and thence marching back again towards the left ſide, and running it ſelf in betwixt the *Ileum* and Back-bone, it reaches to the top of *os Sacrum*, and there unloads it ſelf into the *Rectum*. Its length according to Dr. *Gliſſon*, is about ſeven feet; others reckon it

it ſhorter. It goeth almoſt quite about the *Abdomen*, next to the Muſcles, that it may be the better compreſſed by them for avoidance of the Excrements. *Diemerbroeck* has an ingenious reaſon why it ſhould paſs under the Stomach; *viz.* That as Chymiſts judge no digeſtion more natural, than that which is performed by the heat of Dung, ſo the heat of the Excrements in the *Colon* does help the coction of the Stomach.

It is not of one continued equal width, but at about every two or three Inches diſtance it is more contracted, being ſomewhat furrow'd on the outſide, and ridged on the inner, whereby the Gut is divided into ſeveral *Cells*. This comes to paſs partly indeed from the inmoſt Coat's exceeding the middle and outmoſt ſomewhat in length, but chiefly from the *Ligament* (which is half an inch broad) that runneth on the upper and middle part of this Gut all along, and is much ſhorter than the membranes of the Gut, as appeareth when it is cut through here and there, for then the Gut may be ſtretched out to near half as long again. The *Uſe* of theſe *Cells* is to hinder the flowing of the excrements into one place, which would compreſs the parts adjacent; as alſo for the ſlower paſſage of the *fæces*, that we may not have a continual and haſty need of going to ſtool. On its outſide, eſpecially from its paſſing by the Spleen to its joyning to the *Rectum*, it has a great many fatty knots, which ſerve to moiſten and lubricate it, that the *fæces* may paſs the more glibly. The *Rectum* alſo has ſuch like, for the ſame reaſon. *Its Cells and Ligament.*

It hath a *Valve* where it is joined with the *Ileum*, which Valve is nothing elſe but the inmoſt coat of the *Ileum* propending or hanging out ſhaggy into the *Colon*, (as was noted before:) For its ſhape, *Its Valve.*

Spigelius

Spigelius compares it to the *ſigmoïdes* in the right *ſinus* of the Heart. This Valve ſo ſtoppeth the hole which is common to the *Ileon* and *Colon*, that flatuoſities cannot aſcend from this latter into the former, much leſs excrements regurgitate. But if the periſtaltick motion of the Guts be inverted, (as in the Iliack Paſſion) ſo that the inmoſt coat of the *Ileum* be drawn back from its depending into the *Colon*, the excrements of the *Colon*, yea Clyſters themſelves may aſcend up thro' the ſmall Guts into the Stomach, and be thrown up by vomit.

3. Rectum. The third is *inteſtinum Rectum*, the *ſtreight* Gut. This hath its beginning at the firſt *vertebra* of the *Os Sacrum*, where the *Colon* endeth; and paſſeth ſtreight downwards to the extremity of the *Coccyx*. It is faſt tied on its *back-ſide* to both theſe bones, by mediation of the *Peritonæum*, to keep it from falling out; and on its *fore-ſide* it grows in *men* to the neck of the Bladder, (whence in the pain of the Stone there, there generally happens a *teneſmus* or continual inclination to go to ſtool) and in *women* to the neck of the Womb: but in both there is a muſculous ſubſtance that comes between. It is a foot in length, not ſo wide as the *Colon*, but its Membranes are thicker.

Its Sphincter Muſcle. At its lower end, (called the Fundament,) it has a Sphincter Muſcle, by the help whereof it is cloſe purſed up, to hinder the continual exit of the *fæces*. But in going to ſtool the ſame is partly voluntarily relaxed, and partly forced open by the excrements themſelves whilſt they are ſqueezed or forced down through the compreſſion of the Guts by the contraction of the Abdominal Muſcles.

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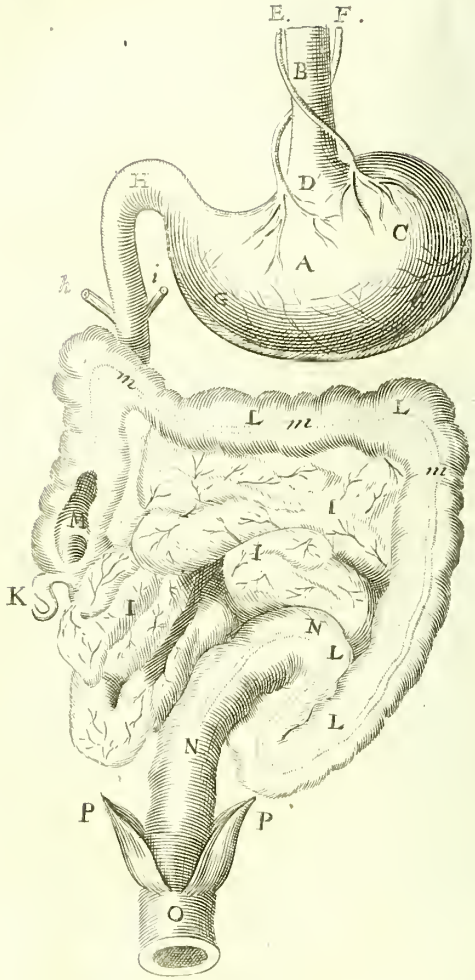
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This Gut (especially its inner Membrane) usually bags a little out in straining at stool, or upon taking Aloetick Purgers, yea sometimes so much, that it requires an artificial putting up again.

As for the *hæmorrhoidal* Veins and Arteries, that are inserted into the *anus*, we have given an account of them before in this Chapter; as we shall do of the *Muscles* belonging to it, in Book V. *of the Muscles*, Chap. 19.

The Explication of the Figure.

A *The Stomach.*
B *The Gullet or* Oesophagus.
C *The left and larger part of the Stomach.*
D *The upper orifice of the Stomach.*
E *The right external Nerve of the sixth pair (Dr.* Willis's *eighth) encompassing the orifice.*
F *The left external Nerve of the same pair.*
GG *The gastrick Vessels creeping along the bottom of the Stomach.*
H *The lower orifice of the Stomach, called* pylorus.
h *The insertion of the Gall-passage into the* Duodenum.
i *The insertion of the* Pancreatick duct *into the same.*
III *The* Jejunum *and* Ileum *with the Vessels creeping along them.*
K *The* Cæcum.
LLLL *The* Colon.
M *The Valve in the beginning of the* Colon *opened.*
mmm *The Ligament holding together the Cells of the* Colon.
NN *The* Rectum.
O *The Sphincter of the* Anus.
pp *The Muscles called* Levatores Ani.

CHAP. IX.

Of the Meſentery.

The Meſentery. Its name and deſcription.

THE *Meſentery* is ſo called from its ſituation. For it has its Greek name μεσέντερον, (from whence the Engliſh is derived) from its being placed ἐν μέσῳ τῷ ἐντέρων, *in the midſt of the Inteſtines.* And it is a membranous part, ſituated in the middle of the lower Belly, ſerving not only for conveying ſome Veſſels *to* the Inteſtines, and others *from* them, but alſo tyes moſt of the Guts together ſo artificially, that for all their manifold windings they are not entangled and confounded. Which may be much wondred at, how the Guts being about nine or ten yards long, ſhould all but the *Duodenum* and part of the *Rectum* be comprehended by that circumference that is but a ſpan diſtant from the centre; for no longer is the Meſentery betwixt thoſe bounds. But it is almoſt of a circular figure, which is moſt capacious; and though it be narrow and plain at its riſe, yet its circumference is wrinkled and enlarged into ſo many folds, as to be three Ells in length, whereby it comes the nearer to anſwer the length of the Guts.

Riſe. It has a double Origine, an higher, and a lower. The higher is at the firſt, and the lower at the third *vertebra* of the Loyns.

Subſtance. It is compoſed of two *common Membranes* which are propagated or continued from a duplicature of the *peritonæum*; and betwixt theſe two it has a third Membrane that is *proper*, (which was firſt diſcover'd by Dr. *Wharton*, in a young Maid) and is thicker than either of the other

other two, wherein the Glands are ſeated, and by which the Veſſels are conducted.

As for the *Fat* with which it is ſtufft betwixt its Membranes, though the ſame happen naturally to it, yet ought it not to be reputed a proper part of it. For not to mention that in Dogs, Cats, and ſuch like Animals, this part is very thin and tranſparent, even in humane *Embryo*'s it is without Fat; and in very lean Men there is but little, though in fat Men it be heaped up to ſo great a thickneſs.

The parts contained in the Meſentery are either common or proper. The *common* are Veins, Arteries, Nerves, and Lympheducts. The *proper* are Glands and the *Venæ lacteæ*. Of theſe laſt we ſhall ſpeak in the next Chapter, of the reſt here. *Parts.*

The *Veins* are called *Meſaraicæ*; theſe ſpring from *ramus meſentericus dexter & ſiniſter*, branches of the *vena Portæ*. (Their uſe, as alſo that of the Arteries, was ſhewn in the Chapter before, ſpeaking of the Veſſels belonging to the Guts.) *Veins.*

It hath alſo two *Arteries*, the one ſuperiour, the other inferiour, branches of the *arteria meſenterica*, which paſs as the Veins do. *Arteries.*

As for the *Nerves*, Dr. *Willis* deſcribeth them very accurately in his Book *de Cerebro*, cap. 25. which take thus in ſhort. "As ſoon as the *inter-*"*coſtal pair* is deſcended as low as over againſt "the bottom of the Stomach, it ſends forth on "each ſide a large meſenterick branch, each of "which is again divided and makes two *plexus* "in each ſide. In the middle of theſe is the grea-"teſt *plexus* of all, which (as he ſpeaks) is like the "Sun amongſt the Planets; from which, twigs "and numerous Fibres are diſperſed into all the "parts of the Meſentery, which accompanying "the ſanguiferous Veſſels in their whole proceſs, *Nerves.*

" do climb upon and twiſt about them.] Others it hath from thoſe which ſpring from the *ſpinalis medulla*, between the firſt, ſecond, third, and fourth *vertebræ* of the Loins, (as *Spigelius* affirmeth.)

Lymphæ-ducts. Beſides theſe Veſſels known to the Ancients, about 38 years ago there were found out another ſort by *Tho. Bartholin* (a learned *Dane*) and called by him *vaſa lymphatica*, which he gives a large account of in *Append.* 3. to the *libel.* 1. *de Venis*, of which I ſhall give a *Compendium* here, becauſe the Meſentery abounds with them.

Their Figure. They are of *figure* long and hollow like a Vein, but very ſmall and knotty, having very many Valves which permit the *lympha* or water contained in them to paſs to the chyliferous Veſſels (and many Veins) but hinder its return.

Colour and Subſtance. They are of a pellucid and cryſtallin *colour*, like *hydatides*, *conſiſting* of a tranſparent and moſt thin skin, which being broken, and the *lympha* flowing out, utterly diſappears.

Number. Their *number* cannot be defin'd, for they are almoſt innumerable.

Riſe. As to their riſe, *Bartholin* ſpeaks uncertainly; but *Malpighius* affirms, that they always proceed from Glands; and *Steno*, that they always either ariſe from or are inſerted into Glands.

Inſertion. As to their *inſertion* or ending, thoſe under the Midriff do diſcharge their liquor into the *receptaculum chyli*, (to be ſpoken of in the next Chapter.) Thoſe in the *thorax*, immediately into the *thoracick duct*. And thoſe of the Neck, Arms, *&c.* into the *jugular* Vein. *Bartholin* thought they all diſcharg'd themſelves into theſe three Chanels: but *Diemerbroeck* affirms, they open alſo into many other Veins; and quotes *Steno* noting that they empty themſelves into the jugular and

and other Veins; and alſo his Countryman *Frederick Ruyſch* writing, that by ligature and ſtructure of the Valves, he has plainly ſeen, that all the lympheducts in the Lungs do diſcharge their *lympha* into the ſubclavian, axillar, and jugular Veins.

Steno diſtinguiſhes them into three ſorts; for ſome from their firſt Origins (but what thoſe are, he cannot ſay) are diſperſed over the ſurface of the firſt Glands they approach unto; others run from the hollow ſide of one Gland to the gibbous of another; and a third ſort run from the hollow ſide of theſe latter, to the Veins into which they diſcharge their *lympha*. Whence (ſuppoſing this difference) an Inquiry may ariſe, Whether the lympheduct that paſſes out of the hollow ſide of the Gland, carry a more elaborated *lympha* than that which entred into its gibbous ſide? or whether only the quantity be encreaſed? I believe that into every Gland there enter an Artery, Vein and Nerve, and therefore that ſome new *lympha* is added to that which was brought in from the Lympheduct inſerted into it, which together therewith enters into the Lympheduct ariſing out of it; but that there is no further elaboration of the former *lympha*, which I think perfect at its entrance into the firſt Lympheduct. *Difference. De muſc. & gland. p. 41.*

There has been much diſpute what this *lympha* which they carry, is. It ſeems to *Bartholin* to be meer limpid water; but to ſimple water there is added an alimentary liquor, or a thinner part of the Chyle, fit for Nutrition, thoroughly mixed with it. The former, he ſays, is cait off either by ſweat, or other ways whereby water paſſes away; the later is circulated on. *Gliſſon*, that it is a liquor conden's'd from the *halitus* of the *What the Lympha is.*

blood (like Dew) driven into these Vessels, and flowing back with the vehicle of the aliment brought by the Nerves. *Segerus* (and *Sylvius*) that it is the animal Spirits, or is made of them, which after they are distributed into all parts by the Nerves, are there partly consum'd and dissipated, and are partly condens'd into this water. *Diemerbrocck* quotes more Opinions besides these, but rejects them all, and establisheth this of his own, *viz.* "That it is a fermentaceous liquor separated from the serous part "of the blood in the conglobate Glands, yet not "simple, but impregnated with much fus'd and "volatile Salt, and also with some sulphureous "particles; which when it is conveyed to the "*vasa chylifera*, makes the Chyle thinner and "apt to dilate easily in the Heart; and when "to the *Veins*, prepares the venous blood (now "too thick) for a quick dilatation in the Heart." This *lympha*, whatever it be, (or be for) differs from the *serum*; for if one gather a little of it in a Spoon, and let it stand, without setting it on the Fire, it will turn into a jelly, which the *serum* will not do.

And thus much of the *Lympheducts* (with their *lympha*) in general; as to those particularly of the Mesentery, some only pass through it from other parts, as from the Liver, *&c.* but many have their rise in it, and both the one and other are emptied into the *receptaculum chyli*.

The Glandules of the Mesentery. It hath many little softish *Glands* fix'd in its proper Membrane, cover'd on each side by the two common ones, and beset with Fat. If you cut them in two, and press them with your Fingers, you may squeeze a whitish liquor out of them. They are whiter in young people than in

in old. In number they are very uncertain; in Man fewer and ſmaller alſo than in other Creatures. The biggeſt by much is at the riſe or centre of the Meſentery, (called by *Aſellius*, *Pancreas*) into which all the *venæ lacteæ* are inſerted. Of its uſe, as alſo of the leſſer, we ſhall ſpeak in the next Chapter, when we come to treat of the paſſage of the Lacteals. We will only note here, that when theſe Glands grow ſcirrhous, or are any ways obſtructed, ſo that the Chyle cannot tranſcolate through them, there follows a *fluxus cœliacus*, or *chyloſus*, which continuing, there enſues an Atrophy, and the party dies tabid. And perhaps from the ſame Obſtruction in the Glands, the courſe of the lympha being ſtopped, and by that means the Lympheducts that paſs from one Gland to another being over-extended and burſting, an *Aſcites* is partly cauſed.

The diviſion of the Meſentery.

It is but one, yet becauſe of its different thickneſs it is *divided* by ſome into two parts.

The one they call *Meſaræum*, μεσάραιον, becauſe it is placed ἐν μέσῳ τῷ λεπτῶν (*ſubaudi* ἐντέρων) *in the midſt of the ſmall* Inteſtines, which it knits together; and this is the thicker part of it. The other being the thinner, they call μεσόκωλον, being ſeated ἐν μέσῳ τῷ κώλῳ, *in the midſt of the Colon*, to which it is joyned in its whole length, ſave only in the *Colon*'s paſſage under the Stomach; and in its loweſt border it adheres to a part of the *Rectum*.

Diſeaſes.

Diſeaſes incident to this part are reckoned up by Dr. *Wharton* to be theſe; thoſe of *intemperies*, ſtraitneſs or obſtruction, tumours of whatſoever kind, (*Scirrhi*, *Scrophulæ*, *Strumæ*) Inflammations, Abſceſſes, Ulcers, and Tone vitiated.

Of all which the Reader that desires fuller information, may be satisfied by the said learned Author, in his *Adenographia*, *cap.* 11.

CHAP. X.

Of the Venæ lacteæ, Glandulæ lumbares, Receptaculum commune, ductus chyliferus Thoracicus, *and of the motion of the Chyle.*

Venæ lacteæ. Their name.

Venæ lacteæ, the *Milky veins* (so called from the *white* colour of the Chyle which they carry) were not discover'd (as such) till the year 1622. when *Caspar Asellius* found them out in dissecting a Live-dog well fed. But since him many others have made a more accurate discovery of them than he.

Definition. They are slender pellucid Vessels, having but a single Coat, dispersed in great numbers thro' the Mesentery, and appointed for the carrying of the Chyle.

Rise. Their *rise* is from the inmost Membrane of the Intestines, where their Mouths are hid under a kind of a spongy crust or *mucus*, through which by the prestion of the Guts the Chyle is strained and received by the mouths of these vessels. From whence they proceed the readiest way to such Glandules of the Mesentery as are nearest to them: but in their passage many small ones uniting to one another do commonly grow into one large trunk; namely, a pretty way before they insinuate themselves into the Gland, to which we said they were going. But in their very entrance into the Gland, or a little before, this trunk

trunk separates again into new branches, more and smaller than the other. And thus far they are called *radicales*, or *primi generis*, of the first kind. Out of the Gland there spring again new capillary ones, which by and by meeting together make one trunk again as before, which keeping its course towards the centre of the Mesentery, enters as many Glands as lye in its way, being divided into new branches just before its entrance into each Gland, as before. But whilst all the trunks bend one way, they also meeting with one another, do in process several of them grow into one. And at length all the trunks arrive at the great or middle Gland of the Mesentery (called improperly *Pancreas*) which most of them enter into, but some of them pass over its Surface, and by and by they all empty themselves into the great or common receptacle of the Chyle that lies behind the said Gland, those that were inserted into it rising out of it in like manner as they did before out of the lesser Glands. As they run from one Gland to another, they are called *secundi generis*, or of the second kind: And from their having past all the Glands to their opening into the common receptacle, *&c.* they are called *tertii generis*, or of the third kind.

By the way we cannot omit to take notice of those three Glands which *Bartholin* calls *Lumbares*, from their being situated upon the *Loins*, and which he thus describes. * Two of them which are larger, lye one upon the other betwixt the descending *Cava* and *Aorta*, in that Angle which the Emulgents make with the *Cava*. The third being smaller stands over these, under the appendices of the Diaphragm. They have communication, or are knit one to another by small lacteal

Glandulæ lumbares.

* *Anat. p.* 108. *Edit.* 74.

lacteal branches, especially the two larger.] He once thought them to supply the place of the common Receptacle in Man; that not being so plain in him as in several Brutes. But since a Receptacle is acknowledg'd as well in Men as Brutes, Dr. *Wharton*'s Opinion concerning their use seems more probable, *viz.* That they supply the place of those larger Glands that are found in the Mesenteries of Brutes, but are not natural to Men; And for this reason he presumes, that all such Animals as want those greater Glands in the Mesentery, have these *Lumbares* as well as Men.

Receptaculum commune.

The *common Receptacle* is called *Receptaculum Chyli Pecquetianum*, from *Pecquet* who first found out both it and the *ductus Thoracicus* (whose beginning it is) in the year 1651. I mean he was the first that assigned the true use unto them, but both were observed in Horses by *Bartholomæus Eustachius* above an hundred and thirty years ago, as appears in a Book he writ, 1564. *pag.* 301. of the *Vena sine pari*, wherein he has these words, (as cited by Dr. *Wharton.*) *From this notable left trunk of the throat*, (viz. *the* Subclavian Vein) *there springs a great branch, which besides that it has a semicircular door,* (or valve) *in its Origine, is moreover white, and full of a watry humour; and not far from its rise it is divided into two, that after a little space unite again into one, which sending forth no branches descends by the left side of the* vertebræ, *and having past through the Midriff runs down to the middle of the Loins: where becoming larger, and folding about the great Artery, it has an obscure ending, which I have not as yet well discover'd.*] Here we have a clear description of them, only that is the beginning

beginning which he takes for the end; and contrarily. It is called the *common* Receptacle, becauſe it receives both the Chyle and Lympha promiſcuouſly; though ſome call it the Receptacle of *the Chyle* in particular: but without reaſon; for it might as well be called *Receptaculum Lymphæ*, as *Chyli*, for that the *Lympha* paſſes not only with the Chyle, but after this is all diſtributed, the *Lympha* ſtill continues to glide into it and to aſcend by the *ductus chyliferus Thoracicus*, which might as well be called *Lymphaticus* for the ſame reaſon.

It is *ſeated* under the Celiack Artery and E- *Its ſite, and* mulgent Veins, about the middle diſtance be- *ſubſtance.* tween the Kidneys and *capſulæ atrabilariæ*, upon the *vertebræ* of the Loins, but for the moſt part rather toward the left ſide. *Pecquet* and *Caſp. Bartholin* ſay, 'tis ſeated betwixt the tendons (or *appendices*) of the Diaphragm; by the motion whereof it is preſſed and milked, as it were, and its contents propelled. It is of a membranous, but thicker *ſubſtance* in Men than in Brutes, but not ſo capacious, ſeldom being ſo large as to admit ones Finger's end. Out of it there ſprings a duct that preſently aſcends up into the *Thorax* (behind the deſcending trunk of the *Arteria magna*) where it begins to be called *ductus Thoracicus*, but, according to *Sylvius*, it might more fitly be called *Spinalis*, ſeeing it runs along the inſide of the *Spina dorſi*. And now though it be paſt out of the *Abdomen* (of the contents whereof we are here treating) yet we will trace it through the middle Ventricle to the Heart whither it conveys its liquor, for the ſame reaſon that being above to ſpeak of the Stomach, we thought it beſt to deſcribe the Gullet alſo,

alſo, which is an appendage to it, and by which the Meat deſcends into it.

Ductus chyliferus thoracicus.

This *Duct* then having paſt the Midriff, marches further upward under the great Artery till about the fifth or ſixth *vertebra* of the *Thorax*, where it turns a little aſide from under it to the left hand; and ſo underneath the intercoſtal Arteries and Veins, and the Gland *Thymus*, it aſcends to the left ſubclavian Vein, into whoſe lower ſide it opens, juſt there where the left jugular Vein enters into it on the upper ſide, ſo that their Mouths face one another. But it opens not into this Vein with any large oriſice, but by ſix or ſeven little ones, which are all cover'd in the Cavity of the *Subclavia* with one broad Valve, looking towards the *Cava* from the Shoulder, whereby there is granted to the Chyle and *Lympha* a free paſſage out of the *ductus Chyliferus* into the *Subclavia*, but their return (or of Blood with them) out of the Vein into the Duct is prevented. This Duct ending thus in the Subclavian vein, the Chyle that it conveys into it paſſes with the Blood (returning by the *Cava*) into the right ventricle of the Heart, where we will leave it, and return to the *Venæ lacteæ* again; having only obſerved, that this Duct has many ſemilunar Valves that hinder the aſcending Chyle and *Lympha* from gliding back again; which Valves are manifeſt by this, that the Chyle contained in the Duct may eaſily by the Finger be preſſed upwards, but by no means downwards: or if one make a hole in it, the liquor tending from beneath upwards will flow out at it; but that which is above it, is ſo ſtopt by the *Valves*, that it cannot be made to deſcend by it.

The

The *Venæ lacteæ* differ from the ordinary Mesaraick veins: *The difference between the Venæ lacteæ, and the ordinary mesaraical Veins.*

First, in *bigness*; for the Mesaraicks are bigger, but the *Lacteæ* are far more in number. Which was necessary, in that more Chyle must pass by them the way that has been spoken, to make Blood of, for the nourishment of the whole Body, than there can be Blood remaining from the nourishment of the Intestines only, to return by the Mesaraicks to the Liver.

Secondly, they differ in *colour*, by reason of the great difference in colour of the liquors they contain. The Lacteals are white and limpid, by reason of the whiteness and clearness of the Chyle that is conveyed by them; but the Mesaraicks are of a dusky blackish colour.

Thirdly, they differ in their *insertion*; for the Lacteals, as has been said, are inserted into the great Gland of the Mesentery, from whence they run forwards to the common receptacle, but the Mesaraicks all terminate in the Liver.

But though there be this plain difference betwixt these two, yet there is not the like betwixt the *Venæ lacteæ* and the *Lympheducts*; for many good Anatomists do affirm, that before and after the distribution of the Chyle, not only the Receptacle and *ductus thoracicus* contain *Lympha*, but that they have seen even the *Venæ lacteæ* themselves do so too, and question whether the same vessels be not, in the Mesentery, common Conduits for both liquors. I believe that the *Lacteæ radicales* (or *primi generis*) are truly distinct from the Lympheducts, but hesitate as to those *secundi*, *& tertii generis*. *Whether they differ from the ductus Lymphatici.*

They have a pretty many *Valves*, but not so many as the *ductus Thoracicus*. They may be discover'd the same way as we intimated those of *Their Valves.*

the

the *Ductus* might, *viz.* that if they be preſſed towards the great Gland, they are preſently emptied; but if one preſs them from the Gland towards the Inteſtines, the Chyle will ſtop, and cannot be driven thither.

The reaſon of the motion of the Chyle.

By what has been ſaid, it ſufficiently appears, what way the Chyle paſſes from the Guts to the Heart; but there is another thing to be enquired into, *viz.* what ſhould be the reaſon or cauſe of this motion. This we cannot impute to the *attraction* of the *Lacteæ*, as if they ſuck'd up the Chyle out of the Guts, for ſuch elective attraction has been a long time exploded: but the true reaſon is, the preſſure of the Guts, whereby the Chyle is ſqueezed through their ſpungy inner Cruſt or Coat into the Mouths of the *Lacteæ*. Which preſſure proceeds *partly* from that undulating contraction of the Guts that is performed by their own Fibres, which one may plainly obſerve in Coneys, *&c.* opened alive; and *partly* from their being heaved to and again by the Muſcles of the *Abdomen*, and the *Diaphragm* in reſpiration. Now as ſoon as the Chyle is once got into the *Lacteæ*, we need not be ſolicitous for a reaſon of its further progreſs to the Receptacle and up the Thoracick Duct; for what is once got in, cannot ſlide back again, by reaſon of the Valves; and ſeeing ſo long as there is any Chyle in the Guts, there is no ceſſation of its being preſt into the *Lacteæ*, that which comes behind muſt needs drive forward that which went before, by which it is made to aſcend to the Heart. Which aſcent is alſo helped by the *Lympha* that mixes with it in the Receptacle and Duct, not only in that it is thereby dilated, but more eſpecially from that motion which is impreſſed upon the *Lympha* from the pulſation of the

the Heart, whereby it is made to circulate by the Lympheducts, as well as the Blood by the Veins.

CHAP. XI.

Of the Liver.

THE *Liver* is seated in the upper part of the *Abdomen*, namely about a finger's breadth distance from under the Midriff, in the right Hypochondre, (under the short Ribs) which, being of a great bulk, it quite fills in a manner, and reaches from thence towards the left side, a little beyond the *Cartilago ensiformis*, or pit of the Stomach. Its upper side is convex or round and smooth, the under is hollow, lying on the right side of the Stomach and *pylorus*, *&c.* Its lower edge reaches below the short Ribs on the right side, and very near as low as the Navel before. *The Liver.* *Its situation.*

In Dogs and many other Brutes, it is plainly divided into divers *Lobes*; to which that Man's might seem to correspond, many of the Ancients reckon'd it to have four Lobes, called *portæ*, *mensa*, *gladius* and *unguis*; and *Galen* describes five: But *Columbus* and *Glisson* do more truly affirm it to be undivided, or continuous: onely there is a little protuberance in its hollow side, to which the Caul is knit, which *Spigelius* called a Lobe, and from him others; but it is improperly called so, and is not at all like the Lobes in the Livers of Brutes. *Lobes.*

It has three *Ligaments* (properly so called) which according to Dr. *Glisson* (*de Hepate*) are these. The first is called *Suspensorium*, because it *suspends* the Liver, or ties it up to the Diaphragm; *Ligaments.*

phragm; it is broad, membranous and ſtrong, ariſing from the *Peritonæum*, and is not onely fixed to the outer membrane of the Liver, but does indeed make it, and deſcends even into the Liver, and is ſtrongly faſtened to the common ſheath or *involucrum* of the *Vena cava* (there where the umbilical Vein is continuous to it.) By this ſtrong inſertion it is the more able to bear up the great weight of the Liver.

The ſecond is the *Vena umbilicalis*, which after the birth, cloſes up and hardens into a Ligament. It is directly oppoſite to the former. It paſſes out of the hollow ſide of the Liver by the *Porta*, and terminates in the Navel. By this the Liver is kept from aſcending upon the motion of the Diaphragm upwards in reſpiration.

The third is that whereby the Liver adheres to the *Cartilago enſiformis*. This is thin and flaccid, but yet ſtrong, broad and doubled, ariſing from that Membrane wherewith the Liver is encompaſſed, (according to *Spigelius*) of which it is a duplicature (according to Dr. *Gliſſon.*) This hinders it from fluctuating to one or t'other ſide, or towards the Back.

Beſides theſe three Ligaments, it has ſeveral other connexions to the neighbouring parts, by the Veſſels that come into it, or go out of it; but thoſe would improperly be called Ligaments.

Membrane. It is covered with a very thin *Membrane* that ſpringeth from the firſt Ligament (as was ſaid before) which cleaveth firmly to the ſubſtance of the Liver. It is ſometime ſeparated from it by a watriſh humour, iſſuing out of the capillary Veins, or Lymphaticks, whereby watriſh Puſtules, by the Grecians called ὑδατίδες, are ingendred. If theſe break, the water falleth into the cavity of the Belly, and in part at leaſt cauſeth that kind of Dropſie called *Aſcites*.

Its

Its *Subſtance* (beſides the veſſels) has uſed by moſt Anatomiſts to be called *parenchyma*, as if it were nothing but an *Affuſion* of ſome certain humour about the veſſels, and there concreted. And becauſe it looks red, they have eſteemed it to be bloud. But red is not its proper colour, as Dr. *Gliſſon* thinks; nor is it parenchymatous, as *Malpighius* teaches. For the former ſays, That its redneſs is only borrowed from the great quantity of bloud that is tranſcolated through it out of the *Porta* into the *Cava*, its proper colour being pale, a little yellowiſh, ſuch as the Liver is of when 'tis boil'd; and yet that yellowiſhneſs ſeems to be cauſed by the Bile which is ſeparated in it: And the latter eſteems it to be glandulous, and naturally of a white colour; whoſe obſervations by the Microſcope, being curious, I ſhall expreſs in ſhort, as they are contained in his *lib. de Hepat. capp.* 2, 3, 5. "He ſays, That 1. the *Parenchyma* "(ſo called) of the Liver in Man is framed of "innumerable Lobules, which have commonly "each of them ſix ſides like a Die, and conſiſt "of ſeveral little ſix-corner'd Glands like the "ſtones of Grapes, (ſo that the Lobules look "like bunches of Grapes) and are each cloathed "with a proper circumambient Membrane, and "are joyned to one another by Membranes con-"tinued from the circumambient, and running "tranſverſly; yet ſo, as that certain *rimulæ* or "little chinks reſult from the joyning of the ſides "of the Lobules together. 2. That the whole "bulk of the Liver conſiſts of theſe little Grape-"ſtone-like Glands, and of divers ſorts of Veſſels; "and hence, that they may perform together a "common work, Reaſon concludes it neceſſary, "that there be a commerce betwixt theſe Glands "and Veſſels, though Senſe cannot diſcern the

Subſtance.

" very ſlender extream twigs of the Veſſels that " are inſerted into the Glands. 3. That the " little branches of the *Porta*, *Cava*, and *Porus* " *bilarius*, do run through all even the leaſt Lo- " bules in an equal number: that the *Porta* does " the office of an Artery, and has ſo great ſo- " ciety with the *Porus bilarius*, that both their " twigs are ſtraitly tyed together in the ſame " cover. 4. That the ſhoots of the ſaid Veſſels " are not joyned by Anaſtomoſes, but that the " Grape-ſtone-like Glandules, making the chief " ſubſtance of the Liver, are a *medium* between " the importing and exporting Veſſels, ſo that " by the interpoſition of theſe, the Importers " transfuſe their liquor into the Exporters. From " theſe Obſervations he concludes the Liver to " be a *conglomerate Gland*, ſeparating the Bile.— " And becauſe it is uſual for the conglomerate " Glands to have, beſides Arteries, Veins, and " Nerves, a proper excretory Veſſel (as in the " *Pancreas*, *Parotides*, *&c.*) diſperſed through " their ſubſtance, receiving and carrying away the " humour ſeparated in them, this kind of Veſſel " in the Liver is the *Porus bilarius* with the Gall- " bladder.] Which account of the *parenchyma*, *&c.* of the Liver, though new, and far differing from any heretofore delivered by others, is now received generally among Anatomiſts. And whereas ſeveral Lymphatick veſſels are ſaid to ariſe from the Liver, and therefore it may ſeem to have a double excretory veſſel; he thinks, that ſeeing in other places the Lympheducts uſe to ariſe not from conglomerate but conglobate Glands, therefore they do not truly ſpring from the Liver it ſelf, but from thoſe conſpicuous conglobate Glands that are in the hollow of the Liver under the *involucrum* or *capſula*, where the trunks

of

of the *Porta* and *porus bilarius* enter into it. Even as *Steno* obſerves, that the Lympheducts which ſeem to ſpring from the *Parotides*, do not indeed ſpring from them, but from a conglobate Gland that is contiguous to them.

It hath two ſorts of *Veins*. In its upper part the *Vena cava* entreth into it, and ſpreads it ſelf all through it in the lower as well as upper part. Into the lower ſide the *Vena portæ* is inſerted, whoſe branches likewiſe run through its whole *Parenchyma*. Of both theſe Veins more fully in the two following Chapters. *Veins.*

It has but very ſmall and few *Arteries*, for the *Porta* ſerves it for an Artery, bringing blood to it. Thoſe which it has, do all ariſe from the right branch of the *Arteria cœliaca*, (called *Hepaticus*) which being ſuſtained by the Coats of the Caul, aſcends to the hollow of the Liver juſt by the *Vena portæ*, on whoſe Coat, with the Bilary veſſels, and the Membrane of the Liver, it is wholly ſpent. For, as was ſaid, the *Parenchyma* (ſo called) is nouriſhed by the blood brought by the *Porta*. *Arteries.*

It has *Nerves* from the Intercoſtal pair, namely one from the ſtomachical branch thereof, another from the meſenterical (called *Hepaticus.*) But the Nerves are extended only to the Membrane and veſſels of the Liver, (as the Arteries were) ſo that the *Parenchyma* has but a very dull ſenſe. *Nerves.*

Till the *ductus Thoracicus Chyliferus* was found out, it was ſtill believed that the *Venæ lacteæ* were inſerted into the Liver, which was looked upon as the great Organ of Sanguification; but now 'tis known for certain that no *Lacteæ* at all go to the Liver, but that thoſe veſſels which were taken for ſuch, are *Lymphatick* veſſels car- *Lymphæ-ducts.*

rying from it a moſt limpid and pellucid juice. That they are diſperſed in the *Parenchyma* of the Liver, has not yet been obſerved; nay, as was noted before, *Malpighius* believes they are not derived from the Liver at all, but from thoſe conglobate Glands that lye under the *Porta* at its ingreſs into the Liver, and ſometimes adhere to it, from whence taking their courſe chiefly along the Meſentery, they open themſelves into the *Receptaculum Chyli*. But ſuppoſing that they enter'd the ſubſtance of the Liver, leſt any one ſhould ſuſpect them to be Lacteals, for which they were a good while taken, after the Lacteals of the Meſentery were found out, but the common Receptacle and thoracick Duct were not as yet known; I ſay, leſt any ſhould ſuſpect them to be Lacteals, and ſo to import Chyle to the Liver, let him ſatisfie himſelf with this Experiment, *viz.* let him in viviſection make a ligature about any one of them or more, and he will ſee them preſently ſwell betwixt the Ligature and the Liver, but be empty on that ſide towards the Receptacle. And the ſame will be more evident if he examine their *Valves* alſo, which open towards the ſaid Receptacle, but hinder any thing from coming back from thence to the Liver.

The Bilary Veſſels. Concerning the *Bilary Veſſels* we ſhall forbear to ſpeak here, deſigning a particular Chapter for them, *viz.* ch. 14.

The Liver does not ſanguifie. *Hippocrates* in *lib.* 4. *de Morb.* ſays, *The fountain of blood is the Heart, the place of Choler is in the Liver*, which comes very near the truth, as ſhall appear hereafter. But after him both the *Greeks* and *Arabs* generally held, that the Meſaraick veins received the Chyle from the Guts, and brought it to the Liver, by which it was turned into Blood, which

which was carried from it into all the parts of the Body by the Veins. Yea and even ſince the *Venæ lacteæ* were found out, Anatomiſts believed that they all terminated in it, becauſe they judged it the fitteſt Bowel for Sanguification, preſuming that that task muſt be performed by ſome or other. But not to multiply Arguments for the confutation of ſo generally rejected an Opinion, this one may be ſufficient to evince its falſity, That none of the *Venæ lacteæ* are inſerted into the Liver, and conſequently no Chyle is imported into it, whereof Bloud ſhould be made. (How and where Sanguification is performed, we ſhall ſhew when we come to the Heart.)

Its true action.

The Liver then being diſcharged from Sanguification, its true action is to ſeparate the *Bile* from the Blood, which is brought plentifully to it by the *Vena portæ*. As to the manner of its ſeparation, ſome ſay it is meerly by colature, others think a Fermentation alſo neceſſary: but this is too intricate a Controverſie to enter upon here, and therefore waving it, I ſhall paſs on to ſpeak of the nature and uſe of the *Bile*.

The nature and uſe of the Bile.

The Ancients (amongſt whom was *Ariſtotle*) thought it to be a meer Excrement, and to be of no other uſe than by its Acrimony to promote the excretion of the Guts. And this Opinion prevail'd ſo long as it was believ'd that the Liver had a nobler action than meerly to ſeparate the Choler. But now it being found out that it has no other Office, it ſeems unlikely that ſo bulky a Bowel was made only for the ſeparation of a *meer Excrement*, and therefore 'tis believed to be a *Ferment* for the Chyle and Blood. This new Doctrine I ſhall give entirely out of *Dymerbroeck*, *p.* 154. "The Blood flowing into the "Liver by the *Porta* out of the Gaſtrick and Me-

" ſaraick veins (and it may be a little by the " Hepatick Artery) is mixed with an acri- " monious, ſaltiſh, and ſubacid juice , (made in " the Spleen, of the arterious Blood flowing thi- " ther by the Arteries, and of the animal Spi- " rits by the Nerves) which is brought into the " *Porta* by the *Ramus Splenicus.* Now both theſe " being entred the Liver by the branches of the " *Porta* , by means of this ſaid acrimonious and " acid juice, and the ſpecifick virtue or coƈti- " on of the Liver, the ſpirituous particles , both " ſulphureous and ſalt , lying hid in the ſaid ve- " nous Blood , are diſſolved , attenuated , and " become alſo a little acrimonious and ferment- " ing ; a certain thinneſt part whereof , like " moſt clear water , being ſeparated from the " other thicker maſs of the Blood by means of " the conglobated Glands , plac'd moſtly in the " hollow ſide of the Liver , is carried from " thence by many Lympheducts , as has been " ſaid. But the fermentaceous Spirits of greater " Acrimony, mixed with the thicker and more " viſcid ſulphureous Juices, (for Sulphur is vi- " ſcid) and more ſtrongly boiling , whenas thro' " the clammineſs of the Juices in which they in- " here , they cannot enter the conglobated " Glands, nor from them the Lympheducts , and " yet through their fierce ebullition are ſepara- " ted from the Blood (as Yeſt from Beer) theſe " fermentaceous Spirits, I ſay, being ſever'd with " the Juice in which they inhere , become bitter, " and are called *Bile.* Which *Bile* being tranſco- " lated through the Grape-ſtone-like Glandules " into the roots of the *Porus Bilarius*, and of the " Gall-bladder , paſſes through them by the " *Ductus communis* into the *Duodenum* or *Jeju-* " *num* , where it is preſently mixed with the " Pancreatick

" Pancreatick juice, and both of them with the " alimentary mass, concocted in the Stomach, and " now passing down this way, which it causes " to ferment. And because at its first entrance " it is more acrimonious, and has its vertue en- " tire, and so causes the greatest ebullition with " the Pancreatick juice, hence the milky Juice " contained in the mass concocted in the Sto- " mach, is most readily and in greatest quantity " separated in the *Jejunum*, and by innumerable " Lacteal vessels, (which are more numerous in " this than the other Guts) it is most quickly " driven on towards the *Receptaculum Chyli*, and " this is the reason that this Gut is always so " empty. But in the following Guts because the " Fermentaceous Spirits are a little pall'd, the " effervescency becomes slower and less efficaci- " ous, and the Chyle is more slowly separated " from the thicker mass, and therefore they " have fewer *Venæ lacteæ*. At length what re- " mains of this fermenting matter is mixed with " the thick *faces* in the thick Guts, where by its " Acrimony it irritates them to excretion.] Thus far that perspicacious and judicious Ana- tomist. And indeed if the Liver have no other office but to separate the Choler, it is by no means to be reputed an Excrement: for though the Liver do not sanguifie, yet however it is to be esteemed as a very noble part, seeing the Dis- eases thereof are generally so dangerous, and wounds in it are so commonly mortal; and by consequence that liquor which it separates must have some noble use, and such as is very neces- sary unto life.

CHAP. XII.

Of the Vena Portæ.

Vena Portæ.

THough it be the method of Anatomists usually to deliver the Doctrine of all the Veins in a distinct Chapter or Book after the description of the three Ventricles; yet seeing all the *Veins* seem (and by the *Galenists* have been affirmed) to have their root in the Liver, of which therefore we cannot but take notice; on this account we will here describe their branchings within the *Abdomen*, seeing they are parts contained in it. Only in contradiction of *Galen*'s Opinion we desire it may be noted, that their root is more properly said to be in those parts wherein they receive their blood from the Arteries, than in the Liver (or in the Heart) whither they convey it. Now we shall in the first place describe the branchings of the *Vena Portæ*.

Its Name. It hath this name from the two Eminences (called by *Hippocrates* πύλαι, *Portæ*, Gates) betwixt which it enters into the lower side of the Liver; and sometimes, without the general name of *Vena*, it is called only *Porta*.

Origine. Some think that the *Vena umbilicalis* ought to be accounted its Root or Original, because it is first formed in the *Fœtus* and inserted into the *Porta*. But this Umbilical vein after the Birth ceasing from the office of a Vein, and degenerating into a Ligament, though it might be accounted its root then, it cannot properly now. Others think, that because its branches every where inserted into the Intestines bring blood from thence to the Liver, (and not *vice versa*) therefore

therefore thoſe ought rather to be accounted its roots, and its diviſions within the Liver its branches. And indeed ſtrictly and properly they ought to be accounted ſo, but however we ſhall not think it abſurd to ſpeak with the Ancients, who becauſe they thought the *Porta* carried blood from the Liver to the Guts for their nouriſhment, ſuppos'd it to ſpring out of the Liver.

As it enters into the Liver, it is inveſted with another Coat, which ſome call *Vagina portæ*, its Sheath, others *Capſula* or *involucrum*, its Caſe, or *Cover*, and *Capſula communis*, becauſe the *Porus bilarius* is involved in it as well as the *Porta*. This outer Coat it has immediately from the membrane that cloaths the Liver, that is, it is continued from it, though it be of a clear other ſubſtance, namely more denſe and carnous. It is inveſted with it in all its ramifications, and ſo having a double Coat is in that reſpect an Artery, as alſo in that it brings blood to the Liver for its nouriſhment as well as for other uſes, and laſtly, in that by means of the *Arteria hepatica* inſerted into the *Capſula* it has an obſcure pulſation (according to Doctor *Gliſſon.*)

When it is enter'd about half an inch into the Liver, it is carried partly to the right hand, partly to the left, and ſo is ſhap'd into a *Sinus* as it were, and thence is divided into five large branches, four whereof are diffus'd all over the hollow ſide of the Liver, but the fifth aſcends ſtreight to its upper ſide where it diſperſes it ſelf. The ſaid *Sinus* is more conſpicuous in an *Embryo*, becauſe the great influx of nutritious juice by the Umbilical Veins enlarges it much. Some make it a ſort of Heart, obſerving in it an obſcurer kind of *Syſtole* and *Diaſtole*, whereby the motion of the

Branchings in the Liver.

the blood in the branches of the *Porta* within the Liver, is promoted in like manner as it is in the *Arteria pulmonaris* and *Aorta* by the right and left Ventricles of the heart. Without which pulsation they think the blood would hardly pass out of the larger branches of the *Porta* into the narrower, and so on into the roots of the *Cava*. In an *Embryo* very observable is the *Tubulus* or *Canalis venosus*, which passes directly out of this *Sinus* into the *Cava*, (almost opposite to the mouth of the Umbilical Vein that opens into the *Sinus*.) This *Canalis* or Pipe is of the same substance and texture with a Vein, and enters into the *Cava* just as it penetrates the Diaphragm; and there also two other great branches out of the Liver are inserted into the *Cava*; and in the same place this Pipe is also knit to the suspensory Ligament spoken of before, and after the Child is born grows it self into a Ligament, being in a manner opposite to the umbilical Ligament. Its *Use* in the *fœtus* is for the freer and readier motion of the blood and chyle out of the umbilical Vein into the *Cava*, seeing the current is hardly strong enough to pervade the *Parenchyma* of the Liver; nor indeed is there any reason why the said liquors should pass there-through, seeing there is either little or no Bile therein, or however they are not yet in a condition to have the same separated from them. But to return to the divisions of the *Porta*. The Ancients taught that they were only spread in the sinous or hollow part of the Liver, but Dr. *Glisson* in his accurate Anatomy of it, affirms the *Porta* to be dispersed very equally in all its parts, upper as well as lower. And whereas it has been a constant doctrine, that the branches of the *Porta* open by *anastomoses* into those of the *Cava*, the same learned Author,

and

and many others since him, have observed, that there are no such *anastomoses* at all, but that the blood doth ouze through the glandulous *Parenchyma* of the Liver out of the Capillary veins of the *Porta* into those of the *Cava*. He that would be fullier informed hereof, may consult his most accurate Book *de Hepate*. But we will now pass to the branches of the *Porta* when it is gone out of the Liver.

Its branches without the Liver.

This Trunk having past a little from the Liver, before it be severed into branches, puts forth two twigs, out of its upper and fore-part, which are inserted into the *Cystis fellea* or Gall-bladder (and are from thence called *Cystica gemellæ*) about the neck of it, and spread by innumerable twigs through its external coat.

A third twig also arises single from it, which is larger than either of the former, and is inserted into the bottom of the right side of the Stomach, from whence it ascends by its hinder side up to the *Pylorus*, which gives it the name of *Pylorica*; it is otherwise called *Gastrica dextra*.

Having sent forth these three twigs, the Trunk passeth down, and bending a little towards the left side, it is parted into two remarkable branches; whereof the upper is called *sinister*, or the *left*, and is the lesser: the lower *dexter* or the *right*, which is the larger. The *left* is bestowed upon the Stomach, the *Omentum*, a part of *Colon*, and the Spleen; the *right* is spread through the Guts and Mesentery: the left is called *Vena splenica*; but the right *Vena mesenterica*.

Vena splenica.

The *Vena splenica* runs acros the body towards the left side, being sustained by the hinder leaf of the Caul, and hath two branches issuing out of it before it come to the Spleen, *viz.* the *superiour* and the *inferiour*.

The

The *ſuperiour* is called *Gaſtrica*, or *Ventricularis*, becauſe it is beſtowed upon the Stomach. It aſcends obliquely towards the left part of the Stomach, into the back ſide whereof it is inſerted, and divides it ſelf into three ſprigs, of which the two outmoſt are ſpent on the body of the Stomach, but the middle aſcends on its back-ſide up to its upper or left orifice, which it encompaſſes like a Garland, and is called *Coronaria.* From the *inferiour* branch two twigs ſpring; The one is ſmall, and ſends twigs to the right ſide of the inner leaf of the *Omentum*, and to the *Colon* annexed to it. This is called *Epiploïs* or *Omentalis dextra.* The other is ſpent upon the ſame leaf of the *Omentum*, with that part of the *Colon* which it ties to the Back, and is call *Epiploïs* or *Omentalis poſtica.*

When the *Ramus ſplenicus* hath juſt approached to the Spleen, it ſends out two other twigs, the upper and lower. The *upper* is called *vas breve venoſum*, and is implanted into the left part of the bottom of the Stomach. It is ſometimes ſingle, in which caſe it is properly called *vas breve* in the ſingular number; but more often there are two, three or more of them, and then they ſhould be called *vaſa brevia.* And note, that theſe Veſſels, be they one or more, do ſometimes ſpring from the *Ramus ſplenicus* after it has entered the Spleen.

This *vas breve* was a veſſel much renowned by the Ancients, who believed it carried an acid juice from the Spleen to the Stomach to ſtir up appetite, and to help the fermentation of the meat in it; but it is certain both by Ligature (whereby it filleth toward the Stomach, and emptieth toward the Spleen) and alſo by the general nature of Veins, whoſe ſmaller branches and twigs

ſtill

ſtill receive the ſuperfluous Arterial blood from the part whereinto they are inſerted, and conduct it by the larger chanels towards the Heart; I ſay it is certain from hence, that this ſame *vas breve* carries nothing to the Stomach, but onely brings from thence into the *Ramus ſplenicus* the remains of the arterial blood.

From the *lower*, two Twigs iſſue.

The firſt is called *Gaſtroëpiploïs ſiniſtra*; this is beſtowed upon the left part of the bottom of the Stomach, and the-fore-leaf of the *Omentum*, chiefly on its left part.

The ſecond ſpringeth moſt commonly indeed from *Ramus ſplenicus*, but ſometimes from the left Meſenterick vein; and running along the *Inteſtinum Rectum*, is inſerted into the *Anus*, by many twigs. This is called *Hæmorrhoïdalis interna*, as that which ſpringeth from the *Vena cava* is called *Hæmorrhoïdalis externa.*

Now followeth *Vena meſenterica*, or the *right* branch of *Vena portæ*. Before it be divided into branches, it ſendeth forth two twigs. Vena meſenterica.

The firſt is called *Gaſtroëpiploïs dextra*; this is beſtowed upon the right part of the bottom of the Stomach, and the right ſide of the upper leaf of the Caul.

The ſecond is called *Inteſtinalis*, or *Duodena*: It is inſerted into the middle of the *Duodenum*, and the beginning of the *Jejunum*, and runneth lengthways of them: whence ſome capillary twigs go to the *Pancreas* and the upper part of the *Omentum.*

After theſe twigs are paſt from it, it enters by one trunk into the Meſentery, where preſently it is divided into two branches, to wit, *Meſenterica dextra, & ſiniſtra.*

Meſenterica

Meſenterica dextra (placed on the right ſide) is double, and ſendeth a great number of branches to the *Jejunum*, *Ileum*, *Cæcum*, and the right part of the *Colon* which aſcendeth up by the right Kidney and runs under the Liver.

It hath fourteen remarkable, though nameleſs branches; and theſe are afterwards divided into innumerable ſmall twigs. Theſe are thoſe Veins that are called the Meſaraicks, whoſe branches are ſupported by the Glandules of the Meſentery, but enter not into them; for the Glands miniſter to the *venæ lacteæ*.

Meſenterica ſiniſtra paſſeth through the middle of the Meſentery, to that part of the *Colon* which deſcendeth from the left part of the Stomach, and to the *Inteſtinum Rectum*.

The Uſe of the Porta. The *Uſe* of the *Porta*, before the circulation of the blood, and the *Venæ lacteæ* were found out, was taught to be for the carrying of nouriſhment to the Inteſtines and other parts contained in the *Abdomen*, and alſo to bring back from the Guts the purer part of the Chyle to the Liver to make Blood of, and a thicker feculent part of it to the Spleen, to be excocted by it into an acid juice, and then carried to the Stomach by the *vas breve venoſum* for the exciting of hunger. As for this laſt opinion, it appears by Ligature, that the *vas breve* carries its contents from the Stomach to the *Ramus ſplenicus*, and it is nothing but the Blood remaining from the nutrition of the Stomach (that was brought thither by the Arteries) which is now a conveying back to the Liver and ſo to the Heart again in its circulation. And as for the Meſaraicks carrying nouriſhment to the Guts, or bringing back Chyle, thoſe errours have been ſufficiently laid open before in the Chapters of the *Venæ lacteæ* and the Liver. And their true

Uſe

Use is only to bring back to the Liver from the Guts that Blood which remains after their nutrition, and which was carried to them by the mesaraick Arteries.

CHAP. XIII.

Of the Vena Cava *dispersed within the* Abdomen.

Vena cava. *Its name.*

THE *Vena Cava* is so called from its large Cavity, being the most capacious of any Vein of the whole Body; for into it as into a River or common Chanel do all the other Veins like Rivulets (excepting the *Pulmonaria*) empty themselves.

Rise.

Its *Root* may very properly be said to be in the Liver; for by its Capillaries it receives the Blood that is transcolated through the glandulous *parenchyma* of the Liver from the Capillaries of the *Porta*, and by its ascending trunk conveys it to the Heart. Now these roots may in some regard be commodiously enough also called branches; for the roots of a Tree in the Earth, as well as its boughs in the Air are spread into many branches: onely there is this difference, that roots bring sap to the trunk, but boughs carry it from the same. However we shall call them indifferently roots or branches. The capillary branches then of the *Cava* are spread through the whole substance of the Liver, and not its upper or gibbous part onely, as has formerly been taught; even as we said before that the Capillaries of the *Porta* were indifferently dispers'd all over it. Betwixt these Capillaries (much less betwixt their larger

larger branches) there are no inoſculations or anaſtomoſes, but thoſe of the *Porta* being quite obliterated in the glands or glandulous *Parenchyma* of the Liver, theſe of the *Cava* ariſe out of the ſame, and whiles they paſs towards the trunk of the *Cava*, many of them meeting together make a twig, as many twigs in like manner concurring make a branch, which ſtill proceeding further, by the acceſſion of new twigs and branches becomes larger and larger, and at length diſchargeth it ſelf into the *Cava*. And thus do all the roots of the *Cava* in the Liver. But they do not all meet together in one common trunk within the Liver, as thoſe of the *Porta* do, but empty themſelves apart into the *Cava* without the Liver. And ſtill the further diſtance the Capillaries have their origine from the *Cava*, the larger their chanel comes to be at their arrival at it. The ſmaller twigs are innumerable; the larger roots joyning immediately to the *Cava* are commonly but three, though two of them are preſently (towards the Liver) divided into other two, as large each as themſelves, ſo that one may account them to be five.

Diviſion. Theſe emptying all the Blood exhauſted out of the Liver into the *Cava*, it is preſently *divided* into the Aſcending and Deſcending trunk. The *Aſcending* forthwith enters the Diaphragm and marches up the *Thorax*, where we ſhall leave it till we come thither, and onely here ſpeak of the *Deſcending* trunk as long as it continues in the *Abdomen*.

Its deſcending trunk. The *Deſcending* trunk is ſomewhat narrower than the *Aſcending*, and paſſing down along with the great Artery it continues undivided till the fourth *vertebra* of the Loins. But in the mean time it ſends forth divers branches from its trunk. As

1. The

1. The *Venæ adipoſæ*, for the Coat and fat of the Kidneys; whereof that on the left ſide goes out firſt.

2. The *Emulgents*, which run to the Kidneys by a ſhort and oblique paſſage; theſe bring back that blood to the *Cava* which the emulgent Arteries carried to the Kidneys with the *Serum*.

3. The *Spermaticks*, called *Vaſa præparantia*. The right ſpringeth from the trunk of *Vena Cava* a little below the *Emulgent*; but the left from the left *Emulgent* it ſelf. Of theſe more in the 20*th* Chapter.

4. The *Lumbares*, ſometimes two, ſometimes three. Theſe run in between four *vertebræ* of the Loins, and are diſperſed through the membranes that cloath the ſpinal marrow.

All theſe Veins being ſent forth of the trunk, by this time it is come to the fourth *vertebra* of the Loins, where it turns to behind the *Arteria magna*, above or before which it had thus far deſcended, and is divided into two equal branches, called *Iliaci*, becauſe they paſs over the *Os ileon*, &c. as they go down to the Thighs.

Juſt about the diviſion there ſpring two Veins called, *Muſcula ſuperior*, for the *Peritonæum* and Muſcles of the Loins and *Abdomen*; and *Sacra*, which is ſometimes ſingle, ſometimes double, for the marrow of *Os ſacrum*, or rather for the membranes that cloath it.

Afterwards the *Iliacal* branches are again divided each into two other, the Exteriour that is greater, and the Interiour that is leſs.

From the *interiour* ariſe two Veins. *Muſcula media*, for the Muſcles of the Hip and Buttocks; and *Hypogaſtrica*, which is a notable one, ſometimes double, miniſtring to moſt parts of the *Hypogaſtrium*; as to the Muſcles of the ſtreight Gut,

(which branches make the external Hæmorrhoidals;) to the Bladder and its neck, to the Yard, and the lower side of the Womb and its neck, which last are the Veins by which the Menstrues were believed to pass, before the circulation of the Blood was found out; for since 'tis known that they pass by the Hypogastrick Arteries, and what Blood is not sent forth at those times, or at other times is not spent on the nutrition of these parts, returns by these Veins to the *Cava*, and by it to the Heart.

From the *exteriour*, three: two before it goes out of the *Peritonæum*, and one after.

1. *Epigastrica*, for the *Peritonæum* and the Muscles of the *Abdomen*; the most noted branch of it ascends under the *Musculi recti* towards the *Vena mammaria*, with which it has been thought to inosculate about the Navel.

2. *Pudenda*, for the Genitals in Men and Women.

3. *Muscula inferior*, for the Buttocks.

And now the descending branches of the *Cava* are past out of the *Abdomen* into the Thighs, and begin to be called Crural; and of them we shall discourse when we come to the *Limbs*, in *Book* IV. *Chap.* 4.

Its Use. Now the *Use* of this Descending trunk of the *Vena Cava* is not to carry any thing to any part from the Liver; but whereſoever its leſſer twigs end into Capillaries, from thence is Blood received (being brought thither by the respective Arteries) and conveyed into the greater branches, and by them into the trunk of the *Cava*, by which it ascends to the right ventricle of the Heart, there to be anew inspirited, and from thence to be sent forth again by the Arteries, as shall be further explained when we come to the Heart.

For

For though the Descending trunk of the *Aorta* or great Artery pass down the *Abdomen* along with that of the *Cava*, and so is contained therein as well as it; yet because the Arteries have all of them their Origine from the Heart, we will forbear to speak of *them* till we come to the Anatomy of *it*, in the *next* Book.

CHAP. XIV.

Of the Gall-bladder and Porus bilarius.

FOR the receiving and evacuating of Bile there have been reckoned only two Vessels or passages, namely the *Gall-bladder*, and *Porus bilarius*. By this latter there flows a thicker but milder; by the former a thinner, more acrimonious and fermentative Choler, into the Intestines. But besides these there have lately been found out a third, which we shall describe by and by.

The *Gall-bladder*, called in Greek χολήδοχος, in Latine *Vesica bilaria*, or *Folliculus fellis*, is a hollow Bag placed in the under or hollow side of the Liver, and in figure representeth a Pear. *The Gall-bladder. Its Name and Description.*

It is about two inches in length, and one in breadth where broadest. *Bigness.*

By its upper part it adheres to the Liver, which doth afford it a hollowness to lodge in; but the lower part which hangeth without the Liver, resteth upon the right side of the Stomach, and the *Colon*, and doth often dye them both yellow. *Connexion.*

It hath three *Membranes*, one *common*, which is thin and outmost. This springing from the Membrane of the Liver, onely covereth that part which hangeth without the Liver. The two other Membranes are *proper*. *Membranes.*

The middle is thick and ſtrong, and hath three ranks of *Fibres*; the outermoſt are tranſverſe, the middlemoſt oblique, and the innermoſt ſtreight.

The inmoſt Coat is nervous, or tendinous as it were; and to the inſide of this there adhereth a kind of glandulous coat. The Glands herein do ſeparate from the Arteries a kind of mucous humour, which ſerves to defend the *Veſica* from being irritated by the acrimony of the Choler contained in it.

Parts. It hath two *Parts*, the *Bottom* and the *Neck*.

The *Bottom* is its larger or wider part that contains the Choler, and is of the ſame colour with the bile that is in it; whence it commonly looks yellow, but ſometimes greeniſh, blackiſh, *&c.*

The *Neck* (otherwiſe called *meatus cyſticus*) is its narrower part, being but about as wide as a Gooſe-quill, and about two inches long. Betwixt this and the *Veſica* there is a certain fibrous Ring which much ſtraitens the paſſage, and ſo hinders the too haſty depletion of the *Veſica*. The other end of the Neck is joined to the *Porus bilarius*, and they both make the *Ductus communis*, or common paſſage of the Choler, which is inſerted into the beginning of the *Jejunum*, or the end of the *Duodenum*. *Peierus* has obſerved that in many Birds and ſome Fiſhes this *Meatus* does not join the *Porus bilarius*, but is inſerted ſeparately into the Guts.

How the Choler is brought into it.

The Ancients (whoſe opinion of late ſtifly defended by Dr. * *Cole*) thought that the Choler in the Gall-bladder was received in by its neck from the *Porus bilarius*, and that it paſſed out into the common Duct the ſame way. And to obviate the Objection, that there uſes not to be a reciprocation

* De ſecret. Animal. *Cap.* 14.

cation of humours in the ſame Veſſel, (at the ſame time eſpecially) Dr. *Cole* ſuppoſes that the Gall paſſes out of the Gall-bladder onely in the time of the diſtribution of the Chyle, but at all other times it is received into it from the *Porus*, and is ſtored up in it againſt the next occaſion. But not to enter into this diſpute, I think Dr. *Gliſſon*'s account of it the more probable, which is this: "The ordinary way of filling the Gall-"bladder, is by its fibrous roots that are diſper-"ſed through the Liver. The whole trunk of "theſe roots enters that part of the Bladder "where 'tis ſtraitned by a fibrous Ring. This "trunk indeed hardly equals the hundredth part "of the roots of the *Porus bilarius*; yet it di-"ſtributes ſome twigs and capillary Veſſels into "the hollow ſide of the Liver. But if you open "the Gall-bladder with a deſign to underſtand "the manner of the inſertion of this trunk into "it, truly you will not eaſily find it. For "though this duct do penetrate the ſaid Blad-"der, and the humour contain'd in it be diſ-"charged thereinto; yet there is hardly any "print or ſign of this hole in the inſide of the "Bladder; which ought not to ſeem hard to be "believed by any one, if he remember the inſer-"tion of the Ureters into the Piſs-bladder: for "though theſe do far exceed this trunk in width, "yet one can hardly find their inſertion if he "cut open the Bladder and look for it. The beſt "way (that I could yet find) to diſcover the in-"ſertion of this trunk, (if you will open the "Gall-bladder, and ſearch for its entrance into "it) is thus: namely, if you look for a certain "little and ſpungy protuberance near the orifice "of the Bladder hard by the *meatus cyſticus*; for "the foreſaid trunk, I think, is pretty plainly Anat. Hepat.

" inserted into that protuberance.] This protuberance is called a Valve by *Spigelius*.

Ductus cyst-hepaticus.

Besides this, Mr. *Perrault* has found out another *new Conduit* for the Bile, which he calls *ductus cyst-hepaticus*, because it is common both to the *Vesicula* and the *Porus hepaticus* (or *bilarius*.) This Duct has three roots, which being subdivided into numerous twigs are dispersed through the Parenchyma of the Liver amongst the branches of the *Vena cava* and *Portæ*: These roots grow into one trunk, which creeping along the surface of the hollow side of the Liver, has a double implantation, one into the *Porus bilarius* two inches and an half before the said *Porus*'s uniting with the *Meatus cysticus*, and another into the middle of the *Vesica* (on that side of it which adheres to the Liver) with a Valve. This Valve seems to be formed of the inner Membrane of the *Vesica*, and also a proper one; and may be said to be a kind of a middle Valve between the nature of the *Sigmoides* and *Trigiottis* (or *Tricuspis*) of the *Vena arteriosa* and *Arteria venosa* in the Heart. Betwixt its insertion into the *Porus bilarius*, and this into the *Vesica*, there is about six inches length. It contains a thinner Choler in it, than the *Porus bilarius*.

Of the circulation of the Bile.

Jo. Alph. Borellus (Professor of the Mathematicks at *Naples*) from the continual and speedy efflux of the bile by the *Ductus communis* into the *Duodenum*, believes that there is a particular circulation of it. For he affirms, That in a days time, from a person fasting, there pass thirty four pound of bilious juice into the *Duodenum* by the common *Duct*, whereas the whole mass of Gall amounts not to above two pound; from whence as he concludes, that so great a quantity of Gall cannot be produced in the Liver by way of fermentation,

mentation, but that it is separated mechanically, without the help of any ferment, only by *Cribration* from the minute vessels of the *Porta* through the Pores of the Glandules of the Liver, as the Urine is separated in the Kidneys; so he infers that there is a particular circulation of the *Bilis* through the *Abdomen*, perform'd by the *Venæ mesaraicæ* into the Trunk of the *Porta*, thence to the Liver, thence through the Bilious vessels into the *Duodenum*, to return again by the Mesaraick veins. He that would enquire more into this novel, and (to me) improbable Opinion, may consult his *Opus posthumum* (pars altera) *de motu Animalium*.

The Valves of the Gall-bladder.

It has been taught by several Anatomists, that its Neck or *Meatus* has sometimes two, sometimes three *Valves* to hinder the recourse of the Choler: but *Diemerbroeck* professes he could never find any, but only that the egress of the *Vesica* was very strait, and its Neck wrinkled. Dr. *Glisson* declares also that he has opened very many Vessels of this kind, and never yet saw a *Valve* in any of them. But he thinks that the fibrous ring (above mention'd) did impose upon those who have thought there was a *Valve*. Besides, upon tryal he has often found, that the Bile by a light compression of the Fingers, has fluctuated to and again out of the *Cystis* into the *Meatus*, and on the contrary; as also out of the *Meatus* into the *Ductus communis*, and back again. Which certainly could not be, if there were any *valve* in the way; for that would hinder the one or other of these motions.

Its Vessels

The *Vesica fellea* hath two *Veins* called *Cysticæ gemellæ*, which spring from the *Porta*. It hath twigs of *Arteries* proceeding from the right branch of the *Cœliaca*. And it hath a small

thread-like ſprig of a *Nerve* from the Meſenterical branch of the Intercoſtal.

Of the ſtones in it. Many times *Stones* are found in it, which are lighter and more ſpongy than thoſe of the urinary Bladder, and will ſwim above water, which theſe latter will not do.

Porus bilarius. The other paſſage which carrieth the thicker ſort of Choler, is called *Porus bilarius*, or *Meatus hepaticus*, becauſe it paſſeth directly from the Liver to the *Ductus communis*.

Its Coats, and branchings within the Liver. Within the Liver its Trunk and Branches are inveſted with a double Coat: its *proper* one, which it retains without the Liver alſo, and another that is *common* to it with the *Porta* called *Capſula communis*, which it has from the Membrane of the Liver. In this *common* Coat this *Porus* and the *Porta* are ſo cloſely enwrapped, that you would take them but for one Veſſel, till you either hold it up to the light, (which will diſcover Veſſels of two colours in it) or very dextrouſly rip up the *Capſula*, and ſo lay them open. Its roots within the Liver are equally divided with thoſe of the *Porta* every where, ſaving that little ſpace where the roots of the *Veſica* are ſpread, in the ſinous and right ſide of the Liver. So that having ſpoken above of the diviſions of the roots of the *Porta*, I ſhall refer the Reader thither for theſe of the *Porus*. I ſhall only obſerve, that they are far larger and more numerous than thoſe of the *Veſica*, drawing Choler from all the parts of the Liver, (ſaving whither the roots of the Bladder reach) and that more thick and viſcous, yet leſs acrimonious.

All Animals have it. This *Porus* ſeems to be a more neceſſary part than the *Veſica*; for many Creatures, as Harts, Fallow-Deer, the Sea-Calf, *&c.* and thoſe which have a whole Hoof, as an Horſe, *&c.* have no Gall-

Gall-bladder, but there is none that is deſtitute of this.

Without the Liver it is as wide again as the *Meatus cyſticus*, with which it is joyned at two Inches diſtance from the Liver, and both make the *Ductus communis choledochus*. *Its connexion with the* Meatus.

It has no *Valve* in its whole progreſs; only the *Ductus communis*, where it enters the Inteſtin, having pierced the outer Coat, paſſes betwixt that and the middlemoſt about the twelfth part of an Inch, and then piercing that alſo marches down further betwixt it and the innermoſt Coat about half an Inch, and at laſt opens with a round mouth into the Inteſtin. So that this oblique Inſertion (as that of the Ureter into the urinary Bladder) ſerves inſtead of a *Valve* to hinder any thing from regurgitating out of the Gut into this Duct, eſpecially the inmoſt Tunicle of the Inteſtin hanging ſo flaggy before its mouth, that when any thing would enter in, it claps cloſe upon it and ſtops it. *It hath no Valve,*

As to any *Anaſtomoſes* of the roots of any of theſe Bilary veſſels, with thoſe of the *Vena Portæ*, ſuch indeed have been much talk'd of, but without truth, for their extreme Twigs or Capillaries terminate in the *Parenchyma* of the Liver, out of whoſe Grape-ſtone-like Glandules they imbibe the Choler there ſeparated from the Blood; even as was ſaid before of the Capillaries of the *Cava*, that they received the Blood it ſelf imported by the *Porta*, in like manner, without any inoſculations. *nor Anaſtomoſes with the* Porta.

The *Uſe* of all theſe *Veſſels* may ſufficiently be learned by what has already been ſaid of them. Though ſome are of opinion, that not only Choler, but other ſuperfluous humours are evacuated by them, eſpecially upon taking a Purge. *The uſe of the* Veſica, ductus cyſt-hepaticus, *and* porus.

The

The *Use* of the *Bile* it self appears from what we quoted above out of *Diemerbroeck*, when we were treating of the action of the Liver, *cap.* 12. We will only further note two things.

Observ. 1. *First*, That sometimes the *Ductus communis* is very irregularly *inserted*. For in some it is knit to the bottom of the Stomach, and then the party vomiteth Choler, and is termed πικρόχολος· and sometimes it is inserted into the lower end of the *Jejunum*, and then bilious affections follow; and such a one is termed πικρόχολος ὑδρωπικός.

Observ. 2. A *second* thing is concerning the *colour* of the Bile; that though for the most part, in a healthful state, it be yellow, yet preternaturally and in a morbous state it is often of several other colours, as pale-coloured, eruginous, porraceous, vitelline, reddish and blackish. And when it thus degenerates and corrupts, it is the cause of most violent and acute Diseases; as the *Cholera morbus*, Dysentery, Colick, *&c.*

CHAP. XV.

Of the Pancreas.

The Pancreas. *Its Substance.*

THE *Pancreas* (as much as to say, *All-flesh*) or the *Sweet-bread*, except its Membranes and Vessels, is wholly Glandulous. It seems to be compacted out of many Globules or knots included in a common Membrane, and joyn'd one to another partly by Membranes, and partly by Vessels. Every Globule by it self is somewhat hard; but all together (becaus of their loose connexion) seem softish. It is of a palish colour, very little tinctured with red. Its investing Membrane it has from the *Peritonæum*.

It

It is *seated* under the bottom and towards the hinder side of the Stomach, and reaches from the Cavity of the Liver, (namely from that part where the *Porta* enters it) to the lower end of the Spleen cross the *Abdomen*. It is annexed (by its *Duct*) to the *Duodenum*, and sometimes to the *Ductus bilarius*, to the *Rami splenici*, the Caul, the upper part of the Mesentery, and upper *Nervous plexus* of the *Abdomen*. It is not joyned to the Spleen. *Situation, and connexion.*

Its *figure* is long and flat, broader and thicker about the *Duodenum*, but towards the Spleen thinner and straiter. *Figure.*

It is lesser than most of the *Viscera*, commonly about five Fingers breadth long: where it is broadest, it is about two Fingers breadth, and about one Fingers breadth thick. *Bigness.*

Its *Vessels* are of five kinds. *Veins* it has from the splenick branch; *Arteries* from the left branch of the *Cœliaca*, sometimes from the Splenick; *Nerves* from the Intercostal pair, especially from the upper *plexus* of the *Abdomen*; it has also many *Vasa lymphatica*, which, as the rest, pass to the *Receptaculum chyli*. *Vessels.*

But besides these Vessels which are common to it with other parts, it has a proper membranous Duct of its own, which was first found out by *Wirtsungus* at *Padua* above 40. years ago. This Vessel commonly has but one Trunk, whose orifice opens into the lower end of the *Duodenum* or beginning of the *Jejunum*, and sometimes is joyned to the *Ductus bilarius*, with which it makes but one mouth into the Intestin. Within the *Pancreas* (according to Dr. *Wharton*) it is divided into two Branches, which send forth abundance of little Twigs into all the *Globuli* above spoken of, where they imbibe the Humour that is sepa- *Ductus pancreaticus.*

rated

rated by them from the Arteries, and by their Trunk transmit it to the Guts. This Pancreatick humour though is never found in this Duct, because it flows so quickly out of it into the *Duodenum* by a steep way; even just as the Urine, passing out of the Reins by the Ureters to the Bladder, is never found in them because of its rapid transit.

Office. Very many have been the differences of Opinions concerning the *Office* of this Glandule. Some have thought it to be only of use to sustain the divisions of the Vessels, and to serve the Stomach for a Cushion to rest upon; others, that it ministers a ferment to the Stomach; others, that it receives the Chyle, and brings it to greater perfection; and others, that it serves as a Gall-bladder to the Spleen, or sometimes serves in its stead. Which Opinions being all very unlikely, I shall not spend time to examine them.

The nature of the pancreatick juice. There are three other Opinions, for the *first* whereof let the credit of the learned Author (*viz.* Dr. *Wharton*) recommend it as it can, but to me it seems improbable, and it is this, That it receives the Excrements or Superfluities of the superiour *plexus* of the Nerves of the sixth pair, (Dr. *Willis*'s Intercostal or ninth pair) being united with some branches from the spinal marrow, and by its proper Vessel or Duct discharges them into the Intestins. In answer unto which I shall only say this, That I cannot tell how thick Excrements should be convey'd by the Nerves that carry such pure Animal Spirits, and have no visible Cavity; nor secondly, how these Nerves in particular should *cum delectu* as he speaks send the Excrements hither, and all the rest be discharged from any such Office.

The

The *second* Opinion is somewhat more probable, and is defended by famous Physicians and Anatomists, as *Franc. Sylvius*, *Bern. Swalve*, *Regn. de Graef*, and *Isbrand de Diemerbroeck*, from which last I shall transcribe it. "I have found, *saith he*, "in the Dissections of Brutes both alive, and "newly strangled, a certain liquor sublimpid, "and as it were salivous, (something austere "and lightly subacid, and having sometimes "something of saltishness mixed) to flow out of "the *Ductus pancreaticus* into the *Duodenum*, "sometimes in a pretty quantity. Whence I "judged——that there is excocted in the *Pancreas* "a peculiar humour from the serous and saltish "part of the Arterial blood brought into it, ha"ving some few Animal Spirits convey'd thither "by small Nerves mixed with it, and that this "liquor flowing into the *Duodenum*, and there "presently mixed with the Bile, and the Meat "concocted in the Stomach gliding by the *Pylo*"*rus* into the Guts, does cause a peculiar effer"vescency in those Aliments, whereby the "profitable chylous particles are separated from "the unprofitable, are attenuated, and being "brought to greater fusion (This Operation of "it, *says he*, is shewn by the diversity of the sub"stance of the Aliments, concocted in the Sto"mach, and still there contained, from that of "those which have already flow'd into the In"testins: for the former are viscid and thick, "and have the various colours of the food taken: "but the latter on the contrary are more fluid, "less viscid, and more white) are withal made "apt to be impelled by the peristaltick motion "of the Guts, through their inner mucous Coat "into the Lacteal vessels, the other thicker by "little and little passing down to the thick Guts,

"to

" to be there kept till the time of excretion. " Now this efferveſcency is cauſed through the " volatile Salt and ſulphureous Oyl of the Bile " meeting with the acidity of the Pancreatick " juice; as in Chymiſtry we obſerve the like " Efferveſcencies to be cauſed by the concourſe " of ſuch things.] Thus he. So that he will not have this Juice to be any thing excrementitious, nor to be ſo very little in quantity, as ſome have affirmed; to demonſtrate which he cites the Experiment of *de Graef*, who in Live-diſſections could gather ſometimes an Ounce of it in ſeven or eight hours time, which he has taſted, and found it of the taſte before-mentioned, *viz.* ſomething auſtere, ſubacid and ſaltiſh. *Vide ejus Anatomen corporis humani*, p. 73, *&c.* where you may ſee what Diſeaſes it is the cauſe of when diſtempered.

A *third* Opinion is that of *Brunnerus*, who thinks that the *Pancreas* is of the ſame uſe with the other conglomerate Glands of the Mouth, Throat, Stomach, and Guts, and its Juice of the ſame nature with the *Saliva*. That it conſiſts of *Lympha* ſeparated from the Arteries, and of Animal or Nitro-aereal Spirits communicated by the Nerves. That like the *Saliva* it is a Diſſolvent or *Menſtruum* in concoction and chylification, but does not ferment with the Bile, but only takes ſomewhat off its Acrimony. That its juice is not of any *peculiar* ſort, he endeavours to evince by repeated Experiments upon Dogs, from ſome of whom he cut the greateſt part of the *Pancreas*, and in others cut aſunder its Duct that paſſes from it to the Inteſtins, and yet they continued (after two or three days indiſpoſition) to be as lively, and in every reſpect in the ſame condition as before. From whence he concludes, that that juice which naturally flows out of the *Pancreas*,

creas, must in these cases be supplied from other parts; and therefore that it is of no *peculiar* nature, but of the same with that of those parts that supply its defect, and those can be no other than the conglomerate Glands of the parts aforesaid. He that would be further satisfied in the grounds of this Opinion, or how this ingenious Author made his Experiments, may consult his Book lately published, entituled, *Experimenta nova circa Pancreas, &c.*

CHAP. XVI.

Of the Spleen.

THE *Spleen* is so called in *English*, from the *Greek* Σπλὴν, from whence also the *Latin* word *Splen* is derived. It is otherwise called in Latin, *Lien*, and in English the *Milt*. *The Spleen, Its name.*

It is commonly but one in Men, though some have found two, yea *Fallopius* three. In Dogs there are sometimes two or three, unequal in bigness, out of each of which there passes a Vessel into the *Ramus Splenicus*. *Number.*

In Infants new-born it is of a red *Colour*: in those of a ripe age it is somewhat blackish; and in old men it is of a leaden or livid colour. *Colour.*

In Man it is broader, thicker, and heavier than in Beasts; for it is about six Inches in length, three in breadth, and one in thickness. Sometimes it is much larger, but the bigger the worse. *Spigelius* has observed, that it is larger in those that live in fenny-places, than in those that live in dry; and in those that have large Veins, than in them that have small. *Bigness.*

As

Figure. As to its *figure*, *Hippocrates* compares it to an Oxe's Tongue; *Aristotle* to an Hog's Milt. Towards the Stomach on its inner-side it is somewhat hollow; on its outer, gibbous, having sometimes some impression upon it from the Ribs. It is smooth and equal on either side, save where in its hollow side it has a streight line or seam (ῥαφὴ) at which place the Splenick-vessels enter into it. Its upper end is called its *head*, and the lower its *tail*.

Situation. It is *seated* in the left *Hypochondrium* opposite to the Liver: (so *Hippocrat. 6. Epidem.* calleth it the left Liver; and *Aristot. 3. de histor. animal. 7.* the bastard Liver) betwixt the Stomach and that end of the Ribs next the Back; in some higher, in others lower: but naturally it descends not below the lowest Rib. Yet sometimes its Ligaments are so relaxed, that it reaches down lower; yea sometimes they quite break, so that it slips down into the *Hypogastrium*: so *Riolanus* tells the story of a Woman that was troubled with a Tumour there, which was taken by her Physicians for a Mole; but dying of it, and being opened, it was found to be occasioned by the Spleen fallen out of its place, and lying upon the Womb.

Whether it may be cut out of the body with safety. And whereas it very much endangers life when it falls out of its place, one would think that it could not but with great danger be cut out of the body. For how can one imagine that a part so difficult to come at, and that has such large Vessels inserted into it, (not to mention its use) can with safety be taken out of the Body? Wounds in it are commonly mortal; Inflammation, or but Obstructions in it do grievously afflict the Patient, and sometimes kill him: sure then the total ablation of it one would think should be very fatal. And yet (among others) the ingenious

nious *Brunnerus* in the Preface to his above-cited Book affirms, that he firſt took the Spleen from a Dog, and at ſome diſtance of time by a ſecond Operation cut out the greateſt part of the *Pancreas* from the ſame, and yet he continued to eat and drink, ſhit and piſs, and run about as briskly as if he had wanted neither of them, till about three Months after the laſt Operation he was loſt in a crowd. And *Malpighius* relates; how having tyed all the Veſſels that come into or go out of the Spleen in a young Dog, (which is much the ſame thing as to cut it out) and cloſed up the wound in his ſide after the Operation, tho' hereby when the ſame ſide after a good while was open'd again, the Spleen was dried up almoſt to nothing; yet in the mean time the Dog was every way both as to his ſtomach, excrements, plight, briskneſs, *&c.* as well as before the Ligature. And *Ant. Nuck* tells us of a Dog out of whom he cut not only the Spleen, but one Kidney alſo, having firſt faſt tyed the Veſſels that go to and ſpring from each; and afterwards healing up the wound, the Dog continued in good plight.

Connexion. It is tyed to five parts; its upper part to the Midriff (commonly) and its lower to the left Kidney by thin Membranes; by its hollow part which giveth way to the Stomach being diſtended, to the upper Membrane of the *Omentum*, and to the Stomach by ſundry veſſels. Its gibbous or arched part is knit to the *Peritonæum* by thin Membranes.

Membranes. It is clothed with a double *Membrane*; the *outer*, common, being propagated from the *peritonæum*, (or as ſome will have it from the *Omentum*:) the *inner*, proper. The firſt is ſtrong, and contains the Spleen as in a bag: Both Veins, Ar-

teries and Nerves run along it, and betwixt it and the inner a great number of Lympheducts. The Arteries that run through the inner Substance of the Spleen, do many of them terminate in it; so that when it is pulled off, (which 'tis not hard to do) you may discern a great many red specks, which are the little mouths of the broken Arteries. The inner Membrane is smooth and strong, but not so dense but that Air can pass through it, if one blow hard into the Spleen by the splenick Artery, after the outer Membrane is drawn off. Some think this Coat springs from the outer one of the Vessels that enter the Spleen: *Malpighius* supposes it to be woven by an Implication of the Fibres that run overthwart the Spleen. Blood-vessels run along this also, as one may observe by syringing Ink into the Splenick Artery; for then they are discover'd both by their swelling and alteration of colour.

Substance. The *substance* of it is flaggy, loose, and spongy, commonly held to be a concrete sanguineous body, serving to sustain the vessels that pass through it: but *Malpighius* with his Microscope has discover'd it to be (besides the Fibres, to be describ'd by and by) a *Congeries* of Membranes form'd and distinguish'd into Cells, in which are included very many Glands. These Cells and Glands he describes thus in the *fourth* and *fifth* Chapters of his *lib. de Liene.* "Though the "Spleen by its colour and looseness of substance "seem to be flesh, or concreted blood; yet if "one tye the Artery, and blow hard by the "Vein, (or on the contrary) the Spleen will ex-"ceedingly swell; and being thus blown up, if "it be dried, and afterwards cut, you may per-"ceive its whole bulk to be made up of Mem-"branes forming *Sinus*'s and Cells like Honey-combs.

" combs. They are propagated either from the " inveſting Membrane, or (which he thinks " more probable) from the venous duct that runs " along the middle of the Spleen; like as the " Cells in the Lungs, he thinks, proceed from " the Branches of the *Trachea* growing ſlender. " Their ſhape is irregular; they communicate " with one another, and gape not only into the " extream branches of the Splenick Duct, but al- " ſo into the ſides of the trunk it ſelf, by means " of the holes or pores therein (to be deſcribed " by and by.) They are watered with Blood- " veſſels, and within them are included nume- " rous bunches of Glands, or if you will, of " Bladders or little Bags, which do exactly re- " ſemble a bunch of Grapes. Theſe little Glands " have an oval figure, and are about as big as " thoſe of the Kidneys: I never ſaw them of " other colour than white; yea though the Blood- " veſſels of the Spleen be fill'd with Ink, and play " about them, yet they always keep the ſame co- " lour. Their ſubſtance looks as if it were mem- " branous, but 'tis ſoft and eaſily crumbled; their " Cavity is ſo ſmall that it cannot be ſeen, but " it may be gueſſed, in that when they are cut " they ſeem to fall into themſelves. They are " almoſt innumerable, and are placed wonderfully " in the aforeſaid cells of the whole Spleen, where " vulgarly its *Parenchyma* is ſaid to be; and " they hang upon fibres ariſing from their caſe, " and conſequently on the utmoſt ends of the " Arteries and Nerves, yea the ends of the Arte- " ries twiſt about them like the Tendrils of " Vines, or clinging Ivy——Each bunch conſiſts " of ſeven or eight. ——Beſides the membranous " cells that encloſe them, they are covered with " a bloody ſubſtance, which plentifully ſtagnates

" in thoſe cells; as appears by ſyringing water " by the Artery into the Spleen, for it will be " tinged after ſeveral repetitions, and bring a- " bundance of blood out with it.] Thus he.

Fibres. From the inner Membrane (according to *Malpighius*) ſpring innumerable *fibres*, which run acroſs the Spleen to the oppoſite part of the ſame Membrane, or to the *Capſula* or common caſe of the veſſels which runs through the middle of the Spleen. They keep not the ſame plane, but ever and anon being ſplit into two, they each inoſculate with others in like manner divided, and make a ſort of Net-work. The Ancients believed them to be twigs of blood-veſſels; Dr. *Gliſſon* ſuppoſes them alſo to be veſſels, but that they contain not blood, but nervous juice: But *Malpighius* concludes them to be only fibres, becauſe they have neither any diſcernible cavity, nor any communication with veſſels; and alſo becauſe both *Spigelius* and himſelf have obſerved the inner membrane of the Spleen, which affords riſe and inſertion to them, and is framed of a *plexus* of ſuch like fibres, to become bony and ſometimes cartilaginous, which he thinks cannot eaſily agree with the nature of veſſels. Their uſe he thinks to be only for the ſtrengthning and conſervation of the ſoft ſtructure of the Spleen.

To theſe opinions of *Malpighius* concerning the glandules and fibres of the Spleen have later Anatomiſts generally ſubſcribed: But Dr. *Fred. Ruyſch* has expreſt his diſſent therefrom in an Epiſtle to *Campdomercus* (lately publiſhed.) He ſayes, " That the whole fabrick of a *Man's* " Spleen is nothing but a certain *congeries* of Ar- " teries, Veins, Lympheducts and Nerves, which " are infolded in the inveſting membranes. But " it is to be noted (*adds he*) that the protracted " and

" and extreme *propagines* of the Arteries and " Veins seem to acquire another nature, for they " are so soft and juicy, that they may easily be " reduced in a manner (as I may say) to nothing; " for their extreme particles are dissolved by the " least rubbing that may be: yea by only steeping " them in fair water till they are a little rotten, " they dissolve into a brown or black-ruddy liquor. " These extreme parts, I say, are mere *propagines* " of the bloud-vessels; and there is no other rea- " son why they represent glandules, but because " they are dispos'd *fasciculatim* or in clusters, and " are reduced into softer, more juicy and round bo- " dies, which hath impos'd not only upon others, " but till of late upon my self also. But these *pro-* " *pagines* thus dispos'd in clusters are to be distin- " guished from glands, seeing they are not covered " with any peculiar membrane, nor consist by " themselves, which is required in glands; —— " They are placed very close to one another, " without any (natural) visible empty space be- " tween, or cell, though *Malpighius* describe, and " *Bidloe* draw all these things.]

Thus far as to the *glandules*: Then he proceeds to the *fibres*, and says, " That though he has used " the utmost diligence, he never found such fibres " in a *Man's* Spleen. He confesses indeed that the " matter is so in a *Calf's* Spleen; *viz.* that there " are in it innumerable fibres, betwixt which the " aforesaid *propagines* or clusters are seated: And " these fibres seem to be of great use in a Calf's " Spleen, *viz.* that they may establish the *fulci* " that are found in a Calf's Spleen (that are in " lieu of the venous branches) that they may not " be too much extended by the refluent bloud. " But in a Man's Spleen that has no *fulci* but " Veins, such fibres are not necessary.

Lastly, as to the *cells* so often mention'd in *Malpighius*'s description of the substance of the Spleen, Dr. *Ruysch* tho' he grant "that in a "Calf's Spleen there is something like cells (for "the texture of the aforesaid fibres resembles the "little holes of cells) yet in a Man's (well constituted) he never found any such thing.

Vessels. Veins. It hath *Vessels* of all kinds; as 1. *Veins* from the *Ramus splenicus* of the *Vena portæ*. The *Ramus* before it enter the Spleen has two Coats, but in its entrance its outer and thicker is received by the inner Coat of the Spleen, which (according to *Malpighius*) turning back enters into it, and becomes a *Capsula* or common cover for both Veins, Arteries, and Nerves. And whereas Anatomists did formerly teach, that this Vein upon its entrance into the Spleen, did presently divide it self therein into sundry branches, and so was all equally obliterated in its Membranes and *Parenchyma*: he affirms, that there is formed out of it a large venous *Duct* or *Sinus*, that runs quite through the Spleen, (somewhat like that in the *Pancreas*) into which the blood (howsoever alter'd) is received through the Glands from the Arteries: And because he could never trace the Veins so far as the Glands, he believes that the blood, *&c.* is conveyed into the aforesaid venous *Duct* by such-like *tubuli* or pipes as the milk is stored up in and issues out of in Women's breasts: and that by making some stay in these, it acquires some new mixture and alteration. That there are such *tubuli*, appears from his own observation, (and from Dr. *Glisson's* before him) that the Veins (especially the venous Duct before-mentioned) have abundance of little holes or pores in their sides, (every where save or that side under which the Arteries and Nerves run)

The venous duct and tubuli.

run) which are extended into the *Parenchyma* of the Spleen, and constitute these little pipes.

Dr. *Ruysch*, as in other things he dissents from *Malpighius* as to the substance of a Man's Spleen, so also in the particular of the holes in the sides of its Veins; for he sayes, a mans splenick vein is not full of holes like a sieve, as a Calf's is, nor does it end into *fulci* like that.

This Vein enters the Spleen sometimes in one and sometimes in more branches: but whether they be one or more, they have each one a Valve, which looks from the Spleen outwards, permitting the humours to flow from the Spleen to the *Ramus splenicus*, but hindring them from returning back. And though one cannot discover any Anastomoses of the Veins with the Arteries in the substance of the Spleen, yet there is one notable one of the Splenick Artery with this *Ramus splenicus* before it enter the Spleen. Whose use must be, partly to further the motion of the humours contained in the *Ramus* towards the Liver, partly that the superfluous plenty of Blood, which perhaps cannot pass quick enough through the narrow passages of the Spleen, may return back again by help of this Anastomosis, through the *Ramus* to the Liver. There are also two Veins that open into the *Ramus* at a little distance from the Spleen; the *one* called *vas breve* (but should rather be called *vasa brevia*, there being for the most part several) which ariseth out of the bottom of the Stomach: (The Errour of the Ancients as to the use of this Vessel was detected before, *chap.* 12. and its true use declared:) and the *other* the internal Hemorrhoidal.

It hath two *Arteries*, entring one at its upper, the other at its lower part. These commonly spring from the left Cœliack branch, which is

2. *Arteries.*

called the *Splenick Artery*; but ſometimes (ſaith *Diemerbroeck*) from a certain branch which ariſeth out of the very trunk of the *Aorta*, and proceeds by a bending paſſage along the ſide of the *Pancreas* to the Spleen, approaching whereto it is divided into two, and theſe branches entring it as aforeſaid, they are ſubdivided through it into a thouſand twigs, the moſt of which terminate in the oval Glands above-deſcribed, and the remainder are ſpent partly on the Membranes that make its cells, and partly on the inveſting coats, as may be made to appear by filling this Artery with Ink or Air.

3. *Nerves.* Its *Nerve* is one of the left meſenterical branches of the Intercoſtal pair, which at its entrance into the Spleen, is ordinarily divided into two branches, which are incloſed in the common caſe, running by the ſides of the Artery, or ſometimes above it, but under the Vein: Its ſubdiviſions do inoſculate with one another, and accompany the bifurcations of the Arteries within one cover through the whole ſubſtance of the Spleen, entring the Glands with the Arteries. Contrary to what has been formerly taught, that they are all ſpent on its inveſting Membrane; which was ſuppoſed, becauſe the body of the Spleen has but a very dull ſenſe: But that proceeds not from defect of Nerves, (ſeeing it has a pretty many twigs) but probably from that *ſtupor* or numbneſs which that acid juice that is bred in the Spleen, may be conceived to induce upon them.

Their Capſula. *Malpighius* in his accurate Anatomy of the Spleen, hath found out a conſiderable Membrane not obſerved by former Anatomiſts, which from its cloathing or incloſing the Blood-veſſels and Nerves, he calls a *common caſe* or *capſula*. It has its riſe from the inner and proper inveſting

ing Membrane of the Spleen, (as was said before in the description of the Veins) which being turned back in the ingress of the vessels enters to within the Spleen, and being formed into a pipe incloses the trunks and branches also of the aforesaid vessels, which spring out of each side of the long *duct* or *sinus*, somewhat like the leaves of Fern. It has such like holes in it as the Veins before described: and the fibres of the Spleen do very many of them either arise from, or else are inserted into it.

Though Dr. *Wharton* in his *Adenographia, cap.* 4. going about to prove the Spleen to be no Gland, uses this as one Argument, That there were never observed any *Lympheducts* to be distributed through this part: yet *Olaus Rudbeck*, *Fr. Sylvius*, *Fred. Ruysch*, *Malpighius*, *&c.* affirm it to have many, which arising from its conglobate Glands pass though the *Omentum* very plainly into the *Receptaculum chyli*. See them expresst in the following figure of a Calf's Spleen. 4. Vasa Lymphatica.

The Ancients knowing neither the true passage of the Chyle, nor the circulation of the Blood, erred grosly as to the *use* of this part. They thought that it attracted a more feculent and melancholick part of the Chyle, by the *Ramus splenicus*, from the Mesaraick veins, which having elaborated, it sent it out again partly by the *vas breve* to the Stomach to excite the appetite and further the concoction thereof, and partly by the internal Hemorrhoidal: but it is certain, that no Chyle, nor indeed Blood passeth by the *Ramus splenicus* to the Spleen, as neither any thing *from* the Spleen by the abovesaid Vessels; but whatever they contain, comes *towards* the Spleen, namely into the *Ramus*, and what is in it, goes to the Liver. One need add no further *The use of the Spleen.*

ther reaſon to evince the errour of their Opinion; nor that of thoſe that would make it either a blood-making, or a blood-perfecting Bowel. Dr. *Gliſſon* (in *lib. de Hepate*, *cap.* 45. *pag.* 434.) thinks it to make an Alimentary juice, or at leaſt a vehicle for it, which being firſt imbib'd by its nervous Fibres, is from them received into the Nerves, by which it is firſt carried to the *Glandulæ renales*; where being refin'd, it is received again by the Nerves, and is carried to the Brain and Spinal marrow, and from thence by the Nerves again into all the parts of the Body. We will not here enter into a diſpute about the nutritious juice of the Nerves; but ſuppoſing it, certainly this ſeems an odd way of conveying either it or its Vehicle thus to and again by the ſame ſort of Veſſels; not to ſay that ſo acid a juice as is excocted in the Spleen, one ſhould think, would be no very welcom gueſt to the Nerves, nor be ſuffer'd to march ſo quietly, eſpecially paſſing againſt the current of the Animal Spirits that continually flow from the Brain and Spinal marrow. This Opinion therefore we ſhall paſs by as very improbable, having little elſe to recommend it ſave the credit of its learned Author.

Velthuſius ſays, That whatever is more thick and feculent in the Chyle and Blood, is drawn to the Spleen, and there by fermentation is brought to a ſtate of fuſion and volatility, from whence ſtore of Spirits are bred in the blood; for 'tis by fermentation alone, ſays he, that Spirits are extracted out of any body.

Dr. *Mayow* according to his Hypotheſis, that the ferment of the Stomach conſiſts of Nitro-aereal Particles ſupplied by the Nerves, and that the ferments in all the other *viſcera* conſiſt of the ſame,

ſame, aſſigns theſe three uſes to the Spleen. 1. That the Nitro-aereous Particles which paſſing through the Brain in a continued *ſeries*, are not ſpent on the natural or animal functions, may be reconveyed (by thoſe Nerves that go to the Spleen, and which have communication with moſt of thoſe that are beſtowed on the *viſcera* in the *Abdomen*) into the maſs of blood, and rightly mixed with it in the Spleen. 2. That the Nitro-aereous Particles may be carried in a due plenty and with a certain regimen to the *viſcera* appointed for the concoction of Meats. For accordingly as thoſe *viſcera* are full or empty of Aliment, ſo they have need of a greater or leſs afflux of fermentative particles. 3. That the Nitro-aereous particles being put in motion and vigour, and intimately mixed with the Salino-ſulphureous particles of the blood in the Spleen, may excite ſuch an effervescency in the maſs of blood, as may be fit to bring its Salino-ſulphureous particles to a due volatility.] Whence, ſeeing theſe offices of the Spleen are not ſo neceſſary, but that life may be continued without them, though they much conduce to the right diſpoſition of the Animal Oeconomy and to a perfect health; I ſay on this account he thinks it not difficult to underſtand how it comes to paſs that an Animal may live that has it cut out.

Blancard gives this as his Opinion. "The numerous Grape-ſtone-like Glands without doubt "receive a Lymphatick humour from the Arterial Blood, which is carried by Lymphatick "veſſels, plain enough to be ſeen on the ſimous "ſide of the Spleen, to the receptacle of the "Chyle. The blood being thus deprived of a "too great quantity of this liquor, is made ſo "much the fitter to have the Bile ſeparated from "it

" it in the Liver. Thus alſo all the blood that " is to go to the Liver, whether in the Spleen, " or in the Inteſtins, or in the Stomach, does " firſt part with its too thin juice. For this rea- " ſon the Spleen is made livid, and all the blood " that enters the Liver, is far blacker than that " which is contained in the *Vena cava*. But the " young Student will ask why the liquor is ſent " from the Lymphatick Veſſels of the Spleen into " the Receptacle of the Chyle? I anſwer, That " through the mixture of liquors whoſe particles " are of divers kinds, the Chyle might (by fer- " menting as it were, as appears in Chymical " mixtures) be made the more perfect

Dr. *Havers* (in his *Oſteologia nova, p.* 210, *&c.*) inquiring into the generation of the *mucilage* that lubricates the Joints, *&c.* thinks, that the change, which that part of the bloud from which it is produced, undergoes in order thereunto, is made by ſome gland; and that there is none which ſeems ſo fit and likely to be concerned in this affair as the Spleen, which he ſuppoſes to be the *officina*, where nature produces and elaborates the mucilage, from whence it is adminiſtred to the bloud, and by that diſpenſed in its circulation to all the parts, about which 'tis neceſſary it ſhould be employed. The reaſons of this his opinion, the Reader may ſee in the place quoted.

The laſt, (and to me the moſt probable) *uſe* is this, *viz.* That it ſerves to make a ſubacid and ſaltiſh juice of the Arterial blood and Animal Spirits that flow plentifully into it, which paſſing by the *Ramus ſplenicus* to the Liver, ſerves there to make (and further the ſeparation of) the Bile, which is the proper action of the Liver, as was ſhewed before, *chap.* 11. Now this juice is thus elaborated: The bulk of the Spleen conſiſt-

ing

ing moſtly of membranous cells incloſing bunches of Glands, as we ſhewed before from *Malpighius*, into theſe the Arterial blood is poured by the capillary Arteries wherewith are mixed ſome Animal Spirits depoſited into the ſame by the ends of the Nerves, which bridling the Sulphureous Spirit of the Blood, induce on it a little acidity; and then being driven out of the Cells and Glandules, by the beating of the Arteries and the preſſure of the adjacent parts, it is received into thoſe *tubuli* before ſpoken of, and ſo into the large venous duct, from whence it flows into the *Ramus ſplenicus*, and by it is conveyed to the *Porta* and Liver. But it does not paſs haſtily through the Spleen, but ſeems to make ſome ſtay in the abovementioned Cells and Pipes, and alſo in the venous duct, that it may acquire ſome more acidity by its ſtagnating in them: as Wine ſtanding in a Vinegar-veſſel ſours more and more; and as the Bile by ſtaying in the Gall-bladder gets a greater acrimony. And this ſtay of the blood in the *tubuli* and venous duct, *Malpighius* aſſigns this reaſon of, *viz.* becauſe they are ſo much more capacious than the Arteries that bring the blood into them; ſo that the current could hardly be continued in them by the impreſs or propulſion of the Arterial blood, if it were not furthered by the motions of the adjacent *viſcera* and Inteſtins ſqueezing as it were the Spleen againſt the Ribs. That the Spleen does miniſter to the action of the Liver, and not to ſanguification (amongſt other reaſons) may be preſumed by this, that the Blood takes ſo long and tedious a march from that to this by the *Ramus ſplenicus*; whereas it might readily have been conveyed into the trunk of the *Cava* that is hard by

by the Spleen, if the juice that is elaborated in it had not been for the ſervice of the Liver.

Tab. IV. *Repreſents the* Pancreas, *and the Spleen with its Lympheducts.*

Fig. 1. Repreſents the *Pancreas.*

AA *The* Parenchyma *of the* Pancreas *opened.*
B *The Trunk of the* Ductus pancreaticus.
CCC *Its Branches.*
D *The* Ductus bilarius *joyning to the Pancreatick Duct.*
E *The* Duodenum *opened.*
F *The inſertion of theſe Veſſels.*

Fig. 2. Repreſents the Lymphatick and Sanguineous Veſſels of the Spleen tied.

A *The Spleen of a Calf.*
B *The Sanguineous and Lymphatick Veſſels tied.*
C *The Splenick Vein.*
D *The Splenick Artery.*
E *The Splenick Nerves, whoſe number is uncertain.*
F *The Lymphatick Veſſels ariſing out of the outer part of the Spleen.*
ffff *The Valves in the ſaid Veſſels.*
G *The Ligature.*

Fig. 3. Repreſents an Oxe's Spleen, from Dr. *Highmore.*

AA *The ſubſtance of the Spleen cover'd with its proper Coat.*
B *A portion of the* Vena portæ.
C *Its left, or Splenick Branch.*
D *This Branch opened near the Spleen that the Valve* b. *may appear.*

EE *The*

Fig. 1.

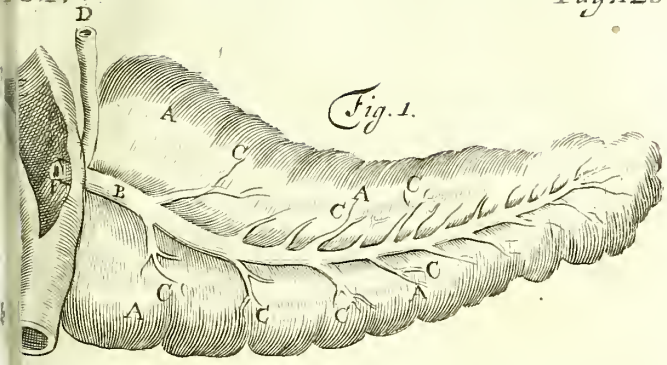


Fig. 2.

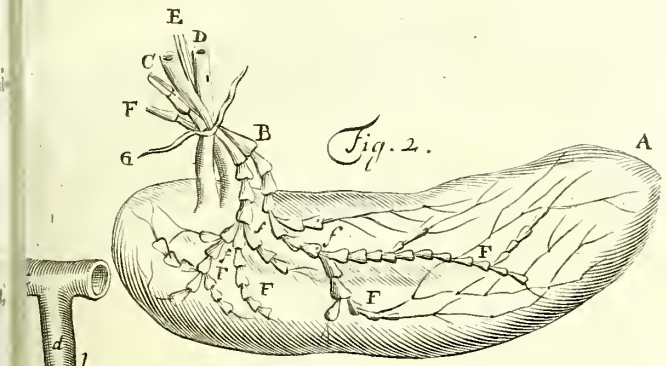


Fig 3.

EE *The Coat of the Spleen dissected and turned back, that the progress and* plexus *of the Vessels and Fibres may be shewn the better.*

F *A portion of the Splenick Artery, which running through the whole substance of the Spleen, doth dispense into it the little Twigs* aaa.

b *The Valve in the Splenick branch looking outwards to the* Porta.

ccc *The holes which appear in the* Ramus splenicus *leading from the substance of the Spleen.*

ddd *Nerves running along the sides of the Splenick Artery.*

CHAP. XVII.

Of the Kidneys, and the Glandulæ renales.

THE *Kidney* is called in Latin *Ren*, from *ῥέω*, to *flow*; because the serosity of the Blood doth flow through the Kidneys to the Ureters, and through them to the Bladder. By the Greeks they are called *νεφροὶ, ἀ νείφειν ningere*, or *spargere*. *The Kidneys.* *Their name.*

They are in *number* two, both because of the great quantity of the serous Excrement that is to be separated and discharged by them; and also that one being stopped by a Stone, or otherwise violated, the *serum* of the Blood might be transcolated by the other. *Number.*

They are *seated* behind the Stomach and Intestins in the Loins, one on each side of the *Vertebræ*, between the Membranes of the *Peritonæum*; their lower end rests on the head of the Muscle *Psoas* (which is one of the movers of the Thigh) just where the Nerve enters into it, which is the cause that a big stone being in the Kidney, and *Situation.*

pressing

preſſing on the Nerve, a numbneſs is felt in the Thigh of the ſame ſide. In Man the right Kidney is loweſt, by reaſon of the greatneſs of his Liver, and commonly bigger alſo than the left; yet it has not ſo much fat about it as the left, by reaſon of the vicinity of the Liver, whoſe heat hindreth the encreaſe of fat.

Figure. In *figure* they reſemble the *Aſarum* leaf, or a Kidney-bean: towards the Loins or outwards they are gibbous; and alſo in their ends on the inſide; but in the middle where the Veſſels enter in and go out, they are hollow. Their ſurface in grown perſons is ſmooth, but in the *Fœtus* and Infants it is very unequal, as may be ſeen in the following figure of the Kidneys of an *Embryo*.

Connexion. As for their *connexion*; by the external fatty Membrane they are tyed to the Loins; by the emulgent Veſſels, to the *Vena cava*, and the *Aorta*; and by the Ureters to the Bladder. The right hath the *Inteſtinum cæcum* joyn'd to it, and ſometimes the Liver; the left hath the Spleen and the *Colon*.

Bigneſs. They are in length about five Inches reaching the length of three and ſometimes four *vertebræ*; betwixt two and three fingers breadth broad, and one Inch thick. In ſalacious or luſtful Men, they are commonly larger than in others.

Membranes 1. *Common.* Their *Membranes* are two. The *outer* is *common*, borrowed from the *Peritonæum*; within the reduplication of which the whole Kidney is wrapped; and therefore it is called *Renis faſcia*. This Membrane is beſmeared with much fat; whence it is called *Tunica adipoſa*; and into it entreth the *Arteria adipoſa* from the *Aorta*; as alſo the *Vena adipoſa*, which on the right ſide commonly ariſeth from the Emulgent, ſeldom from

from the *Cava*; but on the left, always from the *Cava*. By means of this Membrane 'tis that they are both joyned to the Loins; the right, to the *Cæcum* and sometimes to the Liver; the left, to the Spleen and *Colon*, as was noted before.

Many *Uses* have been assigned to the fat collected in this Membrane; as, to serve for a soft swathing-band to the Kidneys; to preserve the hot and moist temperament of them, which otherwise would necessarily be resolved by the continual affusion of the serous Excrement, *&c.* But *Malpighius* thinks it more probable, that seeing much fat bedaubs the Vessels that enter into the hollow side of the Kidneys, not only before their entrance but after, and that the same is extended to the Membranes of the *pelvis* and all its pipes, that therefore its chief use is, to besmear the said Vessels through which the Urine passes, that they may not be fretted and excoriated by its acrimony and saltness. *The use of its Fat.*

The *inner* is *proper*, and seems to be connate with them, and not propagated from any part. It adhereth very close to them, and has inserted into it small Nerves from the Intercostal pair, and one twig from that particular branch thereof which goes to the Stomach; whence that consent betwixt the Kidneys and Stomach, that in the pain of the Stone in the Kidneys, a vomiting is caused. But these Nerves enter the *substance* of the Kidneys in but very few and those small slips, whence it has but a dull sense. The emulgent Vessels as they penetrate this Membrane, are said to borrow from it a *Capsula* or common cover, (wherein they are both included;) as the Vessels of the Spleen, and the *Porta* and *porus bilarius* of the Liver, do from the Coat of their re- *2. Proper.*

ſpective *viſcera*, as was ſhewn above in their deſcription. But * *Bellini* ſays, that theſe Veſſels in the Kidneys borrow their *Capſula* from the Membranes of the *pelvis*, within which they are diſperſed preſently upon their entrance into the Kidneys, and ſpringing out of them again run to the cortical or ſuperficial part of the Kidneys clad with a common *Capſula* from thoſe Membranes.

* De ſtruct. Ren. p. 59, 60.

Subſtance. As to the *ſubſtance* of the Kidneys (excepting the vaſcular part) it has been thought by ſome Anatomiſts to conſiſt of concrete blood or a *parenchyma*: by others, of a peculiar carnous ſubſtance; by others, that it is of a double nature (becauſe of its different colour;) the outer part which is of a dull red, to be a peculiar *parenchyma* like that of the Liver; and the inner, which looks paler, to be carnous, but fibrous. But howſoever their *ſubſtance* may appear to the naked eye, *Malpighius* with his Microſcope hath diſcovered it to be far other than it has hitherto been apprehended. He ſays (*lib. de Renibus cap.* 1, 2, 3.) "That the Kidneys in Men are not of one continued frame, but conſiſt of ſeveral Globules, "as ſo many diſtinct Kidneys: That though in "grown Men their Superficies ſeems commonly "plain, yet it is unequal in Infants new-born; "and that in adult perſons the conjunction of "Globules does ſtill appear within from the diverſity of colour, which in the ſeveral Globules outwardly and towards their ſides, where "by they joyn one to another, is red, but more "pale towards their middle. Each Globule conſiſts of alike parts, namely of all thoſe which "the whole Kidney partakes of, *viz.* of Blood-veſſels, Nerves, Glands, excretory Veſſels, and "a *Papilla* in which the excretory veſſels termi-

"nate."

"nate.——If one take off the Membrane from "a freſh and as yet ſoft Kidney, there may by a "good Microſcope be diſcovered certain round "and very ſhort Bodies roll'd about like little "Worms, not unlike thoſe that are found in the "ſubſtance of the Teſticles being cut through "the middle, or on their ſurface when their co-"verings are removed: The way to diſcover "them is to pour Ink upon them, and then "gently wipe it off; by the help whereof one "may alſo diſcern, under the outmoſt ſurface, "wonderful branchings of veſſels with their Glo-"bules (or Glands) hanging at them, like Ap-"ples. But for this purpoſe 'tis beſt to inject "Ink by the Emulgent Artery; for thereby all "the branches of the Artery will be tinged black, "and ſo much of theſe Glandules as the capil-"lary Arteries run through. Hereby one may "alſo diſcover certain continued winding ſpaces "and *ſinus*'s running through all the outward "Superficies of the Kidneys. Then cut the Kid-"ney in at the back lengthways as deep as to the "*Pelvis*, and pour Ink upon it, which gently "wipe off with your fingers end, and you will "ſee innumerable ſmall pipes running from the "ſurface towards the *Pelvis* as their centre, "which look ſomething like fibrous or parenchy-"matous fleſh, but are indeed membranous and "hollow; which pipes make up a great part of "the ſubſtance of the Kidneys, and are the ex-"cretory Veſſels of the Urine. But if you would "plainly diſcover theſe *tubuli*, you muſt have a "ſpecial care (in cutting of the Kidney in two) "that you cut ſtreightways of them, and not "ſloping, for then you cut them in two, and ſo "cannot trace them in their progreſs. From "the Glands into which the extremities of the

" Arteries end, the roots of the Veins ariſe, and " he thinks that the Nerves reach to them too; " and that it is probable that the excretory veſ- " ſels of the Urine are extended ſo far alſo, ſeeing " this is conſtant in all Glands, that every little " Globule has beſides the Artery and Vein, a " proper excretory Veſſel, as the Bilary in the " Liver, *&c.* And he has obſerved that thoſe " ſame Pipes or Urinary Fibres running ſtreight " from the Glands towards the *Pelvis*, do many " of them terminate into one of the *Papillæ*, " through which the Urine is tranſcolated into " the *Pelvis*, for into it they jet out.] (Theſe *Papillæ* ſhall be deſcribed by and by.) By this curious and accurate deſcription of their ſubſtance, he has greatly diſpelled that miſt of ignorance that Anatomiſts hitherto were in concerning it. But to proceed.

Emulgents. 1. *Arteries.* The *Emulgent Artery*, ſpringing from the deſcending Trunk of the *Aorta*, enters the Kidney in its inner and hollow ſide, being firſt divided into two; but having entred it, theſe are ſubdivided into divers branches, which ſpreading themſelves between the coats of the *Pelvis*, ſhoot forth into ſmaller twigs; and theſe with the like twigs of the Veins borrowing a common *capſula* from thence, (according to *Bellini*, as was obſerved before) run through the whole ſubſtance of the Kidney, and end in the Glands afore-mentioned. By this Artery (being large) is much blood conveyed to the Reins, partly to nouriſh them, but chiefly that in their Glandules a good part of the *Serum* may be ſeparated from it, which being carried by the Urinary fibres or pipes to the *Papillæ* ouzes through them into the *Pelvis*.

2. *Veins.* The *Emulgent Vein* is a little larger than the Artery. It has the like branching within the Kidney

ney as the Artery; and its trunk coming out hard by where the Artery enters, opens into the *Cava*, into which it discharges the Blood remaining from the nourishment of the Kidney, now freed from a good quantity of *Serum* in the Glands. For that there passes nothing by this Vein to the Kidney is plain, *as* from the general office of Veins, which always carry from the part where their Capillaries are spread, (excepting the *Vena portæ*, which indeed has the office of an Artery) *so* from that notable Valve that is placed at its entrance into the *Cava*, looking towards it from the Kidney, so that the Blood may freely pass out of the Emulgent into the *Cava*, but not back again. The Emulgent Vein sometimes comes divided out of the Kidney, as the Artery goes in; but both the branches are presently united into one, and it always opens by one orifice into the *Cava*. The left Emulgent Vein is somewhat higher up than the right, according to the situation of the Kidneys themselves, of which the left stands a little higher.

Of the *Nerves* we have spoken before, discoursing of the proper Membrane of the Kidneys; to which we need add nothing more here. *Nerves.*

Many, particularly *Malpighius*, have endeavoured to discover *Lympheducts* in them, without effect: But *Casp. Bartholin* says, he can demonstrate them to the Eye, and that for the most part they run to a Gland placed below the Kidneys on the left side, where having formed a various *plexus* of Vessels, they tend to the Receptacle, being filled with *lympha* of a reddish colour. *Lymphe-ducts.*

Within the Kidney there is a membranous Cell or *Sinus*, called *Pelvis* or *Infundibulum*, (*i. e.* the Bason or Tunnel) which is nothing but an *The* Pelvis *and* Papillæ.

extenſion or dilatation of the head of the *Ureter*; for it conſiſts of the ſame Membranes and Nervous fibres with it. It has certain Appendices which run in betwixt the *papillæ*, which are extended into membranous *fimbriæ*, and theſe parting into numerous fibres run towards, and are inſerted into, the proper Coat of the Kidneys, and ſerve to ſtrengthen their ſubſtance and to make it more compact, ſo that it is not eaſily violated even by the moſt violent motions and contortions of the Loins where the Kidneys are ſeated. The cavity of the *Pelvis* is not round, but branches itſelf out into eight or ten (*Malpighius* ſays, twelve) open and large Pipes. Into it does the *Serum* iſſue from the Urinary Siphons through the *Caruncuæ Papillares* or *Mammillares*, for one of theſe ſtands at the head of each of the ſaid Pipes (being of an equal number with them) and are like Glandules, of a fainter colour, but harder than the reſt of the *Parenchyma*; they are about as big as a Peaſe, flattiſh above, but round or bunching out on that ſide next the *Pelvis*; their perforations are exceeding narrow, ſo that they will hardly admit the ſmalleſt hair. Each one is the centre to all the Urinary *tubuli* in one Globule of the Kidneys; and through them does all the Urine ouze into the *Pelvis*, and none through any pores of the *Pelvis*, as ſome heretofore have imagined.

The action of the Kidneys.

The *action* of the Reins is to ſeparate and evacuate the ſerous humour from the Blood, which as was ſaid, is brought to them together with the Blood, by the Emulgent Arteries; which is done in this order. After the two branches of the Emulgent Artery are enter'd the Kidneys, they are preſently each of them divided into four or five, and thoſe again into many more, till at laſt the

they end in the ſmalleſt Capillaries, which terminate in the Glandules towards the outer Superficies, whereinto they infuſe their liquor. Into the ſame Glandules are inſerted alſo the Capillary veins, and the Urinary ſiphons, each of which imbibe thence their proper liquor. By the Veins the Blood returns into the larger branches of the Emulgent Veins, from thence into the ſingle Trunk, and by it to the *Cava*, which conducts it to the Heart: But by the Urinary pipes does the *Serum* drill to the *Papillæ* or *Carunculæ*, placed at the entrance into the *Pelvis*, through which it diſtils into it. And this *Pelvis* being the head of the *Ureter*, the *Serum* glides readily out of it down by the Ureter into the Bladder.

But now it is very difficult to determine, whether this ſeparation of the *Serum* in the Kidneys be procured by any kind of efferveſcency or fermentation; or whether they ſerve merely as a ſtrainer, through which it is ſqueezed or tranſcolated. If it be ſeparated only this laſt way, how admirable is the configuration of the Pores, that the *Serum* with all its contents ſhould paſs by them without the leaſt drop or ſtain of blood, when yet often purulent matter, brought out of the *Thorax*, and throughly mixed with the blood, and which is far thicker than the blood it ſelf, paſſes through them with the *Serum*, and not any thing of blood at the ſame time! That ſuch purulent matter paſſes by Urine, is frequently obſerved; but whether it be abſorbed out of the Cavity of the *Thorax* by the mouths of the Veins gaping into it, as the Ancients thought it might; or it be bred in the *Parenchyma* of the Lungs apoſtemating, as is more probable, 'tis not a fit place here to enquire. As neither would it ſignifie much to give you the conjectures of ſome learned

Men, that becauſe ſuch *Pus*, and much more becauſe Pins, Needles, an Iron Nail, *&c.* have paſſed by Urine; that therefore there muſt be ſome more direct and patent way for part of the *Serum* to be convey'd by to the Bladder; and therefore have imagined that ſome Lacteals have been inſerted into the Bladder, as others have ſuppoſed other ways: for as far as could ever be diſcover'd by Anatomiſts, there is no footſtep of any ſuch paſſage, how plauſible ſoever ſuch an *Hypotheſis* may ſeem. And therefore we ſhall ſay no further of it. As to the fermentation whereby ſome ſuppoſe the *Serum* to be ſeparated from the Blood, thoſe who are for it affirm that a Ferment is ſent for this purpoſe from the *Glandulæ renales* (to be deſcribed preſently.) But this cannot be admitted, ſeeing there appears no way whereby ſuch Ferment can be communicated, as ſhall be further ſhewed by and by. And the want of ſuch a way may ſerve for a Refutation of that other Opinion which ſuppoſes the Humour collected in the *Glandulæ renales* to perform the office of a *coagulum* or Runnet to the Blood in the Kidneys, whereby the *Serum* is ſeparated from it like whey from milk.

Some have thought that the Kidneys, beſides the ſeparating of the *Serum*, do prepare matter for the Seed; ſeeing the ſpermatical Veſſels ſeem to have ſome manner of Communication with the Renal, the left ſpermatick Vein ariſing from the left Emulgent. But ſeeing the ſpermatick Vein returns blood from the Teſticles to the Emulgent, and carries nothing from this to them, this Opinion is exploded by the Circulation of the Blood. Yet however though they do not prepare Matter for Seed, yet by ſeparating the Salts and other Recrements, they amend the diſpoſition of the blood,

blood, so that it becomes more capable of being elaborated into Seed by the *Vasa præparantia* and *Testes*.

It is not absolutely necessary for the conservation of Life, that *both* the Kidneys should be continued in a capacity to perform these Actions, tho' they are better performed by them jointly. For sometimes the head of one Ureter is so plug'd up by a stone bred in the Kidney, that not a drop of *Serum* can pass by it; and otherwhiles the whole parenchymatous (or glandulous) part is so consumed by an ulcer, that no separation of the *Serum* can be made by it; and yet the *Serum* is sufficiently carried off by the other sound Kidney. Yea, Dr. *Ant. Nuck* tells us, That after having straitly tyed the Vessels coming unto and going from the Spleen and one Kidney, in a Dog, he has cut them both out; and having healed up the wound in the side by which he performed the Operation, the Dog has continued as well after as if nothing had ail'd him. *Whether necessary Paris.*

Above each Kidney at about half an inch distance there stands a Gland, first found out and described by *Bartholomæus Eustachius*, by some called *Glandulæ renales*; by others, *Renes succenturiati*; by *Bartholin*, *Capsulæ atrabilariæ*; by Dr. *Wharton*, *Glandulæ ad plexum nerveum sitæ*. Which several Names they have had given them, from the several Uses the Imposers have ascribed to them. Glandulæ renales.

They are commonly but two, and are placed over (but towards the inside of) the Kidneys, having the fat about the Kidney coming between. The left is nearer to the Diaphragm, standing higher than the right, but the right is nearer to the *Vena cava*. *Their situation.*

The

Figure and Substance. They are seldom of the shape of the Kidneys, but are of not much unlike *substance*. Their *figure* is often three-corner'd, having the shape of a Satchel with its bottom upward. Sometimes they are oval but flattish.

Magnitude. They are bigger in Children proportionably than in Men; for in the former they are near the bigness of their Kidneys (as may be guessed by the following figure of the Kidneys and these Glands in an *Embryo*;) but they do not increase as other parts do, so that in adult Persons they are not above two inches long and one broad. Commonly the right is bigger than the left.

Membrane. They are covered with a thin *Membrane*, which is knit very fast to the outer or adipose Membrane of the Kidneys.

Cavity. They have a manifest *Cavity* in their larger end, in which is contained a black and feculent Humour, that tinges the side of the Cavity. Into it there are a great many little holes gaping out of the substance of the Gland, according to Dr. *Wharton*; and it self opens into a Vein, but has a Valve placed just at the entrance, that permits the humour contained in the Cavity to flow out by the Vein, but hinders its return.

Vessels. They have *Veins* and *Arteries* commonly from the Emulgents, sometimes from the *Cava* and *Aorta*, and sometimes from the *Vasa adiposa*. Their *Nerves* come from the stomachick branch of the Intercostals, that runs to the proper Membrane of the Kidneys and to the Spleen also. *Lacteals* they have none. *Bartholin* affirms they have *Lymphaticks*.

Use. There have been divers conjectures of the *use* of these Glands, but none generally consented to as true. Dr. *Wharton*'s guess is, that some humour is imbib'd from the Spleen by the Nerves that

that are common to the Spleen and these Glandules (being both from one branch) and is deposited in their Cavity, which being not purely excrementitious (though perhaps unprofitable to the Nerves) is restored again to the Veins, as being of some use to the venal blood. Dr. *Glisson* also thinks they receive something from the Spleen, which being refin'd here is imbib'd again by the Nerves, by which it ascends to the Brain or Spinal marrow, and descends again by them, being either it self a *Succus nutritius*, or else a Vehicle for it. *Riolanus* thinks they are of no use at all in Men, but only in the *Fœtus* in the Womb. *Vesslingius*, *Bartholin* and many others think that they make a ferment, or *Coagulum* for the use of the Kidneys to help the separation of the *Serum* from the Blood. And this indeed were a probable use if there could be found out any way whereby ought could conveniently pass from hence to the Kidneys. But the Veins that go out of them are inserted either into the Emulgent Vein or into the *Cava*, whose Blood is flowing *from* the Kidneys, so that it cannot pass *to* them, unless one would suppose a contrary course of humours in the same Vessel, which seems absurd. And there are no other Vessels to serve this turn. *Diemerbroeck* conjectures, that their black juice is made of the Arterial Blood, and acquires a certain fermentative power necessary for the Venous Blood, into which it is received by the *Cava*, from the Veins that go out of these Glandules. But this, says he, is but a conjecture. And in truth all the other Opinions are no more, nor very probable ones neither; so that we must still acknowledge our Ignorance of their true Use.

Tab.

Tab. V.

Fig. I. Repreſents a Kidney cut in two lengthways, from the Back to the *Pelvis*.

AA *The glandulous part of the Kidney.*
BB *The* Tubuli urinarii *or Siphons, which convey the Urine ſeparated by the Glands, into the* Pelvis C.
D *The mouth of the* Ureter.

Fig. II. Shews the Aſpect of a Kidney cut lengthways from the *Ureter* to the *Pelvis*, from *Bellini*.

AAA *The Kidney diſſected as is ſaid.*
B *Half of the* Ureter *bent toward the right hand.*
C *The other half of the* Ureter *bent to the left hand.*
D *A branch of the Emulgent Vein.*
E *A branch of the Emulgent Artery.*
F *The* Pelvis *opened.*
GG *Some of the* Papillæ *through which the Urine iſſues into the* Pelvis.
I *The beginning of the* Ureter.

Fig. III. Repreſenteth the Kidneys and *Capſulæ Renales* in the ſame proportion as they appeared in an Abortion ſuppoſed to be about five months old, communicated to me by Dr. *E. Tyſon*.

AA *The* Glandulæ Renales, *which were rather bigger than the Kidneys themſelves.*

BB *The*

Tab. V.

fig. 1.

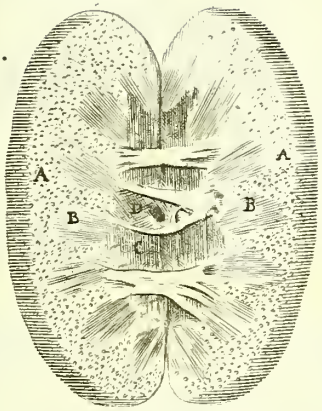


fig. 2.

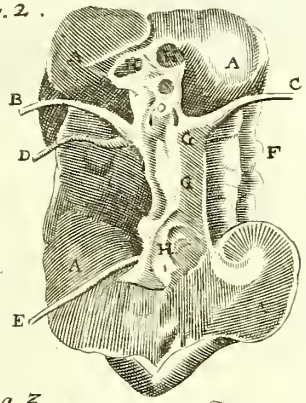
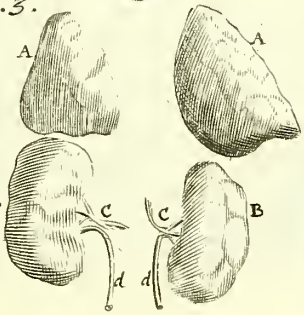


fig. 3.



The Spleen of the same Abortion.

BB *The Kidneys, whose surface is very uneven, being divided into several Bodies as a Bullock's Kidney is.*
cc *The Emulgent Vessels.*
dd *The Ureters.*

CHAP. XVIII.

Of the Ureters.

THE *Ureters*, in Latin *Meatus urinarii*, are called in Greek οὐρητῆρες, either from οὐρέειν, *to piss*, or ὅτι ἔχειν τὴν οὖρον, becauſe they *keep the Urine.* *The Ureters.*

They ariſe out of the inner *Sinus* or *Pelvis* of the Kidneys, coming out on their inner or concave ſide contiguous unto (but on the under ſide of) the Emulgents. *Their Origine.*

There is one on each ſide. *Number.*

They are ſomewhat like to Veins, but whiter, thicker, and more Nervous. They reach from the Kidneys to the Bladder, not in a direct line, but ſomething crooked like an Italick *ſ*. They are a little above a ſpan long, and as thick as a Barley-ſtraw naturally. But in ſuch as have had large Stones deſcend by them from the Kidneys to the Bladder, they have ſometimes become almoſt as wide as a ſmall Gut. *Subſtance and Figure.*

Their *Coats* are almoſt like thoſe of the Stomach and Guts, the inmoſt and outmoſt tendinous, and the middle carnous made up of two ranks of Fibres. They receive ſmall *Veins* and *Arteries* from the neighbouring parts. As to their *Nerves*, Dr. *Willis* ſaith, That after the Intercoſtals have ſent forth all the Meſenterick Nerves, each Trunk deſcending ſends forth three or four ſeveral *Coats and Veſſels.*

several slips that are carried into the Ureters, which makes the pain so very exquisite when some viscid matter or stone sticks in them.

Passage and Insertion. As they go out of the Kidneys they pass over the Muscles *Psoæ* (which bend the Thigh) between the two Membranes of the *Peritonæum*, and descending as aboveſaid, they are inserted in the lower side of the Bladder, (near its neck) running between its two proper Coats about the length of an Inch, and continued with the inner.

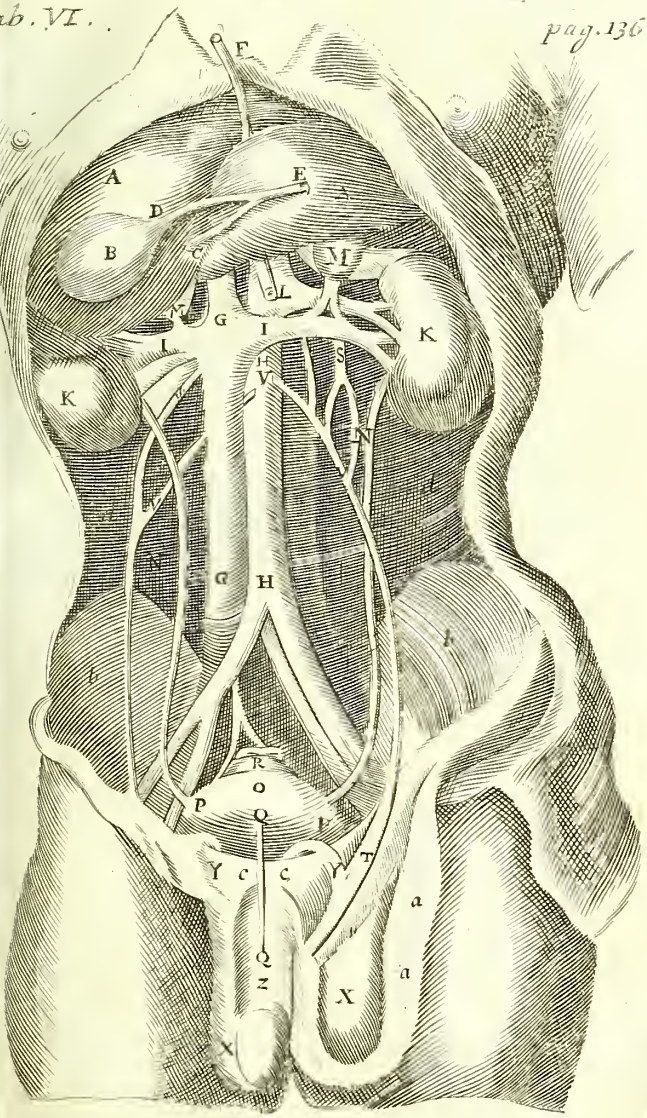
Why the Insertion is oblique. This insertion is thus oblique, to hinder the regurgitation of the Urine, when the Bladder is either distended with Urine, or compressed in making water; for here is no Valve, as some have affirmed.

Use. Their *use* is to receive the Urine separated from the Blood in the Kidneys, and to convey it into the Bladder, thence at discretion at certain times to be emptied out of the Body.

Tab. VI. shews the Liver, Kidneys, Bladder, Testicles, *&c.*

AAA *The sinous or hollow part of the Liver.*
B *The Gall-bladder.*
C *The* Ductus bilarius.
D *The Neck of the Gall-bladder.*
E *The* Ductus communis.
F *The Umbilical Vein turn'd upwards.*
GG *The descending Trunk of* Vena cava.
HH *The descending Trunk of the great Artery.*
II *The Emulgent Veins.*
KK *The Kidneys in their natural situation.*
LL *The Emulgent Arteries.*
MM *The* Glandulæ Renales, *with the Veins that go from them to the Emulgents.*

NN *The*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NN *The Ureters descending from the Kidneys to the Bladder.*
O *The bottom of the Bladder.*
PP *The insertion of the Ureters into its sides.*
QQ *A portion of the* Urachus.
R *A portion of the streight Gut cut off.*
SS *The* Venæ præparantes, *the right whereof springs out of the Trunk of the* Cava, *the left out of the Emulgent Vein.*
T *The* Corpus pyramidale *expreſt on the left side.*
V *The riſe of the* Arteriæ præparantes *out of the trunk of the* Aorta.
uu *Their reception into one common cover with the Veins.*
XX *The Teſticles, the left whereof is diveſted of its common Coat.*
YY *The* Vaſa deferentia, *aſcending from the* Teſtes *to the* Abdomen.
Z *The Yard.*
aa *The Cod, that cover'd the left* Teſtis, *ſeparated from it.*
bb *The* Oſſa ilia.
cc *The* Oſſa pubis.
dd *The Loins.*

CHAP. XIX.

Of the Bladder.

THE *Bladder* is called in Latin *Veſica urinaria*, in Greek κύστις ἐυρώχ, from its office of *receiving the Urine.* *The Bladder. Its name,*

It is ſeated in the *Hypogaſtrium*, betwixt the two Coats of the *Peritonæum*, in that Cavity that is formed of the *Os ſacrum*, *coxæ* and *pubis*, and is called *Pelvis.* In Men it lies upon the *Inteſtinum* *Seat and Connexion.*

rectum,

rectum; in Women it adhers to the Neck of the Womb, which is placed betwixt the Bladder and the ſtreight Gut: in both it is knit before to the *Oſſa pubis*. Moreover it is knit to the Navel by the *Urachus*.

Its ſubſtance is made up of three *Membranes*.

Membranes The firſt and outmoſt is borrowed from the *Peritonæum*. *Riolanus* ſays, this Coat is a duplicature of the *Peritonæum*, within which the Bladder lies hid ſuſpended like a Bottle turned the mouth downwards. On its outſide in Man it is beſmear'd with fat, but not in Beaſts.

The ſecond is thicker, and endued with carnous Fibres; yea *Aquapendens*, *Spigelius*, *Walæus*, and *Bartholin*, will have it to be a true Muſcle, ſerving for the compreſſion of the Bladder, to ſqueeze out the Urine, as the Sphincter ſerveth for conſtriction, to retain it.

The third and innermoſt is white and bright, of exquiſite ſenſe, as thoſe can witneſs who are troubled with the Stone.

Within, it is covered with a ſlippery mucous humour, ſuch as the Gall-bladder has on its inſide, and ſuch as the Inteſtins abound with: which without doubt muſt be ſpued out of ſome Glands in this inmoſt Coat, though they be hardly diſcernable. This doth defend it from the acrimony of the Urine.

Fibres. Its Membranes have all ſorts of *Fibres*. And when theſe Membranes and Fibres are too long or too far extended with plenty of Urine, they loſe the power of contracting themſelves, whence there inſues a ſtoppage of Urine.

Perforations. It is *perforated* in three parts, *viz.* in the Sides, where the Ureters are inſerted, to let in the Urine; and before at its neck, to let it out.

Parts, viz. It hath two *parts*, to wit, the Bottom and the Neck.

The

The *Bottom* comprehends the upper, wider and more membranous part of the Bladder, to which the *Urachus* being tyed reaches the Navel, which, together with the bordering Umbilical Arteries, becomes a ſtrong Ligament in the adult, hindering the Bladder to preſs upon its neck. But as for the Arteries, *Riolanus* * affirms, That they contribute nothing to the ſuſpenſion of the Bladder, neither reaching to the Navel in the adult, nor touching the body of the Bladder. Of the *Urachus* ſee after, chap. 33. *Bottom.*

* *In animadv. ad Bauh.*

The *Neck* is lower than the bottom, and ſtraiter. In Men it is longer and narrower, and being carried to the riſe of the Yard opens into the *Urethra*; in Women it is ſhorter and wider, and is implanted into the upper ſide of the *Vagina* of the Womb; In both it is carnous and muſcular, woven of very many Fibres, eſpecially tranſverſe or orbicular, which lye hid within the ſtreight Fibres that ſurround the whole body of the Bladder, and theſe make the Sphincter, which conſtringes the neck of the Bladder ſo, as no Urine can paſs out againſt ones will, unleſs when it is affected with the Palſie or other malady, by which there ſometimes happens an involuntary piſſing. *Neck.*

The Bladder is oblong and round, in *ſhape* like unto a Pear. *Figure.*

Its *Cavity* is but one ordinarily; yet ſometimes it has been found to have a membranous partition, that divides it into two; which yet had a hole in it for the communication of one Cavity with the other. Such a partition was obſerved in the Bladder of the Great *Caſaubon*. *Cavity.*

It hath *Arteries* and *Veins* from the *Hypogaſtrica*, which are inſerted into the ſides of its Neck, *Veſſels.*

where they are immediately branched into two whereof one is ſpent upon the Neck, and the other on the bottom. *Nerves* it hath (according to Dr. *Willis*) from the loweſt *Plexus* of the Intercoſtals in the *Abdomen*, and from the Marrow of *Os ſacrum*. For the ſaid *Plexus* ſending two Nerves into the *Pelvis*, they have each of them a Vertebral Nerve joyned to them, and ſo make two new *Plexus*, from one of which there paſſes a Nerve, that being divided into many branches is on each ſide diſtributed into the Bladder and its *Sphincter*.

Uſe. The *uſe* of the Bladder is to receive the Urine from the Ureters, and to contain it, like a Chamber-pot, until the time of excretion, when it is ſqueezed out of it by the help partly of its own carnous Membrane, and partly of the Muſcles of the *Abdomen*.

Obſervations. *Bartholin* quotes ſome Obſervations of *Borrichius* concerning the Bladder, worthy to be noted, *viz.* If it be boil'd in acids, it turns into a Mucilage; if in ſalt liquors, it is thickned; if in oleous, or in the liquor of the Alkali ſalts of Tartar or Herbs burnt to aſhes, it is neither thickned nor turns into a Mucilage, but is burnt as if it were laid on burning Coals, and may almoſt be crumbled to powder. By which, ſays he, it appears, with what great danger to the Bladder, Men inject into it either acid, ſalt, or oleous liquors for breaking the Stone.

CHAP.

CHAP. XX.

Of the Vasa præparantia *in Man.*

HItherto we have handled the parts miniſtring to *Nutrition*, whereby the Nutrients are prepared in the lower Belly for the ſuſtentation of an individual body, (and their excrements ſeparated, and diſcharged out of the body;) Now we come to the Organs of *Generation*, whereby through procreation is conſerved a perennity of Mankind, which Nature hath denied to particulars. Theſe parts being not alike in both Sexes, we muſt neceſſarily treat of each apart, and firſt of thoſe of Men.

The parts of the Genitals in man.

In Man ſome of theſe parts afford matter for the Seed, to wit, the *Arteriæ ſpermaticæ*; others bring back again the Blood that is ſuperfluous to the making of the Seed and to the nouriſhment of the Teſticles, and theſe are the *Venæ ſpermaticæ*; and both theſe Arteries and Veins were formerly called *Vaſa præparantia*: ſome make the Seed, as the Stones; ſome convey it from thence into its conſervatory or ſtore-houſe, as the *Vaſa deferentia*: ſome contain the Seed till the time of Copulation, and theſe are the *Veſiculæ ſeminales*: ſome diſcharge the Seed into the Matrix in coition; this is done by the *Penis*: and ſome, laſtly moiſten the paſſage, (*viz.* the *Urethra*) whereby the Seed iſſues, and thoſe are the Proſtates. All which in order. And firſt, of the

Vaſa præparantia.

Vaſa præparantia, which are ſaid to prepare matter for the Seed. Theſe are of two ſorts, *Arteries* and *Veins*.

Arteries. The *Arteries* are two, and ſpring from th Trunk of the *Aorta*, commonly two Finger breadth under the Emulgents, not from its ſide but out of its fore-part, the right whereof climb ing over the Trunk of the *Vena cava*, runs ob liquely to the Vein of the ſame ſide; as alſo th left, marches to the Vein of that ſide.

Veins. The *Veins* are alſo two. The right ariſes uſu ally from the Trunk of the *Vena cava*, a little be low the Emulgent; the left from the Emulgen it ſelf, for otherwiſe it muſt have gone over th *Aorta*, whereby it might have been in danger c breaking; or rather by the continual pulſe of th Artery, the recourſe of the Venal blood migh have been retarded. Now both theſe Veins an Arteries a little after their riſe meet, and are ir veſted both in one Membrane made of the *Perit næum*, and then run ſtreight through the regio of the Loins above the Muſcles *Pſoæ* on eac ſide, and above the Ureters; as they go, beſtow ing little ſlips here and there upon the *Peritona um*, between whoſe duplicature they deſcen and ſo arrive at its proceſſes. The Veins divid very often into many branches, and by and b inoſculate and unite again; but the Arteries g along by one Pipe only on each ſide, until witl in three or four Fingers breadth of the Stone where each is divided into two branches, the le whereof runs under the *Epididymis*, the larg to the Teſticle. And as I ſaid they deſcende betwixt the Membranes of the *Peritonæum*, t they paſs into the *Scrotum* between them, n perforating them in the proceſſes, as in Dogs an other Creatures, wherein the proceſſes of the *P ritonæum* are hollow like a Quill; but in Man th inner Membrane of the *Peritonæum* ſhuts the hol leſt the Inteſtins fall by it into the Cod; whi

which there is greater danger in him, (and we see it often happen) because of his going upright. But to return to the *Vasa præparantia*. It has been generally taught that there are divers inosculations of the Arteries with the Veins in their passage, whereby the Venal and Arterial blood are mixed; but this Opinion is now exploded, for that, granting the circulation of the Blood, it is impossible. For the Blood in the Arteries descends towards the Testicles, and that in the Veins ascends from them, so that if these two Vessels should open one into the other, the blood in one of them must needs be driven back, or else, stagnating, distend and break the Vessels. But the truth is, the blood both for the nourishment of the Testicles and the making of Seed flows down by the Arteries only, and that in an even undivided course, without any of those windings and twirlings like the Tendrels of Vines talk'd so much of, (as the curious *de Graef* from his own frequent inspection testifies:) And the Veins bring back from the Testicles what of the blood remains from their nourishment and making of Seed, and these indeed come out of their inmost Membrane by almost innumerable roots by which they imbibe the said blood, and are most admirably interwoven and inosculated one with another till about four or five Fingers breadth above the Testicle, which space is called *Corpus pyramidale*, *Plexus pampiniformis*, or *Varicosus*; but these Veins are so far from preparing the Seed, as that they only bring back what was superfluous from the making of it. And indeed the *Arteries* in Men do no more merit the name of *Præparantes* in respect to the Seed, than the *Gullet* in respect of the Chyle, or the *Ductus thoracicus chyliferus* in regard to the Blood; for their

blood acquires no ſenſible alteration till it co
to the Teſticles themſelves. But however
continue the old names, declaring only agai
the reaſon of them. And we will only note t
things more. Firſt, That the Spermatick ve
have from their riſe to their end ſeveral *Val*
which open upwards, and ſo ſuffer the blood
aſcend towards the *Cava*, but not to ſlide b
again. Secondly, That though the Spermat
Arteries go ſuch a direct courſe in Men, as
been ſaid; yet in Brutes they are more comp
cated and twiſted with the *Veins*, but witho
any anaſtomoſes of one into the other.

There are *Nerves* and *Lympheducts* that acco
pany theſe *Vaſa præparantia*: of which in t
next Chapter.

CHAP. XXI.

Of the Stones, or Teſticles, the Scrotum, *a the* Epididymidæ.

The Stones. Their name.

THE *Stones* in Latin are called *Teſtes*, eith
becauſe they *teſtifie* one to be a Man, or b
cauſe amongſt the *Romans* none was admitted
bear *witneſs* but he that had them. In Greek th
are called ὄρχεις, κώμοι, and alſo δίδυμοι, *Twin*
becauſe according to Nature they are alwa
two.

They are principal parts.

They are reckoned among the principal part
and that juſtly; for though they are not nece
ſary to the life of the *Individual*, yet they are,
the conſervation of the *Species*. Yea and by t
loſs of them the *Individual* receives very gre
prejudice both as to the ſtrength and activity

h

his body, and as to the acuteneſs of his reaſon, *&c.* according to that of *Avenzoar*, *In Eunuchis malos agnoſcimus mores, rationis ſunt peſſimæ, ——intellectûs diminuti.*

They have a peculiar *ſubſtance*, (ſuch as is not in all the Body beſides) whitiſh and ſoft, made up of innumerable little ropes of Seed-carrying veſſels, which are continued (and by very thin Membranes tyed) to one another, carrying the Seed in their undiſcernable hollowneſs. The way to make theſe *Veſſels* viſible, *de Graef* has taught us, *viz.* Tye faſt the *Vas deferens* in a live-Dog or other Brute, and then theſe internal Ropes of veſſels otherways inconſpicuous, will preſently be ſo filled and diſtended with ſeminal matter, as that they may be eaſily diſcerned. *Galen*, Dr. *Wharton*, and of late *Peyerus*, *&c.* reckon them amongſt the Glands, and that with good reaſon. *Their ſubſtance.*

They are in *Number* two, hanging without the *Abdomen*, at the root of the Yard, in the Cod. Their *Figure* is oval, onely a little flattiſh. Their *Bigneſs* differs very much in ſeveral Perſons; as big as a Dove's Egg is reckon'd a mean ſize. *Hippocrates* held the right to be bigger and hotter than the left, and therefore called it ἀῤῥηνόν, the *Male-getter*, as the left θηλυκόν, the *Female-begetter*. But theſe are fancies that are obſolete, and indeed ſeem ridiculous, ſeeing there is no ſuch difference of their bigneſs, and that their Veſſels are common. *Number, Situation, Figure, and Magnitude.*

They have *Arteries* and *Veins* (as was ſaid before) from thoſe called *Vaſa præparantia*. Which ſome have thought to reach onely to the inmoſt Coat called *Tunica albuginea*, becauſe they are not conſpicuous in the inner ſubſtance of the Teſticles. But though this may be true of the Veins, *Veſſels.*

which onely receive the ſuperfluous Arterial Blood, and have nothing to do with the Seed yet it is not true of the Arteries, namely of the moſt numerous branches of them. Indeed Blood is ſeldom ſeen in the ſubſtance of the Teſticles, but that comes to paſs by reaſon that the Arterial Blood preſently loſes its colour, and by the ſeminifick faculty of the Stones is turned into Seed, which being whitiſh, of the ſame colour with the Veſſels, makes them undiſcernible. Yet in thoſe men that have died of languiſhing Diſeaſes, and whoſe *Teſtes* have their faculty impaired, *Diemerbroeck* affirms that he has oft diſcover'd ſanguiferous veſſels in the inmoſt parts of the Stones, and has ſhew'd them to many in the publick Anatomical Theatre. As for *Nerves*, Dr. *Willis* ſays he could never obſerve more to go to them than one from a Vertebral pair, and that too was moſt of it ſpent upon the Muſcle *Cremaſter*. *Diemerbroeck* agrees to one Nerve, but thinks it proceeds from the ſixth pair, (which is Dr. *Willis*'s Intercoſtal, as diſtinguiſh'd from that commonly called the ſixth, but his eighth.) Others will have branches from both theſe Nerves to go to them. Concerning the uſe of theſe Nerves there is great controverſie. Dr. *Gliſſon*, *Wharton*, &c. will have them to convey a *Succus genitalis*, which makes the greateſt part of the Seed. Dr. *Willis*, as he denies (*in Cerebri Anatome*, cap. 27.) any *Succus nutritius* to be conveyed by the Nerves to other parts, ſo that any *Succus genitalis* is brought by them hither, but onely animal ſpirit. And whereas to ſtrengthen the former Opinion, 'tis uſually objected, That the Seed muſt needs conſiſt of a nervous Juice and plenty of ſpirits brought from the Brain, becauſe of the great debility and enervation that is induced

ced upon the Brain and Nerves by the too great expence of it: he thus anſwers, That this comes to paſs, becauſe after great profuſions of Seed, for the reſtauration of the ſame humour (whereof Nature is more ſollicitous than for the benefit of the Individual) a greater tribute of ſpirituous liquor is required from the Bloud to be beſtowed on the Teſticles: wherefore the Brain being defrauded of a due income and afflux of the ſaid ſpirituous liquor, languiſhes; and ſo the animal ſpirits failing in the fountain, the whole Nervous ſyſtem becomes depauperated and flaggy. Whereto may be added, that alſo the animal Spirits themſelves that actuate the *Proſtates*, being derived from the Spinal Marrow, are much waſted by venereal Acts; ſo that for this reaſon beſides, the Loins are enervated.] In this anſwer *Bartholin* acquieſces. And *de Graef*, *Diemerbroeck*, &c. confeſs indeed that the ſpirituous Arterial Blood is impregnated with Animal Spirits from the Nerves, but affirm, that the matter out of which the Seed is elaborated, is onely the ſaid Blood; and to theſe we ſubſcribe. *Lympheducts* they have alſo ariſing from betwixt their Coats, and aſcending upwards into the *Abdomen* with the *Vaſa deferentia*. Theſe have many Valves looking upwards, which hinder any thing from deſcending by them to the *Teſtes*, but permit the *Lympha* to aſcend, which they convey into the Chyliferous Veſſels. *Malpighius* thinks it not improbable, that ſome fat is derived to the ſeminary Veſſels, for the generation of Seed, or at leaſt to be mixt with it; ſeeing moſt Creatures grow the fatter upon being gelt.

They have two ſorts of *Coats*, proper and common. *Coats.*

The

The Cod. The *common* inveſt both the *Teſtes*, and are two. The outermoſt conſiſts of the *Cuticula* and True skin (here thinner than in other places.) This is called *Scrotum*, hanging out of the *Abdomen* like a Purſe. It is ſoft and wrinkled, and is generally affirmed by Anatomiſts to be without fat. On the outſide it has a Suture or Seam, that runs lengthways of the Cod, and divides it into the right and left ſide. The other or inner common Coat, is a carnous membrane, which ſeems to be muſcular, becauſe of the power it has to contract and wrinkle it ſelf. It is called *Διάρτος*, and adheres to the proper Coat next under it (called *Vaginalis*) by many membranous Fibres.

This is the common account of this part that all Anatomiſts have uſually given: But lately Dr. *Fred. Ruyſch* affirms, "That it has the *membrana* "*adipoſa* alſo under the *carnoſa*, or rather that "the *carnoſa* is fatty (on the inſide) as it is in o- "ther parts of the body. And beſides, *he ſayes*, "that in the *Scrotum* there is a *Septum* within di- "viding it into two parts, of which, ſayes he, "you have nothing in *Veſalius*, *Bartholin*, *Ver-* "*heyen*, *de Graef*, &c. Men that have otherwiſe "deſerved very well of Anatomy: And what "wonder? ſeeing all things about the *Scrotum* of "one newly dead are ſo ſlippery and moveable, "that the true conſtitution of the *Septum* can "hardly appear. Wherefore if any would de- "monſtrate this, the *Scrotum* is to be blown up, "and to be cut open after 'tis dried, by which "means the *Septum* yields it ſelf to view, and "has an infinite of bloud-veſſels running through "it.] Thus he.

The *proper* Coats are alſo two, and theſe encloſe each Stone apart. The outer is called *Elytroides*,

troides, or *Vaginalis*; becauſe it contains the Stone *as a ſheath*. It is a thick and ſtrong Membrane, having many *Veins*. In the outſide it is uneven, by reaſon of the Fibres by which it is knit to the *Dartos*; but in the inner ſide it is ſmooth. This is nothing elſe but the production of the *Peritonæum*, even as the *Scrotum* is of the Skin and *membrana carnoſa* of the *Abdomen*. Into this coat is inſerted the Muſcle *Cremaſter*, of which preſently. The inmoſt is ὑμὴν νευρώδης the *Nervous membrane*, called *Albuginea*, from its colour. It is white, thick and ſtrong, framed of the external Tunicle of the *Vaſa præparantia*. It immediately enwraps the Stone, towards which it is rough, but on the outſide next the *Vaginalis* it is ſmooth; and between theſe two the Water is contained in an *Hernia aquoſa*.

Into the outer of the proper Membranes (as was ſaid) is inſerted the *Muſcle Cremaſter*. Theſe Muſcles (to each Stone one) have their riſe from the *Oſſa pubis*; and almoſt encompaſſing round the proceſſes of the *Peritonæum* deſcend with them to the Teſticles; where their carnous Fibres run through the whole length of this ſame *Tunica vaginalis*, eſpecially in its lower part, and ſo keep the Stones ſuſpended, from whence they have their name (from κρεμάζω *ſuſpendo.*) From their ſpreading themſelves thus on the outſide of the outer proper Coat, *Riolanus* reckons them for a third proper Coat, calling it *Erythroides*: and becauſe by its carnous Fibres it makes the *vaginalis* look *red*, ſuch as take it not for a diſtinct Coat, do give the name of *Erythroides* alſo to the *Vaginalis*, calling it by either name indifferently. Theſe Muſcles pull up the Stones in the act of generation, that the Veſſels, being ſlackned, may the more readily void the Seed: *Muſcles.*

and

and at other times they help to ſuſtain their weight.

Theſe Muſcles in ſickneſs and old age become flaggy, and ſo the *Scrotum* relaxing it ſelf, the Stones hang low.

Epididymidæ. Upon the Stones as yet clad with the *Tunica albuginea*, are fixed the *Epididymidæ* (called alſo *Paraſtatæ*, *Standers by*, or *Aſſiſtants*) enwrapped in the ſame Coat with the Spermatick veſſels. They adhere cloſer to the Teſticles at their ends than in the midſt. *De Graef* defines them to be *Veſſels making with their various windings that Body that is fix'd on the back of the Teſticles.* To find out their ſubſtance, he directs us thus. "Firſt, "take off the Membrane that encompaſſes them "and knits them to the Stones, and then there "will appear many windings, which with the "edge of a Knife may without hurting the Veſ- "ſels be ſo eaſily ſeparated from one another, "that they may be drawn out into a length like "a thing folded: for they are only folded from "one ſide to the other, and are kept in that ſite "by the Membrane received from the *Tunica* "*albuginea*, (or *Spermatick veſſels.*) But when "you have unravel'd half of them, you muſt cut "another very thin Membrane, and then you "will ſee other Veſſels lye juſt like theſe, and "may be unlooſed like them. And the whole be- "ing unravel'd, the thicker they are by how "much further from their origine, which is im- "planted into the upper part of the Teſticle by "ſix or ſeven ramifications: which having run "ſo far as where they joyn into one duct, make "it as thick as a ſmall thread; and this by de- "grees ſo thickens, that being encreas'd like a "cord it makes the *Vas deferens*, (of which in "the next Chapter.)

"So

pag. 152.

Fig. 1.

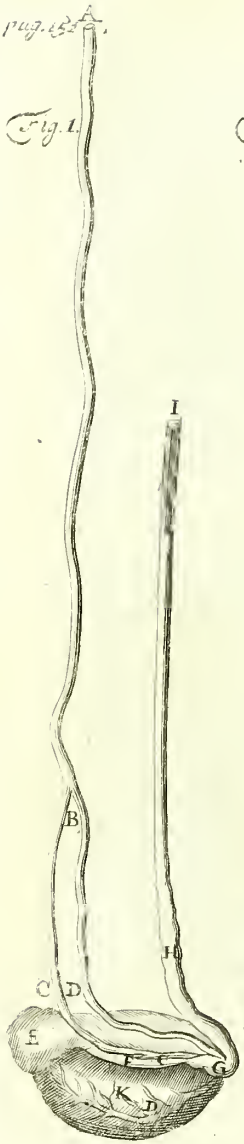


Fig. 2.

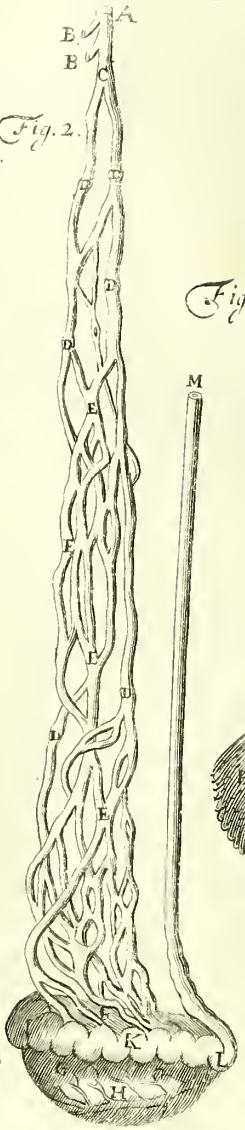
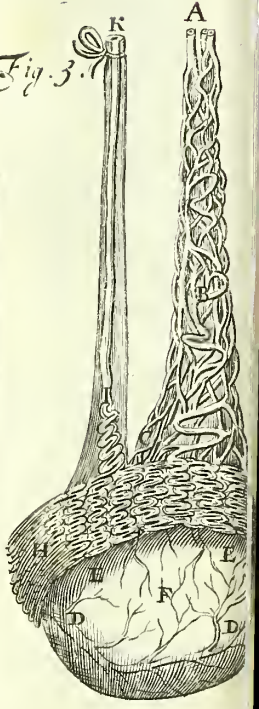


Fig. 3.



"So that (faith he) it is clear from hence, "firſt, that the *Teſtes* do not differ from the "*Epididymidæ* (or *Paraſtatæ*) ſaving that thoſe "conſiſt of divers ducts; but theſe, after their "ſix or ſeven roots that ariſe out of the Teſticle "are united, (which they are in a ſhort ſpace) "but of one, only a little thicker. Secondly, "that the *Epididymidæ* differ not from the *Vaſa* "*deferentia*, ſaving that the former go by a ſer- "pentine winding paſſage, and theſe by a "ſtreight, and that thoſe are a little ſofter and "narrower. And ſo (concludes he) following "this *Ariadne*'s thread we have happily made "our way out of the Labyrinth of the *Teſtes* and "*Epididymidæ*.

Uſe.

The *Uſes* of the *Stones* are two:

The firſt is to elaborate the Seed by the ſeminifick faculty reſident in them. For they turn a good part of the Blood, which is brought by the *Arteriæ præparantes*, and impregnated with Animal ſpirit, into Seed; ſome is ſpent on their own nutrition; and what remains from both, is carried back by the Veins called *Præparantes*.

The ſecond is, to add heat, ſtrength and courage to the Body, as gelding doth manifeſt, by the which all theſe are impaired.

Tab. VII. ſhews the *Vaſa præparantia*, *Teſtes*, *Epididymidæ*, *Vaſa deferentia*, &c.

Figure I.

A *The Artery preparing Seed, running from the Trunk of the* Aorta *to the Teſticle.*

B *Its diviſion into two branches.*

CC *The leſſer branch thereof, which runs to the* Epididymidæ.

DD *The*

DD *The greater, which is implanted into the upper part of the Testicle, and descends along its back towards its lower part, to which the smaller end of the* Epididymis *is annexed; then it goes back again along the Belly of the Testicle, where it is divided into many branches.*

E *The greater end of the* Epididymis *knit close to the upper part of the Testicle.*

F *The middle part of the* Epididymis *turn'd up, that the ramifications of the Artery that run along its lower part, may be seen.*

G *The smaller end of the* Epididymis *sticking firmly to the lower part of the Testicle.*

H *The end of the* Epididymis, *or beginning of the* Vas deferens.

I *The* Vas deferens *cut off, before it come to behind the Bladder.*

K *The Testicle placed so as that its Vessels may best be seen.*

Figure II.

A *The Vein said to prepare Seed running from the Trunk of the* Vena cava *to the Testicle.*

BB *The branches of the* Vena præparans *tending to the Caul and* Peritonæum.

C *The first division of it into two branches, which afterwards are wonderfully subdivided and united again.*

DDDDD *The Valves of the* Venæ præparantes, *about which the Veins being blown up appear knotty.*

EEEE *Very many divisions and unions of the* Venæ præparantes, *that the Blood superfluous from the generation of Seed, being detained in one ramification, may return to the Heart by the other.*

F *The upper part of the Testicle into which the ramifications of the* Vena præparans *are implanted.*

G *The*

G *The ramifications of the* Venæ præparantes *creeping along the ſides of the Teſticles through their white Coat.*
H *The Body of the Teſticle.*
I *The bigger end*, K *the middle, and* L *the ſmaller end of the* Epididymis.
M *The* Vas deferens *cut off almoſt in the middle.*

Figure III.

A *The Preparing Veſſels cut off.*
B *The Preparing Veſſels as they run to the Teſticles.*
C *The ramifications tending to the* Epididymidæ.
D *The greateſt branch of the* Arteria præparans *running along the Belly of the Teſticle.*
EE *The ramifications of the* Venæ præparantes.
F *A Dog's* Teſticle *ſwelled with Seed.*
G *The bigger end of the* Epididymis *turgid with Seed.*
H *The leſſer end likewiſe turgid with Seed.*
I *The end of the* Epididymis *or the beginning of the* Vas deferens.
K *The* Vas deferens *of a Dog tied before the* Coitus, *the preparing Veſſels being unhurt, that the Seminary Veſſels being filled with Seed may be ſeen more apparently.*

CHAP. XXII.

Of the Vaſa deferentia, Veſiculæ ſeminales, *and* Proſtatæ.

OUT of the *Epididymidæ* at their ſmaller end ariſe the two *Vaſa deferentia*, otherwiſe called *Ejaculatoria*, as if in *Coitu* the Seed were ſquirted

Vaſa deferentia.

ſquirted from the Stones through them; which indeed was the common Opinion till the *Veſiculæ ſeminales* were found out, which are now known to be the ſtore-houſes of the Seed, and not the Stones. So that the *Vaſa deferentia* deſerve not the name of *Ejaculatory*, except it be that part of them which reaches from the *Veſiculæ ſeminales* to the *proſtatæ*, through which indeed the Seed is darted in copulation.

Their deſcription. They are white, hardiſh bodies, like a pretty large Nerve, with a Cavity not very diſcernible, but which may be made ſo, if one open one of them ſix or ſeven Fingers breadth above the Teſticle, and then either blow into it with a ſmall Pipe, or ſquirt ſome colour'd liquor into it with a Syringe towards the *Teſtis*, for then the veſſel will be diſtended, and the colour will run along its Cavity towards the *Epididymidæ*: Or if you either blow, or ſquirt liquor by a Syringe the other way towards the *Veſiculæ ſeminales*, the ſaid *Veſiculæ* will be diſtended.

Progreſs. Now from the *Epididymidæ* theſe *Vaſa deferentia* aſcend, and paſs out of the Cod into the *Abdomen* the ſame way by which the *Vaſa præparantia* came down, *viz.* by the proceſs of the *Peritonæum*. When they are entred the *Abdomen*, they are carried preſently over the Ureters, and turning back again they paſs to the backſide of the Bladder; between which and the *Inteſtinum rectum* they march at a little diſtance the one from the other till about the Neck of the Bladder, where they grow wider and thicker: and then juſt as they are going to meet, their ſides open into the *Veſiculæ ſeminales*, in which they depoſite the Seed; but not terminating here, but coming cloſe together and growing ſmaller and

ſmaller,

smaller, they go on and end at the *Urethra* betwixt the *Prostatæ*.

These *Vesiculæ* are little Cells like those in a Pomegranate, or something like a bunch of Grapes; *de Graef* compares them to the Guts of a little Bird diversly contorted. They consist of one thin Membrane, through which some small twigs of both Veins, Arteries and Nerves run. They are about three Fingers-breadth long, and one broad; but in some places broader and some narrower, as they run in and out. They are two, (one for each *Vas deferens*) divided from one another by a little interstice; and they do severally by a peculiar passage emit the Seed contained in them into the *Urethra*. They are very anfractuous and winding, and (as was said) consist of many little Cells, that they should not pour out all the Seed contained in them, in one act of Copulation, but might retain it for several. They have no communication one with another, not even in their very opening into the *Urethra*; but the Seed that is brought to the *Vesiculæ seminales* on the right side by the right *vas deferens*, issues by its proper passage into the *Urethra*; and that which is brought to the left likewise. So that if by any accident the *Vesiculæ* on one side be burst or cut, (as in cutting for the Stone they generally are) yet those on the other being intire may still suffice for generation. Now when the Seed is emitted out of these *Vesiculæ* in the act of Generation, it passes out the same way it came in; which in this case may easily be, (though otherwise it be unusual there should be a contrary motion in the same vessel) for as it comes in from the *vasa deferentia*, it drills along *gently* without any force; but in *Coitu* when the Mus-

Vesiculæ seminales.

ſcles of the Yard and all the bordering parts are much tumified, it is expreſſed or ſquirted out of them with ſome *violence*, and paſſing along their neck, (which is a continuation of the *vaſa deferentia*) ouzes through a Caruncle (like Quick-ſilver through Leather) into the *Urethra*, or the Duct of the Yard that is common both to Seed and Urine. I ſay it ouzes from the necks of the *veſiculæ* through a Caruncle into the *Urethra*, for there is one plac'd as a valve before the orifice of each of them; partly to hinder the coming of the Urine into them, partly to hinder the involuntary effuſion of the Seed.

Now though naturally the little holes through which the Seed paſſes out of the necks of the *veſiculæ* into the *Urethra* be almoſt imperceptible; yet if they be either eroded by the acrimony of the Seed (ſuch acrimony as is contracted by impure embraces, or in Claps as we call them) or if of themſelves they be debilitated and ſo become more lax, (as ſometimes happens to old or impotent Men that meddle too much) then there happens a *Gonorrhœa* or continual efflux of Seed. And ſo *Veſalius* and *Spigelius* have obſerved them much dilated, in diſſecting ſuch as have died with a *Gonorrhœa* upon them.

Proſtatæ. The *Proſtatæ* are placed near to the *veſiculæ ſeminales*; *de Graef* calls them *Corpus glandoſum*, ſuppoſing them to be one body, and only divided by the common Ducts of the *veſiculæ ſeminales* and *vaſa deferentia* coming through the midſt of it. They are of a white, ſpongy and glandulous ſubſtance, about as big as a ſmall Walnut, encompaſs'd with a ſtrong and fibrous Membrane from the Bladder, to the beginning of whoſe neck they are joyned at the root of the Yard. In

ſhape

ſhape they come nearer to an oval, ſave that on their upper and lower part they are a little depreſt, and in that end by which the *vaſa deferentia* enter, they are ſomething hollow like a Tunnel. The Sphincter muſcle of the Bladder encompaſſes them, ſo that for ſo far as they cover the neck of the Bladder, the Sphincter touches it not, they coming between. They have all ſorts of Veſſels, which run moſtly on their outer ſide. In their inner part they have ten or more ſmall Ducts which all unload themſelves into the *Urethra* by the ſides of the great Caruncle (through which the Seed paſſes from the *veſiculæ* into the *Urethra*) but themſelves have each one a ſmall one to ſtop its orifice, leſt the liquor that is contained in the Proſtates ſhould continually flow out, or the Urine ſhould flow in. And theſe ſmall Ducts I ſuppoſe are continued from thoſe *veſiculæ* which appear in the Proſtates of thoſe that die (any way) ſuddenly after having had to do with a Female. For in ſuch, the ſpongy part of the *Proſtatæ* is very turgid with a ſerous liquor, and in their inner part may be found theſe ſame *veſiculæ*, like to *Hydatides*, which if you preſs upon, they will diſcharge themſelves into the aboveſaid Ducts.

What the liquor they contain ſhould be, or what is their uſe, there is great variety of Opinions. Some think that the Seed that flows from the Teſticles, is further elaborated here. But that cannot be; for that the *vaſa deferentia* depoſite nothing in them, but all into the *veſiculæ ſeminales*. Others think that from the blood there is ſeparated in them an acrimonious and ſerous humour, which ſerves for titillation or cauſing the greater pleaſure in Venery. As to this, *de Graef* appeals to the taſte of it, which has *Their uſe.*

nothing of acrimony. Dr. *Wharton* thinks they make a particular kind of Seed, as the Testicles do another, and the *vesiculæ seminales* a third. That these last make a Seed different from that made in the Testicles is grounded on a mistake in Anatomy, *viz.* that the *vasa deferentia* have no communication with the *vesiculæ*, whereas they apparently open into them, and deposite in them all the Seed they contain. That the *Prostatæ* make a peculiar sort, he endeavours to prove, because gelded Animals emit some Seed. But that is but precarious; for though they emit something, 'tis not necessary it should be any true Seed. Or if it be, it may well be supposed to proceed from the *Vesiculæ seminales* that have been full when the Animal was gelt. For, for this reason it has been observed that presently after gelding they have sometimes got the Female with young, but not afterwards when that stock was spent. *Bartholin* with many others thinks they make an oily, slippery, and fat humour, which is pressed out, as there is need, to besmear the *Urethra*, whereby to defend it from the acrimony of the Seed and Urine, and lest it should dry up. This Humour *Malpighius* thinks to be conveyed hither by *Ductus adiposi*; and quotes *Severinus*, affirming that he has observed a plain vessel in the Fat of the Kidneys, tending to the Spermatick vessels. He ascribes the same use to it as *Bartholin*, *&c.* *Diemerbroeck* confesses that it is necessary the inside of the *Urethra* should be kept moist and slippery, but thinks that that is done here as in the Bladder, Intestins and many other places, namely from some mucid part of the nourishment of the *Urethra* it self; and concludes that the *Vasa deferentia* deposite not all the Seed into the *vesiculæ seminales*, but carry

a

a ſmaller part to theſe *Proſtatæ*. *De Graef* denies that the *Vaſa deferentia* convey any thing to them, or have any communication with them; and therefore believes, that the Humour that is ſeparated in the *Corpus glandoſum* (as he calls the *Proſtatæ*) ſerves for a *Menſtruum* or Vehicle of the Seed, which flowing but in ſmall quantity through ſmall pores into the *Urethra*, it was neceſſary that this Humour ſhould be mixt with it, that it might better reach the Womb. Whatever this Humour be, it is ſqueezed out partly by the intumeſcence and erection of the *Penis*, and partly by the compreſſion of the Sphincter of the Bladder that girds the *Proſtatæ* about.

Theſe Proſtates are often (at leaſt partly) the ſeat of the *Gonorrhœa*; and the humour that they contain, that which is ſhed; for, if it were true ſeed, men could never endure a *Gonorrhœa* ſo long without more notable weakning and emaciating, the flux being ſo large as ſometimes it is.

I ſhall here omit all Philoſophical Enquiries into the nature of the Seed, contenting my ſelf purely with the Anatomical part. How far it contributes to the generation or formation of the *Fœtus*, ſhall be ſhewn afterwards, chap. 30. *of a Conception.*

The diſtance betwixt the root of the *Cod* and the *Podex* is called *Perinæum*, *à περινέω, circumfluo*, becauſe it is generally moiſt with ſweat. By the Latins it is named *Interfemineum*, becauſe it is placed *inter femora*, between the Thighs. In Perinæum. *Why theſe parts in men are hairy.*

ripe or grown perſons this part, the *Pubes*, *Scrotum* and the circuit of the *Podex* are clad with hair, which ſerves as a veil to cover theſe obſcene parts.

CHAP. XXIII.

Of the Yard.

The Yard. THE Seed being elaborated and treasured up in the aforesaid Organs, there was need of a peculiar Instrument whereby it might be conveyed into the Womb of the Female; and to this purpose Nature has furnished the Male with a *Yard*, which we come now to anatomize.

Its name. It is called in Latin *Penis*, *à pendendo*, because it hangeth without the Belly. Also *Virga*, *Membrum virile*, *Veretrum*, *Mentula*, and by many other names invented by lustful persons and lascivious Poets.

Description. It is an Organical part, long and round, yet somewhat flat on the upper side, seated under the *Ossa pubis*; appointed partly for making of water, but principally for conveying the Seed into the Matrix.

Magnitude. As to its thickness or length it differs much in divers Men. But it is generally observed to be larger in short Men, and such as are not much given to Venery; also in those that have high and long Noses, and that are stupid and half witted.

Substance. It is neither bony, as in a Dog, Fox, Wolf nor gristly nor fleshy; but is framed of a peculiar substance, such as might most conveniently admit of distention and relaxation.

Parts. The *parts* of it are either *common*, or *proper*.

The *common* are three, the Cuticle, the Skin and the *Membrana carnosa*, which we shall not need to describe.

It hath no *fat*, for first that would have hindred its erection into that stiffness that is necessary; and secondly would have occasion'd it to grow too bulky; and lastly would have dull'd that great pleasure that in Venery the Male is affected with in this part. *Why it hath no fat.*

The *proper* parts are these: the two Nervous bodies, the *Septum*, the *Urethra*, four Muscles, the *Glans*, the *Præputium*, two Ligaments, four Muscles, and the Vessels.

The *Nervous bodies* (called by Mr. *Cowper*, *corpora cavernosa*) are two oblong *capsulæ* or Cases, encompassed with a thick, white, nervous, and very firm Membrane, (like an Artery) but their inner substance is spongy, being mostly a contexture of Veins, Arteries and Nervous fibres, woven one with another like a Net. *The nervous bodies*

They spring from the lower side of the *Ossa pubis* at distinct originals, where they appear like two horns, (called by some *crura*) or are of a figure resembling the Letter Y, that the *Urethra* may have room to pass between them. When they leave the *Ossa pubis* they are each covered with a several Membrane, and are afterwards joyned together with only the *Septum* between, which the nearer it comes towards the *Glans*, is the thinner, so that before it come to the middle of the *Penis* its Fibres extend towards the back of the Yard from the *Urethra* in order like a Weaver's Slay, and while it still goes further, its Fibres by degrees grow so very small, that near the *Glans* the *Septum* is almost obliterated, and the two Nervous bodies seem to grow into one. Whence it is that the *Penis* is equally erected; for if the *Septum* had exactly distinguish'd one part from the other, it might sometimes have so hapned by the compression or obstruction of the Arteries of the

one or the other ſide, that one part of it would have been extended, and the other remained flaggy.

Dr. *Wharton* affirms, theſe Nervous bodies have Glandulous fleſh within them, which keeps the Yard ſomething plump even when it is not erect. But *de Graef* denies this, and demonſtrates, that they have no other ſubſtance than beforeſaid, thus. Let the Yard be prepared thus: Firſt gently ſqueeze the blood out of it, which it always has in greater or leſſer plenty, and then put a little Tube into the ſpongy ſubſtance, namely in at that end that is next to the *Os pubis*; and let the Cavity of the *Penis* be half fill'd with water by the help of a Syringe, and ſhake the *Penis* with the water in it: pour out that bloody water, and fill it again with clear, and ſo three or four times till the water is no longer ſtain'd with blood. Then betwixt two linnen clothes ſqueeze out what water is in the Nervous bodies, and at length blow up the *Penis* ſo long till it have its natural bigneſs; in which poſture if you will keep it, you muſt tye it hard. When the *Penis* is thus diſtended and dried, you may examine it as you pleaſe, and will find no other ſubſtance than was mentioned. *Diemerbroeck* ſays, that their ſubſtance is not a mere texture of Veſſels, but is fibrous, fungous and cavernous, (ſuch as is the ſubſtance of the Lungs) receiving in their hollow Interſtices Blood and Spirits out of the Veſſels that are diſperſed through their ſubſtance.

Mr. *Cowper* (after *Columbus*) ſays, there is great analogy between the internal ſtructure of this and that of the Spleen: in both which the Veins have large apertures or cells, which moſt plainly appear in the *bulbus* of a Dog's *penis*, as he calls the upper part of the *Urethra* that lies between the *crura* of the Nervous bodies. Below

Below these Nervous bodies lies the *Urethra*, being of a much like substance to them, saving that its spongy part, which is outer and lower, hath less pores because of its smaller and more plentiful Fibres. This part does tumifie whensoever the Nervous bodies do. Its inner part is membranous, round and hollow, and exceeding sensible. It is of an equal width from one end to the other, save in its fore-part, where the *Glans* is joyned to the Nervous bodies, for there it hath a small Cavern, into which the acrimonious Urine lighting in the Stone of the Bladder, while it wheels about in it, causeth pain, and is a great sign of the Stone. Sometimes also the acrimonious eroding liquor in a *Gonorrhœa* staying here, doth cause a most tormenting ulceration. *The Urethra.*

It is continuous to the neck of the Bladder, but has not its rise from it, nor is of the same kind of substance. If you boil the Bladder and it, it will easily separate, and appears of a clear other substance and colour. It begins at the neck of the Bladder and reaches to the end of the *Glans*, which it seems to bestow a Membrane upon from its own inner one, for it is plainly continued from it.

Its *Use* is to convey along the Seed and Urine. And to that end there open into it small pores that transmit the Seed into it from the Necks of the *Vesiculæ seminales*, (of which in the foregoing Chapter;) and also the neck of the *Vesica Urinaria* which pours out the Urine into it. *Its use.*

The *Muscles* are two on each side, and so four in all. Of these one pair are called by some, Collateral Muscles, by others *Erectores*. These are shorter and thicker, and spring from the *appendix* or external knob of the *Coxendix*, under the begin- *Muscles.*

beginning of the Nervous bodies, and are inſerted into their thick inveſting membrane, a little from their beginning. Theſe ſerve for erection of the *Penis*.

The ſecond pair is longer and ſmaller, proceeding from the Sphincter of the *Anus*. Theſe paſs ſtreight by the ſides of the *Urethra*, and are inſerted into it about its middle; they ſerve to dilate it for miction and ejaculation of the Seed, and are called *Dilatantes*, wideners, and *Acceleratores*, haſtners.

Theſe have been generally held to be the uſes of theſe Muſcles, but *de Graef* (as alſo *Swammerdam*, *not. in prodr. p.* 35.) aſſigns a clear contrary uſe to them, and that with great ſhew of reaſon. For ſeeing the action of a Muſcle is contraction, how ſhould the former pair extend the *Penis*, and not rather draw it back towards their original? Or how ſhould the latter ſerve to dilate the *Urethra*, and not rather ſtraiten it, ſeeing in the action or contraction of a Muſcle its Belly or Middle ſwells? Therefore he ſays, that the Muſcles only contribute thus far or in this reſpect to the extenſion or erection of the *Penis*, inaſmuch as by their ſwelling (partly by blood and ſpirit flowing into them, partly by their proper action) they ſerve to ſtraiten and compreſs the roots of the Nervous bodies and the ſpongy part of the *Urethra*, and ſo drive the blood that flows in by the Arteries towards the *Glans*, and hinder its returning back again by the Veins: a reſemblance whereof may be exhibited by a piece of a Gut, which if we fill with wind or water, and then compreſs that end by which they enter'd, (the other being ty'd) we ſhall ſee the other ſtrut out and be more diſtended.

Mr. *Cowper*

Mr. *Comper* will not have the intumescence of the bellies of these Muscles to be the principal cause of erection; but explains it thus: The *penis* is approximated (he says) to the *ossa pubis* when these Muscles act, by means of the *Ligamentum suspensorium* (by and by to be described) whereby the bloud is not only driven forwards towards the *Glans* in greater plenty, and its Veins distended, but their great Trunks running over the *dorsum penis* are compresst under the *ligamentum transversum* of the *ossa pubis*. The like cannot happen in the cavernous body of the *Urethra*, since there is no bone whose position can have that effect upon its Veins, as the *ossa pubis* have upon the *penis* it self. Wherefore the *Musculi acceleratores* compressing its veins do that office. Whence it happens, in an imperfect erection the *Glans* is not equally extended with the *penis* it self, and at other times is sooneſt relaxt.—The blood thus hinder'd in its return distends the *corpora nervosa* and *Urethra*, which are thereby erected. See his *append. ad myotom. reformat.* p. 241, 242.

The end or head of the *Penis* is called *Glans*, and *Balanus*. Into this the Nervous bodies terminate; and being a little thicker (on that side next them) than they, it forms a kind of a circle. On its fore-part it is smaller and sharper. It has a peculiar substance (Dr. *Wharton* says glandulous) soft and spongy, and being covered with a very thin Membrane produced from the internal one of the *Urethra* (which coming out of its hollow, dilates it self so as to cover all the *Glans*) it thereby, and from its proper substance much interwoven with Nerves, becomes most exquisitely sensible, and is the principal seat of pleasure in copulation. Which if it had not been very great, who would have taken delight in so brutish Glans.

tiſh a thing as Venery? as *Andreas Laurentius* elegantly expoſtulates, (*Anat. lib.* 7. *cap.* 1. *q.* 7.) "Who (moſt ſtrange!) would have ſolicited "or accepted of ſo vile and filthy a thing as lying "with a Woman? With what face would Man, "that divine Animal, full of reaſon and counſel, "have handled the obſcene parts of Women pol- "luted with ſo much filth, which is diſcharged "into this low place as into the common ſink of "the Body? On the other ſide, what Woman "would have accepted of the embraces of a Man, "conſidering the toil and tedioufneſs of going "nine months with Child, the moſt painful and "often fatal bearing of it, and its Education full "of care and anxiety, unleſs the Genitals had "been affected in the act of coition with tran- "ſporting pleaſure?

Some take the *Glans* to be only a continuation of the *corpora nervoſa*, and not of a ſubſtance diſtinct from them.

Præputium. The *Glans* is covered with the *Præputium*, or Fore-skin, which is framed of the reduplication of the Skin.

It is called *Præputium*, becauſe it is placed *præ pudendo* before the Yard: or rather *à præputando* from being cut off, for this is that which the *Jews* cut off in Circumciſion, from whence they are called *Apellæ* and *Recutiti*. And it is reported by divers perſons from their own inſpection, that in Jewiſh Children it is ſix times as large as in Chriſtians, and hangs a great way over the *Glans*, before it be cut off.

Its glandulæ odoriſ. In that part where the Prepuce is contiguous to the *Glans*, Dr. *Tyſon* (as reported by Mr. *Cowper*) has diſcovered certain ſmall Glands; which from the great ſcent their ſeparated liquor emits, he calls *glandulæ odoriferæ*. They are very

ry conſpicuous in moſt Quadrupeds, particularly in Dogs and Boars, in the latter of which their ſeparated liquor is contained in a proper Cyſt, at the verge of the prepuce, out of which there is a large aperture, whereby 'tis remitted again to lubricate the *penis*.

The Præpuce is tyed to the lower ſide of the *Glans* by a *Ligament*, called *frænum*, the Bridle. This in ſome is ſo ſhort, that 'tis neceſſary to cut it, to procure a compleat erection. *Frænum.*

Beſides this Ligament, I cannot but mention another, firſt (I think) obſerved by the ingenious Mr. *Cowper*, which (from its uſe) he calls *Ligamentum ſuſpenſorium*. It ariſes, he ſayes, from the fore-part of the *oſſa pubis*, and is fixt to the *dorſum penis* on each ſide the great Vein that runs along it. *Ligamentum ſuſpenſorium.*

Of the *Veſſels*, ſome are *cutaneous*, ſome paſs to the *inner* parts of the *Penis*. *The Veſſels.*

The *cutaneous Arteries* ariſe from the external branch of the *Iliack*, and running from the root of the yard towards and along its back, divide themſelves into many branches. They are called *pudendæ*, from the parts they miniſter to; as are alſo the *Veins*, which ſpring from the exteriour Iliack, and keep the ſame courſe with the Arteries. The Veins and Arteries that are beſtowed on the *inner* parts of the *penis*, ſpring from the inner (hypogaſtrick) branch of the Iliack, and after they have ſent ſome twigs to the Muſcles of the *penis* and *anus*, they enter the *penis* juſt at the meeting of the two Nervous bodies, through whoſe length they run, and are moſtly diſperſed in them, and in the fungous part of the *Urethra*, ſending forth little twigs at the ſides. *Veins and Arteries.*

It has two *Nerves* from the loweſt Vertebral. The greater of them, that is very large and long, *Nerves.*

is

is distributed into the Nervous bodies, *Urethra*, and *Glans*; the lesser is bestowed upon its Muscles. Concerning which Dr. *Willis* thus discourses. "This Member (saith he) having only "Nerves from the Spinal marrow, should only "have a spontaneous motion according to our "Hypothesis, (*viz.* that the Nerves from the "Brain serve for natural, and the Vertebral for "voluntary motion.) And yet through the turgescency of the Genital humour, it is often "erected and filled with Spirit against one's "mind; which is from hence, because from this "Vertebral pair, whence the Nerves of the *Penis* "spring, a sprig is reached forth to the Vertebral "pair next above it, *viz.* to that in which is "radicated the *Plexus* that is placed in the *Pelvis* "and bestows Nerves on the *Prostatæ*, into which "*Plexus* also a notable Nerve is implanted from "the Intercostal pair. Seeing therefore there is "a commnnication between the *Prostatæ*; (which "depend much on the Intercostal Nerves) and "the *Penis* it self, (by reason of the insertion of "the foresaid sprig into the *Plexus* from whence "the *Prostatæ* have their Nerves:) hence it "comes to pass that it acts accordingly as they "are affected. But they (*viz.* the *Prostates*) are "not only apt to be moved by the turgescency "of the Seed; but, by the communication of the "Intercostal Nerve, according to the impressions made on the Senses or Brain, are wont to "be irritated by too importune an action; into "consent wherewith the *Penis* is presently excited.

Lymphe-ducts. Mr. *Cowper* has observed *Lymphe-ducts* in this part, running under the common integuments, accompanying the cutaneous Veins, and emptying themselves into the *glandulæ inguinales*. "Which, says

Fig. II.

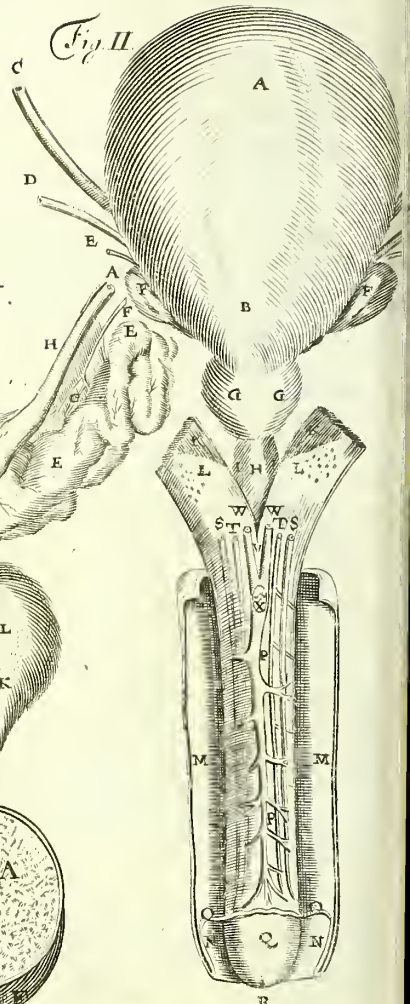


Fig. I.

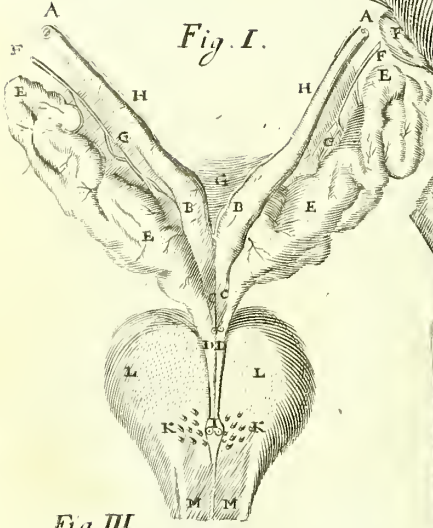
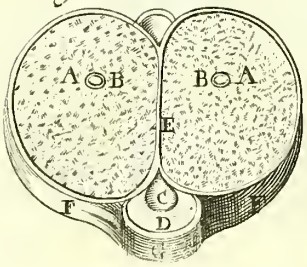


Fig. III.



ſayes he, "may ſerve to inform us, how the "morbid matter comes to be conveyed more par- "ticularly to thoſe Glands in Venereal Caſes, and "cauſe thoſe Tumours that frequently happen on "that occaſion, commonly called *Bubo*'s. See his before-cited Book *p.* 227.

Its principal *uſe* is to convey the Seed into the *Uterus* of the Female; and its uſe to piſs withal, is but ſecondary, for many Creatures (as Fowls in general) make no water by it, yet have a *Penis* for the uſe aboveſaid. *Uſe.*

That part that is next above it towards the Belly, is called the *Pubes*; and its lateral parts are called *Inguina*, the Groins. *Pubes and Inguina.*

Tab. VIII.

Fig. I. ſhews the *Vaſa deferentia*, Seed-bladders, and Proſtates.

AA *Parts of the* Vaſa deferentia, *which appear thick, but have only a ſmall Cavity.*

BB *The parts of the* Vaſa deferentia *of a thin ſubſtance and large Cavity, being widened.*

CC *The extremities of the* Vaſa deferentia *narrowed again, and gaping each with a little hole into the neck of the Seed-bladders.*

DD *The neck of the Seed-bladders parted from each other by a Membrane going between, ſo that the Seed of one ſide cannot be mixed with that of the other, before it come to the* Urethra.

EE *The* Veſiculæ ſeminales, *or Seed-bladders blown up, that their wonderful widenings and narrowings may be ſeen.*

FF *Veſſels tending to the Seed-bladders.*

GGG *The Membranes whereby the Seed-bladders and* Vaſa deferentia *are kept in their places.*

HH *The*

HH *The Sanguinary veſſels running by the ſides of the* Vaſa deferentia.

I *A Caruncle reſembling a Snipe's head, through whoſe eyes as it were the Seed iſſues out into the* Urethra.

KK *The ducts of the* Corpus glandoſum, *or* Proſtatæ *opening into the* Urethra *by the ſides of the Caruncle.*

LK *The* Corpus glandoſum *divided.*

MM *The* Urethra *opened.*

Fig. II. Shews the Bladder, *&c.* the *Penis* and its Veſſels, *&c.*

A *The upper or fore-part of the Bladder.*

B *The neck of the Bladder.*

CC *Portions of the* Ureters.

DD *Portions of the* Vaſa deferentia.

EE *The Veſſels running to the Seed-bladders.*

FF *The* Veſiculæ ſeminales, *or Seed-bladders.*

GG *The fore-part of the* Proſtatæ, *or* Corpus glandoſum.

H *The* Urethra *adjoyning to its ſpongy part.*

KK *The Muſcles called the Erectors or Extenders of the* Penis.

LL *The beginnings of the Nervous bodies ſeparated from the* Oſſa pubis, *which puff up like Bellows when the Yard is erected.*

MM *The Skin of the* Penis *drawn aſide.*

NN *The duplicature of the Skin making the* Præputium.

OO *The Skin that was faſten'd behind the* Gland.

PP *The back of the* Penis.

Q *The* Glans.

R *The urinary paſſage whereby the* Glans *is perforated in its fore-part.*

SS *The Nerves running along the back of the* Penis.

TT *The*

TT *The Arteries running along the back of the* Penis.
U *The Nervous bodies meeting together.*
WW *Two Veins which unite together, and run along the back of the* Penis *in a remarkable branch.*
X *The Vein opened, that the Valves in it may be seen.*

Fig. III. shews the *Penis* cut asunder transversly.

AA *The spongy or fibrous substance of the Nervous bodies.*
BB *The two Arteries that march along the Nervous bodies.*
C *The urinary passage of the* Urethra.
D *The spongy substance of the* Urethra.
E *The* Septum *between the two Nervous bodies.*
FF *A very strong Membrane of the Nervous bodies.*
G *A very thin Membrane containing the spongy substance of the* Urethra.
H *A notable Vein creeping along the back of the* Penis.

Of the GENITALS in Women.

CHAP. XXIV.

Of the Vasa præparantia.

HAving now done with the Parts ministring to Generation in *Men*, we next proceed to those of *Women*; in describing of which it has been the method of divers Anatomists to begin first with the outer parts of the Privity: but because we would observe, as much as may be, the same order in Women as we have in Men, we shall first begin with the Spermatick Vessels, which are of two sorts, *Arteries* and *Veins*.

Spermatick Arteries. The *Arteries* are two, as in Men. They spring from the great Artery a little below the Emulgents (very rarely either of them from the Emulgent it self) and pass down towards the *Testes* not by such a direct course as in Men, but with much twirling and winding amongst the Veins with which yet they have no inosculation, as ha been generally taught. But for all their winding when they are stretch'd out to their full length, the are not so long as those of Men; because in then they descend out of the *Abdomen* into the *Scrotum* but in Women they have a far shorter passage reaching only to the *Testes* and Womb within th *Abdomen*.

Veins. The *Veins* are also two, arising, as in Men, th right from the Trunk of the *Cava*, a little belo the Emulgent, the left from the Emulgent it sel In their descent they have no more windings tha in Men, and therefore are considerably shorter.

Both the *Arteries* and *Veins* as they pass dow are cover'd with one common Coat from the *Peri tonæum*; and near the *Testes* they are divided int two branches, the upper whereof is implanted in to the Testicle by a triple root; and the other i subdivided below the *Testes* into three twigs, on of which goes to the bottom of the Womb, ano ther to the *Tuba* and round Ligament, the thir creeping by the sides of the Womb under its com mon Membrane, ends in its neck, where it is in terwoven with the Hypogastrick Vessels like Net. By this way it is that the *Menstrua* some times flow in Women with Child for the firs Months, and not out of the inner Cavity of th *Uterus*: but yet that blood does not flow at the time so much by the Spermatick Arteries as by th Hypogastrick.

Th

The *use* of these Spermatick vessels is to minister to the (generation of Seed, according to the ancient doctrine; but) nutrition of the Eggs in the *Ovaria* or *Testes* (according to the new) the nourishment of the *Fœtus*, and of the Womb it self, and the expurgation of the *Menses*; inasmuch as blood is conveyed by the Arteries to all those parts to which their ramifications come, in which parts they leave what is to be separated according to the Law of Nature, the remaining blood returning by the Veins. *Their use.*

CHAP. XXV.

Of Womens Testicles or Ovaria.

WOmen's *Testicles* differ much from Men's both in their situation, figure, greatness, coverings, substance, and also use. *Womens* Testes.

First, their *situation* is not without the Body, as in Men, but in the inner Cavity of the *Abdomen*, on each side two Fingers breadth distance from the bottom of the Womb, to whose sides however they are knit by the Intervention of a strong Ligament, that has us'd to be called and accounted the *Vas deferens*; as if the Seed were carried by it from the *Testes* to the Womb. Of which afterwards. *Their situation.*

They are flat on the sides; in their lower part oval, but in their upper (where the Blood-vessels enter them) more plane. Their superficies is more rugged and unequal than in those of Men. They have no *Epididymides*, nor *Cremaster* Muscles. *Figure.*

Greatneſs. They differ in *bigneſs* according to age. I thoſe newly come to maturity they are about hal as big as thoſe of Men; but in thoſe in years the are leſs and harder. Preternaturally they ſome times grow to a vaſt bigneſs from Hydropical tu mours, in which ſeveral quarts of ſerous liquo have been found to be contain'd.

Tunicle. They have but one *Membrane* that encompaſſ them round; but on their upper ſide, where th *Vaſa præparantia* enter them, they are about ha way involved in another Membrane that accom panies theſe Veſſels, and ſprings from the *Per tonæum.*

Subſtance. When this cover is removed, their *ſubſtan* appears whitiſh, but is wholly different from th ſubſtance of Men's Teſticles. For Men's (as w ſaid above) are compoſed of Seminary veſſel which being continued to one another are twe ty or thirty Ells long, if one could draw them o at length without breaking: But Women's d principally conſiſt of a great many Membran and ſmall Fibres looſely united to one anothe amongſt which (in the outer ſuperficies of th *Teſtes*) there are ſeveral little Bladders (like t *Hydatides*) full of a clear liquor, through who Membranes the Nerves and *Vaſa præparantia* ru and are obliterated in them.

Whether they elaborate Seed. The liquor contained in theſe Bladders had a ways been ſuppoſed by the followers of *Hippocr tes* and *Galen*, to be Seed ſtored up in them, as they ſupplied the place of the *Veſiculæ ſeminal* in Men. But from Dr. *Harvey* downwards, m ny learned Phyſicians and Anatomiſts (accordi to *Ariſtotle*) have denied all Seed to Wome Of which the ſaid Dr. *Harvey* thus diſcourſe *De ovi materia*, *Exercit.* 34. "Some Wom "emit no ſuch humour as is called Seed, and y "

' is not conception thereby necessarily frustrated;
' for I have known several Women (says he)
' that have been fruitful enough without such e-
' mission; yea, some that after they begun to
' emit such humour, though indeed they took
' greater pleasure in copulation, yet grew less
' fruitful than before. There are also infinite
' Instances of Women, who though they have
' pleasure *in coitu*, yet send forth nothing, and
' notwithstanding conceive. *Miror maxime*, adds
e, *eos, qui emissionem hanc ad generationem necessa-*
iam putant, non animadvertisse, humorem illum
ras ejici, & circa clitoridem vulvæque orificium ut-
lurimum profundi, raro intra vulvam, nunquam
ero intra uterum, ut cum maris spermate misce-
ur; esseque consistentia serosum sive ichorosum, ad
odum urinæ; non autem genituræ instar, lentum
tque unctuosum; ut tactu facile innotescit. Quor-
um autem foras ejiciatur, cujus usus necessario in-
us requiritur? Debuitne humor ille, ceu utero vale-
dictturus, ad limen vulvæ amandari; ut majore cum
ratia ab utero retraheretur denuo?] So that
oth from the place of its emission, and from its
onsistence, he concludes that the humour emit-
ed cannot be Seed. To strengthen which Opi-
ion two Reasons may be added, why it cannot
e the humour contained in these *Vesiculæ*, and
onsequently that it cannot be Seed; first be-
ause it is sent forth in greater quantity than that
can be supplied from them; and secondly be-
ause the *Vesiculæ* are destitute of any such pore
r passage whereby the liquor contained in them
ight issue out; for if you press them never so
ard, unless you burst them, there will nothing
ass out of them.

We must therefore subscribe to that new but necessary opinion that supposes these little Blad- *They are Ovaries.*

ders to contain nothing of Seed, but that they are truly Eggs, analogous to those of Fowl and other Creatures; and that the Testicles (so called) are not truly so, nor have any such office as those of Men, but are indeed an *Ovarium*, wherein these Eggs are nourished by the Sanguinary Vessels dispersed through them, and from whence one or more (as they are fecundated by the Man's Seed) separate and are conveyed into the Womb by the *Tubæ Fallopianæ*, of which by and by.

That these *Vesiculæ* are analogous to the little Eggs in the *Ovarium* of Fowl, *de Graef* evinces by this Experiment, That if you boil them their liquor will have the same colour, taste, and consistency with the White of Birds Eggs. And their difference in wanting Shells is of no moment; for even the Eggs of Fowls while they are in the Ovary (yea after they have descended into the *Uterus*) have no Shell: and though when they are laid, they have one, yet that is nothing essential to them, but only a fence that Nature has provided (upon their exclusion) to preserve them from external injuries while they are hatched without the body; whereas these of Women being fostered within their body, have no need of other fence than the Womb, by which they are sufficiently defended.

Having compared these *Vesiculæ* to the Eggs of Fowls, I might here follow the method of Doctor *Harvey* and *de Graef*, and describe the *Ovarium*, *&c.* in Hens, *&c.* that from thence these in Women might the better be conceived of and apprehended; but to the curious and learned Reader I shall recommend the said Authors for satisfaction, and avoiding all unnecessary and (to this Epitome) unsuitable excursion, I shall only further

further note two things: Firſt, that theſe Eggs in Women are commonly towards the number of twenty in each Teſticle or *Ovarium*, of which ſome are far leſs than others. And ſecondly, that the Objection of the *Galeniſts* againſt the *Ariſtotelians*, (*viz.* that the *Teſtes* of Females muſt needs make Seed, becauſe when they have been cut out, barrenneſs always follow'd) will be ſufficiently obviated by this new *Hypotheſis*, that agrees to the neceſſity of the Teſticles ſo far as to affirm that the *Veſiculæ* contained in them become (when they are impregnated by the maſculine Seed) the very Conceptions themſelves, which therefore it would be in vain to expect if the Female were caſtrated.

Beſides the *Vaſa præparantia*, and *Nerves* (of which laſt in the 27*th* Chapter) they have alſo *Lymphedu*ct*s*, according to Dr. *Wharton*.

CHAP. XXVI.

Of the Vaſa deferentia *in Women, or their Oviducts.*

Galen with moſt of the Ancients reckoned thoſe ſhort proceſſes that go ſtreight from the *Teſtes* to the bottom of the Womb, to be *Vaſa deferentia*; and that the Seed was emitted from the *Teſtes* through them into the *Fundus uteri*. And *Fernelius*, *Riolanus*, *&c.* thought they found a ſmall Pipe paſſing on each ſide out of theſe proceſſes by the ſides of the Womb to its neck, into which they were inſerted and opened near its Orifice. By the former it was ſuppoſed Women not with Child did emit their Seed into the bot-

tom of the Womb, and by these latter such as were already impregnated: for that, if it should have issued into the *Fundus* where the Conception was, it would there have corrupted to the great prejudice of the *Fœtus*.

But as to these latter Ducts, *Veslingius*, *Diemerbroeck*, *de Graef*, and many other accurate Anatomists, have not been able to find the least footstep of them. And as for the former, seeing they are not pervious, nor have any Cavity, (and therefore can neither contain nor convey any thing of Seed) we must conclude with *de Graef*, that they are only Ligaments of the Testicles to keep them in their place; which he evinces further by observing that they come not to the inner Cavity of the *Uterus*, but are knit only to its outer Coat: for he says, there are only two holes in the *Fundus uteri* that admit a Probe, and those lead to the *Tubæ Fallopianæ* and not to these Ligaments.

Tubæ Fallopianæ. Seeing therefore that those which have been accounted *Vasa deferentia* either are not to be found at all, or are found uncapable of such an office; and having withal rejected the opinion of Women's having Seed, and affirmed, that that which makes the conception is one of those *Vesiculæ* in the *Testes*, dropping from thence and conveyed into the Womb, we must enquire by what way these can pass. For if the abovesaid Ligaments (reputed *Vasa deferentia*) have no passage whereby even the *Semen*, if there were any, might be conducted; much less could one of these *Vesiculæ* be conveyed that way. And therefore for *Vasa deferentia* we assign those Ducts that *Fallopius* in his Anatomical Observations calls *Tubæ*, and describes thus: "They are very slender and narrow Ducts, nervous and white, arising from the "horns

" horns (or ſides) of the Womb, and at a little " diſtance from it they become larger, and twiſt " like the tendrel of a Vine, till near their end, " where ceaſing their winding they grow very " large, and ſeem membranous, and carnous " from their red colour. Which end is very much " torn and jagged like the edge of rent Cloaths: " and has a large Foramen, which (ſays he) al- " ways lies cloſed, becauſe thoſe jags fall toge- " ther; but yet being opened carefully, they are " like the utmoſt orifice of a Braſs Trumpet.] But *de Graef* ſays, though they grow very large towards their end, yet of a ſudden the very extream part is narrowed before it is divided into the aforeſaid jags, which he reſembles unto leaves. Who alſo appeals unto Experiment for theſe *Tubæ*'s being pervious, affirming that if one put a little Tube into the beginning of one of theſe ſame Trumpets and blow it, the wind will preſently break through it, which he ſaith he has obſerved in all the kinds of Animals that he has diſſected.

" Theſe *Tubæ* (according to Dr. *Harvey*) are " the ſame in Women that the *Cornua* or Horns " of the Womb are in other Creatures. For they " anſwer to thoſe both in ſituation, connexion, " amplitude, perforation, likeneſs, and alſo office: " for as other Animals always conceive in the " *Cornua*, ſo it has been ſometimes obſerved (as by *Riolanus* from others; and by Dr. *Harvey* himſelf) " that a conception has in a Woman been contained in one of the *Tubæ*.] Which muſt have happened, when the *Ovum* being received out of the *Teſtis* into it, has been ſtopt in its paſſage to the Womb, either from its own ſmalneſs, or ſome obſtruction in the *Tuba*.

Their

Their substance. Their *substance* is not nervous (as *Fallopius* i the above-recited description affirms) but mem branous. For they consist of two *Membranes* the *outer* and *inner*. The *inner* springs from (o at least is common with) the inmost Membran of the Womb; but whereas it is smooth in th Womb, it is very wrinkled in the *Tubæ*. Th *outer* is common with the outmost of the Womb and this is smooth.

Width. The *capacity* of these Ducts varies very much for in the beginning as it goes out of the Womb it only admits a bristle, but in its progress wher it is largest, it will receive ones little Finger. Bu in the outmost extremity where 'tis divided int jags, it is but about a quarter so wide.

Length. They are very uncertain also in their *length* for from four or five, they sometimes encreas to eight or nine Fingers breadth long.

Use. Their *use* is, in a fruitful copulation to gran a passage to a more subtile part of the Masculin seed (or to a seminal air) towards the *Testes*, t bedew the Eggs contained in them; which Egg (one or more) being by that means fecundate (or ripened as it were) and dropping off fro the *Testis* (in the manner as shall be describe Chap. 30.) are received by the extremity of th *Tubæ*, and carried along their inner Cavity to th *Uterus*. For Dr. *Harvey* affirms, that they hav a worm-like or peristaltick motion like that c the Guts, (*de Cervarum & Damarum Utero*, *Ex ercit.* 65.) And the same is affirmed by *Swam merdam*, *Not. in Prodr.*

Objections against their use answered. Against this *Use* two *Objections* may be made Firſt, that the end of the *Tuba* not adhering clos to the *Testis*, when one of the *Vesiculæ*, (or *Ov* as we think they are) shall drop off from the *Te stis*, it would more probably fall into the Cavit

of the *Abdomen*, than light juſt pat in the mouth of the *Tuba*. Secondly, that when it is received by it, its Duct is ſo narrow, that 'tis hard to conceive how it can paſs by it.

As to the *firſt*; the ſame Objection may lie againſt the uſe of the Oviduct or *Infundibulum* in Hens, for neither in them does it joyn quite cloſe to the *Ovarium*, (as *Swammerdam*, &c. truly obſerves) and yet it is certain that the *Vitelli* or little Yelks (or rudiments of the Eggs) do all paſs by them to the *Uterus*. The ſame, *Swammerdam* obſerves alſo in Frogs, in one of whom there are many hundreds of Eggs, which all paſs one after another from the *Ovarium* by the Oviduct or *Infundibulum*, and yet the mouth of the Oviduct is almoſt two Fingers breadth from the *Ovarium*, and beſides is immoveable, whereas the *Tubæ* in Women are at liberty (and are more than long enough) to embrace the *Ovarium* with their Orifice: and we may reaſonably believe that they do ſo when a conception is made; for it is not improbable that when all the other parts of the Genital are turgid in the act of Copulation, theſe *Tubæ* alſo may be in ſome meaſure erected, and extend their opened mouth to the Teſticle, to impregnate the *Ova* with the Seminal air ſteaming through their Duct, and if any one be fecundated and ſeparate, to receive it afterwards by its orifice.

As to the *ſecond Objection*, which urges the narrowneſs of theſe *Tubæ*; He that conſiders the ſtraitneſs of the inner orifice of the Womb, both in Maids, and Women with Child, and yet obſerves it to dilate ſo much upon occaſion as to permit an egreſs to the Child out of the Womb, cannot wonder that to ſerve a neceſſary end of Nature the ſmall duct of the *Tubæ* ſhould be ſo far widen'd

widen'd as to give paſſage to an *Ovum*, ſeeing its proportion to their duct is many times leſs than of the Child to the uſual largeneſs of the ſaid orifice.

CHAP. XXVII.

Of the Uterus *or Womb, and its Neck.*

HAving treated of the *Vaſa præparantia* (ſo called) that bring nouriſhment to the *Teſtes* or *Ovaria*, as alſo of theſe and their *Ova*, and laſtly of the *Tubæ* through which the *Ova* paſs to the *Uterus*; we now come to the *Uterus* it ſelf which receives the *Ova*, and in which the conception is formed, and the *Fœtus* nouriſhed till it acquire its due maturity and be fit for the birth.

The Womb. The *Uterus* or Womb is uſually divided into four parts, the *Fundus* or bottom, *Os internum* or *Cervix*, the *Vagina*, and the *Sinus pudoris* or outward Privity. Of each of theſe in order. And firſt of the *Fundus*.

Its name. This in a ſpecial manner is called the Womb, becauſe all the reſt ſeem to be made for its ſake. It is alſo called the *Matrix*, from its being as a Mother to conſerve and nouriſh the *Fœtus*; and likewiſe *Utriculus* from its ſhape reſembling a *Bottle*.

Situation. It is ſeated in the *Hypogaſtrium* or loweſt part of the *Abdomen*, in the middle of that large hollow that is called *Pelvis*, and is formed by the *Oſſa ilii*, *coxæ*, the *Oſſa pubis*, and the *Os ſacrum*. In this Cavity is placed between the Bladder and the ſtreight Gut; ſo that Man being

ing bred betwixt Piſs and Dung, if he would but conſider his Origine, might hence draw an Argument of humility.

Its hindmoſt part is looſe, that it might be extended as the *Fœtus* encreaſeth. But its ſides are tied faſt by two pairs of *Ligaments*. *Connexion.*

The *firſt pair* are further from the *Os internum*, and are broad, ariſing from the *Peritonæum*. They have a membranous, looſe, and ſoft ſubſtance, and for their ſhape are reſembled to Bats wings. They tie the ſides of the *Fundus*, the *Teſtes*, and a good part of the *Tubæ* together, and are faſten'd to the *Oſſa ilii*, whereby the Womb is kept from falling down upon its Neck. But if they be either immoderately relaxed, or by any violence ibroken, then the Womb deſcends, and ſometimes falls out (turning inſide outwards) if the ſubſtance of the Womb happen to be relaxed alſo. *Ligaments.*

The *ſecond pair* ariſe nearer to the inner orifice of the *Vagina*, about where the *Tubæ* do, and are called the round Ligaments, or worm-like. From their origine which is broad, they aſcend on each ſide between the duplicature of the *Peritonæum* toward the Groins, and running out of the Cavity of the *Abdomen* become round, and then paſs obliquely above the *Os pubis* towards the fat of *Mons Veneris*, in which they terminate near the *Clitoris*, being divided into many parts or jags, as may be ſeen in the following Figure. They conſiſt of a double Membrane, the inner whereof has all ſorts of Veſſels, Nerves, Arteries, Veins, and *Vaſa Lymphatica*; and are about a ſpan long. *Veſlingius*, *Diemerbroeck*, &c. ſay that they receive a ſmall Seminal veſſel from the *Teſtes* and *Tubæ*, which they conduct to the *Clitoris* into which they are inſerted, and ought rather to be accounted *Vaſa deferentia* than Ligaments.

So

So that what ſome Women emit from about the *Clitoris* in coition they think to be true *Semen* conducted hither by thoſe ſeminal ducts. But *de Graef* denies any ſuch ducts, and affirms that theſe Ligaments reach not the *Clitoris*, but are terminated in the aforeſaid fat. And that humour which Women emit (ſometimes) he thinks doth iſſue out of the *Lacunæ* in the orifices of the *Vagina* and urinary paſſage, or alſo from the *Meatus*'s in the Neck of the Womb: which humour is ſupplied to the former parts from the thick and membranous body that is about the urinary paſſage; and to the latter from the nervoſe-membranous ſubſtance of the neck of the Womb: but he thinks it does not partake of the nature of Seed, but ſerves only for the lubricating of the *Vagina* to cauſe the greater pleaſure *in coitu*. But to this purpoſe more before.

Subſtance. Its *ſubſtance* is whitiſh, nervous or rather membranous; denſe and compact in Virgins, but in Women with Child a little ſpongy and ſoft.

Membranes It is compoſed of three *Membranes*. The *outmoſt*, (which is common to it with all the *Viſcera* in the *Abdomen*, as being derived from the *Peritonæum*) is very fibrous, compact, and tough, without any diſcernible Vein or Artery. The *middle* is much thicker, and endued with carnous Fibres, and is full of Blood-veſſels, very remarkable at all times, but eſpecially in the flux of the *Menſes*, or in the time of geſtation. During this latter time, this Coat (with the *inmoſt*) imbibes ſo much of the nutritious humours that then flow hither, that the more the *Fœtus* encreaſeth, and conſequently the more diſtended the Womb, the more fleſhy and thick doth it grow. And yet (which is ſtrange) within ſixteen or twenty days

days after a Woman is brought to Bed, it becomes as thin as before, and the whole Womb contracts into so little a compass as to be held in ones hand.

The *inmost* likewise abounds with Blood-vessels propagated into it from the middle one, and is full of pores by which the blood in the menstrual flux is extravasated out of the Arteries into the Womb, and upon impregnation the *Succus nutritius* exsudes into the same, and by which also, both blood and chyle are conveyed into the *placenta uterina* after the formation thereof.

In Virgins it is about two Fingers breadth broad, and three long. In those that have lain with a Man it is a little bigger, and something larger yet in those that have born Children. *Bigness.*

In *shape* it is something like a Pear, only a little flattish above and below. But in Women with Child it becomes more round. *Figure.*

In Maids its *Cavity* is so small that it will hardly hold a large Hazel-nut. In those that have had Children it will hold a small Walnut. It is divided into no Cells as it is in most viviparous Brutes, but only into the right and left side by a Suture or line that goes lengthways, much like that on the outside of the *Scrotum* in Man. Its Cavity is not quite round, but jets out a little towards each side; which jetting some call its Horns, but improperly: for though *Galen* (and many after him) having never dissected any Woman, presuming that their Womb was like that of other viviparous Creatures, attributed *Cornua* thereto, yet in truth they have none; but the *Tubæ Fallopianæ* (as was noted before) answer *Cavity.*

to

to them in many reſpects. Only in Brutes (*viz.* ſuch as have *Cornua*) the conception is alway formed in the *Cornua*, as being the greateſt part of the *Uterus*, (which from the very orifice of its *Fundus* is preſently divided into them, a when one parts the fore from the middle Finger as wide as one can) but very rarely in the *Tubæ* in Women, but moſt an end in the *Fundus* itſelf. Of which more in Chap. 30.

Arteries. Its *Arteries* ſpring partly from the Spermatick or *Præparantes*, and partly from the Hypogaſtrick. Theſe two Arteries do on each ſide by a notable branch inoſculate one with the other. And both their branches that run on one ſide the Womb, do inoſculate with thoſe of their own ſtock on the other. Which may plainly be ſeen by blowing into the Trunk of either of them on which ſide you will, for then the branches on the other ſide will be puffed up, as well as thoſe on that ſide you blow.

They run along the Womb not with a ſtreight or direct courſe, but bending and winding, that they may be extended without danger of breaking when the Womb is enlarged to ſo great a bulk by the *Fœtus*. By theſe Arteries it is that the *Menſes* flow, in greateſt quantity out of thoſe that open into the *Uterus* it ſelf, but in leſſer out of thoſe branches that reach and open into the *Cervix* or neck of the Womb, and in leaſt (if at all) out of the *Vagina*.

As to the reaſon of the menſtrual flux, 'tis not likely that the redundance of blood is the ſole cauſe of it; for then would the term of the flux come ſooner or later accordingly as the Diet ſhould be more full, or more ſparing. Whereas experience ſhews, that let a Woman feed never ſo high, and ſo breed never ſo much blood, this

flux

flux comes never the sooner, (though perhaps it may be larger;) or let her use the most spare diet, and (if she be healthful) it will be never the longer a coming. Wherefore besides a sufficient stock of blood there seems requisite also a fermentation therein, to the producing this flux. Which fermentation by what it should be caused, is hard to determine. Those who grant Seed to Women, derive it thence, because as soon as Girls come to puberty, and desire and become fit for coition, the *menses* begin to flow. But concluding, according to the Moderns, that women have no Seed, the same can be no cause thereof. Astrological reasons I account vain, seeing there are menstruous women at all seasons; and the same women have their *menses*, in process of time, at all ages of the Moon. Other reasons may by the Curious be offered, but all those I have met with are unsatisfying. Waving them therefore, but supposing a fermentation in the blood to be the principal cause, we shall only add a word of the immediate reason or manner of the Flux: When through this fermentation the blood flows so plentifully into the Uterine Arteries, that the Veins (which are fewer than the Arteries) cannot return it all back again by the circulation, it bursts forth of the extremities of the Arteries so long, till the too great quantity of the blood be lessen'd and the fermentation ceases, which it does ordinarily after three or four days, and so the flux stops till the next period. In Women with Child they seldom flow, either because the redundant blood is then bestowed on the nourishment of the *Fœtus*, according to the old Hypothesis; or according to the new, because it is defrauded of a considerable part of the Chyle (or nutritious

juice) which is consumed by the *Fœtus*, whereby it becomes diminished and depauperated, which is the reason why Nurses also seldom have them.

Veins. The *Veins* do likewise spring from the *Præparantes*, and from the Hypogastrick. There are many anastomoses of these Veins one with another, (as there was noted of the Arteries) but especially in the sides of the *Uterus*, which do more readily appear by blowing of them up than those of the Arteries above spoken of. The blood brought hither by the Arteries, that is not spent on the ordinary nutrition of the Womb, or is not cast out when the *menses* flow, returns by these Veins back to the Heart.

Nerves. It has *Nerves* from the *Plexus mesenterii maximus* of the Intercostal pair, and from the lower *Plexus* of the same. As also from the Nerves of *Os sacrum*. And the same run also to the *Testes* or *Ovaria*. Now it is these *Plexus* of Nerves that are chiefly affected in the Hysterical passion or Fits of the Mother. For these Fits are merely Convulsive, and often happen without any fault of the Womb at all. And that symptom that in such Fits is usual, namely when something like a Ball seems to rise from the bottom of the Belly and to beat strongly about the Navel (which is usually taken by women for the rising of the Womb or Mother) is nothing but the Convulsion of these *Plexus* of Nerves: which one will the rather believe, when he considers that some men are afflicted with the same symptom. Of which see more in Dr. *Willis* (*in Cerebr. anat.* p. 201.) who derives the pain of the Colick also from the same cause.

Lymphe-ducts. *De Graef* says, there are many *Lymphe-ducts* that creep through the outer substance of the *Uterus*, which

which one after another meeting into one, empty themſelves into the common Receptacle: And theſe, he ſays, *Bartholin* miſtakes for *Venæ lacteæ.*

The *uſe* of the Womb is to receive into its capacity the principles of the formation of the *Fœtus*, to afford it nouriſhment, to preſerve it from injuries, and at length when it is grown to maturity and requires the light and a freer air, to expel it forth. *Uſe.*

The *Cervix* or *Os internum* of the Womb being continuous to it and coming betwixt it and the *Vagina*, we will treat of it in this Chapter. It ſeems to be a part of the *Fundus* or of the Womb properly ſo called, only it is much narrower, for its Cavity is no wider in Virgins than a ſmall Quill, and in women with Child its inner Orifice both either quite cloſe its ſides together, or is daub'd up with a ſlimy yellowiſh humour, ſo that nothing can then enter into the Womb, unleſs in very luſtful Women it be ſometimes open'd for ſuperfœtation. It is an Inch or more in length. Its Cavity as it opens to the *Vagina* is compared to the mouth of a Tench; *Galen* likens its paſſage to that in the *Glans* of a Man's *Penis*; for it is not round, but long and tranſverſe. It is wrinkled, and has many ſmall ducts opening into it, out of which one may preſs a pituitous ſerous matter. It has the ſame Membranes and the ſame Veſſels with the *Uterus* it ſelf. *De Graef* ſays that amongſt its wrinkles he has often obſerved *Hydatides* or little watry Bladders; and thinks, that the aboveſaid ſerous matter ſerves only to moiſten the *Vagina*, &c. and to excite to Venery. *The neck of the Womb.*

CHAP. XXVIII.

Of the Vagina, *and its Contents*, viz. *the* Hymen *and* Carunculæ myrtiformes.

Vagina. *Its name.*

CONtinuous unto the *Cervix* is the *Vagina*, ſ called, becauſe it receives the *Penis* like *Sheath*. It is called alſo the *door of the Womb*, an its *greater Neck*, to diſtinguiſh it from the leſſe juſt now deſcribed in the foregoing Chapter.

Deſcription.

It is a ſoft and looſe Pipe, uneven on its inſid with orbicular wrinkles, of a nervous but ſome what ſpongy ſubſtance (which luſt cauſeth to pu up a little, that it may embrace the Yard mo cloſely) about ſeven Fingers breadth long, and wide as the ſtreight Gut: all which yet, bo length, width, and looſeneſs differ in reſpect age, *&c.* and as a woman is inflam'd more leſs with luſt. So alſo the aforeſaid wrinkles a much more numerous and cloſe ſet in Virgin and in women that ſeldom accompany with man, and that have never born Children, th in thoſe that have born many Children, and Whores that uſe frequent copulation, or tho that have long laboured under the *fluor albus*, f in all theſe three ſorts they are almoſt obliter ted. Its thickneſs on the upper ſide, (accor ing to *de Graef*) is about a ſtraws breadth; b on its lower it is twice as thick. *Stockham* ſays, it conſiſts of a ſpongy and glandulo ſubſtance, through which not only plenti branches of Veins and Arteries, (*viz.* from t hypogaſtrick and hemorrhoidal) are diſperſe as alſo Nerves from the *Os ſacrum*; but it has ſo proper excretory Ducts, which gape like po in

into its inner cavity, and are moſt numerous near the urinary paſſage. And this ſubſtance, he ſays, is contained between two Membranes, of which the inner is nervous and wrinkled; the outer, carnous.

It has very many *Arteries* and *Veins*, ſome of which inoſculate one with another, and others not: By the Arteries that open into it do the *Menſes* ſometimes flow in Women with Child that are plethorick: for they cannot come from the Womb it ſelf, unleſs abortion follow, as ſometimes it does. Theſe Veſſels bring plenty of blood hither in the venereal congreſs, which heating and puffing up the *Vagina* encreaſeth the pleaſure, and hinders the Man's Seed from cooling before it reach the *Uterus*. They ſpring not only from the Hypogaſtrick, but alſo from the Hemorrhoidal, but theſe latter run only through the lower part of the *Vagina*. Its Nerves Dr. *Willis* thus deſcribes: From the loweſt *plexus* of the *Abdomen* two Nerves are ſent into the *Pelvis*, where each receives a notable vertebral Nerve; and ſo they make two *plexus*, one on each ſide, from which there ariſe two aſcending Nerves that run to the *Inteſtinum rectum*, and two deſcending that are carried to this part we are ſpeaking of. *Veſſels.*

Caſp. Bartholin relates that in a Cows *vulva* he was ſhewn by *Joſ. du Verney*, a *Gland* on each ſide of it, ſomewhat on the hinder part, each of which has a duct running from it opening into the *vulva*, but at its orifice has a notable *papilla* placed which cloſes it, ſo that no liquor can paſs out but by the protuberating and uncloſing of the *papilla* in *coitu*. He ſays, he has not yet obſerved them in Women, but inclines to believe they are not wanting in them; and thinks that that li- *Glands.*

quor which is sometimes emitted by them with pleasure, issues a great part of it from hence. The Glands, he says, are of the conglomerate kind, and are invested round with peculiar and proper carnous Fibres, which seem to arise from the Sphincter of the Bladder, as those which incompass the *Prostatæ* in Men do according to the observation of *de Graef*: and therefore he thinks these Glands in Females are in lieu of the *Prostatæ* in Men.

The insertion of the Neck of the Bladder.

Near its outer end, between the *Nymphæ* (of which in the next Chapter) in its fore and upper part it receives the neck of the urinary Bladder encompassed with its Sphincter: opposite whereto in its hinder or lower part it is strongly knit to the Sphincter of the streight Gut. The urinary passage, or *Urethra*, is not above two Fingers breadth long from the neck of the Bladder to its end, and about as thick as a Goose-quill.

Hymen.

The *Hymen* is a thin nervous Membrane interwoven with carnous Fibres, and endowed with many little Arteries and Veins, spread across the duct of the *Vagina*, behind the insertion of the neck of the Bladder, with a hole in the midst that will admit the top of ones little Finger, by which the *Menses* flow. It is otherwise called the Zone or Girdle of Chastity. Where it is found in this form described, it is a certain note of Virginity; but upon the first congress with a Man it is necessarily violated, which is usually accompanied with an effusion of Blood; which blood is called the *Flower of Virginity*; and of this the holy Text makes mention in *Deut.* 22. verses 13.—21. And when once it is broke, it never closes again.

But though this effusion of blood upon coition from the rupture of this Membrane, (or perhaps of Capillary vessels in the *Vagina*) be a certain token of Virginity; yet it will not follow on the contrary, that where it is wanting, Virginity is also wanting. For the *Hymen* may be corroded by acrimonious fretting humours flowing through it with the *Menses*; or may be violated by the falling out or inversion of the *Uterus* or the *Vagina* at least, which sometimes happens even to Maids; or lastly, perhaps the indiscreet and unwary Bride has had her *Menses* a day or two before, in which case both the *Hymen* and the inner wrinkled Membrane of the *Vagina* are so flaggy and relaxed, that no such rupture, and by consequence no such effusion may happen.

In some there naturally wants a *foramen* in the *Hymen*, by which means there being no *exit* for the *Menses*, such are in great peril of their life, if they be not relieved by Surgery, *viz.* by opening it with some sharp Instrument.

Close to the *Hymen* lie the four *Caruncul*æ *myrtiformes*, so called from their resembling Myrtle-berries. The largest of them is uppermost, standing just behind the mouth of the Urinary passage which it helps to shut. Opposite to this in the bottom of the *Vagina*, there is another, and on each side one, so that they stand in a square. But of these there is only the first in Maids, the other three are not indeed Caruncles, but little knobs made of the angular parts of the broken *Hymen* roll'd into a heap by the wrinkling of the *Vagina*, according to *Riolanus* and *Diemerbroeck*. These three when the *Vagina* is extended in a Woman's labour, lose their asperity and become smooth, so Caruncul*æ* myrtiformes.

that they disappear, until it be again contracted to its natural straitness.

The Sphincter Muscle. *De Graef* affirms, "that the *Vagina* near its "outer orifice has a Sphincter muscle almost "three Fingers broad, that upon occasion con- "stringes or contracts it. Which constriction is more particularly described by *Stockhamer*, who says, "it is performed partly by means of the "Fibres that run through the outer carnous coat "of the *Vagina*; and partly by this Sphincter "Muscle, and two Net-like *plexus* which in their "composition are like the nervous bodies of the "*Penis*, or of the *Clitoris*; for they consist of ves- "sels and fibres water'd with black blood, and "clad with a thin Membrane; they climb on ei- "ther side of the *Vagina* near its outer orifice, "and notably help to constringe it when they "are puft up with spirituous blood in coition; "for by their swelling they drive the sides of the "*vagina* inwards; which that they may the bet- "ter do, the Sphincter muscle (ascending from "the Sphincter of the *Anus*) doth outwardly co- "ver these *plexus*, that by its constriction it may "hinder them to swell outwardly.

The use of the Vagina. Having thus described the parts of the *Vagina*, its *use* is easily declared to be, to receive the Man's Yard, being erect, to direct and convey the Seed into the Womb, to serve for a Conduit by which the *Menses* may flow out, and to afford a passage to the *Fœtus* in its birth, and to the After-birth.

CHAP.

CHAP. XXIX.

Of the Pudendum muliebre, *or Woman's Privity.*

THE parts that offer themselves to view without any diduction, are the *Fissura magna* or great Chink, with its *Labia* or Lips, the *Mons Veneris* and the Hairs. These parts are called by the general name of *Pudenda*, because when they are bared, they bring *pudor* or shame upon a Woman.

The great *Chink* is called *Cunnus* by *Galen* à *Fissura.* *Jeiv*, to conceive; by *Hippocrates*, *Natura*. It is also called *Vulva*, *Porcus*, *Concha*, and by many other Names that Fancy has imposed upon it.

It reaches from the lower side of the *Os pubis* to within an Inch of the *Anus*; being by Nature made so large, because the outer Skin is not so apt to be extended in travail as the membranous *Vagina* and *Collum minus* are. It is less and closer in Maids than in those that have born Children. Its length makes the *Perinæum* not to be above an Inch long. It has two Lips, which towards the *Pubes* grow thicker and more full or protuberant, and meeting upon the middle of the *Os pubis* make that rising that is called *Mons Veneris*, or the Hill of *Venus*.

The inner substance of this Hill, which makes *Mons Veneris.* bunch so up, is most of it fat; and under the it lies that Sphincter muscle that we spoke of in the last Chapter, that constringes the orifice of the *Vagina*, and springs from the *Sphincter ani*.

By a little drawing aside the *Labia*, there then appear the *Nymphæ* and the *Clitoris*.

The

Nymphæ. The *Nymphæ* are ſo called becauſe they ſtand next to the Urine as it ſpouts out from the Bladder, and keep it from wetting the *Labia.* They are called alſo πτερύγια, or Wings. They are placed on each ſide next within the *Labia*, and are two carnous and ſoft productions, beginning at the joynting of the *Oſſa pubis* or upper part of the Privity, (where they are joyned in an acute angle, and make that wrinkled membranous production that clothes the *Clitoris* like a *Præputium* or Fore-skin) and deſcending cloſe all the way to each other, when the *Pudendum* is ſhut, reaching but about half the breadth of the orifice of the *Vagina*, and ending each in an obtuſe angle. They are almoſt triangular, and therefore, as alſo for their colour, are compared to the thrills that hang under a Cock's throat.

Their ſubſtance. They have a red *ſubſtance*, partly fleſhy, partly membranous; within ſoft and ſpongy, looſely compoſed of thin Membranes and Veſſels, ſo that they are very apt to be diſtended by the influx of the Animal ſpirits and arterial blood. Spirits they have from the ſame Nerves that run through the *Vagina*, and blood from that branch of the inner Iliacal Artery that is called *Pudenda*. Veins they have alſo from the *Venæ pudendæ* which carry away the Arterial blood from them when they become flaccid. They are larger in grown Maids than in younger, and larger yet in thoſe that have uſed Venery or born Children.

Uſe. Their *uſe* is to defend the inner parts, to cover the Urinary paſſage, and a good part of the orifice of the *Vagina.* And to the ſame purpoſe ſerve the *Labia* above deſcribed.

Above

Above betwixt the *Nymphæ* in the upper part of the *Pudendum* does a part jet out a little that is called *Clitoris*, from κλειτείζω, that signifies la- Clitoris. ſciviouſly to grope the *Pudendum*. It is otherwiſe called *Virga*, for it anſwers to a Man's Yard in ſhape, ſituation, ſubſtance, repletion with ſpirits and erection; it has nervous bodies, a *ſeptum*, a *glans*, muſcles and the like Veſſels with the *Penis*. But it differs therefrom, firſt in magnitude; for this is very ſmall in reſpect to that, as being not to be blown up to the thickneſs of ones little Finger. Secondly, the forked roots of the nervous bodies that lye hid within the fat of the *Pubes*, are twice as long as that part of it which is united into one body with the *ſeptum* between; whereas on the contrary in the *Penis* the united part is four times as long as the forked. Thirdly, the *Clitoris* wants an *Urethra*, and its prominent *glans* wants a *foramen*. Fourthly, it has only one pair of Muſcles. In ſome its united part grows to that length, as to hang out from betwixt the Lips of the *Pudendum*: yea there are many ſtories of ſuch as have had it ſo long and big as to be able to accompany with other Women like unto Men, and ſuch are called *Fricatrices*, or otherwiſe Hermaphrodites; who it's not probable are truly of both Sexes, but only the *Teſtes* fall down into the *Labia*, and this *Clitoris* is preternaturally extended. But in moſt it jets out ſo little as that it does not appear but by drawing aſide the *Labia*.

It is a little, long and round body, conſiſting (like a Man's *Penis*) of two nervous, and inwardly black and ſpongy parts, that ariſe on each ſide from the bunching of the *Os Iſchium*, and meet together at the joynting or conjunction *Its ſubſtance.*

of

of the *Ossa pubis*. It lies under the fat of *Mons Veneris*, in the top of the great Fissure. In Venery by means of the two nervous bodies it puffs up, and straitening the orifice of the *Vagina* contributes to the embracing of the *Penis* the more closely.

Glans. Its outer end is like to the *Glans* of a Man's Yard, and has the same name, (as also *Tentigo.*) And as the *Glans* in Men is the seat of the greatest pleasure in copulation, so is this in Women; whence it is called *Amoris dulcedo* and *Oestrum Veneris*. It has some resemblance of a *Foramen*, but it is not pervious. It is most of it covered with a thin Membrane from the conjunction of the *Nymphæ*, which for its likeness to the *Præputium* in Men, is also called so.

Muscles. The *Clitoris* has formerly been affirmed to have two pair of *Muscles* belonging to it. The upper are round, and spring from the Bones of the *Coxendix*, and passing a little way along the two nervous bodies above-described are inserted into them. These by straitning the roots of the said bodies do detain the Blood and Spirits in them, and so erect the *Clitoris*, even as those in Men do the *Penis*. And this is the only pair which we suppose belong to the *Clitoris*. As for the other which arise from the *Sphincter ani*, they are those we mention'd above in the end of the foregoing Chapter: for though they have been thought to serve for the erection of the *Clitoris*, yet we think with *de Graef*, that they are rather of the nature of a Sphincter, and contribute to the pursing up or constringing the outer orifice of the *Vagina*.

Vessels. It has *Veins* and *Arteries* from the *Pudendæ*, and *Nerves* from the same origine with the *Vagina*, which are pretty large.

Its

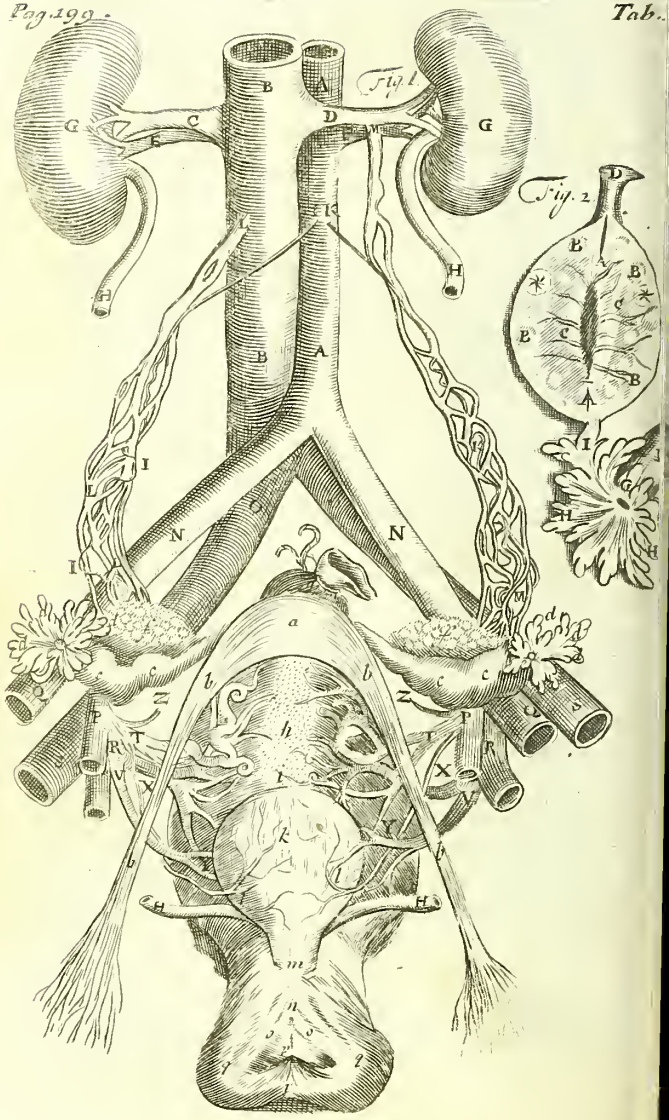


Fig. 1
Fig. 2

Its *uſe* may be known from what has already been diſcourſed. And we will only note further, that in ſome Eaſtern Countries it uſes to be ſo large, that for its deformity and the hinderance it gives to copulation, they uſe to cut it quite out, or hinder its growth by ſearing it, which they improperly call Circumciſion.

Tab. IX.

Fig. I. Repreſenteth the Genital parts of a Woman taken out of the Body, and placed in their natural ſituation.

AA *The trunk of the great Artery.*
BB *The trunk of the* Vena cava.
C *The right Emulgent vein.*
D *The left Emulgent vein.*
E *The right Emulgent artery.*
F *The left Emulgent artery.*
GG *The Kidneys.*
HHHH *The Ureters as they riſe from the Kidneys and are inſerted into the Bladder, but their middle part cut off.*
III *The right Spermatick artery.*
KK *The left Spermatick artery.*
LL *The right Spermatick vein.*
MM *The left Spermatick vein.*
NN *The Iliack arteries.*
OO *The Iliack veins.*
PP *The inner branches of the Iliack artery.*
QQ *The outer branches of the Iliack artery.*
RR *The inner branches of the Iliack vein.*
SS *The outer branches of the Iliack vein.*
TT *The Hypogaſtrick arteries carried to the Womb and* Vagina.
UU *The Hypogaſtrick veins accompanying the ſaid arteries.*

XX *The*

XX *The branches of the Hypogastrick artery tending to the urinary Bladder.*
YY *The branches of the Hypogastrick vein carried to the Bladder.*
ZZ *Portions of the Umbilical arteries.*
a *The* Fundus uteri *cloathed with its common Coat.*
bb *The round Ligaments of the Womb as they are joyned to its* Fundus.
cc *The* Tubæ Fallopianæ *in their natural situation.*
ddd *The* Fimbriæ *or jags of the* Tubæ.
ee *The* Foramina *of the* Tubæ.
ff *The Testicles in their natural situation.*
g *A portion of the streight Gut.*
h *The neck of the Womb, divested of its outer Coat, that the Vessels may be better seen.*
i *The fore-part of the* Vagina *of the Womb, freed from the urinary Bladder.*
k *The urinary Bladder contracted.*
ll *The Blood-vessels running through the Bladder.*
m *The Sphincter muscle constringing the neck of the Bladder.*
n *The* Clitoris.
oo *The* Nymphæ.
p *The Urinary passage.*
qq *The Lips of the* Pudendum.
r *The orifice of the* Vagina.

Fig. II. Exhibiteth a Woman's Testicle or *Ovarium* with the end of the *Tuba* annexed to it.

A *The Testicle opened lengthways in its lower part.*
BB *Eggs of divers bigness contained in the membranous substance of the* Testes.
CC *The Blood-vessels in the middle of the* Testes, *proceeding plentifully from its upper part, as they run to the Eggs.*

DD *The*

DD *The Ligament of the Teſticles, whereby they are knit to the Womb, cut off.*
EE *A part of the* Tuba Fallopiana *cut off.*
F *The Cavity of the* Tuba *cut off.*
GG *The hole that is in the end of the* Tubæ.
H *The leavy ornament of the* Tubæ.
The leavy ornament of the Tubæ *knit to the* Teſtes.

CHAP. XXX.

Of a Conception.

HAving deſcribed all the parts that ſerve for *Generation* both in Man and Woman, Order would that we ſhould ſpeak of the *efficient cauſes*, *matter* or *principles*, from whence that which is generated by and in them, doth proceed. And in the firſt place there occurs the Man's Seed, which is the *active principle*, or *efficient cauſe* of the *Fœtus*; but when we diſcourſed of the *Teſtes*, we ſhewed what the *matter* of it was, *viz.* Arterial blood and Animal ſpirits; and as to the manner of its fecundating the *Ovum*, we omit that, as being too Philoſophical for this place. In the next place therefore we muſt come to the *matter* or *paſſive* principle of the *Fœtus*, and this is an *Ovum* impregnated by the Man's Seed. And here becauſe in Women it cannot be obſerved by what degrees and in what time an *Ovum* in the *Ovarium* or *Teſtis* becomes a Conception in the *Uterus*, we muſt be forced to gueſs at that by the Analogy in other Creatures. To this purpoſe Dr. *Harvey de generatione Animalium*, is worthy to be read of the Curious; eſpecially concerning the

the manner and order of the generation of th parts of a Chicken in an Hen's Egg; in his *Exer cit.* 56. But when he comes to apply this to th Conceptions of viviparous Animals, being ignor rant that there was any formal *Ovum* pre-exiſtin in them, and only then fecundated, he runs int great Errours and odd Notions about Concept on; Imagining an analogy betwixt the Brain forming its Phantaſms or Conceptions, (whic he calls *Animal*) and the Wombs forming her which he calls *Natural*. He rightly indeed re jects the Hypotheſis of the Woman's having tru Seed, as alſo the Notion that the Man's Seed any part of the Conception; but then he give an unſatisfactory account of it, when he ſays, is formed of the primeval albugineous humour that tranſude into the *Cornua* in Brutes, or *Uteri* in Women, after they are impregnated or ma tur'd, as he ſpeaks. For thoſe albugineous hu mours (as ſhall be ſhewn more fully afterwards are not the firſt principle from which the *Fœtu* is formed, but the matter whereby its Lineament firſt drawn within the *Ovum*, receive their ex creaſe and perfection. I ſhall not therefore re hearſe the Hiſtory of generation in Harts that h has given us, for an analogical explication of tha in Women; but ſhall tranſcribe the obſervat ons of the Curious *de Graef* concerning the gene ration of Rabbets, as being more adapted to ou purpoſe, and more conſonant to truth.

"We made the firſt Tryal (*ſays he*) on a fe "male Rabbet that had not yet accompanie "with the male. Diſſecting which we obſerve "a very wide *Vagina*, and about eight Finger "breadth long; which being opened length "ways, there ſtood out two narrow mouths i "its upper part divided with a ſemilunar pa

"titio

tition, namely the beginning of each *Cornu*: for the Womb in Conies is presently from the very *Vagina* divided into two parts, one of which bends towards the right hand, the other towards the left, about three Fingers breadth asunder, where they are presently contracted and continued with the Oviducts, which in these Animals have a peculiar situation (or make:) because if you lightly blow up the *Cornua*, these will not swell, nor the wind penetrate them because of some loose *Fimbriæ* or jags closing like the Valve of the Gut *Colon*. These Oviducts being small at their rising from the *Cornua*, for five Fingers breadth run with a winding Duct beyond the Testicles, widening more and more by degrees, and then they turn back towards them, and end in the form of a Tunnel..... The Testicles are small, but contain very many limpid Eggs, which being cut open, there issued out a clammy liquor like the White of an Egg. This being premised,

"We opened another half an hour after the *Coitus*, the *Cornua* of whose *Uterus* look'd a little redder, but the *Ova* in the Testicles were not yet chang'd, unless they had remitted a little of their clearness: but neither in the *Vagina* nor in the *Cornua* could we perceive any Seed, or any thing like it.

"About six hours after the coupling we dissected another, in whose Testicles the *Folliculi* (or Cases) of the *Ova* inclined to redness, out of which being pricked with a Needle, a clammy and clear liquor issued first, but blood followed, flowing out of the Sanguinary vessels dispersed through the *Folliculi*: We could find no Seed neither in this Coney.

" Four and twenty hours after the *Coitus*, " opened another, in one of whose Testicles " found three, and in the other five *Folliculi* " the *Ova* very much changed; for being befo " limpid and colourless, they were now turn " duskish and of a faint red, in the middle " whose Superficies a little *Papilla* (or Teat) " it were discover'd it self: when the *Follic* " were cut open, there appear'd a little limp " liquor in their middle, and in their circum " rence a certain thicker and reddish matter.

" Twenty seven hours after the *Coitus* we " spected another, the *Cornua* of whose *Ute* " with the Oviducts looked more bloody, a " the extremity of the Oviducts did on every s " embrace the *Testes* like a Tunnel; in the mi " dle superficies of the *Folliculi*, as in those b " fore, there stood out little *Papillæ*, throu " which by pressing the substance of the Tes " cles there issued a limpid liquor, which w " followed by another redder and thicker. Ope " ing the *Cornua* of the Womb we found no Eg " but the inner wrinkled Tunicle of the *Corn* " was a little more tumid.

" Eight and forty hours after the *Coitus* " examin'd another, in one of whose Testic " we found seven, in the other three *Follic* " changed, in whose middle the *Papillæ* we " something more eminent, through which, " pressing the substance of the Testicles, there " sued a little liquor like the White of an Eg " but the remaining reddish substance of t " *Ova*, being now become something thicke " was not so easily pressed forth as in the " before.

" Tw

"Two and fifty hours after the *Coitus* we "viewed another, in one of whose Testicles we "found one, in the other four *Folliculi* altered; "cutting open which we found a glandulous-like "matter, in the middle of which there was a "little Cavity, wherein finding no notable li-"quor, we begun to suspect whether or no their "limpid substance, which is contained in proper "Membranes, were burst forth or expelled: "wherefore we searched carefully both the Ovi-"ducts and the *Cornua*, but we could find no-"thing; only the inner Tunicle of the *Cornua* "being much puft up, shined.

"Seventy two Hours, (or three Days and "Nights) after the *Coitus* we inspected another, "which exhibited a far other and most wonder-"ful change; for the *Infundibulun* did embrace "the Testicles on every side most closely, which "being pull'd off we found in the Testicle of "the right side three *Folliculi* a little greater and "harder, in the middle of whose superficies we "saw a Tubercle with a little hole in it like a "*Papilla*; but dissecting the said Cases through "the middle, their Cavity was quite empty: "wherefore we searched the ways through which "the *Ova* must pass, again and again, and found "in the middle of the right Oviduct one, and in "the outer end of the *Cornu* of the same side two "very small Eggs, little bigger than small Pins-"heads, which notwithstanding their smalness "are cloathed with a double Coat; out of these "Eggs being pricked, there issued a most limpid "liquor..... In the very beginning of the *Cornu* "of the left side we found only one Egg, just like "those small ones of the other side, whence it is "clear that the *Ova* excluded out of the *Testes*

" are ten times leſs than thoſe that yet ſtick
" the *Teſtes*; which ſeems to us to come to pa
" inaſmuch as thoſe that are ſtill in the *Teſtes* co
" tain as yet another matter, namely that
" which the glandulous ſubſtance of the Ca
" is made.

" The fourth Day from the *Coitus* we oper
" another, in one of whoſe Teſticles we fou
" four, in the other three Globules or Caſes e
" ptied; and in the *Cornua* of the reſpective ſi
" we found as many Eggs, greater than the f
" mer, which did not ſtick in the Oviducts
" beginnings of the *Cornua*, but were now ro
" on towards their middle: in their Cavity
" beheld as it were another Egg ſwimming,
" clearer than in the other before. . . . . .

" The fifth day from the *Coitus*, we diſſec
" another, in whoſe *Ovaria* or Teſticles we t
" ſix emptied *Folliculi*, that had each a not
" *Papilla*, through whoſe *Foramen* we eaſily
" an ordinary briſtle into their Cavity: we fo
" alſo the ſame number of Eggs (bigger t
" thoſe the day before) in divers parts of
" *Cornua*, in which they lay ſo looſely, tha
" blowing only, one might drive them this
" or that way. The inner Tunicle of theſe
" the Egg within an Egg as it were) was bec
" yet more conſpicuous.

" The ſixth day after the *Coitus* we exam
" another, in one of whoſe Teſticles we obſe
" ſix Caſes emptied, and in the *Cornu* of the f
" ſide we could light of but only five I
" near the *Vagina*, brought as it were upo
" heap: and in the Teſticle of the other ſid
" found four *Folliculi* emptied, and in the C
" of that ſide only one Egg: The cauſe of w
" differ

difference we ſuppoſe to be, either becauſe ſome Eggs by the wave-like motion of the *Cornua* (not unlike the periſtaltick motion of the Guts) being carried downwards towards the *Vagina* were driven forth; or becauſe being conſumed in the *Folliculi* they came not to the *Uterus*; or light on ſome other miſchance. Theſe Eggs were as big as ſmall peaſe.

"The ſeventh day from the *Coitus* we examin'd another, in whoſe *Ovaria* we found ſome *Folliculi* emptied, that were greater, redder, and harder than the foregoing, and ſaw as many tranſparent Tumors or Cells in divers parts of the *Uterus*; out of which being opened we turned *Ova* as big as Pocket-Piſtol Bullets, in which we beheld nothing but the inner Tunicle very conſpicuous and a moſt limpid humour. It is to be wondred at, that in ſo ſhort a ſpace of time the Eggs ſhould imbibe ſo great plenty of liquor, that whereas before they might eaſily be taken out of the Womb, now they could very difficultly.

"The eighth day from the *Coitus* we opened another, in the right *Cornu* of whoſe *Uterus* we ſaw one, in the left two Cells; one of theſe was almoſt twice as big as the other: for Nature doth ſometimes ſo vary, that there are Eggs of divers bigneſs found not only in divers Animals of the ſame ſpecies diſſected at the ſame diſtance from the *Coitus*, but alſo in one and the ſame Individual. In the horns of the Womb being opened we ſaw the Eggs a little bigger than the day before, but all of them, their Tunicles breaking, poured out their clear liquor before we could take them quite out: for which reaſon we tried another diſſected

" likewiſe the eighth day after the *Coitus*; tl
" right *Cornu* of whoſe *Uterus* we ſaw ſwelled u
" into two, and the left into four tranſpare
" Tumours or Cells, out of which that we mig
" take the *Ova* we uſed the greateſt diligen
" and attention; but as ſoon as we came to ther
" their Tunicles were ſo very tender that th
" burſt as the former: which when we ſaw, tl
" Eggs that remained we boiled with the *Uteru*
" whereby their Contents harden'd like tl
" Whites of Hen's Eggs. The inner ſubſtan
" of the Cells on that ſide whereon it receiv
" the Hypogaſtrick veſſels, was become mo
" tumid and red.

" The ninth day after the *Coitus* we diſſect
" another that was old; the Teſticles of th
" were almoſt as big again as thoſe of younger
" in the right we ſaw two, in the left five *Foll*
" *culi* lately emptied, and beſides theſe, othe
" that look'd very pale, which we judged to l
" thoſe that had been emptied the *Coitus* befo
" this, although for the moſt part they lea
" only ſome paliſh points or ſpecks, to which tl
" encreaſe of the Teſticles is owing. The *Foll*
" *culi* of the laſt *Coitus* were each beſet with
" *Papilla*, but the others were ſmooth. In th
" right *Cornu* there were two, and in the le
" five Cells, whoſe ſubſtance being more rare an
" pellucid than the other parts of the *Uterus*, w
" interwoven with many twigs of Veins and A
" teries. Opening ſome of theſe Cells, we cou
" ſee the *Ova*, but could not take them o
" whole; wherefore being compelled to exami
" the Contents of the Eggs in the very hollow
" the Cells, we found it clear like Cryſtal;
" the middle whereof a certain rare and th

" clo

'cloud was seen to swim, which in other Conies 'dissected likewise on the ninth day after the 'Coitus, for its exceeding fineness escaped our 'sight. The inner substance of the Cells, namely 'that which receives the Hypogastrick vessels, 'being more tumid than the rest, exhibited the 'rudiments of the *Placentæ*.

"The tenth day after the *Coitus* we inspected 'another, in whose right Testicle we found one 'onely *Folliculus* emptied, which by reason of 'the Sanguineous vessels dispersed plentifully 'through it, was redder and had a less *Papilla*; 'in the middle of this pale substance there ap-'pear'd as yet a very small Cavity: but in the 'left Testicle we found six such *Folliculi*. In the '*Cornua* of the *Uterus* we found also so many 'Cells, namely one in the right and six in the 'left, distant a Fingers breadth one from ano-'ther, in the middle of which Cells lay a rude 'mucilaginous draught of the *Embryo* like a little 'Worm. One might also plainly discern the '*Placenta*, to which the Egg by means of its *Cho-'rion* was annexed. The matter of the Eggs 'boil'd with the Womb hardned like the White 'of an Egg, and tasted like the boiled congealed 'substance of the Eggs in the Testicles.

"The twelfth day after the *Coitus* we opened 'another, in one of whose Testicles we found 'seven, in the other five *Folliculi* emptied, and 'as many Cells in the *Cornua* much bigger and 'rounder than the foregoing, in the middle of 'which the *Embryo* was so conspicuous, that one 'might in a sort discern its Limbs. In the regi-'on of its breast two sanguineous specks, and as 'many white ones did offer themselves to view: 'in the *Abdomen* there grew a certain mucilagi-

" nous ſubſtance inclining here and there to red
" We could not diſcern more in this ſhapeleſ
" little Animal becauſe of its tenderneſs.

" The fourteenth day after the *Coitus* we diſ
" ſected another, the Cells of whoſe *Uterus* w
" beheld to be yet greater, and their ſanguineou
" veſſels more, and more turgid: we alſo note
" that the Cells the larger they grew, came alſ
" nearer to one another, and their Interſtice
" were leſſened. The Membranes *Amnios* an
" *Chorion* were knit together, which though the
" appear thicker and ſtronger, are yet more har
" to be ſeparated from one another than in th
" *Ova* taken intirely out of the Womb; tearin
" theſe we ſaw an *Embryo* with a great and pellu
" cid Head, with the *Cerebellum* copped; it
" gogle Eyes, gaping Mouth, and in ſome ſor
" its little Ears might be diſcovered alſo. It
" Back-bone was drawn out, of a white colour
" which bending in about the *Sternum* reſemble
" a Ship; by whoſe ſides moſt ſlender Veſſels run
" whoſe ramifications were extended to the Bac
" and Feet. In the region of the Breaſt two ſan
" guineous ſpecks greater than the foregoing ex
" hibited the Rudiments of the Ventricles of th
" Heart; at the ſides whereof were ſeen two
" whitiſh ſpecks for Lungs. In the *Abdomen* be
" ing opened, there firſt ſhew'd it ſelf a reddiſ
" Liver; then a white Body, to which was knit
" a mucilaginous matter like a writhed thread,
" being the rudiments of the Stomach and Guts.
" All which in thoſe that we diſſected afterward
" had acquired only a greater bulk and perfe-
" ction. And therefore to prevent tedioufneſ
" by repeating the ſame things, we will on pur-
" poſe paſs by all the other diſſections we mad

" in

'in this kind of Creature, excepting only one 'which we made the day before the kindling; 'that those things that in the former were only 'confusedly discerned, may appear plain in 'this.

"At length on the twenty ninth day after the 'Coitus we inspected another, that had kindled 'six weeks before, and in the *Coitus* by which 'she was impregnated had voided all the thicker 'part of the Seed of the Male, which in some 'measure did resemble the consistence of a most 'limpid jelly. In her *Ovaria* we found eleven 'little whitish *Folliculi*; and besides these, others 'far less, little or nothing differing from the 'substance of the *Testes*. The *Folliculi* of the '*Ova* in the *Testes* seem not to vanish wholly, 'but to leave a certain speck in them; whence 'it certainly comes to pass, that Conies, the oft-'ner or the more young ones they bring forth, 'have the greater and whiter Testicles; so that 'one may guess by only viewing the *Testes*, whe-'ther they have had many young ones or often. 'Having view'd the *Ovarium* we past to the *Ute-'rus*, which we found no longer distinguish'd in-'to Cells, but all along distended like a Pud-'ding; which was so agitated with a wave-like 'motion, like the peristaltick of the Guts, that 'the young ones nearest the *Vagina* as yet in-'cluded in their Membranes were excluded, and 'that so hastily, that if we had not cut out the 'whole *Uterus*, they had all certainly gone the 'same way. The Womb was no thicker than when 'they are not with young, otherwise than we have 'said it to be in Women. In its Cavity we 'saw eleven *Fœtus* sprawling, which were all 'so closely coupled together by the Membrane '*Chorion* (wherein all are severally involved)

'as

" as if they had all been included in one and the
" same *Chorion*——

Thus much I thought fit to tranſlate of that accurate Anatomiſt's Obſervations concerning the generation of this ſort of Animal, becauſe it gives ſo very great light into the manner of the generation of an humane *Fœtus*. For there is an exact analogy betwixt them, abating ſome circumſtances; as *Firſt*, that in Women the Conception is not formed in the *Cornua*, ſeeing her Womb has none, nor in the *Tubæ* very ſeldom and according to nature, for they are only the *Infundibula* or Oviducts to convey the *Ova* from the *Teſtes* to the *Fundus uteri*, though they bear ſome reſemblance to the *Cornua* in Brutes; I ſay the conception is not formed in theſe, but in the *Fundus uteri* or Womb properly ſo called, whereinto the *Ovum* being received, preſently begins to ſwell and grow bigger, and there appears as it were an Egg within an Egg, by means of the two Membranes with which it is cloathed; which Membranes are originally in the *Ovum* while it is in the Teſticle, and imbibe the moiſture that is ſent now plentifully into the Womb, even as the little Yelks in Hens, *&c.* gather the White about them in the Oviduct and *Uterus*, which they have none of in the *Ovarium*; or as Seeds in the Ground do imbibe the fertile moiſture thereof to enable them to ſprout. *Another* conſiderable circumſtance wherein they differ, is the ſlow procedure of the formation of the *Fœtus* in Women in compariſon of that in Conies now deſcribed. For ſeeing theſe go with young but 29 or 30 Days, and Women 9 Months, we muſt imagine that the *Embryo* is as perfectly formed in the former on the tenth Day as in the latter in the

the tenth Week, or longer. But I say, abating these, or if there be any other such like circumstances, there is so great a likeness betwixt the one and the other, that without insisting more on the matter or manner of the Conception, we shall pass on to the description of the parts that encompass the *Fœtus*, then shew how it is nourished, and lastly what parts there are in a *Fœtus* that differ from those in a Child born.

CHAP. XXXI.

Of the Placenta Uterina *or Womb-liver, and* Acetabula.

Placenta uterina.

UPon the cutting open the Womb of a Woman with Child, the first thing that offers it self is the *Placenta uterina*, or Womb-cake, otherwise called *Hepar uterinum*, or Womb-liver, from the likeness of substance, and also use, according to those that imposed the name.

Its substance.

Its *substance* is very like that of the Spleen, only that is more brittle, and this more tough and tenacious, so that it cannot so easily be separated from the Vessels. It is soft, and has innumerable Fibres and small Vessels. Its *Parenchyma* is partly, if not altogether, glandulous.

Dr. *Fred. Ruysch* affirms (as he does of the Spleen) that it has no fibres, no peculiar glands, nor cells, with bloud-vessels placed between; but that its whole fabrick is only an *aggeries* of Arteries and Veins. Of which opinion you may see more before in chap. 16. *of the Spleen.*

Shape and situation.

It is of very different *shapes* in several Creatures, but in Women it is circular, yet with some

ſome inequalities in its circumference. It is two Fingers breadth thick in its middle, (but thinner near the edges) and a ſpan or a quarter of a yard over from one ſide to the other when the *Fœtus* is come to maturity ready for the birth. On that ſide next the *Fœtus* it is ſmooth and ſomething hollowiſh like Navel-wort, and grows every where firmly to the *Chorion*; but on that next the Womb it is very unequal, having a great many tubercles or bunchings, whereby it adheres faſt and immediately to the Womb. But to what part of it, is not agreed among Anatomiſts, ſome affirming it to grow to the fore-part, ſome to the hinder-part; ſome to the left ſide, others to the right. Dr. *Wharton* (aſſenting to *Fallopius*) ſays, it always adheres to one of the two corners of the Womb (that anſwer in ſome manner to the *Cornua* in Brutes) whereinto the *Foramen* of the *Tuba* opens; ſo that he ſays, the ſaid *Foramen* is as it were the centre to the *Placenta*. *De Graef* thinks it is moſt commonly faſten'd there, but not always, becauſe the *Ovum* for a while being looſe in the Cavity of the *Uterus*, may be tumbled to this or the other part, and where ever it fixes, there it is joyn'd to the Womb by the *Placenta*.

Number. When there is but one *Fœtus* in the Womb, it is but one; but if there be Twins, then according to Dr. *Wharton*, &c. are there two *Placentæ*, either diſtinct in ſhape, or if they appear in the ſhape of one, then are they ſeparated by a Membrane one from the other; and a particular rope of Umbilical veſſels is inſerted into each from each *Fœtus*. But Dr. *Needham* affirms, that there is generally but one *Placenta* even when there are two or more *Fœtus*. Nor does that line that ſeems to divide the *Placentæ* from one another, really

do

do ſo. For the Veſſels of the right-hand *Fœtus* extend beyond this line to the left ſide of the *Placenta*; and on the contrary, 'tis but ſeldom, ſays he, that the *Placentæ* are multiplied according to the number of the *Embryo's*.

Origine. It grows not out of the Womb originally, but its firſt rudiments appear like a woolly ſubſtance on the outſide of the outer Membrane that inveſts the *Embryo* (called *Chorion*) about the eighth or ninth Week, upon which in a ſhort while a red, carnous and ſoft ſubſtance grows, but unequally and in little knobs, and then it preſently thereby ſticks to the Womb, and is very conſpicuous about the twelfth or thirteenth Week. Till now the *Fœtus* is encreaſed and nouriſhed wholly by the appoſition of the cryſtalline or albugineous liquor wherein it ſwims looſe in the inner Membrane (called *Amnios*) having no *Vaſa umbilicalia* formed, by which to receive any thing from the *Placenta*. But when it waxes bigger and begins to need more nouriſhment, the extremities of the Umbilical veſſels begin to grow out of the Navel by little and little, and are extended towards this *Placenta*, that out of it, as Plants by their Roots out of the Earth, they may draw a more firm nutritive juice, and carry it to the *Fœtus*. But of this more in the 33*d*. Chapter.

Veſſels. It has *Veſſels* from a double Origine, ſome from the Womb, and ſome from the *Chorion* immediately, but mediately from the *Fœtus*. The former are of four kinds, Arteries, Veins, Nerves and Lympheducts: all which though they be very large and conſpicuous in the Womb, and are ſo even in that very place where the *Placenta* is joyned to it: yet they ſend but the ſmalleſt Capillaries into the *Placenta* it ſelf, and are diſperſed only through that ſide of it that is next

the

the Womb. Thoſe that come from the *Chorion* are Arteries and Veins, and Dr. *Wharton* ſuppoſes alſo Lympheducts. The Arteries and Veins that come from the Womb ſpring from the Hypogaſtricks, and alſo that branch of the Spermaticks that is inſerted into the bottom of the Womb. Thoſe that come from the *Chorion* are the Umbilical veſſels of the *Fœtus*. Of the uſe of both the one and the other we ſhall ſpeak in Chap. 33. when we come to diſcourſe how the *Fœtus* is nouriſhed, as alſo of the uſe of the *Placenta* it ſelf, of which we ſhall only obſerve this further here; That after it is joyned to the Womb, it ſticks moſt firmly to it for the firſt months, as unripe Fruit do to the Tree: But as the *Fœtus* becomes bigger, and riper, and nearer to the birth, by ſo much the more eaſily will it part from the Womb; and at length like to ripe Fruit, after the Child is born, it falls off from the Womb, and makes part of the After-birth.

Acetabula. It was an old tradition continued for many hundred years, that the *Placenta* adheres to the Womb by certain parts called *Cotyledones* or *Acetabula*. That there are ſuch in ſome Creatures it is certain; Dr. *Needham* ſays, they are only properly ſo called in Sheep and Goats, in whom being with young the Uterine glands are hollow like a Saucer or an Acorn-cup; and are adapted to the little Prominences (or *Digituli*) of the *Placentulæ* that grow on the *Chorion*; (though *Diemerbroeck* ſay; that on the contrary the *Placentulæ* are hollow, (and ſo are truly the *Acetabula*) and the Uterine glands protuberant) and doubts not but theſe names were firſt given by thoſe that diſſected theſe kind of Creatures, and were afterwards applied in following ages to other Animals. So that no wonder there have been

been so great contests even about the signification of the word *Cotyledon*, (which is the Greek word for the Herb *Umbilicus Veneris* or Navelwort) and what that was that was so called in the several Creatures that were said to have them. But because such Controversies are now obsolete, and that 'tis generally confessed that Women have them not, we shall not in this Epitome run out into needless Disputes; but only observe one singular Opinion of *Diemerbroeck*, who ascribes *Cotyledones* to Women. He thinks that each Woman (unless she go with Twins) has but one *Cotyledon*, and that the foresaid *Placenta uterina* is it. And indeed it must be confest that it resembles much the shape of that from which the *Cotyledones* have their name; and therefore seeing he formed this Opinion to defend our great Master *Hippocrates*, who had ascribed them to Women, (that is, as *Diemerbroeck* expounds it, one *Cotyledon* to one Woman) we shall not oppose it, but confess it to be, if not true, yet both ingenious and ingenuous.

CHAP. XXXII.

Of the Membranes involving the Fœtus, *and of the Humours and Air contained in them.*

NExt to the *Placenta* follow the two *Membranes* that involve the whole *Fœtus*, *Chorion* the outer, and *Amnios* the inner: betwixt which two, after the *Fœtus* is perfectly formed, Dr. *Needham*, &c. affirms there is a third, *viz. Allantoides*, which in Women likewise includes the whole *Fœtus* *. Of each of these in their order, with the *liquors* they contain.

* *Needh.* de formato fœtu, p. 59.

The

Chorion. The outmoſt *Membrane* is called *Chorion*, it is pretty thick, ſmooth on the inſide, but without ſomething unequal or rough, and in that part of it that adheres to the *Placenta* and by it to the Womb, has very many Veſſels which ſpring from the *Placenta* it ſelf, and from the Umbilical veſſels Thoſe which ſpring from the *Placenta* are diſperſed through it before the *fœtus* is ſhaped, (as *Diemerbroeck* affirms;) but the latter not till the Navel-rope is grown out to a juſt length, at which time they enter it and intermix with the former; and from this Membrane are inſerted into the *Placenta* to which the *Chorion* adheres. It is but one even when the Mother goes with Twins: for, as in a Nut that has two Kernels in it, they are both included within the ſame Shell, but are each inveſted in their proper Membrane; ſo Twins are both incloſed in one *Chorion*, but have each a particular *Amnios*. It inveſts the *Ovum* originally, which *Ovum* being brought into the Womb, and becoming a Conception, this Membrane imbibes the moiſture that bedews the Womb plentifully at that time. For whiles the Conception is looſe in the Womb, and has no Veſſels that reach out of it ſelf, nor is faſten'd to any part, it muſt have its encreaſe after the ſame manner as the Egg has in Hens, " which while it " is in the *racemus* or knot, conſiſts of no other " ſubſtance but Yelk; and when it drops off from " thence and deſcends through the *Infundibulum*, " it receives no alteration; but when it comes " into the Cells of the proceſs of the *Uterus*, it " begins to gather a White, although it ſtick to " no part of the *Uterus*, nor has any Umbilical " Veſſel; but (*ſays my Author*, the immortal " *Harvey*)

Harvey *) as the Eggs of Fishes and Frogs do without, procure to themselves Whites out of the water; or as Beans, Peafe, and other Pulfe, and Bread-corn being steep'd in moisture swell, and thence acquire aliment for the bud that is springing out of them: so in like manner out of the *plicæ* or wrinkles of the Womb (as out of a Dug or Womb-cake) does there an albugineous moisture flow; whence the Yelk (by that vegetative and innate heat, and faculty wherewith it is endued) gathers and concocts its White. And therefore in those *plicæ* and the hollow of the Womb does there plentifully abound a liquor resembling the taste of the White. And thus the Yelk descending by little and little is encompassed with a White, till at last in the outmost *Uterus* having assumed Membranes and a Shell, it is perfected.] Thus say does the *Chorion* imbibe that albugineous quor that from the first Conception encreases ily in it, (and transudes through the *Amnios* herein the *Embryo* swims) till the Umbilical ssels and the *Placenta* are formed, from and rough which the *Fœtus* may receive nourishent.

* De generat. Animal. Exercit. 9. de generat. Ovi.

Its liquor.

This *liquor* that it imbibes I take to be nutriis juice that ouzes into the Cavity of the *Uterus* t of the capillary orifices of the Hypogastrick d Spermatick Arteries, and is of the same nare with that which afterwards is separated in e *Placenta* and carried to the *Fœtus* by the Umical Vein, and with that also which abounds i the *Amnios* even till the Birth. For the plaick or vegetative vertue is only in the *Ovum* it f, and the augmentation that the first Lineaents of the *Embryo* receive, is only by apposion of this nutritious albugineous juice. But this

Membrane *Chorion* by that time the Umbilic Veſſels and *Placenta* are formed, is grown denſe and compact, that it is not capable of in bibing more; but that which at this time is in does in ſmall time tranſude into the *Amnios*, an ſo it ſelf becomes empty, and gives way to t encreaſe of the *Allantoides*, (which thencefo ward begins to appear) whoſe liquor augmen daily as the *Fœtus* grows nearer and nearer the birth. This is my conjecture, which I ſu mit to the cenſure of the learned.

Amnios. The *Amnios* is the inmoſt Membrane that in mediately contains the *Fœtus*. It is not knit the *Chorion* in any place ſave where the Umbil cal Veſſels paſs through them both into the *Pl centa*. It is very thin, ſoft, ſmooth, and pell cid, and encompaſſes the *fœtus* very looſly. It h Veſſels from the ſame origins as the *Chorion*. is ſomething of an oval ſhape.

Its liquor. Before the *Ovum* be impregnated, this Mem brane contains a limpid *liquor*, which after t impregnation is that out of which the *Embryo* formed. In it reſides the plaſtick power, an the matter alſo out of which the firſt lineamen of the *Embryo* are drawn. But becauſe its liquc is ſo very little, there tranſudes through th Membrane preſently part of that nutritious albu gineous humour that is contained in the *Chorio* which it had imbibed out of the *Uterus*, as w but even now ſhewn. And by the juxta-appoſi tion or addition of this humour to the undiſcer nible rudiments of the *Embryo*, it receives its en creaſe. But though the *Amnios* have its addition nutritious liquor at firſt only by tranſudation yet when the Umbilical Veſſels and the *Placent* are formed, it receives it after another manne

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For then this liquor being separated from the Mother's Arteries by the *Placenta*, and imbibed by the Umbilical Vein of the *fœtus*, it passes directly to its heart, from whence being driven, a great part of it, down to the *Aorta*, it is sent forth again by the Umbilical Arteries, out of whose Capillaries dispersed plentifully through the *Amnios* it issues into its Cavity, even as far more gross and viscid juices in taking a purge (or sometimes critically) ouze into the Intestins out of the small mouths of the Arteries; though indeed it be here by the intervention of Glands, which 'tis hoped the Curious will sometime discover also in the *Amnios*.

There are some that think they have observed *Venæ lacteæ* to come directly to the *Placenta*, and that out of it (as out of the Glands in the Mesentery) there arise others that convey the Chyle into the *Amnios*: and this indeed were a plausible Opinion, if it were grounded on any certain or frequent Observation of such Lacteals, and were not rather invented to avoid some difficulties with which the former Opinion seems to be pressed.

Note, that though the liquor contained in both the *Chorion* and *Amnios* be in colour and consistence very like the *serum* of the blood; yet it differs so much from the nature of that, that being held over the Fire in a Spoon, it will not coagulate, as the *serum* will.

A third *Membrane* which invests the whole *Fœtus* (according to Dr. *Needham*, &c.) is that called *Allantoides*, though improperly as to Women. For it is so called from its likeness to a pudding (ἀλλᾶς τὸ, *farcimen*) which indeed it does resemble in Sheep, Does, Hogs, &c. but in Women, as also in Mares, it has the same Figure Allantoides.

gure as the *Chorion* and *Amnios*, betwixt which is placed in their whole circumference, (as the said obſerving Anatomiſt affirms.) Now though it muſt be ſuppoſed that this as well as the other two, is originally in the *Ovum*, yet there is no appearance of it till after the Umbilical veſſels and *Placenta* are formed, and the albugineous liquor (ſo often mentioned) ceaſes to be imbibed by the *Chorion* out of the *Uterus*. But as ſoon as the *fœtus* begins to be nouriſhed by the Umbilical veſſels, and the *Urachus* is permeable, then preſently this Membrane begins to ſhew it ſelf containing a very thin liquor, which is the Urine of the *fœtus* brought into it by the *Urachus* from its Bladder; and with which it is filled daily more and more till the birth. It is very thin, ſmooth, ſoft, and yet denſe. It may be known from the *Chorion* and *Amnios* by this, that they have numerous Veſſels diſperſed through them, but this has not the leaſt viſible Vein or Artery. It is very hard to ſeparate the *Chorion* from it, becauſe when it appears, the *Chorion* becomes void of all liquor, and ſo claps cloſe to it. But towards the birth of the *fœtus* it becomes ſo turgid with Urine, that the *Amnios* (immediately containing the *fœtus*) ſwims in it, and ſo may moſt eaſily be diſtinguiſht and ſeparated from it.

Its liquor. The *liquor* that it contains is (as has been ſaid) the Urine of the *fœtus* brought hither by the *Urachus*. For as ſoon as the *fœtus* is perfectly formed, its Kidneys muſt needs perform their office of ſeparating the *Serum* from the blood, for otherwiſe it would be affected with an *Anaſarca* or other ſort of Dropſie. I ſay, the *Serum* is ſeparated in the Kidneys, and glides down from thence into the Bladder, in which it is found pretty plentiful when the *fœtus* is five or ſix

Months

ſonths old. Now it flows not out of the Blad-
er by its neck, becauſe at that time the Sphin-
er is too contracted and narrow, and if it ſhould
aſs that way, it would mix with that nutritious
ice in which the *fœtus* ſwims in the *Amnios*, and
herewith, by taking it in by its Mouth, it is
artly nouriſhed, and ſo would defile and cor-
ıpt it, and make it unfit for nouriſhment. Na-
ıre therefore has provided it another *exit* by
ıe *Urachus* inſerted into the bottom of the Blad-
er; which though after the Child is born it
ow ſolid like a Ligament, like as the *Vena um-
licalis* does, yet while the *fœtus* is in the Womb
is always pervious, and conveys the Urine in-
the *Allantoides* that is placed betwixt the *Cho-
on* and *Amnios*, where it is collected and pre-
rved till the birth.

Beſides theſe three Membranes, Dr. *Needham*
s obſerved a fourth in Cats, Bitches, and Co-
ys, containing a nutritious liquor; but I ſhall
ot here deſcribe the ſame, becauſe it is not my
eſign to be ſo copious as to treat of any part in
her Animals, whereto there is not ſomething
ſwerable in an humane body.

Note, that according to Dr. *Needham*'s Ob- *Air in the Membranes.*
rvation, theſe Membranes are not only filled
th liquors, but contain a pretty deal of air.
r if one take a Secundine up in his hand, he
ys, one may obſerve in the uppermoſt part of
e Membranes a pretty diſtance between the
embrane and the liquor contained in it. And
thinks that the *Vagitus uterini*, (of which he
ves an inſtance not to be denied) are a clear
monſtration, that there is air, at leaſt in the
nnios. And the piping of Chickens in the Egg,
fore either the Shell or the Membranes be
oke, evince the ſame. And ſeeing there ap-

pears no way whereby the wind ſhould ente from without, he is of opinion that it is bred i the Membranes themſelves; that is, that the li quor which is pretty ſpirituous, and fitted fo the fermentation and concoction of the *Fœtu* and therefore well repleniſht with air, may we be ſuppoſed to yield plenty of exhalations; b the interpoſition whereof the Membranes, bein ſeparated from the humours, are kept ſo la that they may yield to all the motions both o the *Fœtus* and of the Mother, without danger o burſting. For this air does not ſo diſtend th Membrane, but that by blowing, it will wide to thrice as large a dimenſion as the liquor it con tains, and the air too, do extend it.

CHAP. XXXIII.

Of the Umbilical Veſſels, and of the nouriſh ing of the Fœtus.

The Navel-ſtring.

HAving opened the Membranes that enwra the *Fœtus*, there appears the *Navel-ſtrin* or *Rope*, which is membranous, wreath'd and un equal, ariſing out of the middle of the *Abdomen* (*viz.* the Navel) and reaching to the Woml liver or *Placenta*, of a notable length, bein three ſpans or half an Ell long, and as thick a ones Finger. It was convenient to be ſo lon and lax, that when the *Fœtus* in the Womb grov ſtrong, it might not break it by its ſprawlin and tumbling about; and after it is born, th Secundines or After-birth might be drawn ou the better by it.

Th

The way that it passes from the Navel to the *Placenta* is very unconstant; for sometimes it goes up on the right hand to the Neck, which having encompassed, it descends to the *Placenta*, and sometime it goes on the left hand up to the Neck, *&c.* Sometimes it comes not to the Neck at all, but goes first a little up towards its Breast, and then turns round its Back, and from thence passes to the *Placenta*. *Its situation.*

The *Vessels* contained in this string (and which are enwrapped in a common Coat called *Funiculus* or *Intestinulum*) are four, one Vein, two Arteries and the *Urachus*. *Vessels.*

The *Vein* is larger than the Arteries, and arises from the Liver of the *fœtus*, (*viz.* out of its Fissure) by the Trunk of the *Vena portæ* (of which it seems to be but a branch) and from thence passing out of the Navel, it runs along the *Funiculus* to the *Placenta*, into which it is implanted by innumerable roots; but in its passage it sends some little twigs into the *Amnios*. *Vein.*

The Ancients that thought the *Fœtus* was nourished by the Mother's blood onely, taught the sole *use* of this Vein to be, to carry blood from the *Placenta* to it: and since it has been found out and believed that it is nourished also (if not onely) by Chyle or *Succus nutritius*, some have continued the same office to this Vein, and think that the Chyle is brought by Lacteal Vessels arising out of the *Placenta*, as (they say) it was brought thither by the Mother's Lacteals. And indeed if any certain discovery had been made of these same *Lacteæ*, we should have embraced this Opinion as the most probable. But we are not to form Hypotheses out of rational Notions onely, but much rather from what appears to the Eyes of the Dissector. We do affirm there- *Its use.*

fore, that the Umbilical Vein serves for conveying to the *fœtus* the nutritious juice separated in the *Placenta* from the Mother's Arteries. How this separation is made, and how it is first of all turned into blood, we shall consider by and by.

But together with this juice there returns so much of the Arterial blood (that comes from the *fœtus*) as is not spent upon the nourishment of the *Placenta*, or of the *Chorion* and *Amnios*. Which liquors thus mixed, though by the Umbilical Vein they are poured into the *Sinus* of the *Porta*, yet are they not distributed through the Liver by the usual Chanels thereof only, but by the Venal duct (described before, Ch. 12.) is the greatest part thereof conveyed in a direct course and full stream into the *Cava* above the Liver.

Besides this Vein which is common to all Creatures, there have been observed in Whelps and Coneys (and may perhaps in others) two small Veins more that, arising from the fourth involving Membrane peculiar to them, pass directly from the *Umbilicus* to the Mesentery of the *fœtus*, as the other great one does to its Liver; which may strengthen the Opinion, that the Chyle or *Succus nutritius* is brought to the *fœtus* by the Umbilical Vein (or Veins.) These Veins Dr. *Needham* calls *Omphalo-mesentericæ*.

Arteries. In the *Funiculus* are included also two *Arteries*, which are not both of them together so big as the Vein. They spring out of the inner Iliacal branches of the great Artery; (Dr. *Needham* judges them to be derived immediately from the extremity of the *Aorta* before its division) and passing by the sides of the Bladder they rise up to the Navel, out of which they are conducted to the *Placenta* in the same common cover with the Vein and *Urachus*, with which they are twined and

wreathed

wreathed not unlike a Rope. I ſay, they are inſerted into the *Placenta*, and with the Vein make a moſt admirable Net-like texture. But there is one branch of each of them which is manifeſtly inſerted into the *Amnios*. Dr. *Harvey* ſays, the Vein is conſpicuous a pretty while before theſe Arteries appear.

In the Creatures mention'd in the foregoing Paragraph, there are beſides theſe Arteries, others anſwering to and accompanying the Veins called *Omphalo-meſentericæ*, above-mention'd.

Blood and Vital Spirit are not carried by them from the Mother to the *Fœtus*, as many, from *Galen*, have taught; but on the contrary, Spirituous blood is driven from the *Fœtus*, by the beating of its Heart, to the *Placenta* and the Membranes for their refection and nouriſhment; from which what blood remains, circulates back again in the Umbilical Vein together with the *ſuccus nutritius* afreſh imbibed by its capillaries diſperſed in the *Placenta*. But beſides Arterial blood, there flows out of the Navel by them part of the *ſuccus nutritius* that was imported by the Umbilical Vein, namely that of it which is more craſs and terrene, which by one circulation through the Heart (or it may be many) could not be changed into blood: this part I ſay flows out by theſe Arteries, which by their branches that are diſperſed through the *Amnios* diſimbogue it by their little mouths into it; for what uſe, ſhall be declared preſently. *Their uſe.*

And here I ſhall tranſcribe a material Objection with the Anſwer to it, out of *Diemerbroeck.* by. "How can theſe Veſſels (Vein and Arteries) when they have grown from the Belly of the *Fœtus* to that length as to reach the Membranes, penetrate and paſs through them to the *Placenta*? *How the veſſels paſs through the Membranes.*

" *Placenta*? *Anſw.* This is done in the ſame
" manner as the roots of Herbs, Shrubs and Trees
" penetrate into the hard Ground, yea often into
" thick Planks, Walls and Stones, (which water
" cannot enter) and root themſelves firmly in
" them. For juſt ſo the firſt ſharp-pointed and
" moſt fine ends of the Umbilical Veſſels in-
" ſinuate themſelves by little and little into the
" pores of the Membranes, (for the figuration
" of thoſe pores are fitted for their entrance,
" and paſs through them, and yet the liquor
" contained in theſe Membranes cannot flow out
" by them: and when thoſe Veſſels inhering in
" the pores grow more out into length, by lit-
" tle and little the ſaid pores are more and more
" widened, (according to the encreaſe of the
" Veſſels) and are inſeparably united unto, and
" grow in them.

Urachus. The fourth Umbilical Veſſel is the *Urachus* or Urinary Veſſel. This is a ſmall, membranous round Pipe, endued with a very ſtrait Cavity ariſing from the bottom of the Bladder up to the Navel, out of which it paſſes along within the common cover, and opens into the *Allantoides*. It is more apparently pervious in many of the larger Brutes than it is in Man, in whom ſome have denied it any Cavity: but that it is hollow in him, is confirmed by many Hiſtories of perſons adult, who having the ordinary Urinary paſſage along the *Penis* ſtopt, the paſſage in this Veſſel has been unlocked, and they have made water by the Navel, which could not have been imagin'd to have happen'd, if it had been originally a Ligament without any *Meatus*. *Bartholin* and others have affirmed that the *Urachus* in Men reaches no further than the Navel; How then comes that humour into the *Allantoides* that has perfectly

perfectly the same taste with the Urine in the Bladder? But their Errour sprung from hence, that they thought a humane *Fœtus* had no *Allantoides*, and that humour that is found in it, they thought had been contained in the *Chorion*. But this is in short refuted above, but more fully and accurately by Dr. *Needham*, *lib. de formato Fœtu*, *cap.* 3. As to the perviousness of the *Urachus* I shall add this further, That in Abortions of five or six Months old, the Bladder of the *Embryo* is always full of Urine, out of which if in the following Months it should not be emptied by the *Urachus*, the Bladder would soon burst, seeing there is daily some *Serum* separated from the blood in the Kidneys, and sent to the Bladder; and the more the *Fœtus* encreases, the more must needs be separated. Yea Dr. *Needham* affirms, that one may either press the liquor contained in the *Allantoides* by the *Urachus* into the Bladder, or with a Pipe blow wind out of the Bladder by the same way into the *Allantoides*.

Its *use* has been sufficiently declared in the preceding Paragraph; as also above, when we delivered the use of the *Allantoides*, which we shall not repeat. *Its use.*

These four Vessels (as has been said above) have one *common cover*, which also keeps each of them from touching other. It is called *Intestinulum* and *Funiculus* (by which it with its Vessels is sometimes understood.) It is membranous, round and hollow, indifferent thick, consisting of a double coat, (the inner from the *Peritonæum*, and the outer from the *Panniculus carnosus.*) Sometimes it self only is wreath'd about like a Rope, the Vessels included in it running streight along Funiculus.

along its Cavity; and sometimes they are wreathed together with it.

Its knots. It has several *knots* upon it here and there, which Dr. *Wharton* thinks to be *Papillæ* or little Glands through which the lacteal (or nutritious juice) distils out of the capacity of the *Funiculus* into the Cavity of the *Amnios* I cannot tell whether this be so or no; but that use that doting Midwives make of them, to guess by their number how many Children more the Mother shall have, and by their colour, whether those Children shall be Male or Female, is most ridiculous and superstitious.

How to tye the Navel-string and cut it off. When the Infant is born, this Navel-rope is used to be tyed, about one or two fingers breadth from the Navel, with a strong thread cast about it several times, and then about two or three fingers breadth beyond the Ligature to be cut off. What is not cut off, is suffered to remain till it drop off of its own accord. Which the longer or shorter while it is a doing, the longer or shorter liv'd, Women propheſie the Children will be.

Of the nutrition of the Fœtus. There have been great Disputes among both Philosophers and Physicians, with what, and by what way the *fœtus* is nourished. Some affirm by blood only, and that received by the Umbilical Vein; others by Chyle only, received in by the Mouth: each of which are in an extream. The truth is, according to the different degrees of perfection that an *Ovum* passes from a Conception to a *fœtus* ready for the birth, it is nourished diversly.

First, by apposition. For first, as soon as an *Ovum* impregnated is descended into the Womb, it presently imbibes through its outer Membrane some of that albugineous

neous liquor that at this time plentifully bedews the internal Superficies of the *Uterus*; ſo that as ſoon as the firſt Lineaments of an *Embryo* begin to be drawn out of that humour contained in the *Amnios*, they preſently receive encreaſe by the appoſition of the ſaid liquor filtrated out of the *Chorion* through the *Amnios* into its Cavity. And this ſame liquor that thus encreaſeth the firſt rudiments of the *Embryo*, is called by Dr. *Harvey Colliquamentum.* That this way of nutrition or augmentation of the *Embryo* is poſſible, need not be doubted by him that conſiders that the *fœtus* of a Sow have no other poſſible way of being nouriſhed till ſhe is near half gone with Pig: 'for even till then, ſaith Dr. *Needham*, the *Cho-* 'rion cleaves not to the Womb, but look as ma- 'ny *fœtus* as there are, there are ſo many Eggs 'as it were without Shells, neither ſticking to 'the Womb nor to one other; but when one 'opens the Matrix, they all tumble out of their 'own accord. There are no Glandules, no 'Placenta. But the *Chorion* which is ſoft and 'porous, does like a Sponge imbibe or ſuck up 'the ſerous liquor that ſweats out of the inmoſt 'Membrane of the *Uterus*, to be afterwards 'ſwallowed by the Veins, (I ſuppoſe he means the Mouths of the Umbilical Vein, after the ſaid Vein is ſo perfectly formed as to receive it.) But of this more in the beginning of the foregoing Chapter.

But when the parts of the *Embryo* begin to be little more perfect, and the *Chorion* becomes ſo denſe that not any more of the ſaid liquor is imbibed by it, the Umbilical Veſſels begin to be formed, and to extend to the ſide of the *Amnios*, which they penetrate, and both the Vein and Arteries paſs alſo through the *Allantoides* and *Chorion*, 2. *By the Umbilical Vein.*

rion, and are implanted into the *Placenta*, that at this time, first gathering upon the *Chorion* joyns it to the *Uterus*. And now the Hypogastrick and Spermatick Arteries, that before spued out the nutritious juice into the Cavity of the *Uterus*, open by their orifices into the *Placenta* where (whether by meer percolation through it, or by some sort of fermentation also, I will not determine, but) they deposite the said juice which is absorbed by the Umbilical Vein, and by it conveyed first to the Liver, then to the Heart of the *fœtus*, where the thinner and more spirituous part of it is turned into blood. But the more gross and terrene part of it descending by the *Aorta* enters the Umbilical Arteries, and by those branches of them that run through the *Amnios*, is discharged into its Cavity. They that will laugh at this passage of the nutritious juice becaus it is made by this doctrine to choose it's way, as if it were some animal or even rational Creature, let them avoid the like treatment if they can, while they deliver that the Chyle passes immediately either from the Mesentery, the *Receptaculum*, or *Ductus communis* to the *Placenta* when a *fœtus* is in the Womb. 'Pray how should the Chyle know, or the Lacteals, by which it passes, that there is any *fœtus* in the Womb, that the one should offer to go that way, and the other give it way to go thither at that time whereas the passage is shut at all other times? yet this my Opponents maintain. As also how comes the Chyle presently to turn its course after the *Fœtus* is born, and instead of descending to the *Uterus*, ascend to the Breasts? What mechanical cause can be assigned to these and many other the like *Phænomena*? We must therefore be content to resolve some things into the admirable

mirable and unintelligible disposal of our wise Creator.

But there lies another Objection against this Opinion, Because it allows none of the Mother's blood to be received by the *Fœtus* through the Umbilical Vein, but only *Succus nutritius*; how should Blood be first bred in the *Fœtus*, seeing it has Blood before the Liver or Heart, or any other part that conduce to Sanguification, are in a capacity to perform their office?

I confess it is inexplicable by me how Blood should be made so soon; but that it may be and is made, out of the *Succus nutritius* or *Colliquamentum*, without the mixture of any from the Mother, is apparent from the most accurate Observations of Dr. *Harvey*, concerning the order of the generation of the parts in a Chicken, (which from first to last receives nothing from the Hen.) Says he, * "there appears at the very first a red leaping *Punctum* or Speck, a beating Bladder, and Fibres drawn from thence containing Blood in them. And as much as one can discern by accurate inspection, Blood is made, before the leaping Speck is formed; and the same is endued with vital heat, before it is stirred by the Pulse: and as the pulsation begins in the Blood and from it; so at length at the point of death it ends in it.——And because the beating Bladder and the sanguineous Fibres that are produced from it appear first of all; I should think it consentaneous to reason, that the Blood be before its receptacles; namely the content before its container; and that this is made for the sake of the other. He confesses it to be a *Paradox*, that Blood should be made and moved, and endued with vital spirit before any sanguifying or motive Organs are in being;

* De generat. Animal Exercit. 51.

being; and that the Body ſhould be nouriſhed and encreaſed, before the Organs appointed for concoction (namely the Stomach and Bowels) are formed: but neither of theſe are greater Paradoxes than that there ſhould be ſenſe and motion in the *Fœtus* before the Brain is compoſed; and yet, ſays he, "the *Fœtus* moves, contracts, and ſtretches out it ſelf, when there is nothing conſpicuous for a Brain but clear water. I ſay, if all theſe unlikely things do certainly come to paſs in an Egg, that has nothing to ſet the vegetative, or vital principle thereon work, but the warmth of the Hen that ſits upon it; why ſhould we think it ſtrange that nutritious juice impregnated with the vital ſpirits of the arterial Blood, with which it circulated through the Mother's Heart (it may be more than once) ſhould be turned into Blood in an humane *Fœtus* (foſtered with ſuch kindly warmth in the Womb) though it neither receive any humour under the form of Blood from the Mother, nor have it ſelf as yet any Organs of ſanguification ſo perfect as to perform their office? But to proceed.

* Exercit. 57.

3. *By the mouth.* The groſſer nutritious juice being depoſited by the Umbilical Arteries in the *Amnios*, as ſoon as the Mouth, Gullet, and Stomach, *&c.* are formed ſo perfectly that the *Fœtus* can ſwallow, it ſucks in ſome of the ſaid juice, which deſcending into the Stomach and Inteſtins is received by the *Venæ lacteæ*, as in adult Perſons.

That the *Fœtus* is nouriſhed this way, *Diemerbroeck* evinces by theſe Reaſons.

"1. Becauſe the Stomach of the *Fœtus* is never "empty, but is found poſſeſt of a milky whitiſh "liquor; and ſuch like is contained even in its "Mouth.

"2. Becauſe

" 2. Becauſe there are *Faces* contained in the " Inteſtins, (which Philoſophers call *Meconium*) " which the Infant as ſoon as 'tis born voids by " ſtool. Without doubt theſe are the excrements " of ſome aliment taken in by the Mouth.

" 3. Becauſe the Stomach could not preſently " after the birth perform the function of con- " coction, if it had not at all been accuſtomed " to it in the Womb.

His fourth Reaſon, ſuppoſing the *Fœtus* to be ouriſhed in part by the Mother's Blood, I ſhall ot recite, becauſe I think that to be an erro- eous Opinion; as I think to make appear by id by.

" 5. Becauſe the Infant as ſoon as it is born knows how to ſuck the Breaſt, which it could not be ſuppoſed to be ſo dextrous at, if while it remained in the Womb it had taken nothing by ſuction.

" 6. Becauſe many Infants as ſoon as they are born, before they have ſucked any Breaſt, or taken any thing by the Mouth, vomit up a milky aliment: which therefore muſt needs be received into their Stomach in the Womb. his he gives an inſtance of in one of his own Children.

The Fœtus is not nouriſhed at all by the Mother's blood.

Theſe Arguments I think ſufficient to prove hat they are alledged for; but when he would erwards prove that the *Fœtus* is alſo nouriſh- by the Mother's Blood conveyed by the Um- bical Vein, I think his Reaſons are invalid. For ays it muſt be ſo, *firſt*, becauſe the ſaid Vein mplanted into the *Placenta*; (but this is but ging the Queſtion, for 'tis neceſſary it ſhould emplanted into it, though it receive nothing m it but nutritious juice.) *Secondly*, becauſe of great quantity of Blood that will iſſue out of

the Umbilical Vein, if one tye the Navel-rop and then open the ſaid Vein betwixt the Lig ture and *Placenta*: for he ſays there will flow o four times as much Blood as could be ſuppoſed be contained in the ſmall Arteries on that ſi the Ligature next the *Placenta*. I anſwer, th firſt one would be well ſatisfied that the Ligatu was made ſo ſtrait, that there could no Blo paſs through it from the *Fœtus* to the *Placen* And ſecondly, it cannot exactly be gueſſed ho much Blood may be contained in the *Fœtus*'s A teries in the *Placenta*, ſo as that one ſhould certain that there does four times more flow o by the Vein. But laſtly, ſuppoſe there do fo times as much more blood iſſue out of the Ve as is contained in the *Fœtus*'s Arteries that are that ſide the Ligature next the *Placenta*, and t blood come from the Dam's Hypogaſtrick a Spermatick Arteries; I ſay there will not o four times, but forty times as much iſſue the from, for all the blood of the Dam might th be drawn out this way. Wherefore I think t Experiment makes much more againſt his O nion than for it. His *third* Reaſon is the nece ty of it; becauſe as the *fœtus* encreaſes, it nee much aliment, and its weak Bowels can conc but little, it muſt therefore have ſome purer a ment, and which is already concocted (he mea blood) to nouriſh it, and by its commixture help forward the changing the aliment receiv by the Mouth into blood. *Anſw.* This rea himſelf invalidates in the next Paragra

* Anat. corp. hum. p. 367.

* where he confeſſes that the *Fœtus* in the Wo is nouriſhed in the ſame manner as the Chick in an Egg, which receives encreaſe firſt by t *inner* White (as he diſtinguiſhes) by way appoſition; Secondly, it receives nouriſhme

n by the mouth from the *outer* White, and t the ſame time its Umbilical Veſſels enter ne Yelk (to draw nouriſhment from thence) hich, he ſays indeed, reſembles the Mother's lood; but ſeeing it has not the leaſt form of lood, why would it not be more plauſibly ſaid nat it is inſtead of the *Succus nutritius* that the *ætus* in viviparous Animals receives by the Na-l-vein? And ſeeing theſe ſeveral Liquors are rned, part of them, into blood in a Chicken, ithout any of the Hen's blood to *ferment* them s he ſpeaks;) why ſhould not the ſame power granted to the vegetative or animal ſoul of e *Fœtus* in the Womb, without any aſſiſtance om the Mother's blood? To which I ſhall add nother Argument (out of Dr. *Harvey*) taken om Cæſarean births, when living Infants are t out of the Mother's Womb, after ſhe is ad. For if it had its life and heat from the Mo-r's blood; ſurely it ſhould dye as ſoon as ſhe aleaſt, if not ſooner: for when death approa-es, the ſubordinate parts do languiſh and grow d before the principal; and therefore the art fails laſt of all. Wherefore the blood of *Fœtus* would firſt loſe its heat, and become it for its office, if it were derived from the ther's Womb; ſeeing her Womb is deſtitute all vital heat, before her Heart. But enough this.

But ſome may object, if the *Fœtus* be nouriſhed none of the Mother's blood, why ſhould her *nſes* be ſtopt all or moſt of the while ſhe is h Child? To which I anſwer, that 'tis for ſame reaſon that Nurſes that give ſuck com-nly want them alſo; for as in Nurſes the chyle es in a great proportion to the Breaſts, reby the blood being defrauded of its due

The reaſon why Women with Child want their Menſes.

and wonted ſhare does not encreaſe to that degree as to need to be leſſened by the flowing of the *Menſes*; ſo in Women with Child, there is ſo great a quantity of the *Succus nutritius* (which is only Chyle a little refined and impregnated with vital ſpirit) that paſſes to the *Placenta* by the Hypogaſtrick and Spermatick Arteries for the nouriſhment of the *Fœtus*, that unleſs the Mother be very ſanguine, her *Menſes* intermit after the firſt or ſecond Month.

I ſhall conclude therefore, that the *Fœtus* is nouriſhed three ſeveral ways, but only by one humour: firſt by appoſition of it whiles it is yet an imperfect *Embryo* and has not the Umbilical Veſſels formed; but after theſe are perfected, it then receives the ſame nutritious juice by the Umbilical Vein, the more ſpirituous and thin part whereof it tranſmutes into blood, and ſends forth the groſſer part by the Umbilical Artery into the *Amnios*, which the *Fœtus* ſucks in at its Mouth, (after the parts of the Mouth, the *Gulet* Ventricle, *&c.* are formed ſufficiently for ſuch an action) and undergoing a new concoctio in its Stomach is received out of the Inteſtins by the *Venæ lacteæ*, as is done after the birth.

Obſervation The now generally received opinion of the *Fœtus*'s receiving nouriſhment by the mouth in the latter months, may, beſides the reaſons above recited from *Diemerbroeck*, be further confirmed by the following Obſervation. About *November* 1696. I was ſent for to an Infant that could not ſwallow. The Child ſeem'd very deſirous of food and took what was offer'd it in a Spoon with greedineſs; but when it went to ſwallow it, it was like to be choaked, and what ſhould have gone down returned by the mouth and noſe, and it fell into a ſtrugling convulſive-ſort of fit upon it

I

It was very fleſhy and large, and was two dayes old when I came to it; but the next day died. The Parents being willing to have it opened, I took two Phyſicians and a Surgeon with me. Opening the *Abdomen* firſt, the Guts had ſome of the *Meconium* remaining ſtill in them, though the Child had gone two or three times to ſtool. The Stomach had in it a pretty deal of a ſlimy ſort of Liquor, (or gelly rather) ſomewhat like pretty thick (ſtrained) water-gruel. I ſhall not mention any obſervations upon other parts in the *Abdomen*, as being not to our preſent purpoſe.

Then we cut open the *Thorax*, and taking out the Gullet (with the Wind-pipe, Lungs, &c.) continued to the Stomach, we blew by a pipe down the Gullet, but found no paſſage for the wind into the Stomach. Then we made a ſlit in the Stomach, and put a pipe into its upper orifice, and blowing, we found the wind had a vent, but not by the top of the Gullet. Then we carefully ſlit open the back-ſide of the Gullet from the Stomach upwards, and when we were gone a little above half way towards the *pharynx*, we found it hollow no further. Then we begun to ſlit it open from the *pharynx* downwards, and it was hollow till within an inch of the other ſlit, and in the imperforated part it was narrower than in the hollowed. This *Iſthmus* (as it were) did not ſeem ever to have been hollow, for in the bottom of the upper, and the top of the lower cavity there was not the leaſt print of any ſuch thing, but the parts were here as ſmooth as the bottom of an acorn-cup.

Then ſearching what way the wind had paſſed when we blew from the ſtomach upwards, we found an oval hole (half an inch long) on the fore-ſide of the gullet opening into the *aſpera ar-*

teria a little above its firſt diviſion, juſt under th lower part of the *Iſthmus* above-mentioned.

Now, I ſay, this is a plain confirmation of th *fœtus*'s being nouriſhed by the mouth; for th *Gula* being impervious, Nature had formed th hole in the wind-pipe and gullet, for the liquc contained in the *amnios* to paſs into the Stomach which it might do without prejudice, or an fear of choaking, in the Womb, while the Chil breathed not: but when it was born and came t breathe, there could be no longer any paſſage th way, and ſo the Infant was neceſſarily famiſhed.

CHAP. XXXIV.

What parts of a Fœtus *in the Womb diff from thoſe of an adult perſon.*

HAving delivered the Hiſtory of the *Fœtu* we will only further ſhew in what Parts *Fœtus* in the Womb differs from an adult perſo And this we cannot do more exactly than in tl manner that *Diemerbroeck* has reckon'd then whom therefore we ſhall here tranſlate, with li tle alteration.

This diverſity, he ſaith, conſiſts in the diff rence of magnitude, figure, ſituation, numbe uſe, colour, cavity, hardneſs, motion, excrement and ſtrength of the Parts.

Now this diverſity is conſpicuous either in tl whole Body, or in the ſeveral Ventricles, or the Limbs.

There is conſiderable in the whole Body,

1. The littleneſs of all the parts.
2. The reddiſh colour of the whole.

3. T

3. The ſoftneſs of the Bones; whereof many are as yet griſtly and flexible, and that by ſo much the more, by how much the *fœtus* is further from maturity.

In the Head there are ſeveral differences. As

1. The Head in reſpect to the proportion of the reſt of the Body is bigger, and the ſhape of the Face leſs comely.

2. The bones of the Scull are ſofter, and the Crown is not covered with bone, but only with a Membrane.

3. The bone of the Forehead is divided, as alſo that of the under-Jaw: and the *Os cuneiforme* is divided into four.

4. The bone of the *Occiput* or hinder part of the Head is diſtinguiſht into three, four or five bones.

5. The Brain is ſofter and more fluid, and the Nerves very ſoft.

6. The bones that ſerve the ſenſe of Hearing are wonderfully hard and big.

7. The Teeth lye hid in the little holes of the Jaw-bone.

8. There is no leſs diverſity in the *Thorax*. For,

1. The Dugs ſwell, and out of them in Infants new-born whether Male or Female, a ſerous Milk iſſues forth ſometimes of its own accord, ſometimes with a light preſſure: yet there are no Glandules very conſpicuous, but there is ſome faſhion of a Nipple.

2. The *Vertebræ* of the Back want their ſpinous proceſſes, and are each one made of three diſtinct Bones, whoſe mutual concourſe form that hole whereby the ſpinal marrow deſcends.

3. The Heart is remarkably big, and its *Auriculæ* large.

4. There are two unions of the greater Veſſels, that are not conſpicuous in adult perſons : *viz.* 1. The *Foramen ovale*, by which there is a paſſage open out of the *Cava* into the *Vena pulmonaris*, juſt as each of them are opening the firſt into the right Ventricle, and the latter into the left Ventricle of the Heart. And this *Foramen* juſt as it opens into the *Vena pulmonaris* has a Valve that hinders any thing from returning out of the ſaid Vein into the *Foramen*. 2. The *Canalis arterioſus*, which two fingers breadth from the *baſis* of the Heart joyns the *Arteria pulmonaris* to the *Aorta*. It has a pretty large Cavity, and aſcends a little obliquely from the ſaid Artery to the *Aorta*, into which it conveys the blood that was driven into the pulmonary Artery out of the right Ventricle of the Heart, ſo that it never comes in the left Ventricle; even as that blood that is ſent out of the left Ventricle into the *Aorta*, never came in the right, (except a little that is returned from the nutrition of the Lungs) but paſſed immediately into it out of the *Vena cava* by the *Foramen ovale*. So that the blood paſſes not through both the Ventricles as it does after the *fœtus* is born; for then it muſt have had its courſe through the Lungs, which it cannot have, becauſe they are now very denſe and lye idle and unmoved. Yea they are ſo denſe and heavy, that if one throw them into water they will ſink; whereas if the *fœtus* be but born and take only half a dozen breaths, they become ſo ſpongy and light that they will ſwim. Which (by the way) may be of good uſe to diſcover whether thoſe Infants that are killed by Whores, and which they commonly affirm were ſtill-born, were really ſo or no. For if they were ſtill-born, the Lungs will

ſink;

ſink; but if alive, (ſo as to breath never ſo little a while) they will ſwim.

4. The Gland *Thymus* is notably large, and conſiſts as it were of three Glands.

In the lower belly there are theſe differences.

1. The Umbilical Veſſels go out of the *Abdomen.*

2. The Stomach is narrower, yet not empty, but pretty full of a whitiſh liquor.

3. The Caul is hardly diſcernible, being almoſt like a Spider's-web.

4. The Guts are ſeven times longer (or more) than the Body.

5. In the ſmall Guts the Excrements are pituitous and yellow, but in the thick ſomewhat hard and blackiſh, ſometimes greeniſh: the *Cæcum* is larger than uſual, and often filled with *fæces.*

6. The Liver is very large, filling not only the right Hypochondre, but extends it ſelf into the left ſide, and covers all the upper part of the Stomach. It has a paſſage now more than in the adult called *Canalis venoſus*, which ariſing out of the *Sinus* of the *Porta* carries the greateſt part of what is brought by the Umbilical Vein directly and in a full ſtream into the *Cava* above the Liver; but as ſoon as the Infant is born, and nothing comes any longer by the ſaid Vein, this *Canalis* preſently cloſes, as the Vein it ſelf turns to a Ligament; as alſo do the *Urachus* and the two Umbilical Arteries.

7. The Spleen is ſmall.

8. The Gall-bladder is full of yellow or green Choler.

9. The Sweet-bread is very large and white.

10. The Kidneys are bigger and unequal in their ſuperficies, and look as if they were compounded of a collection of very many Glandules.

11. The

11. The *Renes succenturiati* are exceeding large; they do not only border upon the Kidneys, as in the adult, but lye upon them and embrace their upper part with a large *Sinus* as it were.

12. The Ureters are wide, and the Bladder distended with Urine.

13. In Females the *Uterus* is depressed, the *Tubæ* long, and the *Testes* very large.

The difference in the Limbs consists,

1. In the tenderness and softness of the Bones.

2. The little bones of the Wrist and Instep are gristly and not firmly joyned together.

CHAP. XXXV.

Of the Birth.

THE *Fœtus* swimming in the liquor of the *Amnios*, and the Navel-rope being so long it must needs have scope enough to change its situation, and that is the reason that Anatomists differ so much about it. But according to Doctor *Harvey* its usual posture is thus.

The posture of the Fœtus in the Womb.

"Its Knees are drawn up to the Belly, its Leg "bending backwards, its Feet across, and it "Hands lifted up to its Head, one of which i "holds to the Temple or Ear, the other to th "Cheek; where there are white spots on th "Skin as if it had been rubb'd upon. The back "bone turns round, the Head hanging dow "towards its Knees. Its Head is upwards, an "its Face commonly towards the Mother's "Back.

At its birth.

But towards the birth (sometimes a Week o two before) it alters its situation, and tumble dow

down with its Head to the neck of the Womb, with its Feet upwards. Then the Womb alſo ſettles downward and its orifice relaxes and opens. And the *Fœtus* being now ill at eaſe ſprawls and moves it ſelf this way and that way, whereby it tears the Membranes wherein it is included, ſo that the Waters (as they call them) flow into the *Vagina*, which they make ſlippery for the eaſier egreſs of the Infant: though ſometimes the Membranes burſt not, but come forth whole, (as they do commonly in Brutes.) At the ſame time the neighbouring parts are looſened and become fit for diſtention: the joyntings of the *Os ſacrum* and *Pecten* with the *Coxendix*, as alſo of the *Oſſa pubis* are ſo relaxed, that they yield very much to the paſſage of the *Fœtus*. And its motion gives that diſturbance to the *Uterus*, that preſently the animal ſpirits are ſent plentifully by the Nerves to its conſtrictory Fibres, and the Muſcles of the *Abdomen*, which all contracting together, very ſtrongly expel the *Fœtus*, which (in the moſt natural birth) goes with the Head foremoſt: and if the Feet or any other part (beſides the Head) do offer it ſelf firſt, the travail is always more painful and dangerous.

The term of going with Child.

The ſeveral ſorts of Creatures have ſundry terms of going with young: The ſtated and moſt uſual time of Women is nine Months; though ſome bring forth ſome Weeks ſooner, and others later. But when it is given out that perfect and ſprightly Infants are born at ſeven Months end; it is either to hide the faults of ſome new-married Woman, or from the miſtake of the ignorant Mother. As alſo when ſometimes the Mother has affirmed her ſelf to go eleven Months or upwards, it is either through miſtake, or to keep faſt ſome fair Eſtate, when the pretended Father's dead

dead without an Heir, for which the cunning Widow plays an after-game.

The reason of the birth. Divers reasons are given why the *Fœtus* at the stated time of birth is impatient of staying any longer in the Womb. As the narrowness of the place, the corruption of its aliment, or the defect of it, the too great redundance of excrements in the *Fœtus*, and the necessity of ventilation or breathing. All these are plausibly defended by their several Authors. But without blaming ingenious Men for exercising their Wits on such a Subject, we choose however rather to be content with resolving all into the wise disposal of the great Creatour, whose Power and Wisdom were not more eminent in creating Man at first out of the Dust of the Earth, than out of those principles and in that method whereby he is produced in ordinary generation.

Tab. X.

Fig. 1. Represenleth the usual situation of the *Fœtus* in the Womb.

A *Its Head hanging down forwards, so that its Nose is hid betwixt its Knees.*

BB *Its Buttocks, to which its Heels close.*

CC *Its Arms.*

D *The Umbilical rope passing by its Neck, and wound round over its Forehead.*

Fig. II. Sheweth the *Fœtus* taken out of the Womb, and as yet tyed to the *Placenta*, the Umbilical Vessels being separated at their rise.

AAA *The* Abdomen *opened.*

B *The Liver of the* Fœtus.

C *The*

C *The Urinary Bladder.*
DD *The Inteſtins.*
E *The Umbilical Vein.*
FF *The Umbilical Arteries.*
G *The* Urachus.
H *The Umbilical Veſſels united and inveſted in their common Coat.*
I *The* Funiculus umbilicalis *reaching to the* Placenta.
KKKK *The Veins and Arteries diſperſed through the* Placenta.
LLL *The* Placenta *of the Womb.*

Fig. III. Sheweth an *Embryo* in its juſt dimenſion, (communicated to me by Dr. *E. Tyſon.*)

Its wide Mouth with the Tongue in it.
The Umbilical rope.
The Thighs and Legs, with the Coccyx d *appearing like a Tail.*

The End of the Firſt Book.

The

The Second Book.

OF THE MIDDLE CAVITY, CALLED THORAX.

CHAP. I.

Of the common containing parts of the Thorax *or Breast.*

HItherto of the lowest Cavity or *Abdomen*, and of the parts contained in it, whether appointed for *Chylification* (and in some respect for *Sanguification*) or for *Procreation*. Now it followeth that we describe the middle Cavity, called *Thorax*, which containeth the Organs of Respiration, and those that elaborate the Blood and Vital Spirits, with the trunks of the Vessels whereby these are distributed into all the parts of the Body, for their refection, and the preservation of their natural heat. *The Breast.*

This Cavity is bounded above by the *Clavicula* or Chanel-bones, below by the Diaphragm or Midriff, (whereby it is severed from the *Abdomen*;) in the fore-part by the Breast-bone and Cartilages; *Its bounds.*

Cartilages; in the Sides by the Ribs; behind by the *Vertebræ* of the back.

Figure. The *figure* of it is in a manner Oval, somewhat flat before and behind, whereas in Beasts it is somewhat sharp: So that only Man lieth on his Back.

Parts. The *parts* whereof it is composed, are either *containing*, or *contained*. The parts *containing* are either *common*, or *proper*.

The common containing parts. The *common containing parts* are in number five, viz. *Cuticula*, *Cutis*, *Pinguedo*, *Membrana carnosa*, and the common Membrane of the Muscles. Of which having at large discoursed in Book I. Ch. 3. when we treated of the *common containing parts* of the lower Belly, we shall not here repeat what is there delivered, but pass on to the *proper*.

CHAP. II.

Of the proper containing parts; and first, of the Dugs.

The proper containing parts. THE *proper containing parts* are either *external*, or *internal*. The *external* are in number Three, the Breast, the Muscles, and the Bones. The *internal* proper containing parts are three in like manner; the *Pleura*, the *Mediastinum*, and the Diaphragm.

The Paps. *Dugs* are granted to both Sexes, and are seated in the middle of the *Thorax*, on each side one, upon the pectoral Muscle that draweth the Shoulder forwards.

1. Of Men. In Men they are framed of the *Cutis*, the *Membrana carnosa*, Fat, and the Nipple, and serve only for beauty, and are called *Mammillæ*.

In

In Women, besides these parts, they have remarkable Vessels, Glandules, and Pipes to contain the Milk separated by the Glandules, and are called *Mammæ.* 2. *Of Women.*

They differ much as to their bigness in several Women, and in the same Woman in regard of age and other circumstances: for before they have their *Menses*, and when they are very old, they bunch out but very little. And in the middle or flower of their age, when they give suck, or are with Child, they are bigger than at other times. *Their bigness.*

They are made up of many *glandulous* bodies of a different bigness, and are not of one continued glandulous substance, (as Dr. *Wharton* affirmeth, *lib. de Gland. p.* 236.) There is one Gland in the middle just under the Nipple that is bigger than the rest. The spaces between the Glands are filled up with fat, and there are abundance of Vessels that go from one to another. They are all inclosed by the *Membrana carnosa*, and make up as it were an half globe. They are softer of substance in Women than in Brutes. Through these Glands the Milk is separated from the Blood, being nothing but the Chyle rising out of the left Ventricle of the Heart with the Blood, (to which it is not as yet assimilated) and driven hither along the Thoracick Arteries. Unless we will admit *Venæ lacteæ* to come hither; which Opinion we shall examine afterwards. *Glands.*

Upon the middle great Gland standeth the *Papilla* or Nipple, which is round and of a spongy substance, covered with a very thin Skin, and with many little holes in it for the Milk to distil out by, when the Child sucketh it. It is of an exquisite sense; and resembles something the *Papilla.*

Glans of a Man's *Penis*, in that by handling sucking, it becomes erect or stiff, being othe wise commonly flaggy. It is red in Virgins, vid in those that give suck, and blackish in o Women. All the *Tubuli lactiferi* or Milk-co duits end in it.

Its bigness. It differs in *bigness*, being as big in some as Mulberry, in others as a Raspberry, in othe less: when Women give suck, it is longer th at other times.

Use. Its *use* is to be like a Pipe or Tunnel, throu which the Child (taking it in its Mouth) m suck the Milk out of the Breast: And it is of e quisite sense, that the Milk passing through it m cause a kind of titillation, whereby Mothers a Nurses may take the greater delight and pleas to suckle their Infants.

Areola. There is a little circle that surrounds it call *Areola*, which in Virgins is pale and knotty; those that are with Child or give suck, brow and in old Women, black.

Their Vessels. The Breasts have all sorts of Vessels, Vei Arteries, Nerves, Lymphedücts, which are co mon to them with other parts; and *Tubuli la feri* proper to themselves, and according to son *Venæ lacteæ*. Of all these in order.

Veins. The *Veins* are of two sorts, for some are *ext nal*, some *internal*. The *external* spring fr the *Axillar* branch, and run only under the Sk which covereth the Breasts, and are called *T racicæ superiores*, or the uppermost Breast-vei And these are they that look so blue in t Breasts of fine-skin'd Women. The *internal*, c led *Mammariæ*, spring from the *Rami subclav* They are in number two, on each side one. Th enter in among the Glands of the *Mam* where they send forth a great many branch

but descending thence by the *Mucronata cartilago*, they pass out of the Breast, and go downward under the *Musculi Recti*. When they are come almost to the Umbilical region, they are said to be joyned by sundry inosculations with the *Venæ epigastricæ*, which meet them there; though most late Anatomists deny any such inosculation.

These *Venæ epigastricæ* spring from the external *Ramus iliacus*, and by a streight way pass upward under the aforesaid Muscles. And from the internal branch of the said *Ramus* spring the *Venæ hypogastricæ*, which are inserted into the neck and bottom of the Matrix. Of which in Book I. when we treated of the Womb.

They have the same number of *Arteries* as *Veins*, and of the same denomination, *viz. Arteriæ thoracicæ superiores* which are sent forth from the *Axillar*, and *Arteriæ mammariæ* in like manner which spring from the Subclavian, and from the Breasts descend to about the Navel. Whither when they are come, they are said (but erroneously) to be united by inosculation with the *Arteriæ Epigastricæ* ascending. This inosculation being rejected, principally, because it is opposite to the circulation of the blood, seeing the blood in the descending Arteries runs a course direct contrary to that which is contained in the ascending; Dr. *Highmore* suggests, "that the Mammary Arteries do not inosculate with the Epigastrick Arteries, but with the Epigastrick Veins, and accordingly the Mammary Veins with the Epigastrick Arteries: Whence supposing (according to the old Opinion) that Milk is made of blood, he thinks he has found a ready way whereby the blood may pass to the Womb in pregnant Women for the nou- *Arteries.*

" rishment of the *Fœtus*, and whereby it may " ascend to the Breasts in Nurses. For by the " Epigastrick Arteries, he says, blood is derived " from the Iliack branches, and consequently " from the Womb to the Mammary Veins, so " that that blood which in those that do not give " suck, or are not with Child, uses to stagnate " about the Vessels of the Womb, or to be eva- " cuated by the *Menses*, does in those that give " suck ascend by the Epigastrick Arteries to the " Breasts, which it causes to swell, and is turn- " ned into Milk: And on the contrary, when " the Child is weaned, that blood which used " to be carried to the Breasts by the Mammary " and Epigastrick Arteries, is conveyed to the " Womb, and evacuated monthly.] And for the confirmation of his Opinion, in his Tab. 17. he gives a Scheme of such inosculation, as if he had really observed it in his tracing these Vessels. But not to mention, that it is contrary to truth that Milk is made of blood; later Anatomists have wholly rejected any Anastomosis of Veins and Arteries with one another; so that his Hypothesis which is built thereupon, falls to the ground. As for the true use of both Veins and Arteries, that shall be shewn by and by when we come to the *use* of the Breasts.

Nerves. They have *Nerves* (according to *Spigelius*) from the fourth Vertebral pair of the *Thorax*, which about the middle of the Rib, perforating the Intercostal Muscle, is divided into four branches, which are sent afterward to the pectoral Muscle, and so into the Breasts, the thickest passing to the Nipple. Dr. *Needham* says, that they have several Nerves from the Axillary: And supposes from their many Nerves, that some spirituous juice is brought unto the Breasts [illegible] ther

them, which being mixt with the nutritious mass endows it with a nutritive vertue; or perhaps it supplies a ferment for the separation thereof from the blood. But I believe they serve only for the more exquisite sensation, that Nurses may take the greater delight in giving their Children suck.

They have very many *Lymphe-ducts*. Dr. *Wharton* saith, they are very conspicuous and numerous in the *Ubera* of Cows, but one can hardly trace them into the *Parenchyma*. Wherefore saith he) 'tis likely that they carry back all the exhalations resolved into sweat by help of the Membranes——which they rather minister to than to the *Parenchyma*. But this is contrary to the now received Opinion, that the Lymphe-ducts receive their *Lympha* only by the mediation of Glands. *Lymphe-ducts.*

Besides these four sorts of Vessels that are common to them with most other parts of the Body; they have proper to themselves certain *lactiferous* (or milk-carrying) *Pipes*, which are the Store-houses wherein the Milk is reserved, and through which as by Conduits it flows to the Nipple when the Child sucks. *Bartholin* has observed ten or more of them, full of Milk in Women giving suck, with their outer ends encompassing the *Papilla* circular-wise, each of which as they pass further into the Breasts, are divided into sundry branches, which end in the Mammary Glands (above spoken of) from whence they bring the Milk, and discharge it through the pores of the *Papilla*. Tubuli lactiferi.

The several branches of these *Tubuli* amongst the Glands many do take for true Lacteals, and therefore do believe that there are some *Venæ lacteæ* that conduct the Chyle directly to the Venæ lacteæ.

Mammæ. But from whence those Lacteals have their Origin, is not agreed among the Defenders of that Opinion. Some affirm them to rise from the Stomach, some from the *Receptaculum chyli* some from the *Ductus thoracicus*, and some from the *Womb.* The truth is, it is no wonder they should not agree concerning their rise, seeing the Opinion is grounded more upon rational conjecture, than ocular discovery; though some of each of these Opinions have pretended it. For as was said in the former Book (Chap. 32.) discoursing of the *Venæ lacteæ* their being said to convey the liquor into the *Amnios*, That that were a plausible Opinion, if such could be demonstrated by Anatomy; so we may say as to their conveying the Chyle to the Breasts, where it comes to be called Milk. But with all due respect and deference to the Espousers of this Hypothesis, (such as the most learned Sir *George Ent*, *Caspar Martianus*, *Diemerbroeck*, &c.) we must crave leave to dissent therefrom (with *Steno*, Dr. *Wharton*, Dr. *Needham*, &c.) till there shall be observed more certain footsteps of such Vessels.

Ductus adiposi. From the great quantity of Fat that is collected in the Breast *Malpighius* contends for another sort of Vessel besides all the foregoing, namely *Ductus adiposi*; and believes that the fat here has a nobler use than to fill up the Interstices of the Glands so as to make the Breasts round and plump, namely that therefrom issues at least a the buttery part of the milk. It cannot be denied but that Fat and Butter are very much of the same nature: but it seems not so probable that Nature should separate the oily or fatty particles from the Chyle, to the end only that they may be mixed with the same again, and so issue

under one form out of the body; but granting that the same matter out of which fat is generated, is an ingredient in the milky mass, I am inclin'd to believe that both the serous, caseous, and butyrous particles of the milk continue in one mothers embraces through all the ways by which they pass from their first entrance into the *Lacteæ* to their *exit* by the *Papilla*.

The *use* of the Breasts in Women is to prepare or separate Milk for the nourishment of the Child. Which how it is done, we shall shew in as few words as may be. *The use of the* Mammæ.

It was an old Opinion that Milk was made of blood sent from the Womb by the Epigastrick Vessels ascending, and as was thought inosculating with those branches of the *Mammariæ* that descend towards the Navel. But as later Anatomists have found those Anastomoses only imaginary (invented to serve an Hypothesis;) so it is generally denied that blood either sent from the Womb, or from whereſoever, is the true matter out of which Milk is made. For not to mention (which yet is very considerable) that it is incredible that the Mother could every day endure the loss of so much blood (suppose a pound and half) as the Child sucks daily Milk from the Breasts; I think the Argument urged by Dr. *Wharton* may satisfie any man, *viz.* "Nature does 'nothing in vain; she goes not forward and 'backward by the same path. But if she make 'blood of Chyle *(which is certain)* and then make 'Chyle of blood again, she goes so. For Chyle 'is a sort of Milk, as appears by the opening of 'the Lacteal veins. If therefore that Chyle be 'first excocted into blood, and then return again 'to the nature of Milk, Nature should certainly 'frustrate her first work.] We shall not there-

fore ſpend further time to refute ſo improbable (and now obſolete) an Opinion; but ſhall avow, that Chyle is the true matter out of which Milk is made, which is done after this manner.

How Milk is made.

The Chyle being received into the common receptacle from the *Venæ lacteæ* of the Meſentery aſcends up by the *Ductus Thoracicus*, and by it is conveyed into the ſubclavian Veins, where it is mixed with the blood, and from whence it is circulated with it through the ventricles of the Heart. And when it comes out of the left ventricle by the *Aorta*, a good part of it (as yet not aſſimilated to the blood) is ſent to the Breaſts by the Mammary and Thoracick Arteries, whoſe Capillaries are inſerted into the Glands through which it is ſtrained or filtrated into the *Tubuli lactiferi*, even as the *Serum* of the blood is ſeparated from *it* by the Glands of the Kidneys into their *Tubuli* or *Siphons*. And as thoſe *Siphons* of the Kidneys carry the *Serum* into the *Pelvis*, ſo do theſe of the *Mammæ*, the Milk into the common Duct of the Nipple. As for the blood that came along with the Chyle to the Glands, that returns back again into the Subclavian and Axillar Veins, and ſo to the Heart.

Beſides this matter of the Milk (*viz.* Chyle) Dr. *Wharton* (ſuitable to his Hypotheſis of the *Succus nutritius* of the Nerves) thinks that the Nerves contribute their ſhare, which he calls Spermatick; for the nouriſhment and encreaſe of the Spermatick parts of the Child. But if it ſhould be ſuppoſed that the Nerves have ſuch *Succus* in them (which we do not believe) what weakneſs muſt it needs induce upon the Mother to have ſo much of it (with the Animal Spirits) daily drain'd out of them? whereas we ſee that many

many Women are more chearful and healthful when they give suck, than at other times. We cannot therefore consent to that Opinion.

And here a most difficult Question may arise, why the Chyle (whether it be brought by some *Venæ lacteæ*, or by the Arteries) flows only to the Breasts at some certain times, and not always, seeing the Vessels that carry it are not obliterated, nor it self exhausted.

Why it flows to the Breasts at some times onely.

They that taught, that the Milk was made of blood, and that that blood was derived from the Womb by the Hypogastrick vessels into the Epigastrick, which latter they believed to inosculate with the Mammary; these I say deriving the Milk from the Menstrual blood as its matter out of which it is made, thought that the stopping of the *Menses* (as commonly happens to Nurses, unless very plethorick) occasioned the regurgitation of the blood by the said Vessels up to the Breasts, where so free a vent was found for it, after it was first changed into Milk by their Glandules. They assigned the same blood for the nourishment of the *Fœtus* in the Womb, and thought that after the birth it ascended up to the Breasts. But having in the former Book (Ch. 33.) shewn that the *Fœtus* is not nourished at all by the Mother's blood, as also in this Chapter that Milk is not made of it; we need not (though it were easie to) shew how ill this Hypothesis would satisfie the Question, if blood should be supposed the matter out of which Milk is made. And indeed it is far easier to invalidate the Reasons that have been urged for it, than to draw any from the new that are more satisfactory. So that as above in (Book I.) discoursing of the manner and matter of the nourishing the *Fœtus* in the Womb, we scrupled not to expose our

selves

ſelves to the Smiles of our ſo over-ſagacious *Virtuoſi*, in reſolving all into the wiſe diſpoſal of the Creatour; ſo we ſhall not be aſhamed to profeſs our (I think invincible) ignorance here alſo, without giving this Queſtion any other Reſolution, than that it is ſo, becauſe Providence has order'd it ſo to be. However we will not omit to give *Diemerbroeck*'s Opinion, which if it cannot ſatisfie, may for its ingeniouſneſs delight.

"The cauſe of it (ſays he) is a *ſtrong imagi-*
"*nation*, or an intenſe and often thinking of
"Milk, Breaſts, and their Suction, which work-
"eth wonderful things in our Bodies: not in-
"deed ſimply of it ſelf, but by mediation of the
"appetitive power, or of the paſſions of the
"Mind, which induce various motions on the
"Spirits and Humours. So the imagination and
"thinking of a great danger maketh a man
"tremble, fall, be cold, fall into a ſwoon, yea
"hath ſometimes turn'd his Hair grey in a ſhort
"time: The imagination of a joyful matter
"cauſeth heat and animoſity of the body; think-
"ing on a ſhameful thing, or a view of it, cau-
"ſeth bluſhing; thinking on a terrible thing,
"paleneſs; on a ſad thing, cold. Luſtful thoughts
"make the Body hot, relax the ſtrict Genitals
"of Women, erect the *Penis*, and do ſo open the
"ſeminary ways that are otherwiſe inviſible, that
"Seed iſſueth out of its own accord in involunta-
"ry or nocturnal pollution. The ſame intenſe
"imagination (*adds he*) and a deſirous cogita-
"tion of ſuckling the Infant, is the Cauſe that
"the Chyliferous Veſſels (*by which he means* Ve-
næ lacteæ *properly ſo called*) "are looſened and
"opened towards the Breaſts, eſpecially if ſome
"outward Cauſes tending that way favour and
"further

'further incite that strong imagination, as wanton handling of the Breasts, the moving of the *Fœtus* in the Womb, the sucking of the *Papilla*, '&c. For according to the different influx of 'the Animal Spirits, the parts are sometimes 'straitned, sometimes relaxed, as every one 'knows; and according to that different constriction or relaxation the blood and other impelled humours, flow sometimes more, sometimes less into the parts; and sometimes beget 'heat, softness, redness; sometimes constriction, 'cold, and paleness. Amongst these impelled 'humours is the Chyle, *&c.*———] To confirm this Opinion, he gives several Instances wherein nothing but imagination could move the Chyle to tend to the Breasts. His first is that known Story of *Santorellus*; "That a poor 'man's Wife dying, and not having means enough to hire a Nurse for the Infant she had 'left behind her, he used, (to still it a little) 'often to lay it to his Paps, (without doubt '(says *Diemerbroeck*) with a great desire to 'yield it some Milk) and so at length by that 'intense and continual thought, and often repeated sucking of the *Papilla*, his Breasts afforded Milk enough for the suckling the Infant. (Which by the way seems to make much against his Opinion of the Chyle's being conveyed to the *Mammæ* by the *Venæ lacteæ*; for seeing Men according to Nature give no suck, to what purpose should *Venæ lacteæ* be distributed to their *Mammillæ?* and yet here is an instance of a man giving suck, and therefore the Chyle is more likely to be brought by the Arteries, which Men have as well as Women; unless we will grant that force to imagination, to make *Venæ lacteæ*, as well as to send the Chyle by them,

them, which would be an equal force of imagination to imagine. But to proceed.) He tells another Story of an old Woman that came to give suck, and he delivers it with such Circumstances as may create a belief of the truth of it.

"At *Vyanen* a Town not far from us (*viz.* "from *Utrecht*, in which Province it is) about "thirty years ago there was an Hostess that kept "the Bore's-head Inn without the Gate, who "was brought to Bed a little after her Husband's "death, and died in Child-bed, or very soon after "ter, leaving a healthful Child behind her; "and having left very little Estate, her Mother "whose name was *Joan Vuyltuyt*, being also poor "and not able to put it out to Nurse, yet had "such pity on her Daughters Child, as to undertake to Nurse it, and she was now three "score and six years old. Now having sometimes used, with the greatest commiseration "to hold it to her Breasts when it cried, and offered it the Nipple to suck; by that strong "imagination, and desirous cogitation of nursing "the Infant, her Breasts begun to give Milk, and "that in a few days so plentifully, as was abundantly sufficient to feed the Child, so that it "had scarce any need of other sustenance; and "so, to the admiration of all, the Infant was "well nourished with the Milk of this old Woman, whose Breasts for many years had been "wither'd and flaggy, but now became plump "and full like a young Woman's. There are "many still alive in that City that remember this "thing very well.] I confess the Story is very odd, but whether to be resolved into the force of imagination, I leave the Curious to meditate. However he very plausibly answers several Objections that may be made against it, which I will

ill be worth the while for the Latin Reader to eruſe in his *Anat. corp. human. lib.* 2. *cap.* 2. *p.* 09, 411, *&c.*

The two other *external* proper containing urts of the *Thorax* are the *Muſcles* and the *nes.* But of theſe we ſhall omit the deſcription re, having thought it more convenient to treat all the *Muſcles*, and all the *Bones* of the whole dy in two diſtinct Books, *viz.* of the *Muſcles* the *fifth*, and of the *Bones* in the *ſixth*: And for theſe of the *Thorax* in particular, the *Muſ-s* are deſcribed in Chap 15. of B. V. and the *nes* in Chap. 11, 12, 13. of B. VI.

CHAP. III.

Of the internal proper containing Parts, viz. *the* Pleura, Mediaſtinum *and* Diaphragm.

THE *internal* proper containing parts are in number three, the *Pleura*, the *Mediaſtinum*, (with the *Thymus* growing to it) and the *Diaphragm.*

The *Pleura* hath its denomination from the Pleura. bs which it cloaths on their inſide, (for a Rib in Greek called πλευρὰ) and ſo it may be term- in Engliſh, the *Coſtal membrane.*

It is membranous, white, thin, and hard, re- *Its ſub-* nbling the *Peritonæum*, and lining all the Ca- *ſtance.* ty of the *Thorax.*

Spigelius de human. corp. fabr. lib. 9. *cap.* 3. will ve it to be thicker and ſtronger than the *Peri-*

tonæum,

tonæum, contrary to the Opinion of *Riolanus*, wh affirmeth the *Peritonæum* to be the thicker an ſtronger, becauſe it is appointed for ſuſtainin the weight of the Guts.

Parts. It conſiſts of a double Membrane, of whic the inner, or that next the cavity, is thickeſ This is ſmooth on its inſide, and bedewed with wateriſh humour, that the Lungs might pla againſt it without any prejudice. Sometimes o one ſide, and ſometimes on both, it ſends fort (on its inſide) certain nervous Fibres, (even i healthful perſons) which being inſerted into th inveſting Membrane of the Lungs do ſo fix the in their place, as to hinder that liberty of aſcer and deſcent in reſpiration which is natural t them, and yet many times without any notabl injury to their breathing. Though ſometime (as *Spigelius* has obſerved) they tye the Lungs ſ very cloſe to the ſides, as to cauſe a continual an incurable *Dyſpnœa.* As to that wateriſh humou that bedews the inſide of this Membrane, it ſeem to proceed from vapours raiſed from the blood and condenſed by the (comparative) coldneſs o this Membrane. The outer Membrane is thinner and rough on its outer ſurface, that it migh cleave the more firmly to the Ribs and Muſcle by the intervention of their proper membrane.

Figure. As for its *figure*; without, it is arched; with in, hollow; above it is narrower, below broad er, being chiefly widened ſide-ways.

Holes. Above, it is perforated in ſix or ſeven places to give way to the *Vena cava* deſcending, an the *Aorta* aſcending, the *Gula*, the Wind-pipe Lacteals, Lympheducts and Nerves. Below where it covereth the Midriff, it is perforate in three places, to give way to the *Vena cav* aſcending, and the *Aorta* deſcending, as alſo t the *Gula*.

It is said to have its *rise* from the Membranes covering the *Spinalis medulla*; however, it adheres very close to the *Vertebræ* of the Back, from whence it comes forward on each hand by the sides to the Breast-bone, under which the Membranes of each side are joyned together, and so becoming double it goes back again streight from the middle of the Breast to the Back, dividing the cavity of the *Thorax* into two parts, like a partition-wall, and one Lobe of the Lungs from the other: and this is called *Mediastinum*, of which by and by. *Rise.*

Its *Veins* spring from the superiour Intercostal branch, and from the *Vena sine pari.* *Veins.*

The *Arteries* in like manner proceed from the superiour Intercostals, (which arise from the subclavian) and these descend to about the fourth rib, below which it has its Arteries from the inder part of the *Aorta* descending. *Arteries.*

It hath *Nerves* from twelve vertebral pair, viz. from all the pairs of the *Thorax*: for from betwixt each of the twelve *Vertebræ* of the Back here springs a pair of Nerves, and each is immediately divided into the *fore-* and *hinder-branches:* The *fore-branches* are they which serve the Intercostal Muscles, external and internal, and also the *Pleura*: as for the *hinder*, they are bestowed upon the Muscles which lye on the back, *&c.* *Nerves.*

The Veins and Arteries according to *Spigelius* run between the two Membranes of the *Pleura*, and therefore he thinks that when an inflammation of the *Pleura* (called a Pleurisie) imposthumates, the matter is rather gathered betwixt its Membranes, than berwixt the Intercostal muscles and it.

The

Of the Mediastinum. The second *internal* proper containing part is the *Mediastinum*; so called because it standeth in the middle of the Breast, and divideth its cavity into two partitions, *viz.* a right and left.

Its rise. It springeth from the Membranes of the *Pleura* meeting at the *Sternum*, (as was said before;) so that at its rise it consists of four Membranes, because the *Pleura*, of the duplicature whereof it is made, consists of two. But as the *Mediastinum* tends from the *Sternum* through the middle of the *Thorax* towards the Back, its duplicated Membranes are so severed, that the Heart with its *Pericardium* are contained in the cavity that is formed by their separation. Yet when they arrive near the Back, they joyn one to another again as close as they did at the Breast, though they presently part again, (saith *Diemerbroeck*) and make another narrower Cavity, but as long, for the Gullet, *&c.* to descend by. Some have formerly imagined a third Cavity at its Origin under the *Sternum*, as in particular Dr. *Highmore*, who says the interstice betwixt the Membranes is large, and yet (he says) they are knit to one another by certain Fibres. In this Cavity, he thinks, there are thick vapours and *flatus* sometimes contain'd, which cause very acute pains there, by retching the membranes and violating the fibres that knit them together. But in truth there is no such Cavity, nor consequently any such vapours, or pain depending thereupon. For though indeed, if the dissection be begun at the *Sternum*, when one has pull'd it off from the *Mediastinum*, one would think at first sight that there were as great a distance betwixt the Membranes of the *Mediastinum*, as the *Sternum* is broad; yet if one begin the Section at the Back, and loose the Rib there

here, and so come to the *Sternum*, he will see he *Pleura* doubled knit close to the *Sternum* ithout any Cavity.

The *substance* of it is like that of the *Pleura* om which it springs; only where it is parted, is thinner and softer than the *Pleura*. The outer de towards the Lungs is smooth, but the interiur is rough, by reason of the fibres whereby it heres to the *Pericardium* in some places, and which its own two Membranes at their meetg are united. It is sometimes pretty well sto-d with fat, especially about its Vessels, somewhat ke the Caul in the *Abdomen*. *Substance.*

As for its Vessels: *Veins* and *Arteries* it hath om those called *Maminariæ internæ*, but small; d *Veins* besides from *Vena sine pari*. *Veins.* *Arteries.*

It hath moreover one special *Vein* called *Medina*, which springeth from the lower side of e *Ramus subclavius*.

The *Nerves* called *Phrenici*, and *Stomachici*, ringing from the sixth pair (Dr. *Willis*'s eighth) scend betwixt its Membranes, and send forth hall twigs into it. *Nerves.*

Bartholin says, it has *Lympheducts*, which rising re and there in many Rivulets, enter the *ductus racicus* at last in one chanel. These (he says) ibibe the water that is condensed betwixt its plicature, and convey it into the said Duct. *Lympheducts.*

It hath three *uses*: *First*, it divideth the Breast d Lungs into two parts, that one part being ounded or any way hurt, the other might perm the office of respiration. *Uses.*

Secondly, It holdeth up the Heart inclosed in *Pericardium* so, that it may not rest upon the ck-bone, when we lye upon our Back; or fall on the Breast-bone, when we bend our selves

towards the ground; or touch the Ribs, whe we lye upon our Sides.

Thirdly, It giveth a ſafe paſſage to the Veſſe which paſs by it, and holdeth up the Diaphragı ſo that it is not pulled too much down by th weight of the Bowels that hang by it, *viz.* th Liver and the Stomach.

Thymus. To the upper part of the *Mediaſtinum* at th Throat there groweth a glandulous body calle *Thymus*, ſeated between the diviſions of the Sul clavian Veins and Arteries. It is a whitiſh, (bu lightly tinctur'd with blood) ſoft, ſpongy body (in ſhape reſembling a Tyme-leaf, from whic it has its name.) It is larger in Children an Women than in Men. In Infants it conſiſts three Glands, and is in ſubſtance ſomething lik the Sweet-bread; but in adult Perſons it dri up and contracts into one continued ſubſtanc It has no proper Duct whereby any thing is con veyed into any peculiar cavity, and therefore to be reputed in the number of conglobat Glands.

its Veſſels. The Jugular *Veins* and *Arteries* paſs through as they go up to the Neck, but if they ſend fort any twigs into it, they are ſo ſmall as not to b diſcovered in diſſecting it. Dr. *Wharton* ſays, has *Nerves* from the ſixth pair (Dr. *Willis*'s eighth and from the Subclavian *Plexus*, which depoſit their *Succus nutritius* in it, whoſe ſuperfluous c impurer parts are ſeparated from itin this Glanc and conveyed away by the Lympheducts, an the refined liquor is reſumed by the Nerves di perſed in it, for the uſe of the nervous parts the whole Body. And becauſe he foreſaw ho open this Opinion, (which himſelf calls *ſcrupu ſa ſententia*) lay to the Objection, that it is ver improbable that the Nerves ſhould bring the *Suc*

ci

nutritius to this part, and after depuration should resorb it; he answers, that either the Nerves must do it, or it cannot be done at all, seing there are no other Vessels fit for the refining of it. But he had better have suspected his supposed office of the *Thymus*, when he saw himself so hard set to maintain it. For it is more probable that when there is found any witish liquor in it, (as there is in Infants, and in Calves, &c.) that liquor is Chyle which is brought thither by Lacteals, and descends from thence into the Subclavian Veins; seeing if one in a Calf about two hours after it has been plentifully suckled, the *Thymus* abounds with this liquor, as *Diemerbroeck* affirms; who also denies that there are any perceptible Nerves inserted into it, but grants Lympheducts, which empty themselves into the Subclavian Vein.

Its *uses* are, first, to prop and strengthen the divisions of the Vessels, namely of the *vena cava* and ascending *Aorta*; and secondly, to defend them from compression by the *Claviculæ*, in heaping forward. In adult persons it seems to be of little other use; but in Infants, in whom it is larger, and has liquor like Chyle in it, it seems to contribute something towards the refining or depuration of it. *Uses*

The third and last *internal* proper containing part is the *Midriff* or *Diaphragm* (derived ἀπὸ τοῦ φραγνύειν, *to distinguish*, because it divides the whole of the Body into two Ventricles, the *Abdomen* and *Thorax*.) It is also called φρὴν or φρένες, the *mind*, because when it is enflam'd or otherwise much distempered, the Mind and Senses are disturbed, through the great consent it has with the Brain, as being a very nervous part. The *The Diaphragm*

Latines call it *Septum transversum* for the same reason as the Greeks call it *Diaphragma*.

Now this part being truly Muscular, and assisting respiration, we might on that account have deferred to treat of it till we come to describe the Muscles of the *Thorax*: but because it is wholly an internal part, and serves to compose the cavity of the Breast, we rather chuse to discourse of it here, and omit it in the Treatise of Muscles.

Its figure and situation. It is almost round, (excepting its two appendages whereby it is fastned to the *Vertebræ* of the Back and Loins) and is seated transversly or cross the Body, only sloping a little backward. It is as broad as the width of the *Thorax*, for its edges are fastned to the lower part of the *Sternum* to the ends of the lowest Ribs, and to the lower *Vertebra* of the *Thorax*.

Substance. Its *substance*, as was said but now, is muscular, consisting of carnous and tendinous Fibres, like other Muscles. But whereas it has constantly been described by all former Anatomists as one Muscle, *Caspar Bartholin* has demonstrated it to consist of two, an upper and a lower, (or a fore and an hinder) to which discovery he was partly directed by *Steno*'s Observations, who first question'd the generally supposed Fabrick of this part.

It consists of two Muscles. I say it consists of two Muscles, an *upper* and a *lower*, which are thus described by the aforesaid Author.

"The *upper* Muscle by one end, (*viz.* its head) "adheres circular-wise to the Ribs, and to the "*Appendix* of the *Sternum*; the other passeth "to the *Tendon*, which makes the *nervous* centre "of the *Diaphragm* (as they call it) and is spread "on (or continued unto) the flesh of the lower "Muscle, and so the whole Midriff becomes

like one digaſtrick or double-bellied Muſcle. ay, the ſaid Author makes it a trigaſtrick one, iaſmuch as he has obſerved (in *Oxen*) that the re-part of the upper Muſcle ſhoots forth a tendon to every baſtard Rib on each ſide the *ternum*, to which Ribs the upper part of the anſverſe Muſcles of the lower Belly alſo adheres, ſo that he thinks they are continued one to the other. Of what uſe he makes this unio, ſhall be ſhewed in *Book* V. *chap.* 17. *Of the Muſcles of the Abdomen.*

"The *lower* ſprings from the *Vertebræ* of the "Loins, and neither proceeds from the other, "or touches it but by the mediation of the "Tendon, (for though the Fibres of each Muſ"cle ſeem ſometimes to mix a little one with "nother on the under ſide, yet that is only by "mediation of each of their Tendons.) Thoſe "wo *Appendices* (as they are called) of this low"r Muſcle whereby it adheres to the *Vertebræ*, "ave by all Anatomiſts been repreſented as if "hey were of the ſame length; whereas indeed "hey are not ſo, for the right is both longer "han the left, and very much exceeds it in the "umber of carnous and tendinous Fibres. Yea "he right ariſes from (or rather terminates "nto) the firſt, ſecond and third *Vertebræ* of "he Loins, as from ſo many heads; whereas "he left adheres to the laſt, and laſt but one of "he Back.

As to the courſe of the *Fibres* of both theſe Muſcles, becauſe they are better apprehended by h view than they can be by the deſcription, I hl wave this latter, and content my ſelf with exhibiting to the Eye of the Reader a Scheme of he Muſcles in *Tab.* 13. *Fig.* 2, & 3. from the a Author.

The membranes. The upper side of the Midriff is cloathed wi
the *Pleura*, and its lower with the *Peritonæu*
To the upper membrane the *Mediastinum* a
Pericardium are knit; and sometimes the low
tips of the Lobes of the Lungs, but that connexi
is preternatural.

Holes. It is perforated on the right hand in (or ne
the Nervous centre by the Trunk of *Vena ca*
ascending from the Liver; and on the left ha
a little more backwards, its lower Muscle in
upper or fore-part (before it is become t
dinous) is perforated by the Gullet and two S
machick Nerves springing from the *par vagu*
At which latter perforation the fabrick of
Diaphragm is remarkable; for there (as
may see in the foresaid Figures) the Fibres wh
are next to the upper orifice of the Stoma
run not streight as in other parts of it,
crooked like a Bow, encompassing the said o
fice, and by their contraction so constringing
that the continual motion of the Diaphragm c
ses no regurgitation of any thing out of the S
mach, nor is the ascent even of vapour perm
ted, except when it is violently burst open
belching or vomiting. In the hinder part of
lower muscle, *viz.* betwixt its two Appenda
or productions whereby it is knit to the *Vertel*
there descend the *Aorta*, a branch of the *V*
azygos, and the Intercostal Nerve (distinguis
from the *par vagum* by Dr. *Willis*) for the us
the parts of the *Abdomen*.

Vessels. It has been said to have two *Arteries*, ca
Phrenicæ, from the *Aorta* descending, and as
ny *Veins* from the Trunk of *Vena cava* ascend
through it. But the above-mentioned *Barth*
says, that the lower muscle has peculiar Blo
vessels. "For besides those Veins that spr
"fr

" from the *Cava*, (which provide for the upper " Muſcle and middle part of the lower) this " lower has on each ſide peculiar and notable " ones which ariſe from the *Vena adipoſa*, to " which as many Arteries anſwer in like manner " ſpringing from the *Lumbares*, yet at a different " Origin from thoſe other that accompany the " above-mentioned Veins that ſpring from the " *Cava.*] It has a peculiar *Nerve* which ſprings from the *brachial Nerves* with a double or triple Root; namely two or three ſlips, proceeding from the aforeſaid Nerves, grow into one trunk, which is the *Nerve* of the *Diaphragm*. The firſt and chiefeſt ſlip is produced from the ſecond vertebral Nerve: and the trunk that is made up of all the three, deſcends down the Neck and through the cavity of the *Thorax* without any ramification as far as the Midriff, where being divided again into two or three ſlips, on each ſide it is inſerted into its fleſhy or muſcular part. Now becauſe the Intercoſtal pair, according to Dr. *Willis*, has communication with the Vertebral from whence this Nerve of the Diaphragm ſpringeth, yea with this Nerve it ſelf, (for he ſays that two or three Nerves are ſent from the cervical *Plexus* of the Intercoſtal into the Trunk it ſelf of the Nerve of the Diaphragm) that learned Author very ingeniouſly gives a reaſon of the great conſent of the Midriff with the Heart, Brain and Face, when a man laughs. " For, " *ſays he*, as often as the imagination is affected " with ſome pleaſant or wonderful conceit, the " Heart would preſently fain triumph (*ovare*) " and be lighten'd by throwing off its burthen as " it were: wherefore that the blood may the " quicklier be emptied out of its right Ventricle " into the Lungs, and conſequently out of the

" left into the *Aorta*, the Diaphragm being in
" ſtigated by the Nerves that go to it from the
" aboveſaid *Plexus*, is drawn upwards with a
" more rapid *Syſtole*, and often repeating it
" jumps as it were, it bears up the Lungs, and
" cauſes them the quicker and frequenter to diſ
" charge the Air and Blood: and then inaſmuch
" as the ſame Intercoſtal Nerve, that communi
" cates below with the Nerve of the Diaphragm
" is alſo continued above with the Maxillar
" Nerves, when a cackling is begun in the Breaſt
" the geſtures of the Mouth and Face pathetical
" ly anſwer thereto.] And when the Dia
phragm is wounded in its Nervous part, then the
muſcles of the Face ſuffer Convulſions, and the
laughter called *Riſus Sardonius* (which is involun
tary) is cauſed. Beſides the aboveſaid peculiar
Nerve, it has *ſecondly* ſmall twigs from the Sto
machick Nerves and Intercoſtal as they deſcend
through it.

Uſe. Its *uſe* is *firſt* to divide the *Thorax* from the *Abdomen*, that noiſom and impure Vapours may not aſcend from the more ignoble parts (as the Guts) to offend the more noble (as the Heart *&c.*) *Secondly*, to help the muſcles of the *Abdomen* in excluding the Excrements, and (in Women) the *Fœtus*. But *thirdly*, its chief Uſe is to aſſiſt reſpiration, in which as * *Steno* obſerves
*De Muſc. & gland. p. 11, 12.
" it felt rather becomes leſs convex than its com
" paſs contracted. For, *ſays he*, all the line
" which you pleaſe to conceive from the *Vertebra*
" to the reſt of its circumference, both when it
" is relaxed, and when it is ſtretched out and be
" comes ſtiff, are crooked in ſome part of them
" looking towards the *Thorax* with their conve
" ſide, and towards the *Abdomen* with their con
" cave. Theſe lines the leſs they are extended

" the

" the more convex they are; whereby the *Abdo-*
" *men* is ſo much the larger, and the *Thorax* the
" ſtraiter; and the more they are contracted, by
" ſo much the Surface of the Diaphragm is the
" leſs convex; whereby the *Thorax* is ſo much
" the larger, and the *Abdomen* the ſtraiter.
" And ſo the bottom of the *Thorax*, (*viz.* the
" Diaphragm) in inſpiration is more depreſſed,
" but in expiration aſcends.] Thus far *Steno*, to whom (the often mentioned) *Bartholin* aſſents, who ſays, " that its firſt motion is per-
" formed downwards, which the Lungs following,
" draw in the Air; and by and by it is moved
" upward, whence the Lungs being compreſſed,
" the Air with the Vapours that are mixt with
" it are excluded. So that from a convex laxity
" it comes to plainneſs (in inſpiration) but is
" not at all extended. Notwithſtanding in ex-
" piration (which *Diemerbroeck* has well obſer-
" ved) it is firſt of all ſtretched as it were with
" violence, but it is preſently relaxed again, and
" by drawing the Ribs together with that tenſi-
" on it begins expiration with ſome force, and
" then the Ribs following it, its tenſion pre-
" ſently ceaſes, and it becomes lax. Which
" procedure *Diemerbroeck* illuſtrates with a pret-
" ty and pat ſimilitude, when he affirms it to be
" done in the ſame manner as when Bells are
" rung with long Ropes; in which action the
" Rope is firſt ſtretch'd with violence; but be-
" cauſe the Bell doth preſently follow that vio-
" lence, hence the Rope forthwith becomes lax,
" until the Bell being turn'd about to the other
" ſide, the Ringer do again ſtretch the Rope
" with the like violence, and draw it back again.]
At length *Bartholin* concludes, " When the Dia-
" phragm is compreſſed into the *Abdomen* (in
" inſpiration)

" inſpiration) the *Thorax* is elevated, otherwiſe
" than others think, who ſuppoſe the depreſſion
" of the Diaphragm to cauſe a depreſſion of the
" *Thorax*. But in expiration the Diaphragm be-
" ing driven upwards, the Breaſt is contracted,
" the Breaſt being contracted preſſes the included
" Air, the Air the Surface of the Lungs, that
" the Air may be driven from the *Veſiculæ* into
" the branches of the *Trachea*, whither as ſoon
" as it is come, the rings of the *Trachea* are con-
" tracted by the intermediate Fibres, and drive
" forth all the Air; and on this manner doth
" Reſpiration proceed; all the Cells of the
" Lungs being filled again by and by in Inſpi-
" ration.

The nature of its motion.

Its *motion* ſeems to be a kind of mixt motion, but rather *Animal* than *Natural*; for though we move it in our ſleep, and ſo it may ſeem natural, yet ſeeing when we awake we can ſtop, ſlacken, or haſten its motion as we pleaſe, it ſeems to be voluntary or animal.

And thus much of the parts *containing*, now to the parts *contained*.

CHAP. IV.

Of the Pericardium, *and the Humour contained in it.*

THE *Parts contained* are either *Viſcera* or *Vaſa*, Bowels or Veſſels.

Pericardium.

The *Bowels* are the *Heart* and *Lungs*. But the Heart being incloſed in a membranous cover called *Pericardium*, we will firſt treat of *it*, in this Chapter.

It is called *Pericardium*, becauſe it is placed *about the Heart*. It is called alſo *Capſula cordis*, the Heart-caſe, and *involucrum* the Cover, *&c.* *Its name.*

It is membranous, and encompaſſeth the whole Heart, whoſe ſhape it therefore reſembles, but is larger, both to grant a free motion to the Heart, and to contain its proper liquor. *Subſtance and figure.*

It ſprings at the Baſis of the Heart from the outer common Coats (that are borrowed of the *Pleura*) of thoſe Veſſels that enter into the Heart. *Origin.*

Whence it has *five holes* according to the number of Veſſels that go in or out of the Heart. As firſt one made by the aſcending Trunk of the *Cava*, another by the deſcending, both which enter the right Ventricle of the Heart, from whence there goes out *Vena arterioſa* into the Lungs, which makes a third hole. A fourth is made by the *Arteria venoſa* entring the left Ventricle of the Heart, and a fifth by the *Arteria magna* going out of the ſame. *Holes.*

Its outſide *adheres* to the *Mediaſtinum* by many Fibres, and is continued to it at the baſis of the Heart, where the Veſſels perforate it. Its lower end is knit firmly to the centre or nervous part of the Diaphragm, which (*Bartholin* ſays) is peculiar to Men, for in all other Creatures it hangs looſe. *Connexion.*

It has *Veins* below from the *Phrenicæ*, above from the *Axillares*. Its Arteries are ſo exceeding ſmall, that ſome have almoſt denied it to have any: but Dr. *Ruyſch* ſays, "That in Bodies he "had kept above two Years, he has ſhewed "them as plain as any thing can be ſeen in the "Body, and that there are very few, if any, "membranous parts that are furniſht with great- *Veſſels.*

er

" er plenty of *Arteries*. See his anſwer to *Gaubius*'s ſecond Letter, where he deſcribes them as derived from four or five ſeveral Origins. It receives *Nerves* from the eighth pair (heretofore reckon'd for the ſixth.) Dr. *Willis* ſays, " It has a great many twigs of Nerves from that " *plexus* of the *par vagum* that is over againſt the " firſt or ſecond Rib, and that it has ſo many for " this reaſon, *viz.* That ſeeing it is appointed " for a defence to the Heart, as often as any " offenſive matter invades or beſets it (ſelf), it " may be able to contract it ſelf and ſhake off its " enemy: for it is likely that *tremors* and *inordi-* " *nate vibrations* of the Heart, which in truth do " manifeſtly differ from its *natural Pulſe*, do pro- " ceed from the violent ſuccuſſion of this Mem- " brane.] *Bartholin* affirms it to have *Lympheducts* alſo; which is very probable, that they may abſorb part of the liquor contained in it, leſt it abound too much, ſeeing it receives continual ſupply: for I am not of opinion that this liquor is ſpued out of the Lympheducts, as *Steno* thinks, but that they rather imbibe it and convey it to the *Ductus thoracicus*.

Its liquor. It contains in it a *ſerous liquor*, that in healthful bodies is a little reddiſh, much like water wherein fleſh has been waſh'd. It is bred of Vapours exhaling from the Heart, which are ſtopt by this denſe Membrane, and condenſed into humour. Dr. *Lower* oppoſing this Opinion brings for Argument, that if it were collected this way, becauſe it would be continually a gathering, it would ſoon encreaſe ſo much that this *Capſula* could not hold it. But the aboveſaid *Lympheducts* abſorbing what is ſuperfluous, waſh away this Objection; which if they did not, his own Opinion

Opinion that it drops out of the Glands ſeated at the baſis of the Heart, would be liable to the ſame inconvenience. For ſuch diſtillation would be as continual as this condenſation is ſuppoſed to be. Naturally it is not in quantity above two ſpoonfuls, (though it differ much according to the temperament of the Party, the hot having a ſmaller, and the cold a larger quantity.) But in diſeaſed perſons it is ſometimes increaſed to half a pound, yea to a whole pound, as *Diemerbroeck* has oft obſerved. This is that liquor that is ſuppoſed to have flown from the Side of our Saviour when the Souldier pierced it with a Spear, for ſaith the Text (John 19. 34.) *There came forth blood and water.* Sometimes Worms have been obſerved to breed within this bag, and ſuch perſons, when they were alive, have been ſubject to palpitation of the Heart, and ſwoonings.

The *Pericardium* is ſome ſort of fence to the Heart, but it ſeems to be chiefly made for the ſake of the liquor it contains, which ſerves for the moiſtening of the Heart, and making its Superficies ſlippery, that it may move more glibly. *Their Uſes.*

CHAP. V.

Of the Heart, in general, and of the reaſon of its motion.

THE *Heart* (in Latin *Cor*, in Greek κῆρ, or κέας ἀ καίω, to *burn*, becauſe it is the ſource of *vital heat*) is the principal Bowel of the whole Body, which no perfect Animal does want, nor can long ſurvive its Wounds. Vital ſpirit and natural *The Heart.*

tural heat are communicated from it to all the parts of the Body, though they are not ſo much owing to its ſubſtance as to the ebullition or accenſion of the Blood and Chyle in it; as ſhall be diſcourſed hereafter.

Its ſituation. It is *ſeated* in the middle of the Breaſt, encompaſſed with the *Pericardium* and *Mediaſtinum*, its lower tip or *Mucro* bending a little to the left ſide. Neither its *Mucro* nor ſides are knit to any place, but it hangs looſe in its Caſe, only ſuſpended by the Veſſels that go in and out of its upper part or baſis, to which the *Pericardium* adheres. Its ſituation in Beaſts that feed upon Graſs is near the middle of the whole body, reckoning from the Head to the Tail; but in Man (and moſt carnivorous Animals which generally have ſhorter Necks than others) it is nearer the Head; whereof the learned Dr. *Lower* gives an ingenious reaſon. "Seeing, *ſays he*, the "trajection and diſtribution of the blood de- "pends wholly on the *Syſtole* of the Heart, and "that its liquor is not driven of its own nature "ſo readily into the upper parts as into Veſſels "even with it, or downwards into thoſe under it: "if the ſituation of the Heart had been further "from the Head, it muſt needs either have been "made ſtronger to caſt out its liquor with grea- "ter force; or elſe the Head would want its "due proportion of blood. But in Animals that "have a longer Neck, and which is extended "towards their Food as it were, the Heart is "ſeated as far from the Head as from the other "parts; and they find no inconvenience from "it, becauſe they feed with their Head for the "moſt part hanging down, and ſo the blood, as "it has farther to go to their Head than in others, "ſo it goes a plainer and often a ſteep way.

It

It has a firm, thick, denſe *ſubſtance*, thinner and ſofter in the right ſide, thicker and more denſe in the left, but moſt compact and hard at its tip; only on the left ſide of the tip it is thin, as conſiſting moſtly of the concourſe of the inner and outer Membrane. Its *Parenchyma* is for the greateſt part made up of muſculary Fibres, ſo that it ſelf may truly be reputed a Muſcle. *Subſtance.*

Its *Fibres* are a few of them ſtreight, but far more oblique. Both are inſerted into a Tendon that is ſpread over its baſis under the Auricles. Part of which Tendon at the egreſs of the *Aorta* in ſome Creatures becomes bony, as in a Stag, *&c.* On the outer Superficies of the right Ventricle there run a few ſlender Fibres ſtreight upwards, and are terminated in its baſis. In which alſo terminate the oblique ones next under theſe, aſcending from the left ſide towards the right, ſpiral-wiſe. The Fibres that lye under theſe, hold a clean contrary courſe. For they ariſe every where from the right ſide of the Heart, whence being carried obliquely towards the left, and having embraced each Ventricle of the Heart, they aſcend to the baſis of the left ſide ſpiral-wiſe to the other. But they run not all of them the whole length from the baſis to the cone; for then would the Heart be as broad or thick at the lower end as the upper: but ſome reach not above half way, others a little further, *&c.* and ſome to the very *Apex*. The Fibres of the left Ventricle differ not from thoſe of the right as to kind, only they are conſiderably ſtronger. Which they are for this reaſon, that whereas the right Ventricle only promotes the circulation of the blood through the Lungs, the left muſt caſt it forth with that force as that it may circulate through the whole Body. *Fibres.*

The

The curious Reader may find a moſt accurat deſcription of theſe Fibres in Dr. *Lower*'s Trea tiſe *de Corde*, whither I refer him; for, to inſiſ too long on ſuch minute ſimilar parts, would no be ſuitable to this Epitome of Anatomy. Thoug by a view of thoſe Figures that I have borrowe of Him, their ſtructure may be pretty plainl apprehended.

Figure. Its *ſhape* is like a Boy's Top (ſave that it i ſtattiſh behind) or a Pyramid turn'd topſie tur vy; whence it is divided into its baſis, which i its broader part and upper; and into its cone o *apex*, or narrower and lower part; which end in a tip or *mucro*.

Bigneſs. It is *bigger* in Men than in other Creatures conſidering the proportion of their bodies. I is leſſer but more denſe in hot and bold men, tha in the cold and cowardly. In adult perſons it i commonly ſix fingers breadth long, and fou broad at the baſis.

Coat. Outwardly it is covered with a proper *Coa* which is thin, but ſtrong and denſe, and ver hard to ſeparate from it; it is the ſame with th outer Coat of the great Artery, as that whic cloaths the Ventricles on the inſide is continue unto and common with that thin skin that cover the inſide of the Arteries like a *Cuticula*: an hence 'tis likely (ſays *Diemerbroeck*) that th Arteries borrow theſe Coats of the Heart, as th Nerves borrow their two Tunicles from the *Pi* and *Dura mater* of the Brain. Upon this Mem brane that inveſts the Heart, there grows ſom hard fat about the baſis, which ſerves to moiſte it.

Veſſels. It is not nouriſhed by the blood or chyle tha are received into its Ventricles, but by Veſſel running through its *Parenchyma*.

It

Its *Arteries* are two, ſpringing out of the *Aorta* before it paſs out of the *Pericardium*, and are called *Coronariæ*, becauſe their Trunks do not preſently enter into the *Parenchyma* of the Heart, but fetching a circuit on its ſurface the better to branch out themſelves towards its cone, they encompaſs its baſis like a Diadem. And though at their riſe they turn one on one ſide and t'other on the other of the Heart, yet at their ends they meet again and inoſculate one with the other: ſo that if one inject any liquor into one, it will run to the other. *Arteries.*

It has alſo two *Veins* called *Coronariæ*, which encompaſs its baſis in like manner, and communicate one with the other. Theſe receive and carry back the Arterial blood that remains from the nutrition of the Heart, and refund it into the *Cava* juſt at its entrance into the right ventricle. *Veins.*

Its *Nerves* do ariſe chiefly from the *Plexus cardiacus* of the *par vagum* or eighth pair, into which *plexus* many twigs do enter from the Intercoſtal. But a little below this *plexus* after the recurrent Nerve has parted from the Trunk of the *par vagum*, the *par vagum* ſends forth on each ſide a notable branch: which being carried towards the Heart, and creeping along its baſis behind, meet one another, and in all their progreſs ſend forth twigs through the whole Surface of the Heart, eſpecially on its backſide: as thoſe branches which proceed from the *plexus cardiacus*, are diſperſed chiefly on its foreſide, as Dr. *Willis* affirmeth. *Nerves.*

The cauſe of the motion of the Heart.

Great controverſie hath been and ſtill is abo the *motion* of the Heart, *whether* it depend on t influx of the animal ſpirits, *or* on the accenſi and dilatation of the blood in its Ventricles, partly on one, partly on the other. Plauſi Arguments are produced on every ſide, but ſ as rather tend to ſhew the ſhortneſs and inſuffi ency of the contrary Opinions to ſolve this *Ph nomenon*, than pretend to demonſtrate any c tain reaſon of it. That the immediate Inſt ments of its motion are its Fibres, none doubt; but what ſets theſe Fibres on work is the queſtion. That it cannot be the Animal S rits conveyed by the Nerves (*only*) is appare *firſt*, becauſe the Heart moves in the *Embryo* fore either Brain or Nerve are ſo perfectly f med, that the Animal Spirits can be elabora out of the blood by the former, or tranſmit to the Heart by the latter: yea ſeeing they made of Arterial blood, that muſt be ſent to Brain by the pulſation of the Heart before t can be generated. And *ſecondly*, becauſe Heart of living *Fœtus*'s (as of young Puppie and of Eels, being cut out of the Body and fr all the Nerves by which any Animal Spi ſhould flow into it, will continue beating as lo as 'tis warm: yea when it has ceas'd beating, one throw warm blood or but warm water u it, it will recover ſome kind of pulſation aga Which may ſerve alſo to convict the ſecond O nion of Errour; for if its motion depended o on the dilatation or rarefaction of the blood, would ceaſe as ſoon as the blood flows no lon into its Ventricles.

And for a further confutation of the ſecc Opinion, which ſuppoſes the accenſion (and c

ſequ

quent dilatation) of the blood as the cause of his pulsation, Dr. *Lower*'s Experiment, or his observation seem argumentative beyond contradiction. His *Experiment* is this: "He drew "out of the *Jugular vein* of a Dog about half of "his blood away, injecting by turns into the "*Crural vein* a like quantity of Beer mixt with "a little Wine; and this he repeated alterna-"tively so often, till instead of Blood there "flow'd out of the Vein only a paler tincture "like water wherein Flesh had been wash'd, or "Claret diluted with very much water; and yet "the Heart in the mean time remitted but a lit-"le of its former pulsation..... His *Obser-vation*, which he had from a Physician worthy "credit, is this: "A Youth about sixteen years "old, continuing bleeding for two days toge-"ther; his Friends and those that waited on "him, gave him good store of Broth to keep "up and recruit his Spirits; which he swallowing "down greedily, his bleeding was now and then "increas'd thereby, so that at length having "poured forth almost the whole mass of his "blood, that which now run out was dilute and "pale, neither of the nature nor colour of blood, "but liker the Broth he had drunk so much of: "and this kind of flux continued a day or two, "the Heart the mean-while retaining its pul-"sation) till at length being stopt, the Youth "was restored by degrees to entire health, and "grew to a robust and lusty Fellow.] This Ex-periment and Observation, I say, do make it ap-parent, the motion of the Heart depends not on the accension and dilatation of the blood, for how when in the first the Beer and Wine, in the second the Broth, flow'd into its Ventricles in stead of blood, its motion must either have been

more notably alter'd, or rather have quite ceas'
these liquors being so far distant from the natu
of blood, especially the Broth.

And lastly, that this motion is not caus
partly by the influx of the Animal Spirits, a
partly by the accension and rarefaction of t
blood, may be evinced by the Arguments pr
duced against each Opinion apart: and yet if
Reason could be given, this seems the most pr
bable. Namely, that the blood distilling in
the Ventricles of the Heart, is in them accend
and rarefied, so that requiring a larger space,
bears against their Sides: whereby the Heart b
ing molested, it calls in the Animal Spirits
help, which coming in in convenient plenty co
tract its muscular Fibres, and so by straitning
Ventricles drive forth the blood contained
them into the Arteries. But we had rather
genuously confess our ignorance of the reason
so admirable an action, and profess with D
Lower, that it is too hard for Man to conceive c
and that it is the Prerogative of God only, w
searcheth the secrets of the Heart, to know the r
son of its *motion* also.

CHAP. VI.

Of the Pulse, and the circulation of the Blood.

The Pulse. THE *motion* of the Heart is called in Gr
Σφύξις, in Latin *Pulsus*, pulse or beati
And this is performed by *Diastole*, or Dilatati
in which it receives blood into its Ventricles;

Sy

ystole, or Contraction, by which it expels it *out* them.

Contraction being the proper motion of a uscle, the *Systole* is the proper motion of the eart; and the *Diastole* is but a ceasing or resti- tion from that motion. For in the *Diastole* e Fibres of the Heart are relaxed, during which e blood distils down into its Ventricles out of e Auricles; whereby when they are filled and some measure distended, the Fibres both reight and oblique begin to contract themselves, d compress or straiten the Cavities of the Ven- icles, not only by constringing their sides, but so by drawing up the cone or tip of the Heart rarer its basis, whereby their Cavity is shortned, that the blood is expelled with force out of em into the Arteries; which motion is called e *Systole*. But why the Heart should keep such ted turns of *Systole* and *Diastole*, and continue em for (it may be) fourscore years together, *ut* (as we said above) we cannot conceive e reason of, but admire the Wisdom and Power the Creatour, in beginning and continuing ch a motion.

Systole *and* Dia- stole.

At the same time as the Heart beats, there is a pulsation of all the Arteries to be felt in the stream parts of the Body. Whence may arise dispute, whether the Arteries be not also en- ed with a pulsifick faculty. I incline to the ne- tive, and think their pulsation is meerly pas- e, and that as for other reasons, so upon the count of these two Experiments, *viz.* 1. That an Artery be cut in sunder, and a Pipe be put to each end of the divided Artery, whereby e blood may be conveyed out of one into the her, the pulsation will continue beyond the pe, as well as on that side next the Heart.

whether the pulsation of the Arteries depend wholly on that of the Heart.

And, 2. That in transfusion of blood out of on Animal into another, though the blood be re ceived into a Vein, yet that Vein will have a pu sation answering to that of the Artery in th other Animal whence the blood issueth. So tha the pulsation of the Artery seems wholly owin to the repeated *impetus* of the blood poured int it out of the Heart in each *Systole*.

The circulation of the blood.

Now seeing by the continual reciprocation o the Pulse there is a constant expulsion of bloo *from* the Heart into the Arteries, and as cont nual an influx of blood *into* it out of the *Cava* and seeing the *Cava* from whence the supply i is never drawn dry, nor on the other hand, th Arteries that receive the blood continually fro the Heart, unduly swell'd with it; it necessaril follows, that this motion proceeds *circularly*, *vi* that the blood is continually driven out of th Heart into the Arteries, out of these into th parts to be nourished; from whence it is reso bed by the Capillary Veins, which conduct back through the larger into the *Cava*, and i at length it returns to the Heart again. The in vention of which Circulation is owing to ou Countryman Dr. *Harvey*, and may be prove undeniably by these reasons.

1. The great quantity of blood that is drive out of the Heart into the Arteries at every Puls For though the Ancients who knew not this Ci culation, imagin'd that only a drop or two w expelled by every *Systole*, which they were n cessitated to suppose, to avoid the great disten sion that the Arteries must be liable to, if an considerable quantity issued into them; yet it certain and demonstrable that there must nece an Ounce or more be driven into them eac time. For (taking it for granted that there

o other way for any liquor to pass from the tomach to the Kidneys but through the Heart, long with the blood) seeing if some Men at ome times drink three Pints of Drink, they shall ifs it out again in half an hour, yea more of *unbridge* Waters in that space; and seeing secondly, that there is commonly as much blood s *Serum* that flows to the Kidneys (the blood eturning back by the Emulgent Veins) it is lear that by the two Emulgents (which are one of the largest Arteries) there must pass in alf an hours time six pounds of liquor, all which ust come from the Heart; and how much more nen may we conceive to be driven through all ne other Arteries that run through the whole ody? This is more accurately evinced by Dr. *owe*r's Experiment, which is this: "I cut asunder (*says he*) both the *Cervical* Arteries in a large Dog, and at the same time through an hole made in the left side of his Breast over against the Heart, I compress the Trunk of the *Aorta* below the Heart with my Finger, to hinder any blood from descending by it; and lastly, I took care also to straiten the *Brachial* Arteries under the *Axillæ*, by which means almost all the blood was driven out of the Heart through the *Cervicals* (besides that which was sent into the *Vertebrals*) and which is wonderful to be related, within the twentieth part of an hour the whole mass issued out; so that it is not to be denied but that it all past through the Heart in that space.] And though it may e granted that amidst such wounds and tortures ne Heart does beat somewhat quicker than at ther times; yet the same thing is partly evient from wounds in the Limbs when some noble Artery is cut asunder, for 'tis strange in

how ſmall a time a Man will bleed to death ever at that one Artery. Yea we may give a great gueſs how much blood is ſent out at every Pulſe even from the ordinary opening of one *Vein* in the Arm, from whence a notable quantity of blood will iſſue in a ſhort time; how much then may we ſuppoſe would flow out of all the Veins if they were opened at one time? Seeing then 'tis evident that ſo great a quantity of blood is expelled out of the Heart at every *Syſtole*, and that for all that the Arteries are not unduly diſtended nor any part ſwell'd by it, neither yet the *Cava* and other *Veins* emptied, 'tis certain that the blood that is driven into the Arteries flows back to the Heart by the Veins, in a conſtant circulation.

2. A ſecond Argument to prove it, may be taken from the Valves in the Veins, which are ſo framed that blood may freely flow through them out of the leſſer Veins into the greater, (and ſo into the *Cava*) but not on the contrary out of the greater into the leſs. Yea if one blow into the *Cava* through a Pipe, there will no wind paſs into the ſmaller Veins; but on the contrary, if you blow up the leſſer Veins, the wind will readily paſs to the larger, and ſo to the *Cava*.

3. And laſtly, The ſame thing is moſt clear by the Ligature in Blood-letting. For whether you let blood in the Arm or Foot, you always tye the Fillet above where you intend to make the orifice, and then the Vein below the Ligature will preſently fill and grow tumid, but above, it will fall and almoſt diſappear. Which muſt needs be from thence, for that the blood being driven along the Arteries towards the extreme parts returns by the Veins and aſcends upwards, which coming to the Ligature and being ſtopt there

ſwell

wells the Vein below the Ligature, and spurts out as soon as the orifice is made: but when the fillet is loosed again, the blood flows no longer out thereat, but holds on its wonted chanel, the Vein, and the orifice closes up again.

Having sufficiently demonstrated the Circulation of the Blood, we will shew two things further; *first*, how the blood passes out of the Arteries into the Veins, and *secondly*, in how long a time the whole mass of blood may be supposed to pass through the Heart in its ordinary Circulation.

How the blood passes out of the Arteries into the Veins.

As to the *first*, it was the Opinion of *Riolanus* that the blood circulated only through the larger Vessels, by anastomosis or inosculation of the Veins with the Arteries; and that that which run into the smaller, was all spent on the nutrition of the parts. But it is clear that there must be a circulation even in the smallest, from the great quantity of blood that will flow out of the least Artery in the Hand or Foot, when it is cut; which it were very absurd to imagine to be all spent on the nourishment of the respective part. Now there are but two ways whereby the blood can be supposed to pass out of the Arteries into the Veins, *viz. either* by the former's being continued to or opening into the latter by inosculation, *or* else by the Capillary Arteries letting out their blood into the pores of the substance of the parts, on whose nutrition part is spent, and the remainder imbibed by the gaping mouths of the Capillary Veins. That it is necessary to admit of this *latter* way, is evident, because if part of the Arterial blood did not issue into the substance of the parts, they could not be nourished by it; for while it is in the Vessels, it may add warmth indeed to the parts thro' which it flows, but

but cannot nouriſh them, ſeeing even the Veſſels themſelves are not nouriſhed by that ſtream of blood that glides along their Cavity, but by Capillaries running through their Coats; and if the blood be driven into the ſubſtance of the parts, and that in a greater quantity than ſuffices for their nouriſhment, (as was juſt now ſhewn that it is) what is ſuperfluous muſt needs enter the mouths of the Capillary Veins, from which it goes forward to the larger, and ſo to the Heart. But ſeeing this way of transfuſing the blood through the ſubſtance of the parts has ſeemed to ſome not to anſwer to that haſty circulation of it we above demonſtrated; they have thought it neceſſary alſo to admit of the *former* way, namely, anaſtomoſes, by which the Veins are continued to the Arteries, and that not only in their larger branches (as that notable one of the Splenick Artery with the Splenick Vein) but alſo in their ſmaller twigs in the extreme parts. But we muſt conſider, that in a living body the ſolid parts are infinitely more porous and permeable than in a dead; ſo that though the Anatomiſt find their ſubſtance ſo denſe and cloſe, as to make it ſeem almoſt impoſſible they ſhould permit ſo quick a paſſage to the blood through them; yet he ſhould rather believe it, than ſuppoſe ſuch anaſtomoſes as he cannot diſcover, (though it were not difficult to find them out if they had an exiſtence.) For abating that ſingle one of the Splenick Artery with the *Ramus Splenicus* of the *Porta*, (and perhaps ſome of the *Arteria* with the *Vena pulmonaris* in the Lungs) none of the lateſt moſt accurate Anatomiſts have been able to find out any. And as for that mentioned, it ſeems rather to be of an Artery with an Artery (ſuch as are frequent in ſeveral parts of the body, as are alſo

also of one Vein with another) than of an Artery with a Vein; for the *Porta* from which this *Ramus* is propagated, is generally reputed rather an Artery than a Vein, for the reasons alledged in Chap. 12. of Book I. where we described this Vessel.

In what space of time the whole mass circulates.

And *secondly*, as to the space of time in which the whole mass of blood may ordinarily circulate through the Heart, it is probably much shorter than many have imagined. For supposing that the Heart makes two thousand pulses an hour, (which is the least number any speak of, and some have told twice as many) and that at every pulse there is expelled an Ounce of blood (which we may well suppose, seeing the Ventricles are wide enough to contain two Ounces, and that it is probable, both that they are filled near full in the *Diastole*, and that they are near if not quite emptied by the strong constriction of the Heart in the *Systole*) seeing the whole mass usually exceeds not four and twenty pound, it will be circulated six or seven times over through the Heart in the space of an hour. And by so much the oftner, by how much the blood comes short of the supposed quantity, or the pulse either naturally, or by a Fever, spirituous liquors, or violent motion is rendred more frequent. By which quick motion the blood it self is kept from coagulation and putrefaction, and the parts are cherished with vital heat, which heat of the parts is much according to the slowness or rapidness of the circulation: so when we sit still, and the pulse is slow or rare, we grow cold; but when upon running or any violent exercise the pulse becomes more frequent and quick, we become hot.

CHAP.

CHAP. VII.

How Blood is made of Chyle, of its Heat and Colour, and whether the Body be nouriſhed by it.

ACcording to Dr. *Harvey*'s Obſervations, there appears in an *Embryo* a *punctum ſaliens*, or red beating ſpeck, which is Blood, before any the leaſt Lineament of the Heart. So that whatever Inſtrument of Sanguification the Heart may appear to be afterwards, it contributes nothing to the making of the firſt blood; but it ſeems rather to be made for the blood's ſake, to tranſmit it to all the parts of the *Embryo* or *Fœtus*, than the blood to be made by it. But it muſt be confeſt that things proceed in the grown *Fœtus* far otherwiſe than they do in the firſt formation. For the parts of an *Embryo* are nouriſhed and encreaſed before it hath a Stomach to concoct any thing, and yet in a perfect *Fœtus* none can deny that the Stomach does concoct and prepare nouriſhment for it: ſo it moves before the Brain is formed ſo perfectly as to be able to elaborate Animal Spirits; and yet after it is perfected, every one knows that the Brain does elaborate ſuch Spirits, as being ſent into all the parts of the Body by the Nerves, enable them to move. In like manner though there be blood in the *Embryo* before the Heart be formed, yet after it is perfected, nothing will hinder but it may at leaſt contribute ſomething to Sanguification.

We will ſuppoſe then, that as all the other parts are formed by the *Vis plaſtica* or generative faculty

faculty of the (firſt) vegetative and (then) animal Soul, ſeated in the *Ovum*, and receive their firſt encreaſe by the aſſimilation of the *colliquamentum*; but as ſoon as they are perfected, and the *Fœtus* excluded, are nouriſhed by the blood: ſo the blood it ſelf being at firſt made in like manner, as ſoon as the Veins, Heart and Arteries are completed ſo as it can circulate by them, may, not improperly, be ſaid to be nouriſhed by the Chyle or nutritious juice, the Heart aſſiſting the aſſimilation of the one into the other. And this is done in this manner. The Chyle aſcending by the *Ductus thoracicus* (as was deſcribed, Book I. Chap. 10.) and flowing into the Subclavian Vein together with the returning venal blood, is poured by the *Vena cava* into the right Auricle, and ſo into the right ventricle of the Heart in its *Diaſtole* or Relaxation; then by its *Syſtole* or Contraction it is driven out from thence into the Lungs, from whence it aſcends again into the left Auricle firſt, and then into the left Ventricle of the Heart, out of which it is expelled through the *Aorta*, and paſſing along with the blood through the Arteries of the whole body, returns again with it by the Veins to the Heart. For it undergoes many circulations before it can be aſſimilated to the blood. Which is evident, both becauſe it is the Chyle (but little alter'd) that is ſeparated in the *Placenta uteri* for the nouriſhment of the *Fœtus*, and in the Breaſts for the Infant to ſuck, in the form of Milk; and alſo from hence, that if one be let blood four or five hours (or later) after a full Meal, there will a great quantity of the milky Chyle it ſelf ſwim a-top the coagulated blood. But every time the new infuſed Chyle paſſes through the Heart with the blood, the particles of the one are more intimately

How chyle is turned into blood.

ly mixed with those of the other in its Ventricles, and the vital Spirit and other active principles of the blood work upon the Chyle; which being full of salt, sulphur and spirit, as soon as its *Compages* is loosened by its fermentation with the blood in the Ventricles of the Heart (especially, but also in the Arteries) the principles having obtained the liberty of motion do readily associate themselves; and are assimilated with such parts of the blood as are of a like and suitable nature; so that at length all the mass of Chyle that is capable of being turned into blood, is sanguified; and what is not, is evacuated by Urine or Stool, or other proper Emunctory.

How the blood becomes hot.

It is a very difficult question, by what means the blood acquires its *heat.* In order to the resolution whereof it will be necessary to consider how many ways a *liquid body* is capable of being heated, and those (according to Dr. *Willis*) are three. "*First*, by setting it to something that is "hot; so Water is made hot by being set on the "Fire, or in the Sun, or a Stove, or by dissolving "Lime in it. *Secondly*, when Saline Corrosives, "which are of a contrary nature, being mixt "with one another, or with sulphureous, act one "on another, and by the great strugling and agi"tation of their particles do often excite heat, "yea sometime smoke and burning: as when "spirit and butter of Antimony, or when *aqua* "*stygia* and Oyl of Turpentine are mixed toge"ther; also when corrosive liquors eat into me"tallick bodies, they often grow hot. *Thirdly*, "(which is the only way besides that a liquid "grows hot) when some humour abounding with "sulphur or much spirit is set on fire by holding

"a flame

" a flame to it, and ſo grows hot by deflagration, " as Brandy, *&c.* There are other ways indeed " of calefaction, as *fermentation*, *putrefaction*, and " *attrition*, whereby *thicker* or *ſolid bodies* often " grow hot, but in *liquid* they produce no ſuch " effect. Thus Leaven becomes (ſomewhat) hot " by *fermentation*, and Dung or wet Hay by *pu-* " *trefaction*; but neither way will a *liquid body* " wax hot: for though Wine, Cider, *&c.* fer- " ment ſo much as to burſt the ſides of the Hogs- " head, yet they are not actually hot; nor will " blood become ſo, when it is let out of the bo- " dy, diſpoſe it how you will in fit Glaſſes to fer- " ment or putrefie. Indeed the blood within the " body is fermented, and is thereby depurated, " but it is not heated by ſuch fermentation, as " neither is any other liquid. Neither does the " heating by *attrition* agree to it; for though ſo- " lid bodies are heated by being rubb'd one a- " gainſt another; yet ſhake and agitate Liquids " as much as you will, they ſhall be never the " warmer for it. Therefore ſeeing there are " only thoſe three ways firſt mentioned whereby " actual heat can be produced in any Liquors, " let us ſee to which of them the incaleſcence of " the blood ought to be aſcribed.

" *Firſt*, both the Ancients and ſome Moderns " are of opinion, that the blood is heated the firſt " way, *viz.* by the admotion of ſomething that " is hot. Thus the former have taught that the " *innate heat*, and the latter that the *vital flame* is " lodged in the Heart, and heats the blood as it " paſſes through it: But both theſe Opinions fall " to the ground, ſince it is clear that the Heart " is a *mere muſcle*, and contains no fit fewel for " perpetuating a flame, or I know not what im-

" planted

" planted heat: For though it must be acknow
" ledged that the circulation of the blood de
" pends on the continual motion of this bowel
" yet the *Heart* derives its heat wholly from th
" *blood*, and not the *blood* its from the *Heart*.

" *Secondly*, this heat cannot be caused in th
" blood the second way, because its liquor in
" natural state is always homogeneous; an
" though it abound with salt, yet that is onl
" volatile, mild and benign. Nor can any on
" discover either in the *Heart*, or in any othe
" *focus* a saline or otherwise heterogeneous mine
" ral, by acting whereupon or corroding whereo
" the sanguineous liquor should conceive heat.—

" *Thirdly*, as to the third way, whereby liquid
" grow hot, though it seem an hard saying, tha
" *the blood is accended*; yet seeing we can attri
" bute its incalescence to no other cause; wh
" should we not impute it to this? especiall
" seeing the *proper passions of fire and flame* agre
" to the *life of the blood*.

" For the chief and most essential Requisites t
" continue a flame are these three, *first*, that
" free and continual access of air be granted t
" it as soon as it is kindled; *secondly*, that it en
" joy a constant sulphureous *pabulum* or fewel
" and *thirdly*, that it be ventilated, whereby a
" well its suliginous, as thicker recrements ma
" be continually amanded from it: And seein
" these agree to the *vital flame* as well as to a
" elementary, it seems very rational to affirm
" that *life it self is a kind of flame*.] Thus far tha learned Author, whom the Latin Reader will d well to consult discoursing further on this sub ject, in his *Exercit. medico-physica de sang. incales centia sive accensione.*

Di

Dr. *Henſhaw* thinks that " the diſſimilitude of " parts between the Chyle and Blood is ſo great, " that it becomes immediately the cauſe of an ex- " traordinary ebullition upon their mixture toge- " ther; which is very much encreaſed by the re- " ciprocal motion of the Lungs; whereby the " blood is wrought almoſt into a froth or foam " by that time it gets into the left Ventricle of " the Heart. Which ſudden exceſs of heat, is not " unlike what happens upon the mingling ſeveral " Chymical liquors together; as ſpirit of *Wine* and " ſpirit of *Turpentine*, and other ſuch like, where " the heat becomes ſo great, that it often endan- " gers the Veſſels they are contained in. He af- rms (contrary to Dr. *Willis*, and I think to he truth) that " new Wine or Muſt while it " ferments, is hot; and that if juice newly preſ- ſed out of the Grapes were added to it as it begins to cool, it would again renew its ebul- lition, and its warmth would be continued ſo long as one ſhould perſiſt to do ſo: In like manner he thinks is the warmth in the blood continued by the new affuſion of Chyle, which renews its fermentation, and conſequently in- vigorates its heat.

Diemerbroeck is of opinion, that " the *vital ſpi- rit* (by which he underſtands the more ſubtile part of the blood) while through its great volatility it always endeavours to flie away, does continually agitate the other thicker par- ticles of the blood, with which it is intangled and detained from flight, and is diverſly vibra- ted by them, and beat back; and ſo the whole maſs being kept in a continual fermentative motion, there is produced in it an heat; which in a great agitation is great, in a mean, mean, and in a ſmall, ſmall.

I might cite other Opinions concerning t
reaſon of this *heat*, but they generally fall in wi
ſome of theſe mentioned: of which I ſhall n
make my ſelf an Umpire, but think that Dr. *W*
lis has ſaid enough in his above-cited Exercit
tion, to evince that it is not cauſed either
theſe later ways; *viz.* by fermentation, or
agitation of the particles of the blood in the ma
ner *Diemerbroeck* deſcribes it; and whether t
accenſion of the blood be a more probable reaſ
of it, let the Reader judge.

The colour of the blood. Why the Blood ſhould be of a *red colour* rath
than any other, no ſatisfactory reaſon (I thin
can be given, but the Will of the Creatour, thou
ſome attribute it to the Heart, others to the mi
ture of ſalt and ſubacid juices with ſulphureo
becauſe from ſuch a mixture there reſults a r
colour, as appears in the diſtillation of Sal nitr
(which contains many ſulphureous particles
it;) or by the pouring Oil of Vitriol upon Co
ſerve of Roſes, or other thing that is of a *pal*
red, (if it contain any thing of ſulphur) for
will be thereby made of a moſt *deep* red. We w
not ſpend time to ſhew in how many reſpe
theſe Inſtances differ from the *Phænomenon* und
conſideration, but ſhall content our ſelves wi
inquiring from whence the difference of colo
ariſes between the Venal and Arterial Bloo
Every one knows that when blood is let out of
Vein into a Porringer, the *coagulum* is of a flor
ſcarlet colour in its ſurface, but of a dark r
from the ſuperficies to the bottom, and of ſu
a colour it appears as it ſtreams out of the o
fice of the Vein. But if an Artery be cut, t
ſtream then looks of a far brighter colour, li
the ſuperficies of the Venal blood when it is co
gulat

plated in a Porringer. Now the Arterial blood receives not this florid colour in the Heart, but in the Lungs. For if it receiv'd it in the Heart, then might the right Ventricle be supposed to give it as well as the left: but that it does not so, is clear by this Experiment of Dr. *Lower*'s. If you open the *Vena arteriosa* which receives the blood out of the right Ventricle, the blood differs nothing in colour from the Venal, but its curdled part looks every whit as black. But if you open the *Arteria venosa* as it is entring into the left Ventricle, it has the perfect colour of Arterial blood; which shews, that as it owes not that colour to the left Ventricle any more than to the right, (being not yet arriv'd at it) so it must receive that alteration of colour in the Lungs, in which the nitrous air being diffused through all the particles of the blood is intimately mixed with it, and (if you will) accends it. For if there be any such thing as a *Flamma vitali* (properly so called) in Animals, though the Blood (or Chyle rather) be to it in stead of the Oil or other matter whereon it feeds, yet it owes the continuance of its burning to the Air, without the continued inspiration of which the Animal cannot live, but instantly dies, even as a Candle is presently extinguished if you put it in a close place where the air cannot come to it, or by some Engine be suckt from it. But this by the bye. For I must confess that (how plausible soever this Opinion may seem on other accounts) this alteration of the colour of the Blood by the Air in the Lungs, is no sufficient Argument to prove any such vital flame, seeing the Arterial blood being extravasated, retains its florid colour, when no doubt if there ever was any accension, the flame is extinguished. But this

ſcarlet colour is owing meerly to the mixture the particles of the Air with the Blood in t Lungs, from which it tranſpires, in a great me ſure, through the pores of the Skin, while t blood circulates in the habit of the Body o of the Arteries into the Veins, whence the V nous blood becomes ſo much darker in colo than the Arterial. And yet the Venous blo it ſelf when extravaſated appears of a ſcarlet d in its ſurface, which is meerly from its being e poſed to the Air; for if one turn the congeal blood in a Porringer upſide down, the bott which at the turning is blackiſh, will in a lit while turn to a lighter red.

Whether the Body be nouriſh'd by Blood.

Though we have confeſſed that the Chyle d circulate through the Body ſeveral times bef it be perfectly aſſimilated to the blood; yet do not think that it paſſes into the nouriſhm of the parts in the form of Chyle. And therefo when ſpeaking of the Nutrition of the *Fœtus* the Womb (Book I. Chap. 33.) we often m tioned a *nutritious juice* (which was Chyle a lit alter'd) we did not call it ſo with reſpect to ſolid parts of the *Fœtus*, but to the blood it whoſe *Pabulum* or nouriſhment it is, as ſoon the Umbilical Vein is formed, as the blood is the Body. For as to the encreaſe of the firſt lineated parts of an imperfect *Embryo*, that is different from ordinary nutrition.

The Blood then conſiſting of particles of different nature, each particle paſſes into the n riſhment of that part which is of the ſame nat with it. So the ſalt and ſulphureous particles ing equally mixt, are agglutinated and aſſim ted to the fleſhy or muſculous parts; the and ſulphureous to the Fat; the ſalt and tarta

is to the Bones, *&c.* Now this is not done by y election or attraction of the parts, as if they ck'd and choos'd (with a kind of discretion) ch particles of the blood as are suitable to their vn nature; for the mass of blood is equally and differently carried to all the parts: But there that diversity of figure both in the several par-les of the blood and in the pores of each part, at in the circulation through the habit of the dy some stick in these, and others in those, here they are fasten'd and united to the sub-nce of the respective parts; and those which rough their peculiar figure are unapt to adhere one or other, return again to the Veins and so the Heart, where they receive some new alte-ion. So that as *the life of the Flesh is in the lood* (according to *Levit.* 17. 11.) so has it its al heat and nourishment from it also.

CHAP. VIII.

f the parts of the Heart, viz. *the* Auriculæ, *the Ventricles, and the* Septum *that divideth them.*

HAving treated of the *Heart* in general, and of its *Action*, *&c.* we now come to discourse of the *Parts* which it consists of, *viz.* its o *Auriculæ*, two Ventricles and the *Septum*.

The *Auriculæ* or *Ears* of the Heart are so called Auriculæ. om some similitude of shape they have with ose of the Head: for they rise from a long ba-, upon the basis of the Heart, and end in an tuse point, making an obtuse triangle. They

are as it were two Appendages of the Hea
ſeated at its baſis over the Ventricles. They a
of the ſame fabrick and uſe, being both Muſcl
and made up of the ſame order of Fibres, whi
are carried into oppoſite Tendons, whereof th
at the baſis of the Heart is common to it a
theſe *Auriculæ*, and the other runs along th
upper part. The right is larger and ſofter, t
left is leſs, but more firm. Their ſuperficies
ſmooth when they are filled; but when empty,
is wrinkled, and the left more than the rig
When they are cut open, there appear in th
Cavity many fleſhy columns running from t
upper to the lower Tendon, and betwixt th
there are pretty deep Ditches or long Caviti
but fewer in the right than the left.

Their motion. They are dilated and contracted in like m
ner as the Heart, but at different times: for t
Syſtole of the Ventricles is at the ſame time w
the *Diaſtole* of the *Auriculæ*; and on the contra
the *Syſtole* of the *Auriculæ* with the *Diaſtole* of t
Ventricles. So that the *Auriculæ* are a receivi
their blood from the Veins, while the Ventric
are expelling theirs into the Arteries; and wh
the Ventricles are relaxed and empty in their *D*
aſtole, the Auricles force their blood into th
by their *Syſtole*.

Arteries. They are not nouriſhed by the blood th
comes into and goes out of their Cavity, but th
have a great many branches of Arteries runni
through them for this purpoſe, which ſpring fr
the *Arteria coronaria*, and are called by Dr. *Ruy*
(I think the firſt obſerver of them) *Arteriæ A*
riculares; and muſt alſo, no doubt, have branc
of Veins from the *Cava* to attend them. Th
Arteriæ Auriculares you have repreſented in t
next Table, *viz.* XI.

Th

They ſerve to receive the Venal blood immediately out of the *Vena cava*, and *Pulmonaris*, and to meaſure it, as it were, into the Ventricles. Whither that they may expel it with the greater force, the internal Fibres or Columns of their Cavity ariſing from their root where they are joyned to the baſis of the Heart, reach directly outward towards the *Vena cava*, and *Pulmonaris*, and in the *Syſtole* of the *Auriculæ* graſp the blood contained in their cavity like ſo many fingers, and ſqueeze it into the Ventricles whilſt they are relaxed in their *Diaſtole*. *Uſe.*

The Heart hath two Cavities, called *Ventricles*, whereinto it receives the blood from its two Auricles, and out of which it expels it into the *Arteria pulmonaris* and *Aorta*. They are not altogether like one another; for the right is wider, and in ſhape almoſt ſemicircular, nor reacheth it down to the *Mucro* or tip of the Heart; whereas the left is almoſt round, and reacheth down to the very tip. Now though the outſide of the Heart be ſmooth, yet theſe Ventricles are very unequal, having their ſides hollowed into divers Interſtices or Furrows, and interwoven with carnous Fibres reaching this way and that way. They are more numerous in Men's Hearts, than in thoſe of any other Animal; though ſuch as are big, as Horſes and the like, have them larger. Theſe Fibres or fleſhy Columns ſerve to straiten or conſtringe the Ventricles, and the clefts or furrows betwixt them help their ſides to cloſe more exactly in their *Syſtole* than they could have done, had they been ſmooth. The Fibres are more and ſtronger, and the furrows deeper in the left Ventricle than in the right, yea they are alſo in that ſide of the *Septum* that *The Ventricles.*

makes part of the left, though that side that looks to the right be well-nigh smooth. For there was need of greater and stronger constriction in the left than in the right; seeing the right expels the blood to no greater circuit than through the Lungs, but the left to the extremest parts of the Body.

Septum. They are divided from one another by the *Septum*, which is a carnous and dense partition that stands like a Wall betwixt them. It is hollow towards the left Ventricle, and (as was just now said) has such like Fibres and Clefts, as the rest of the Cavity; but towards the right it is convex or bunching out, and has but very little inequality. Many have been of Opinion that it has some wider pores through which part of the blood does pass immediately out of the right into the left Ventricle; but he that searches for them diligently will find none, unless he first make them with his Probe. And indeed if there were any in grown persons, we may much more suppose them to be in *Fœtus*'s in the Womb, in whom are several passages that after the birth are obliterated. But if these were in the *Fœtus*, then should Nature have made those two other passages in vain, namely the *Foramen ovale*, whereby the blood passes out of the *Cava* into the *Vena pulmonaris* as it is entring the left Ventricle; and the *Canalis arteriosus*, which carries the blood out of the *Arteria pulmonaris* into the *Aorta*. I say, if the blood could have passed out of one Ventricle into the other (without going through the Lungs) by any pores that perforate the *Septum*, these other passages had been superfluous. And therefore we may suppose, that as in grown persons they cannot be found by any Probe or Bristle, so they were not there even while the

Fœtus

fœtus was in the Womb, seeing there was no occasion for them.

As to the *use* of the Ventricles, it may be learned partly by what has been discoursed in the three former Chapters, and partly by what shall be said further in the following, wherein we are to describe the Vessels opening into and out of them. Whither also we transfer the treating of their *Valves* that are placed at their orifices.

CHAP. IX.

Of the ascending Trunk of Vena Cava.

BEcause the Vessels contained in the *Thorax* either open into the Heart or run out of it, having finished the description of *It*, we shall discourse next of *them* as appendages to it. But having the repetition of what we discoursed book I. Chap. 10. of the *Ductus chyliferus thoracicus*, that runs up the *Thorax* by the Spine, and opens into the Subclavian vein, and referring the reader thither for the description of that vessel; I shall here only meddle with the Sanguiferous Vessels, that are four in number, *viz. Vena cava*, *Vena arteriosa* (or *Arteria pulmonaris*) *Arteria venosa* (or *Vena pulmonaris*) and the *Aorta* or *Arteria magna*; and in this Chapter of the first, *viz. Vena cava.*

In the former Book, Chap. 12, and 13. where Vena cava
we discoursed of the Vessels contained in the *Abdomen*, we supposed (with the *Galenists*) that both the *Vena portæ* and *Cava* had their rise from the Liver, not dogmatically asserting it, but supposing it for methods sake. And in Chap. 13.

describing

deſcribing the branches of the *Cava* in the *Abdomen*, we found it preſently dividing it ſelf (after its riſe out of the upper part of the Liver into the *Aſcending* and *Deſcending* Trunk; the deſcription of the branches of the *latter* (in the lower Belly) we there finiſhed; but traced the *Aſcending* Trunk no further than its penetrating through the Midriff up into the *Thorax*, deferring the further proſecution of it till this place that we come to treat of the Veſſels contained in the *Thorax*.

Venæ phrenicæ. As it aſcends through the Midriff it ſends forth a ſmall ſprig on each ſide, called *Venæ Phrenicæ* theſe run through the Midriff, the *Mediaſtinum* and *Pericardium*. If at any time matter gathered in the cavity of the *Thorax* be afterwards diſcharged by Urine, (which many Phyſicians have affirmed) it is probable that it is abſorbed by the mouths of theſe Veins gaping in the upper ſide of the Diaphragm, (upon which ſuch matter muſt be ſuppoſed to fluctuate) whereby it is brought into the *Cava*, and ſo in the circulation is ſeparated by the Kidneys out of the Emulgent Arteries and deſcends by the Ureters to the Bladder.

Venæ coronariæ. From the Diaphragm it paſſes undivided to the right Auricle of the Heart, but before it enters it, having pierced the *Pericardium* it ſends forth ſometimes one, ſometimes two twigs called *Venæ coronariæ*, which compaſſing the *baſis* of the Heart bring back into the *Cava* the blood that is ſuperfluous from its nutrition. As theſe open into the *Cava*, there is a *Valve* placed, which permits the blood to return by them into the *Cava*, but hinders any to paſs out of the *Cava* into *them*.

Before this Trunk of *Vena cava* open into the Auricle, it is joyned to that other Trunk that deſcend

descends from the *Claviculæ*, (though for method's sake we must consider *that* as a continuation of *this*, by and by) and both of them discharge the blood contained in them by one mouth first into the Auricle and then into the Ventricle of the Heart. As they are going to joyn, there comes a Tubercle or Protuberance betwixt them, that hinders the one from opening into the other in a direct line, but makes them both go obliquely towards the left hand as they enter the *Auricula*; without which provision, that blood that is a descending from the *Claviculæ* would have faln so full on that which is ascending by this Trunk of the *Cava*, we have been a describing, as must have made it either to stagnate (if not regurgitate) or however would have retarded its motion.

Now immediately beyond this Protuberance, out of the united Trunk there goeth a passage (called *Foramen ovale*) along the *basis* of the Heart to the *Vena pulmonaria* in *Fœtus*'s in the Womb, which as soon as they are born closes up and is obliterated. The reason of this passage of the blood in them is, because their Lungs having either none or but a very obscure and imperfect motion, the blood does but little of it pass through them, but a good part of it through this *Foramen* out of the *Cava* into the *Vena pulmonaria* just as it is entring into the left Auricle, through which this blood is discharged into the left Ventricle together with that little that is returning by the said *Vena pulmonaria* from the nutrition of the Lungs. For though there be expelled out of the right Ventricle a pretty quantity of blood at every pulse into the *Arteria pulmonaris*, yet there is but a little of it that goes to the Lungs, (though all do in adult persons, that

it

it may be there impregnated with air) but the greatest part by a Pipe arising from this Artery, called *Canalis arteriosus* runs into the *Aorta*, which Pipe does degenerate into a Ligament after the *Fœtus* is born. So that the *Fœtus* in the Womb liveth after the manner of Fish or other Creatures that have no Lungs, and but one Ventricle of the Heart; for there is but very little of its Blood that passeth any more than one of its Ventricles in one circulation, that which circulateth through one missing the other. But to return:

The united trunk of the *Cava* opens by one large orifice into the right ventricle of the Heart, (as most Anatomists have taught; but *Steno* affirms, it goes no further than the Auricle) into which is poured all the Blood that returns from all the parts of the Body (except the Lungs) in its circulation. And lest in the *Systole* or constriction of the Heart, the Blood should be expelled the same way it comes in; at the orifice of the *Cava* there grows a membranous circle, which is cleft into three membranous *Valves*, looking inwards, called *Tricuspides* (or three-pointed) which permit the Blood to come in, but not to go out. And this office these Valves perform in this manner, (as is most ingeniously described by Dr. *Lower.)* Out of the sides of the right *Ventricle* there grow certain *Papillæ*, or round and long Caruncles (called before, fleshy Columns) from whose top there proceed certain tendinous Fibres that are knit to these Membranous *Valves*. Now these Membranes encompass the orifice of the *Cava* round about, so that whereas the *Mucro* or tip of the Heart is in every *Systole* drawn up towards the *basis*, the *Papillæ* being also moved upwards, do slacken their Fibres (like Bridle-reins) whereby it comes to pass that the Membranes (o-

Valvulæ tricuspides.

Valves

Valves) also, to which they are tied, hanging loose are driven upwards (like sails filled with wind) by the Blood that is squeezed in every *Systole* of the Heart, and thereby they shut this inlet into the Heart so closely, that not a drop of liquor can flow back again into the *Auricula* or *Cava*, but is expelled all into the *Arteria pulmonaris*, whose orifice is now open: But, as in every *Systole* of the Heart (its tip being brought nearer its *basis*) the *Papillæ* do much relax their Fibres; so in the *Diastole* the tip receding from the *basis* again, does also draw down the *Papillæ*, and their Fibres with it: whence it comes to pass that the *Membranes* or *Valves* being also drawn down, do presently uncloſe this orifice, and open the door as it were for more Blood to come in, what came in before being expelled in the last *Systole*.

The two Trunks of the *Cava* having thus discharged themselves by one orifice into the right ventricle, that Trunk which ascends towards the *Claviculæ* (for so we must consider it for orders sake, though in truth it descends from thence) assoon as it is gone out of the *Pericardium*, sendeth forth a notable branch called *Vena sine pari*, (or ἄζυγος) because it is but one, having no fellow.

It ariseth out of the hinder part of the *Cava*, *Vena sine pari.* out more towards the right hand, and descends through the right side of the cavity of the *Thorax*. After its rise, which is betwixt the fourth and fifth *vertebra* of the Breast, it bends a little forward toward the right hand, till it be descended as far as the eighth or ninth *vertebra*, where it begins just to keep the middle. It sends forth on each side Intercostal branches to the Interstices of the eight lowest Ribs; and at the eighth Rib it is divided into two branches: One whereof, being the larger, descends toward the *left hand* betwixt

the

the processes of the Diaphragm, and is inserted sometimes into the *Cava* above or below the Emulgent, but oftener into the Emulgent it self: The other being the *right* is joined also to the *Cava*, commonly a little above the Emulgent, but seldom into the Emulgent it self.

How Pus *collected in the* Thorax *is voided by urine.*

It was formerly held, before the circulation of the Blood was found out, that in an *Empyema* of the *Thorax*, the matter was absorbed by the mouths of this Vein, and carried directly to the Emulgent Veins, where it was separated with the *Serum* by the Kidneys. But seeing the Blood does indeed ascend from the Emulgents by this Vein, and that at its insertion into them there is commonly a Valve that hinders any thing from issuing out of the *Vena sine pari* into the Emulgent, but permits the contrary; it is certain, that if this Vein be at any time an instrument to evacuate such *Pus*, it must first ascend to the *Cava*, and pass through the Heart, and so be carried to the Kidneys by the *Aorta* and the Emulgent Arteries arising out of it. But though it is difficult to conceive how the mouths of this Vein should open so wide into the cavity of the *Thorax*, as to imbibe slimy ropy *Pus*, and yet not let forth the Blood that is more fluid; so that one would hardly assign this office to it: yet when the *Pus* is collected betwixt the *Pleura* and Intercostal Muscles, and the Tumour does not burst, I see not why it may not be supposed that the Intercostal branches of the *Vena sine pari* do imbibe the matter out of the Tumour, and carry it that way which was just now spoken of. And if ever *Pus* be imbibed out of the cavity of the *Thorax*, because it floats upon the Diaphragm, the *Venæ phrenicæ* are liker to do it than this, as was noted before in this Chapter, when we described those Veins. But the truth is,

s, 'tis more probable, when such matter is void-
d by urine, that it is absorbed by neither of
hese vessels nor from the places mentioned, but
ather by the *Vena pulmonaria* out of the Lungs
hen they apostemate.

Of this *Vena sine pari* we shall say no more, but
hat at its rise out of the *Cava* it has a *Valve* that
pens towards the *Cava*, which having sent forth
his vein, ascends on towards the *Claviculæ*,
rengthned and sustained by the *Mediastinum*
nd *Thymus*, and before it is divided into the two
ami subclavii (sometime after) sends out yet
vo other small veins called

The *superiour Intercostals*, on each side one, each Intercostales superiores.
which has a *Valve* where it joins to the *Cava*,
ermitting the influx of the Blood into the *Cava*,
ut hindring its relapse. These run along the
nterstices or Intervals of the three or four upper-
ost Ribs. Yet sometimes the *Vena sine pari* sends
vigs to these four Interstices of the Ribs as well
to the eight lower, and then these superiour
ntercostals are wanting.

Afterwards the trunk of the *Cava* is divided Venæ subclaviæ.
to two large Veins, one of which goes to the
ght hand, the other to the left. These while
ey are within the Breast, are called *Venæ subcla-
iæ*, running along the under side of the *Clavi-
læ*: but as soon as they are gone out of it, *Axil-
res*. They send forth several branches both *up-
rds* and *downwards*. Sometimes the superiour
tercostals just now mentioned (though seldom)
ise out of them. Next, the

Mammariæ descend from them, (though these *Branches arising from them.*
metimes spring out of the trunk of the *Cava*;
uncertain is the origine of some of these Veins.)
hese send forth double branches, Internal and 1. Mammariæ.
xternal. The *Internal* run to the gristly ends

of

of the Ribs and their Intercoſtal ſpaces, ar
ſome of their twigs alſo are terminated in th
glands of the *Mammæ*. The *External* paſs dow
on the outſide of the Breaſt, and ſend mar
twigs into the ſaid glands, and marching furth
by the ſides of the *Cartilago enſiformis* deſcend o
of the *Thorax*, continuing their courſe down th
Abdomen, under the ſtreight Muſcles thereof, t
about the Navel, where it hath been an old Tr
dition that they inoſculate with the *Venæ epig*
ſtricæ; but this was a miſtake, as has been not
more than once already. *Bartholin* ſays that ſom
times there is but one *Mammaria*.

2. Mediaſtina. The ſecond Vein that ariſeth out of the Su
clavian is the *Mediaſtina*; this ſends twigs to t
Mediaſtinum (from which it hath its name)
the *Pericardium* and to the Gland called *Thym*
This alſo ſometimes ſpringeth out of the trunk
the *Cava*.

3. Cervicalis. The third is *Cervicalis* or *Vertebralis*; this tur
backwards towards the *vertebræ* of the Nec
into whoſe lateral holes it enters by ſome ſma
twigs, which diſperſe themſelves through th
Membrane that inveſts the marrow contained
theſe *vertebræ*; and other twigs it beſtows upo
the Muſcles that lie next upon the *vertebræ*.

4. Muſcula inferior. The fourth is *Muſcula inferior*; this is ſpe
upon the lower Muſcles of the Neck and the u
per of the *Thorax*. It riſeth ſometimes from th
external Jugular.

All theſe ſpring from the lower ſide of the Su
clavian veins; but theſe that follow from the *u*
per. As

5. Muſcula ſuperior. The *Muſcula ſuperior*, which is diſperſed thr
the Muſcles of the Neck.

6 Jugulares. Then the *Jugulars*, which are double, *E*
ternal and *Internal*. As theſe go out of the Subcl
via

ians, there is placed sometimes one thin Valve, ometimes two, to hinder the return of the Blood ut of the Subclavians into them.

The *External* ascend on the outside of the eck, and these are they which are opened when ne is let blood in the Neck for any Distemper f the Head, or Quinzy, *&c.* They ascend but st under the Skin, and provide for the outward arts of the Neck, Chaps, Head and Face. They ake the Temple-veins, and the Forehead-vein, oth which are wont sometimes to be opened. ea they send small Capillaries through the sures of the Skull into the Membranes that cover e Brain.

The *Internal*, in Men, are larger than the *External*. They ascend from the Subclavian by the es of the Wind-pipe, on which they bestow all twigs. As soon as they are come to the *ba*- of the Skull, they are each divided into two, e greater and less. The greater is carried ckwards, and by that hole of the *Os occipitis* by hich the sixth pair of Nerves (Dr. *Willis*'s eth) comes out of the Head, they enter in, l are dispersed through the *Dura Mater*, &c. e less enters in by the holes made for the third l fourth pair of Nerves, and is also bestowed the *Dura Mater*, &c.

When the Subclavian Veins have sent forth all se branches, they then pass out of the *Thorax*, begin to be called *Axillar*, of which we shall t in the Fourth Book, Chap. 1.

nto the *Vena subclavia* are inserted also the *ctus chyliferus thoracicus* (of which in the First k, Chap. 10.) and *Lymphaticus ramus*, which ers the *Lympha* from the Arms, Neck, *&c.* sometimes this opens into the Jugular.

CHAP. X.

Of Vena arteriosa, *and* Arteria venosa.

Vena arteriosa. THE second vessel in the Breast is common called *Vena arteriosa*, but more properly *Arteria pulmonaris*, both because it performeth the office of an Artery, in carrying Blood out of the right Ventricle of the Heart to the Lungs; and also because its Coat is double like that of other Arteries.

Its Valves. As it riseth out of the right Ventricle of the Heart, there stand at its orifice three Membranous *Valves* looking outwards, called *Semilunares*, because they make as it were a half circle; as also *Sigmoides* or *Sigmoideæ*, from the shape of the Greek letter *Sigma*, which of old was of the same figure with an English *C*. These Valves are made of the tendons of the Fibres of the Heart, as *Steno* affirms; yea the same tendons, he says, pass into the substance of the Artery it self. In the *Systole* of the Heart they open, and permit the Blood to issue out of the Ventricle into this Artery; but in the *Diastole* they shut, so that none can return back again. A little beyond these valves in a *Fœtus* in the womb there springs out of this Artery a pipe called *canalis Arteriosus*, that runs cross the Breast to the *Aorta*, into which it conveys the greatest part of the blood out of this Artery, without its passing through the left Lobe of the Lungs, or the left Ventricle of the Heart; but assoon as the Child is born it closes up, and turns ligamentous, as was said before of the *foramen ovale*.

Branchings in the Lungs. Assoon as it is past out of the *Pericardium* it bends towards the *Aspera Arteria* or Wind-pipe

id is divided into the right and left branch, hich applying themselves to the like branches of e *Aspera Arteria* do every where accompany em on the under side, and as they run along id out very many twigs on every side, which esently associate with those of the Wind-pipe, d of the *Vena pulmonaris.* And where the small pes of the *Aspera Arteria* end into the little und Cells (which we shall describe in the Chapt of the Lungs) the twigs of this Artery be- ig interwoven with those of the Vein do embice them like a Net. Whence one may guess t the reason why the sanguiferous vessels do so ctly accompany all the branches of the Windpe and its annexed little Bladders, is, that the ole mass of Blood passing this way may be inred or impregnated with the particles of the rous Air. For there is but a very little spent the nutrition of the Lungs, but the greatest t of it is received by the small twigs of the *na pulmonaria* which accompany those of this tery in all its ramifications.

The third vessel is called *Arteria venosa*, other- Arteria
e *Vena pulmonaria*; this has but a single Coat venosa.
he other Veins have. After it has accompani- the Wind-pipe and *Arteria pulmonaris* in all ir branchings in the Lungs, and by its small gs has received the Blood (by *anastomoses* as t affirm) out of the Artery, all these twigs united first into two trunks (*viz.* the right left) afterwards into one, which opens into left Ventricle of the Heart.

At its orifice there are placed two membranous *Its Valves.*
ves called *Mitrales*, because when they are ed together they do in some manner resemble shop's Mitre. They are of a stronger contex-

ture than thoſe called *Tricuſpides* at the orifice
the *Cava* in the right Ventricle; and ſo are t
Fibres, that aſcend to them from the *Papillæ*
fleſhy columns, ſtronger. For ſeeing the Blood
expelled more impetuouſly out of the left Ve
tricle than out of the right, (for the Blood ſe
out of the one is to circulate only through t
Lungs, but that out of the other, through t
whole Body) it was convenient that the valv
and Fibres ſhould be ſtronger, to ſuſtain the v
lent motion of the Blood, and hindring it fr
returning into this *Vein* again, to direct its cou
into the *Aorta* whoſe orifice opens in the *Syſ*
of the *Ventricle*.

Juſt as this *Vena pulmonaria* is entring into
left Auricle, there is, in a *Fœtus* in the Wor
a Pipe called *Foramen ovale* that opens into it
ming from the *Cava*, as was noted above.
which we ſhall here add, that at its orifice i
this *vein* there is a valve placed, that hinders
Blood from returning into the *Foramen* out
the *vein*.

And here there is one thing worth noting c
cerning the pulmonary *Artery* and *Vein*: T
whereas in all the other Arteries and Ve
through the whole Body beſides, the Blood c
tained in the Arteries is of a bright ſcarlet colc
and that in the Veins of a black purple; on
contrary, the *Arteria pulmonaris* containeth bl
purple Blood, and the Vein ſcarlet-colou
The reaſon whereof was ſhewn before, Chap.
viz. That the ſcarlet colour of the Blood is wh
owing to the mixture of Air with it in the Lu
And therefore that Blood which the pulmon
Artery brings into the Lungs out of the ri
ventricle of the Heart, being the Venal bl
that was brought thither from the circulation

Cava, changes not its colour till it passes out the small twigs of the said Artery into those the pulmonary *Vein*, where the airy Particles insinuate themselves into it, and so alter its colour.

The pulmonary *Vein* hath no Valve in it, except that at its opening into the left Ventricle. which Dr. *Willis* gives this reason, That the Blood within the *Præcordia* may always, because the *Impetus* of the passions, freely fluctuate and regurgitate both ways, backwards and forwards. Lest the left ventricle of the Heart should at time be suffocated by the Blood rushing too impetuously into it, the fleshy Fibres in the root of the Vein (for both this and the *Cava* have there, which seem to make a kind of Sphinter) by the instinct of Nature contracting themselves invert its course, and make it flow backward toward the Lungs.

CHAP. XI.

Of the Aorta, *or great Artery.*

THE fourth vessel is the great Artery called *Aorta (arcula*, a little Chest) and by way of eminency *Arteria magna*, because it is the greatest Artery of the whole Body, from which the others (except the pulmonary) are derived. Aorta.

It springeth out of the left ventricle of the heart, and at its rise hath three *Valves* looking upwards, called *Semilunares*, being altogether like those at the orifice of the *Arteria pulmonaris* in the right ventricle. And these with the *Aorta*, *Its Valves.*

according to *Steno*, are both of them constitut
of the tendons of the Fibres of the Heart, as w
as the *Sigmoidea* and *Arteria pulmonaris*, of whi
in the former Chapter. These hinder the Blo
from returning out of the great Artery into t
Heart again. The orifice of the *Aorta* (or rath
the Tendon of the Heart that is continuous to i
in some Creatures (especially in Harts) does oft
grow bony; and sometimes in Men, accordi
to the observations of *Bartholin* and *Riolanus*.

Assoon as the *Aorta* is gone out of the Heart
ascends not in a direct course towards the Hea
for if it had, seeing it openeth streight upwa
out of the ventricle, it would have poured
Blood (especially in lying along) in too rapi
stream into the Brain, and the lower parts of
Body would have been defrauded of their
share: but it first bends arch-wise, so that
bowed corner sustains the first *Impetus* of the
pelled Blood, and directs the greatest torrent
wards its descending trunk, and a lesser quant
passes up by the ascending, being to convey
Arterial Blood to fewer and smaller parts.

In a *Fœtus* in the Womb there comes a P
out of the *Arteria pulmonaris* into the *Aorta*, cal
Canalis arteriosus, which brings out of it the gre
est part of the Blood that was expelled out
the right *Ventricle*; little more passing into
Lungs than may serve for their nourishment;
which we have given the reason in the two f
mer Chapters, as also in Book I. Chap. 34. A
the *Fœtus* is born, the *Canalis* degenerates into
impervious Ligament, as was also noted before

Before the *Aorta* come out of the *Pericardi*
it sendeth forth sometimes one, but oftener t
small Arteries, from each side one, which comp
the *basis* of the Heart like a Garland, in their

cuit ſending down divers twigs length-ways of the Heart: they are called *Coronariæ*. When theſe two ſmall Arteries have incompaſs'd the *baſis* and meet, they inoſculate with one another, but not with the *Veins*. At their riſe out of the *Aorta* there is a *Valve* placed that permits the Blood to flow out of the great Artery into them, but hinders its reflux.

Theſe (as was above obſerved from Dr. *Ruyſch*) ſend branches to the auricles of the heart, and alſo to the whole ſubſtance of the heart it ſelf; yea, according to the ſame Author, to the coats of the root of the trunk of the *Aorta* it ſelf alſo.

The diviſion of the Aorta *into the aſcending and deſcending Trunk.*

When it hath pierced the *Pericardium*, and bended a little arch-wiſe backwards, it is divided into two Trunks, whereof the one is called *Truncus aſcendens*, the aſcending Trunk; the other *deſcendens*, the deſcending.

Of theſe two, the *deſcending* is largeſt, becauſe it miniſtreth to more parts.

The but juſt now quoted Dr. *Ruyſch* does not approve of this diviſion, but ſayes, "that the "trunk of the *Aorta* coming forth of the left *ſinus* "of the heart, tends upwards indeed, but ma- "king an arch is preſently bended downwards; "and as it ſo bends, it ſends forth ſome branches "to the parts ſituated above the heart, and eſpe- "cially the ſubclavian and *carotides*, and (which "is to be noted) on the right ſide for the moſt "part, if not alwayes, the *carotis* and ſubclavian "artery are for a little ſpace at their riſe joined "into one, otherwiſe than in the left ſide, where "for the moſt part they come ſeparately out of "the *Aorta*. So that the *Aorta* is not divided by "Nature properly into two Trunks, for both the "aſcending and deſcending trunk is the ſame. But "if any be minded to call this *Aorta* as it a-

" ſcends, the aſcending, and as it deſcends, the
" deſcending, I will not be againſt it; but I have
" by no means found it in man ſo ſeparated and
" divided into two parts, that the one part ſhould
" aſcend, and the other deſcend, as it is repre-
" ſented in the figures of divers Authors.]

Thus he, and becauſe he is a perſon very curious, I have here inſerted his figures lately publiſhed in his Anſwer to *Gaubius*'s third Letter.

Tab. XI.

Fig. 1. A *The root of the trunk of the* Aorta, *out of each ſide of which ſpring*
The coronary Arteries BB.
CC *The Arteries running through the auricles of the heart.*
D *The little branches of Arteries ſpringing out of the* arteria coronaria, *and diſperſed through the coats of the root of the* Aorta.
EEE *Very numerous ſprigs of Arteries ſpread through the ſubſtance of the heart.*
FF *The trunks of the coronary Arteries cut off, deſigned for the back ſide of the heart.*

Fig. 2. A. *The heart of a boy about ten years old.*
BB. *The Arteries diſperſed through the ſubſtance of the heart.*
C *The right auricle of the heart.*
D *The trunk of the* Aorta *emerging and riſing up out of the left* ſinus *of the heart.*
E *The deſcending trunk of the* Aorta.
F *The right ſubclavian Artery united for a little ſpace to the right Carotid.*
G *The left ſubclavian Artery coupled to the cervical Artery, and is leſs in diameter than the foregoing.*

Fig. 1.

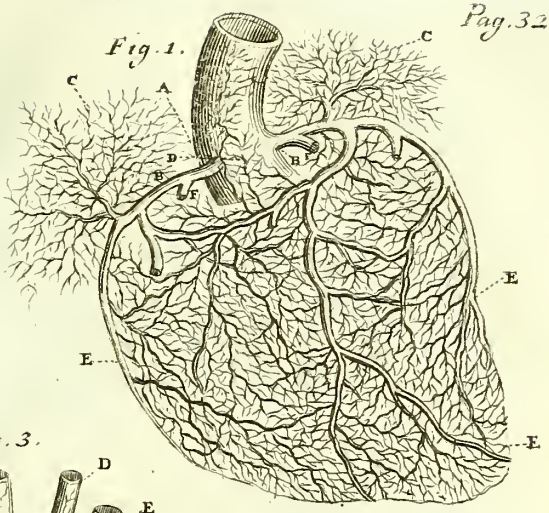


Fig. 3.

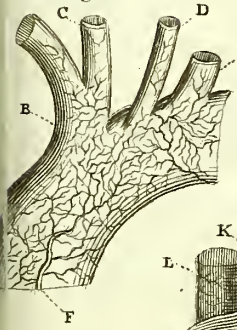
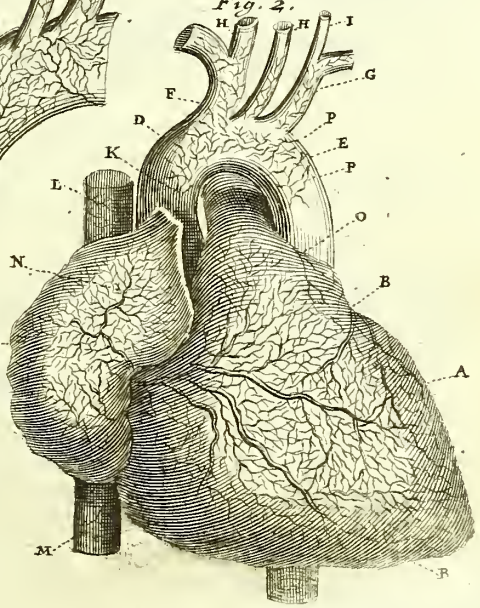


Fig. 2.



H *Each Carotid Artery.*
The left cervical Artery.
The little Arteries ſpringing from the coronary Artery furniſhing the coats of the root of the Aorta.
The aſcending trunk of the Vena cava.
The deſcending trunk of the Vena cava.
The Arteries diſtributed through the right auricle of the heart, and ariſing out of the coronary Artery.
The root of the pulmonary Artery coming forth of the right Thalamus *of the heart.*
The little Arteries ſpringing from the internal mammary Arteries and diſtributed through the coats of the Aorta.

ig. 3. A *The trunk of the* Aorta *of an adult man.*
A branch of the right ſubclavian Artery, out of which the right carotid Artery ſpringeth, noted by the Letter C.
The carotid Artery of the left ſide.
The left ſubclavian Artery.
The branches of Arteries that ſpring from the Arteria coronaria.

Now though I muſt needs acknowledge that hat this curious Anatomiſt ſpeaks againſt the diding the *Aorta* into its aſcending and deſcendg trunk has much reaſon in it, as appears by ie ſecond figure; yet having his lieve I ſhall here to the uſual diviſion, and proceed to ɔſerve the *aſcending*, and *deſcending* trunks of ie *Aorta* in their ſeveral off-ſprings, as they have en hitherto deſcribed.

The *aſcending* Trunk then running up under ie *Vena cava* lies upon the Wind-pipe, and pre- ntly ſendeth forth two large branches, whereof ie paſſeth to the right, the other towards the left Arm; *The branches of the Trunk aſcending.*

1. Subclavia. Arm: They are called *Rami ſubclavii*, becauſe they march under the *Claviculæ*; and aſſoon as they are gone out of the Breaſt, are called *Axillares*. The right is the larger, and riſing higher goes a more direct way towards the right Arm; the left is leſs, and riſing lower aſcends more obliquely towards the left Arm. They ſend out ſeveral branches both from their *lower* and *upper* ſide.

2. Intercoſtalis ſuperior. From the *lower* proceeds the *ſuperiour Intercoſtal* which runs along the interſtices or intervals of the four uppermoſt Ribs, and ſends ſlips to the neighbouring Muſcles and ſpinal Marrow. These ſometimes are propagated from the cervical Arteries, coming out through the holes of the *Vertebræ*.

3. Mammaria. From the *upper* ſide of each ſubclavian ſpring firſt *Mammaria*, which deſcends towards the Breaſts through the Muſcles that fill up the interſtices of the cartilages of the true Ribs; and a conſiderable branch of each deſcending out of the *Thorax* by the ſides of the *Cartilago enſiformis*, runs down the *Abdomen* under the *Muſculi Recti* ſpreading there into many twigs: which are ſaid to inoſculate with the extremities of the like twigs of the epigaſtrick Artery aſcending. But that opinion is ſo oppoſite to the circulation of the Blood, that it is impoſſible to be true. For if Blood can aſcend by the *Mammariæ*, nor deſcend by theſe aſcending twigs of the *Epigaſtricæ*.

4. Cervicalis. The next is *Cervicalis* (otherwiſe called *Vertebralis*) which ſendeth ſlips to the *Vertebræ* and Muſcles of the Neck, at whoſe ſeventh *Vertebra* it enters in by the holes of the tranſverſe proceſſes, and pierceth the Membrane that inveſts the ſpinal Marrow, beſtowing twigs both on the Membrane and Marrow, and runs up therewith in at the great hole of the *Occiput*, and being

te

ter'd the Skull, both branches (the right and left) join under the *medulla oblongata*, and then are divided into innumerable moſt ſmall twigs, which make wonderful net-like *Plexus* in the *Pia Mater* about the *Cerebellum*, and run into the ſubſtance of the *Cerebellum* it ſelf; and ſome of them being united with thoſe of the *Carotides* make part of the very *Rete mirabile*.

The third Artery that riſes out of the *upper* ſide of the ſubclavian is *Muſcula*, which is ſpent on the Muſcles of the Neck, and ſometimes alſo on ſome of the Arm. 5. Muſcula.

After the *Subclavians* have had all theſe pairs of Arteries going out of them, they paſs out of the *Thorax*, and begin to be called *Axillar*, of which in Book IV. Chap. 2.

At the ſame place, or very near, where the aſcending Trunk of the *Aorta* ſends out the Subclavians ſide-ways, the remainder of it is divided into two, called *Carotides*, which aſcend directly upwards, (though the right ſometimes ariſes from the right Subclavian.) Theſe at their riſe are ſuſtained by the *Thymus*, and having beſtowed twigs on the *Larynx*, Tongue, the Muſcles of the *Os hyoides* and the neighbouring Glands, paſs up on each ſide by the ſides of the Wind-pipe to the Jaws with the internal Jugular Vein, and there are each ſubdivided into the *external* and *internal* branches. Carotides.

The *external* is ſmaller, and is diſperſed into all the Muſcles of the Cheeks, Fore-head, Temples, Lips; and in general, through all the outer parts of the Head and Face.

The *internal*, which is larger, ſends firſt ſome more twigs to the *Larynx*, Tongue, *&c.* as alſo to the Glands behind the Ears, and the ſpongy parts of the Palate and Noſe. Then it entreth

the

the upper Jaw, and bestows a small slip on the root of each Tooth (as the *external* did on the roots of the Teeth of the lower Jaw) whereby sharp humours flowing in upon them sometimes cause a very painful Tooth-ach. The remainder of it climbs upon the Skull, being about its *basis* divided into two branches. The *less* and hinder whereof having sent one slip to the inner Muscles of the Neck, and another through the hole of the uppermost *Vertebra* into the Membrane that invests the spinal Marrow, ascending further enters the Skull at the hole by which the sixth pair of Nerves (commonly so called) comes out, and creeping along the *Dura Mater* ends near its *Sinus*, (which yet some say it enters.) The *larger* branch, tending upwards, is carried through the bony chanel in the wedge-like bone with a winding duct to the *Sella equina*; at whose *basis* after it has sent out a twig on each side into the *Dura Mater*, it opens it self into many small slips, which being interwoven with those of the cervical Artery (above-mentioned) make the *Rete mirabile*, which is more observable in Beasts than in Men. Yet it is not all spent on the said slips, but perforating the *Dura Mater*, it enters the *Pia Mater* with two notable branches, which being divided into very small twigs are mingled with those of the cervical Artery, with which they pass out of the Skull and accompany the spinal Marrow even to the Loins. Afterwards it sends a small branch through the second hole of the wedge-like Bone with the optick Nerve, out of the Skull, to the Eye. And yet still supplying more twigs to the substance of the Brain and *Pia Mater*, and being united with some other twigs of the cervical Artery, it makes the *Plexus choroides*.

The

The *descending* trunk of the *Aorta*, which is larger than the *ascending*, goes down by the Gullet, to which it cleaveth. And hence is a Man that is hot, so much cooled with a draught of cold drink; for the Gullet being cooled thereby, the Blood in the *Aorta* contiguous to it must needs be cooled likewise. *The branches of the Trunk descending.*

Before it arrive at the Diaphragm it sends out of its hinder side the *inferiour Intercostals*, which run along the interstices of eight or nine of the lower Ribs, namely those which the *superiour Intercostals* did not supply. They likewise send sprigs by the holes of the *Vertebræ*, made for the Nerves, to the Marrow of the Back, and to the Muscles which rest upon the *Vertebræ*, and also to those of the *Thorax*. Sometimes above this and sometimes below it, there ariseth also out of the hinder part of the *Aorta*, an Artery called *Bronchialis*, first found out and so named by *Frederick Ruysch*, which accompanies all the *Bronchia* of the Wind-pipe. 1. Intercostalis inferior.

When it comes to the Midriff, there spring out of it the *Phrenicæ*, one on each side: these running all through the *Diaphragm*, pass up into the *Mediastinum*, and sometimes into the *Pericardium*. 2. Phrenica.

Then having penetrated the Midriff it descends in one trunk to the fifth *vertebra* of the Loins; in which passage it first sendeth forth *Cœliaca* which ariseth single, and is so called, because it sendeth twigs to the *Stomach*. This springeth from the fore-part of the Trunk, at the first *vertebra* of the Loins, and descending under the hollow of the Liver, upon the Trunk of the *Vena Portæ* it is divided into two branches, the *right* and *left*. 3. Cœliaca.

The

Its branches. The *right* which is ſmaller, aſcending, produces in its *upper* part the *Gaſtrica dextra*, that comes to the *Pylorus*, whence *Spigelius* calls it *Pylorica*.

Gaſtrica dextra.

Cyſticæ gemellæ. And beſides, the *Cyſticæ gemellæ*, which are very ſmall, and are diſperſed through the Gall-bladder. And out of its *lower* ſide there ſpring

Epiploïs dextra. 1. *Epiploïs dextra*, which runs thro' the right ſide of the inner or hinder leaf of the Caul and the *Colon* that it is annexed to.

Inteſtinalis. 2. *Inteſtinalis*, beſtowed on the *Duodenum* and beginning of *Jejunum*.

Gaſtroëpiploïs dextra. 3. *Gaſtroëpiploïs dextra*, on the right ſide (to the middle) of the bottom of the Stomach, and alſo on the Caul that is knit to its bottom.

Hepaticæ. 4. *Hepaticæ*, which are two ſmall ones: theſe are ſpent on the inveſting Membrane of the Liver (for its *Parenchyma* is nouriſhed by the *Porta*) the *Capſula communis*, the Gall-bladder and *Porus biliarius*.

The remainder of this *right* branch enters the Meſentery with many twigs.

Splenica. The *left* branch of the *Cœliaca*, which is called *Splenicus* (ſometimes ſpringing immediately from the *Aorta*) is larger than the right, and as it goes towards the Spleen it ſendeth forth of its

Gaſtrica major. *upper* ſide *Gaſtrica major*, which after it hath beſtowed a ſlip on the upper and middle part of the Stomach, is divided into two others; the

Coronaria ſtomachica. firſt whereof is called *Coronaria ſtomachica*, which encompaſſes the upper orifice of the Stomach like a Garland, and ſends many twigs to the body

Gaſtrica ſiniſtra. of the Ventricle it ſelf, the other *Gaſtrica ſiniſtra*, which (according to *Diemerbroeck*) is carried towards the right hand into the upper part of the Stomach and to the *Pylorus*. Out of its *lower*

Epiploïs poſtica. ſide ſpring, firſt *Epiploïs poſtica*, which runs to the hinder leaf of the *Omentum*, and the *Colon* annexed

exed to it; secondly *Epiploïs sinistra*, which is bestowed on the lower and left side of the *Omentum.* Epiploïs siniſtra.

Just as this splenick branch is entring into the spleen, there arise out of its upper part *Vas breve arteriosum*, which goeth streight to the left part of the bottom of the Stomach; and the *Gastro-epiploïs sinistra*, which being sustained by the upper or fore-leaf of the *Omentum* sends some twigs hereto, and also to the left part of the bottom of the Stomach, and to both its fore and hinder sides. Then it enters into the Spleen, whose branchings therein we described in the former book, Chap. 16. *Of the Spleen.* Vas breve arteriosum. Gastroëpiploïs siniſtra.

All these Arteries spring from the *Cœliaca*, and accompany the Veins of the *Porta* of the like denomination.

The next that arises out of the trunk of the *Aorta* is the *upper Mesenterick*, which springs from the fore-part of it as the Cœliack did. It accompanies the *Vena mesaraica* of the *Porta*, and runs through all the upper part of the Mesentery, and bestows many branches on the Guts, *Jejunum*, *Ileum*, and that part of *Colon* that lieth in the right Hypochondre. 4. Mesenterica superior.

Immediately below this, about the second *vertebra* of the Loins, there go out of each side of the descending trunk of the *Aorta* an *Emulgent Artery*, each of which being after its rise divided into two and sometimes three branches, enters the Kidney of its own side. The right springs out of it a little lower than the left. Both are subdivided into innumerable twigs in the *Parenchyma* of the Kidneys, (all of which are invested with the Veins in one common *capsula* borrowed from the *Pelvis*) and their Capillaries end in the Glands, wherein the *Serum* that these Arteries 5. Emulgentes.

bring

bring with the Blood is separated therefrom, an carried from them by the urinary Siphons int the *Pelvis*, of which more in the former Bool Chap. 17. *Of the Kidneys.*

6. Spermaticæ. Next to these arise the *Spermaticæ* (called *A teriæ præparantes.*) These go out of the for part of the Trunk very near together (very se dom either of them out of the Emulgents, as th left Spermatick Vein does) and the right pass over the trunk of the *Vena cava.* About tw fingers breadth from their rise they are each join ed with the *Vena præparans* of their own sid and descend with them in *Men* through the pro cess of the *Peritonæum* to the Stones, being divi ded into two branches a little before they arriv at them, one of which runs under the *Epididymi* and the other to the *Testis.* In *Women*, whe they come near the *Testes*, (or *Ovaria*) they ar divided also into two branches, one whereof goe to the *Testis*, and the other to the bottom of th Womb.

7. Mesenterica inferior. Next below the Spermatick springs the *lowe Mesenterick* out of the Trunk a little before it i divided into the *Rami iliaci.* This entreth th lower region of the Mesentery, and distribute many branches to the left part of the *Colon* and t the streight Gut, and lastly descending to the *Anu* makes the internal hemorrhoidal Artery.

8. Lumbares. Very near to this, out of the Trunk still, aris the *Lumbares*, reckoned four in number. Thes go out of the backside of the *Aorta*, and are distri buted not onely to the neighbouring Muscles o the Loins, and to the *Peritonæum*, but enter in a the holes of the *vertebræ* of the Loins, and ru along the Membrane that involves the spinal Mar row, and penetrate into the Marrow it self.

Beside

Beſides theſe ſome reckon other two, on each ſide one, called *Muſculæ ſuperiores*, (which run to the Muſcles of the *Abdomen*) unleſs theſe be two of the four called *Lumbares*.

When the Trunk is deſcended as low as the fifth or laſt *vertebra* of the Loins and the top of the *os ſacrum*, it begins to climb upon the *Vena cava*, under or behind which it paſſed thus far. But as it begins to get upon it, it is divided into two equal branches called *Rami iliaci*, and at its very diviſion there ſprings out of it *Arteria ſacra*, whoſe ſmall twigs entring in at the holes of *Os ſacrum* penetrate into the Marrow contained in it. Rami iliaci.

The Trunk of the deſcending *Aorta* being divided into the *Rami iliaci*, theſe are ſubdivided preſently into the *interiour* and *exteriour* branches. *Their branches.*

From the *interiour*, which is leſs, proceed three others.

Firſt, the inferiour *Muſcula* (called otherwiſe *Glutæa*) which is beſtowed on the Muſcles named *Glutæi* that make the Buttocks, and alſo on the lower end of the Iliack Muſcle and the *Pſoas*. 1. Muſcula inferior.

Secondly, the *Hypogaſtrick*, which is large, and at the lower end of *Os ſacrum* runs to the Bladder and its Neck, and the Muſcles that cover the *Oſſa pubis*. In *Men* it goes alſo along the two nervous bodies of the *Penis* as far as the *Glans*: and in *Women* it is diſtributed in numerous branches into the bottom of the Womb and its Neck, out of which for the greateſt part iſſue the *Menſes* or their monthly purgation. It goes alſo to the *Podex*, where it makes the external hemorrhoidal Artery. 2. Hypogaſtrica.

Thirdly, The *Umbilical* Artery, which aſcending by the ſides of the Bladder, and being inſerted into the *Peritonæum*, proceeds betwixt the two membranes thereof to the Navel, out of which it 3. Umbilicalis.

paſſes in a *Fœtus* in the Womb, and runs into th *Placenta uterina*, of which before, *Book* I. *Ch.* 3: But after the Infant is born, when there is n more uſe of it, it cloſes up, and turns into th nature of a Ligament, in ſome meaſure ſuſtainir the ſides of the Bladder, and hindring it fro preſſing on its Neck.

From the *exteriour branch* of the *Ramus iliac* two Arteries ariſe.

4. Epigaſtrica. Firſt, The *Epigaſtrick*, which turning upwar on the outſide of the *Peritonæum* runs betwixt and the *Muſculi recti* of the *Abdomen* as high the Navel, where the Mammary Artery meets i and according to tradition (though falſe) inc culates there with it. Of which before, in th Chapter.

5. Pudenda. Secondly, *Pudenda*, which ſends forth a not ble Artery on each ſide into the nervous body the *Penis* in Men, and into the *Clitoris* in Wome Hence it is carried inwards by the jointing of t *Oſſa pubis* to the *Pudenda* and Groins, and the Glands, and is ſpent on the Skin of thoſe part and of the Yard (in Men.)

When all theſe pairs of Arteries have ariſ out of the *Rami iliaci*, they run down out of t *Abdomen* to the Thighs, where they begin be called *Crurales*, where we ſhall leave them t we come to ſpeak of the Arteries of the *Lim Book* IV. *Chap.* 5.

Having now traced all the Arteries ſpringi out of the *Aorta* (whether out of its *aſcendi* or *deſcending* Trunk) in the *Thorax* and *Abdom* taking occaſion to do ſo, becauſe the *great A tery* out of which they all ariſe, has its Origi in the *Heart*, to which we have conſidered it an Appendage; we ſhall paſs on to the deſcrip on of the remaining parts in the *Breaſt*, not y ſpoken to.

T

Fig. 1

Fig. 2

Fig. 3

Fig. 4

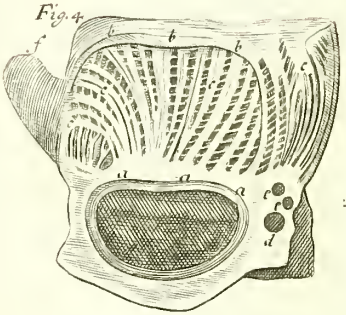


Fig. 5

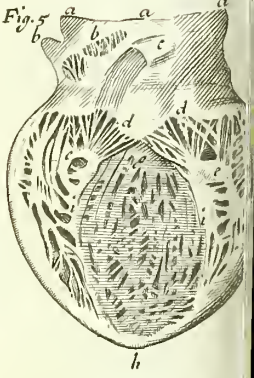


Fig. 6

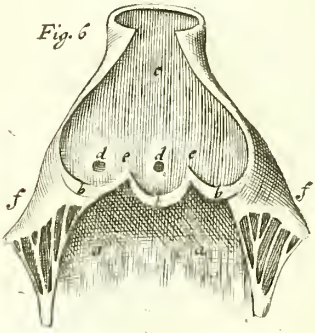


Fig. 7

Tab. XII.

Repreſenteth the Fibres of the Heart, with its Auricles, Ventricles, Valves, &c. (*from Dr.* Lower.)

Fig. I. Sheweth the outmoſt or ſtreight Fibres of the Heart.

a *The Baſis of the Heart.*
b *Its Cone.*
cc *The ſtreight Fibres tending upwards towards the baſis.*

Fig. II. Sheweth the ſecond rank of Fibres (which are oblique) lying next under the former, which aſcending obliquely from the left ſide towards the right, terminate in the baſis of the Heart, imitating a Snail-ſhell, or Screw, by their ſpiral circuit.

a *The Baſis of the Heart.*
b *The Cone.*
c *The Fibres that encompaſs the left Ventricle.*
d *The Fibres encompaſſing the right.*
e A Sinus *in the interſtice of the Ventricles, made for receiving the Veſſels of the Heart.*

Fig. III. Sheweth the third or inmoſt rank of Fibres, which are oblique alſo, but run a contrary courſe to the former; for they ariſe every where from the right ſide of the Heart, whence being carried obliquely towards the left, and embracing each Ventricle of the Heart they aſcend to the Baſis of the left ſide.

a *The Baſis of the Heart.*
b *The Cone.*
c *The right ſide of the Heart.*
d *The left.*
e *The Fibres of the right Ventricle.*
f *The Fibres of the left.*

Fig. IV. Shews the right Auricle of the Heart inverted and laid open.

aaa *The Baſis of the Auricle, where it is united to the Tendon of the Heart.*
bbb *The tendinous Circle whereby it is diſtinguiſhed from the* Vena cava.
ccc *The carnous Fibres which are carried to the diverſe or oppoſite Tendons.*
d *The Coronary Vein.*
ee *Other leſſer Veins appointed for bringing back the Blood which remains from the nutrition of the Heart.*
f *The upper part of the Auricle.*

Fig. V. Shews the inner *Sinus* of the left Ventricle.

aaa *The pulmonary Vein laid open before its entrance into the Heart.*
b *The left Auricle of the Heart.*
c *The* Foramen ovale, *whereby the Blood flows out of the* Vena cava *into the pulmonary Vein juſt before the door of the left Ventricle.*
dd *The two Mitral Membranes or Valves.*
ee *The fleſhy Columns protuberating out of each ſide of the Ventricle.*
g *The place under the Mitral Membranes where the Blood is ſent forth into the* Aorta.
h *The Cone of the Heart.*

iii *The*

iii *The carnous Fibres running on every ſide through the whole circuit of the inſide of the Ventricle.*

Fig. VI. Sheweth the ſemilunar Valves at the riſe of the *Aorta* out of the left Ventricle, (whereunto thoſe at the riſe of the pulmonary Artery out of the right Ventricle are like.)

aa *Part of the left Ventricle laid open.*
bbb *The three ſemilunar* Valves *conciding looſly that they may yield an Exit to the Blood burſting forth.*
c *The Trunk of the* Aorta *laid open.*
dd *The two coronary Arteries riſing immediately without the ſemilunar* Valves.
ee *The root of the* Aorta *where it is united with the Tendon of the Heart.*
ff *The Mitral Membranes divided and turned back on each ſide, that the ſemilunar* Valves *may come into ſight.*

Fig. VII. Shews the ſemilunar Valves cloſed.

aaa *The Trunk of the* Aorta *cut off at the root.*
bbb *The three ſemilunar* Valves *coming cloſe to one another, and hindring the recourſe of the Blood out of the* Aorta *into the Ventricle.*
cc *The two coronay Arteries.*

CHAP. XII.

Of the Aſpera Arteria *and Lungs.*

AS in the Firſt Book, being to treat of the *Stomach*, we firſt deſcribed the *Gullet*, which ſerves as a Tunnel to it; ſo the ſame rea- *The Wind-pipe.*

son induces to begin with the *Wind-pipe*, called *Trachea* or *Aspera Arteria*, thereby to usher in the description of the *Lungs*, to which it performs the same office as the *Gullet* to the *Stomach*, this receiving in Air, as that does Meat and Drink.

Its Figure and Substance. The *Aspera Arteria* then is a long Pipe, consisting of Cartilages and Membranes, which beginning at the Throat or lower part of the Jaws and lying upon the Gullet descends into the Lungs, through which it spreads in many branchings.

Parts. It is commonly divided into two parts, the

1. Larynx. upper which is called *Larynx*, and the lower that is named *Bronchus*. Of the former we shall speak in Chap. 14. where we shall treat of the parts contained in the Neck; of the other, here.

2. Bronchus. By the *Bronchus* we mean all the *Trachea* besides the *Larynx*, as well before as after it arrives at the Lungs. It is joyned immediately to the *Larynx*, to whose lowest Cartilage all those of the *Bronchus* (so far as it rests upon the Gullet

Its Cartilages and Membranes are assimilated. These Cartilages are like so many Ribs, Hoops or Rings, seated one below another at equal distances, and kept in their place by the *inner* Membrane of the *Trachea*, which fills up their Interstices and tyes them one to another like a Ligament. Yet these Rings have not their circle intire, but on the back side of the *Bronchus* next the Gullet, that they might give way to the Meat in swallowing, they pass into a Membrane, which is the same with the inner Membrane that tyes them together. So that they are in figure like the letter C. But this interstice in their circle which most Anatomists affirm to be membranous, *Casp. Bartholin* (after his Father) says is rather "carnous, for there are very plain "and remarkable carnous Fibres that run from "one side or end of the Cartilage across to the "other

" other, which in expiration (eſpecially violent) " contracting themſelves draw the ends of the " Cartilages towards one another on each ſide, " and thereby ſtraiten the Pipe of the *Trachea.*] And though the Cartilages ſo far as they are contiguous to the Gullet, are thus ſemilunar as it were; yet thoſe of the branches of the *Bronchus* within the Lungs have no interſtice in their circumference, being all cartilaginous, though not all of a circular figure, but ſome four-ſquare, others triangular, *&c.* as *Diemerbroeck* obſerves. This *inner* Membrane is plentifully beſet with miliary Glands, out of which a good part of that mucous matter that bedaubs its inſide iſſues, for the lubricating of it. The *outer* Membrane helps to connect the Cartilages the more firmly one to another, and the whole *Trachea* to the neighbouring parts, that it may more ſafely and firmly deſcend into the *Thorax.* This is much thinner than the other: for the inner (according to Dr. *Willis*) has two rows of muſcular Fibres, the outer ſtreight, the inner oblique; the firſt by their contraction ſhorten the *Trachea*, the latter ſtraiten it; ſo that he thinks they aſſiſt expiration, eſpecially when it is violent, as in coughing, hawking or the like. Yea he ſays, this inner Membrane has two others growing upon it as it were, one glandulous, and another vaſcular. Through this latter do the Blood-veſſels and Nerves every where run; and the Glands placed in the former receive and keep all the ſuperfluous moiſture or *lympha* depoſited by the Arteries, which the Veins do not imbibe, till they can remand it by the Lympheducts (which ſpring from them;) or if it be over plentiful, ſo that the Lympheducts cannot receive it all, then it iſſues both out of theſe Glands and out of the Arteries into the

Cavity of the Wind-pipe and cauſes a Catarrh, But the inſide of this Membrane is naturally moiſt, being beſmear'd with a fattiſh and mucous humour, to hinder its drying, and to make the voice ſmoother; ſo that when this humour is fretted off in Catarrhs, or the inſide of this Membrane becomes rough from any cauſe, the voice becomes hoarſe; and when it is dried by too much heat, as in Fevers, it becomes ſqueaking.

Veſſels. The *aſpera Arteria* has *veins* from the external Jugulars. *Arteries* from the *Carotides*, and from the *Arteria bronchialis*, (firſt found out by *Frederick Ruyſch*) which ſprings from the backſide of the deſcending Trunk of the *Aorta*, a little above the lower intercoſtals. *Nerves* it receives from the recurring branches of the *par vagum*, which run moſtly along its inner Membrane, whence it becomes ſo exquiſitely ſenſible.

Diviſion. When it is deſcended as low as the fourth *vertebra* of the *Thorax*, it is divided into two Trunks, whereof one goes into the right lobe of the Lungs, the other into the left, and each is preſently again divided into two, and thoſe into others, till at laſt they end in very ſmall branches, which are diſperſed among the like branches of the pulmonary Artery and Vein, and end into and are continued with the little Bladders that make up the greateſt part of the bulk of the *Lungs*. For

The Lungs. Their Subſtance. Though the *Lungs* (called in Greek πνεύμων, ἀπὸ τοῦ πνέω to *breathe*) have been held to be of a carnous *ſubſtance*, not much unlike the Liver or Spleen; yet *Malpighius* hath diſcover'd them to be of a far other, namely ſoft, ſpongy and rare, made up of moſt thin and fine Membranes continued with the inner coat of the *Trachea*, which

Membranes

Membranes compoſe an infinite number of little round and hollow Bladders, ſo placed that there is an open paſſage from the *Trachea* out of one into another, and all terminate at the outer Membrane that incloſeth the whole Lungs.

Theſe *Bladders* though they are continued to the *Bronchia*, yet they have no Cartilages as thoſe have; but though they are very fine, yet they have muſcular Fibres, whereby they contract themſelves in expiration, but not ſo cloſe as to expell all the Air included in them; for if the Lungs had wholly ſubſided and fallen flat and cloſe in expiration, they would have given ſome ſtop to the circulation of the Blood through them out of the pulmonary Artery into the Vein; whereas now that there remains ſtill ſo much Air in theſe *Veſiculæ* as to keep the Lungs a little puff'd up and rare, the Blood can paſs the more eaſily and ſwiftly through them.

That there are ſuch Bladders annexed to the *Bronchia*, *Diemerbroeck* ſhews by two notable Stories: The one of a *Stone-cutter*'s Man that died of an *Aſthma*, in whom he found theſe *veſiculæ* ſo ſtuff'd with the duſt of the hewn Stone, that when he cut his Lungs open, his Knife ſeem'd as if it went through an heap of Sand: The other of one that being imployed to pick and cleanſe Feathers, died of a long continued *Aſthma*, and had theſe Bladders quite filled with the fine Duſt or Down of the Feathers. From whence he concludes, That whereas in a natural State the Air in inſpiration is received as well into theſe Bladders as the *Bronchia*, ſeeing they could not now admit any Air, being ſtuff'd with the aforeſaid matters, the Patients were neceſſarily Aſthmatical, and died ſo.

We

Investing Membrane. We said before that all these *Vesiculæ* were in vested with a common Membrane in the *superficies* of the Lungs; and this Dr. *Willis* will have dou ble; The *outer* Tunicle is thin and smooth, whic seems to be a fine texture of nervous filaments the *inner* rough and thicker, consisting almo wholly of the extremities of the Vessels and *Vesi culæ*; and through the little pits that are all ove made in it by them, its inner *superficies* looks lik an Hony-comb. This investing Membrane con sisting thus of two Tunicles has many large Pores but such as admit not any thing to pass fro within outwards; for if one fill the Lungs newl taken out of a Sheep or the like (before they ar cold) with a pair of Bellows, never so full c wind, there will none pass out of the Membrane not so much as to make the flame of a Candle t wave: but on the other side they do admit eve liquors to pass from without inwards; so whe the Breast has been opened to let out matter in a *Empyema*, (which was too thick to be absorbe by the too narrow pores) and bitter cleansing in jections have been squirted into the cavity of th *Thorax*, to clear it from the purulent matte stagnating in it, it has been observed that a goo part of such injections have been hawk'd an cough'd up. And though some think that whe soever *Pus* is cough'd up, it is certainly bred i the Lungs themselves; yet I am of opinion tha in an *Empyema* when it is thin, these Pores ma be so large as to imbibe it even out of the cavit of the *Thorax*; otherwise I see not how any la bouring of an *Empyema* should ever be cure without tapping: for of the two I think this far more probable way to discharge the matt by, than that it should be imbib'd by the mouth of the Veins gaping (as is suppos'd) either th

the *superficies* of the *Pleura*, or Diaphragm. But to proceed.

The Lungs are *divided* into the right and left part, being parted by the *Mediastinum*, and each part is otherwise called a *Lobe* And because they are two, that have no communication one with the other (save in one common trunk of the *Trachea*, by which the Air comes into and goes out of them) hence in common speech we say *Lungs* in the plural. Each of these parts or Lobes is subdivided into two, sometimes three others, and those into many lesser Lobules, as may be seen in the following Figure taken from Dr. *Willis*. *Division.*

The Lungs hang loose in the cavity of the *Thorax*, being suspended by the *Aspera Arteria* that runs every where through their substance, and is it self sustained by its connexion to the parts of the Neck. Preternaturally (though pretty often) they cleave by their outer *superficies* to the *Pleura*, and sometimes with their lower end to the Diaphragm. *Connexion.*

They have all sorts of *Vessels*, that are common to them with other parts; but peculiar to themselves they have *Bronchia* or the branches of the Wind-pipe, for bringing in and carrying forth of Air. *Vessels.* 1. Trachea.

Their *Arteries* and *Veins* are the *Arteria* and *Vena pulmonaris*, that accompany all the Divisions of the *Aspera Arteria* within their several Lobes. These are said to have many Anastomoses one with another, for the readier Circulation of the Blood through the Lungs; however, they are admirably interwoven one with another all through the coats of the *Vesiculæ*. But of these we discoursed so largely before, *Chap.* 10. that we shall say no more of them here. Besides these, that were 2. *Arteries and Veins.*

all

all the ſanguiferous Veſſels Anatomiſts had obſerved to reach to the Lungs, there has of late been found out an Artery by *Frederick Ruyſch* (which he calls *Arteria bronchialis*) that ſeems to convey Blood for the nouriſhment of the Lungs and *Bronchia*. But of this likewiſe before (in this *Chapter*.)

3. *Lympheducts.* They have abundance of *Lympheducts* that attend upon the Veins and Arteries. Their ſmall twigs running upon the outer *ſuperficies* of the Lungs, towards their Root unite into ſeveral greater Trunks; which being inſerted into the common thoracick Duct, diſcharge thereinto the *Lympha* imbibed by them in the Lungs. They may be made to appear very plain in the outward ſurface, if in diſſecting a live Dog, one preſs upon the top of the thoracick Duct, ſo as nothing be poured from thence into the Subclavian Vein: for then the Lympheducts of the Lungs, ſeeing they cannot unload themſelves into the common Duct that is now ſtopt and full, will ſwell very much, and be very conſpicuous. If theſe Lympheducts at any time be obſtructed or broken, Dr. *Willis* thinks there often proceeds from thence a Dropſie of the Breaſt or Lungs; yea, Coughs and Phthiſica Diſtempers.

4. *Nerves.* The laſt ſort of Veſſels diſperſed in the Lungs are the *Nerves*. And theſe proceed from the recurring Nerves of the *Par vagum*, uſually called the ſixth Pair, but Dr. *Willis'* eighth, who ſays they are diſtributed all over the Lungs along with the ſanguiferous Veſſels and Ducts of the *Bronchia*, to ſupply Animal Spirits to the muſcular Fibres of their Coats.

The *Action* to which they contribute is Reſpiration, of which in the next Chapter.

Tab

Tab X

Fig. I.

Fig. II.

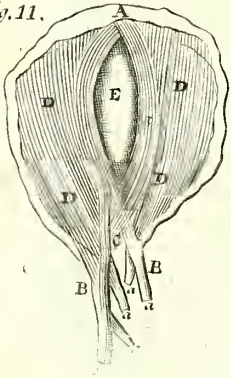
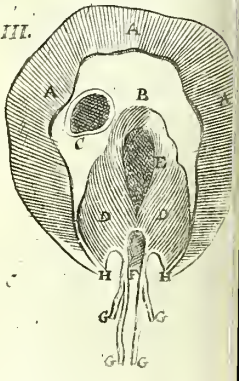


Fig. III.



Tab. XIII.

epreſenteth the Lungs, Diaphragm, Ductus ſalivalis, *&c.*

g. I. Repreſenteth the *Sternum* cut off and lifted up, the *Mediaſtinum*, *Thymus*, Lungs, Diaphragm, *&c.*

AA *The inner ſuperficies of the* Sternum *and of the Cartilages knit to it.*

3 *The mammary Veins and Arteries deſcending under the* Sternum.
The glandulous Body called Thymus.
DDD *The ſides of the* Mediaſtinum *pull'd aſunder from the* Sternum.
E *The ſpace between the Membranes of the* Mediaſtinum, *ariſing from the tearing of it from the* Sternum.
G *The Lungs.*
H *The Diaphragm.*
The Cartilago enſiformis.
The external ſalival Duct.

ig. II. Shews the Diaphragm of a Dog (very little differing from that of a Man) from *Caſpar Bartholin.*

AA *Shew the courſes of the carnous Fibres in the upper or fore Muſcle, which run ſtreight from the Ribs to the Centre or tendinous part of the Diaphragm.*
The Centre or tendinous part.
The hole in the right ſide of the tendinous part for the tranſit of the aſcending Trunk of Vena cava.

DD *The*

DD *The lower or hinder Muſcle of the Dia-phragm.*

E *The hole in the upper part of the lower Muſcle through which the Gullet deſcends.*

F *The hole in the hinder part of the lower Muſcle through which the* Aorta *deſcends.*

GGGG *Its tendinous extremities whereby it adhere to the* Vertebræ *of the Loins, formerly called it proceſſes.*

Fig. III. Shews the lower or hinder Muſcle of Man's Diaphragm, ſomething differing fro that of a Dog, (from the ſame Author.)

A *Shews the Tendon that intervenes betwixt th upper and lower Muſcle, commonly called th nervous Centre of the Diaphragm.*

BB *The lower Tendons (commonly called its pro ceſſes) which ariſe by five Heads as it wer (aaaaa) from the* Vertebræ *of the Back an Loins.*

C *The hole by which the* Aorta *(lying alon the* Vertebræ *of the Back and Loins) d ſcends.*

DDDD *The fleſhy Fibres of the lower Muſcle i their natural and proper Courſe.*

E *The hole in its carnous part by which the Gull deſcends.*

CHAP. XIII.

Of Reſpiration.

The Action of the Lungs.

THE *Action* to which the Lungs are appoin ed by Nature to miniſter, is *Reſpiratio* which is an alternative *Diaſtole* and *Syſtole*, dilatatio

ilatation and contraction of the Breast, where-
y the Air is received in, and driven forth of the
ungs.

In dilatation, whereby *inspiration* is perform- *How Respi-*
d, the Lungs are purely passive; for they do not *ration is*
all dilate themselves by any proper power or *performed.*
culty of their own, being destitute of instru-
ents to perform such an action, (*viz.* Muscles;)
ither do they attract the Air by any magnetick
roperty: But the Muscles of the *Thorax* being
framed, that tho' contraction be the only and
roper action of a Muscle, yet the *Thorax* is dilated
certain of them, as it is contracted by others;
hilst it is dilated, there is greater space given for
xpanding the Lungs, and then the Air partly
the pressure of the Atmosphere, and partly
its proper elastick Virtue issues in at the *Tra-*
ea, and insinuates it self into all its *Bronchia*,
d through them into the *Vesiculæ*, and puffs them
l up. The manner whereof is very ingeniously
xpress by Dr. *Mayow*. "Namely seeing the Air
thro' the weight of the superincumbing Atmo-
sphere does not only rush into all empty places,
but also strongly presses upon whatsoever things
are next it; it follows that the Air which is
continued thro' the Nostrils and *Trachea* even
to the *Bronchia* or entrance of the Lungs, doth
bear upon the Lungs from within, and endea-
vour an entrance into them. Whence it comes
to pass, that, whilst the insides of the *Thorax*
(which by compressing the Lungs from without
resisted the pressure of that Air) are drawn out-
wards by the Muscles of the Breast that are ap-
pointed for its dilatation, and the width of the
Thorax is enlarged, that Air which is neares
adjacent to the *ostia* of the *Bronchia* (all obsta-
cles being now removed) rushes into the cavities

"of

" of the Lungs with all the preſſure of the At-
" moſphere, and puffing them up, occupies and
" fills the widened ſpace of the *Thorax*. Nor doe
" the preſſure of the Atmoſphere alone, avai
" to inſpiration; but the Elaſtick Power of th
" Air alſo, whereby it endeavours to extend it ſel
" *in immenſum*, is aſſiſting to the ſame. For th
" Air, eſpecially that which is neareſt the earth
" is compreſſed by the weight of the ſuperincum
" bent; whence it always endeavours to free i
" ſelf from that preſſure, much like as a fleec
" of wooll, when the force that compreſs'd it
" taken away, by a certain motion of reſtitutio
" preſently ſpreads and enlarges it ſelf. Whic
" may be confirmed by this known Experimen
" *viz.* If a Bladder, out of which the Air is fir
" in a great meaſure preſſed, be tyed ſtraitly abou
" its ſphincter (or neck) and put into a glaſs, an
" then the Air be drawn out of that glaſs, th
" Bladder will preſently begin to ſwell and pu
" up to its firſt dimenſion. The reaſon whereof i
" That the Air that was in it, though little, whe
" the external Air (from whoſe preſſure the ſan
" was driven into a narrow ſpace) is remove
" preſently expands it ſelf and puffs up the Bla
" der, yea, ſometimes burſts it with violence. Ju
" thus is the inflation of the Lungs cauſed in i
" ſpiration: for aſſoon as the ſides of the *Thora*
" (which by compreſſing the Lungs make the
" concide) are drawn outwards, the Air that
" at the entrance of the Lungs, whether throu
" the preſſure of the Atmoſphere, or becauſe
" its own Elaſtick virtue, is preſently thruſt i
" to the Lungs, and diſtends them.] But in *Ex*
ration (or the contraction of the *Thorax*) t
Air is not only driven forth of the Lungs by t
compreſſion of the *Thorax*, but alſo by the co
tracti

action of the muscular Fibres of the *Vesiculæ* d of the inner coat of the *Trachea* and its *onchia.*

The *Muscles* that assist the dilatation of the east, are those that lift up the Ribs and draw em backwards; which shall be described *Book* I. *Chap.* 15. And besides these there is another ternal Muscle, namely the Midriff, that contributes towards it, as was shewed *Chap.* 3. of this *ok*, where we treated of it. And as for the aitning or concidence of the *Thorax*, that it is t onely a motion of restitution, or a cessation the aforesaid Muscles from their action, is evident, seeing sometimes Expiration is performed re laboriously and violently than inspiration, n coughing, hollooing, or the like: And therefe Nature has provided peculiar and proper scles for that purpose, described in the same *apter* of the *Fourth Book*; and these are assisted tly by some Muscles of the *Abdomen*, and partly the muscular Fibres of the *Vesiculæ* and *Bronhi*, as aboveſaid. *Muscles ministring to Respiration.*

There hath been great Controversie among losophers, whether Respiration be an Animal Natural Motion. That it is *natural* is thought e proved, both in that it is performed as well en we are asleep, as awake; and also that ugh it be continued through a Man's whole , yet we are never wearied with it as we are h animal and voluntary motions. On the er side, some prove it to be *animal*: first beae it is performed by such Instruments as serve animal Motion, namely Muscles; and secondpe, ause at our pleasure we can make it quicker flower, stronger or weaker, or alter it how please. Others thinking the Arguments on er side convincing, take both in, and suppose *What kind of Motion Respiration is.*

it a kind of *mixt* Action, partly natural, a
partly ſpontaneous. But I think there is no n
ceſſity from the Arguments alledged to grant th
motion to be *natural*, or any more than *anim*
or *ſpontaneous*. For as to the *firſt* Argument, Th
the motion is as well performed when we ſleep
when we are awake, and therefore it cannot
voluntary; if this were allowed to be of forc
we muſt alſo grant walking and talking to be n
tural motions, becauſe many perform them bot
when they are aſleep. And as to the *ſecond*, fro
our not being wearied by it, in Anſwer to
we may diſtinguiſh of animal actions, into ſu
as are done by inſtinct and are free, and in
ſuch as ſerve the affections of the mind: the fo
mer proceed always and without impedime
even when we think not thereon, but may no
withſtanding be directed and moderated wh
we *do* think of them, and ſuch is Reſpiratio
the latter is not performed continually, as to ri
leap, write, *&c.* In the former there is a plen
full and continual influx of animal ſpirits in
the Muſcles, of cuſtome or courſe; whence th
follows no wearineſs, though they be continu
In the latter, ſeeing by the determination tha
made in the Brain, the Spirits now flow in a
anon ceaſe, ſometimes in greater plenty a
ſometimes in leſs, from this mutation and un
cuſtomedneſs does the wearineſs proceed.

The Uſe of it. Reſpiration is ſo neceſſary to the continua
of life, that after once the *Fœtus* comes into
open Air and begins to breathe, it can hardly l
two minutes without it. But upon what acco
it becomes ſo neceſſary is not agreed among lea
ed Men, each party exhibiting ſuch reaſons
it, as may beſt ſuit with their Hypotheſes. He
ſome (and thoſe the moſt) think that Reſpir

c serves for the cooling and ventilating of the Blood that acquires a great heat in the right Ventricle of the Heart, and also for the carrying out fuliginous steams therefrom. *Others*, that it serves for the better mixture of the particles of the Blood as it passes through the Lungs. *Others*, that it condenses the Blood, which was very much rarefied in the right Ventricle of the Heart, whereby it comes to take up less room in the Lungs, and passes the readilier through each Lobe into the left Ventricle. *Others*, that it principally serves for the Circulation of the Blood thro' the Lungs; For in Expiration all the *Bronchia* with the appendant *Vesiculæ* being in a great measure emptied of the Air, permit a free entrance of the Blood into the Lungs by the *Vena arteriosa* out of the right Ventricle of the Heart; but when the said *Bronchia* and *Vesiculæ* being filled again with Air, do compress the Vessels of the Lungs, whereby the Blood that was received into them in Expiration, is squeezed out of the Arteries into the Veins, and so its Circulation thro' the Lungs promoted; whereas otherwise it would be apt to stagnate and occasion a suffocation. Dr. *Mayow* thinks that a double benefit, chiefly, accrews by Respiration; *first*, That the Blood by the admixture of the Nitro-aereal Particles of the Air is fermented, and freed from coagulation; and *secondly*, that the same Nitro-aereal Particles being received into the Blood are carried to the Brain for the refection and supply of the Animal Spirits. Lastly, Dr. *Willis*, Dr. *Charleton* &c. think that the Air is drawn in for the greater subtilization of the Blood, and accending or continuing the vital Flame. Some other Opinions there are concerning the primary Use of Respiration, which we will not recite, as being

ing leſs probable ; and which of theſe produ
is the moſt likely, we leave the Reader to jud
being unwilling to enter into the diſpute ab
ſo difficult a ſpeculation in this ſhort Anatomi
Treatiſe.

Secondary Uſes of Reſpiration are, *firſt*,
form the Voice ; and *ſecondly*, to miniſter to
Senſe of Smelling by drawing or ſnuffing up
vapours with ſome violence through the Noſtri
without which the Organ of Smelling is but lit
affected. Which Uſe Dr. *Needham* draws fr
Dr. *Lower*'s Experiment: who having cut a Do
wind-pipe aſunder in his throat, and turn'd it o
ward (the wound being in other regards hea
up again) ſo that the Dog took not his breath
his mouth or noſtrils, but altogether by his thro
found, that thereby he loſt not his Voice one
but his Smelling alſo wholly, ſo that the m
ſtinking Smells would not excite him.

Tab. XIV.

Repreſenteth one Lobe of the Lungs, with its
bules, Membranous Interſtices, &c. *from*
Willis.

Fig. I. Sheweth one whole Lobe of the Lun
in whoſe ſuperficies the Lympheducts app
creeping this way and that way.

A *The orifice of the* Trachea *cut off, lying in*
middle of the Veſſels.

B *The orifice of the ſubjacent Pneumonick*
tery.

C *The orifice of the Pneumonick Vein lying*
the Artery.

Fig. 1.

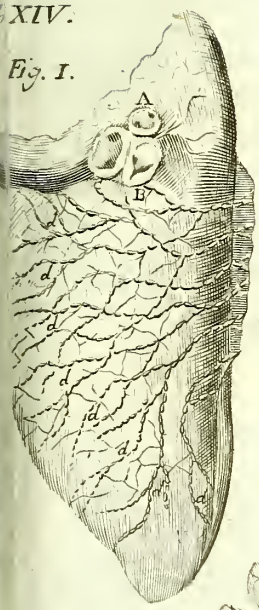


Fig. 4.

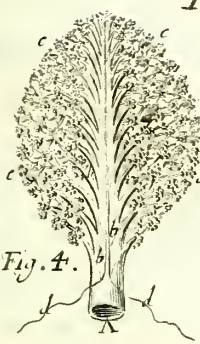
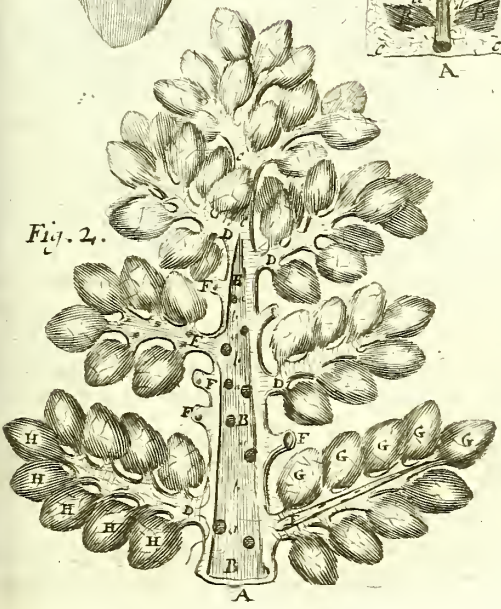


Fig. 3.

Fig. 2.



ddd, &c, *The outward Lympheducts dispersed thro' the surface of this Lobe.*

§. II. Expresses one Lobe of the Lungs divided into smaller and very little Lobules, according to the Ramifications of the *Aspera Arteria*, the Branchings and off-springs of which Vessel being first filled by a Liquor injected into them, and then severed from one another as to the Lobules, were drawn by the Life.

A *The Trunk of the* Aspera Arteria, *cut from the rest of its body.*

BB *Its wider part cut open, that as well the Holes that lead into each Branch, as its streight muscular Fibres may be seen.*

aa *The aforesaid Holes leading into the Branches that are extended this way and that way.*

bb *The streight muscular Fibres, whereupon other circular ones lie.*

C *The smaller end of this Trunk intire and shut, that the annular Cartilages may appear.*

DDD *The Tracheal Branches, constituting the lesser Lobules, intire and shut in that place; that the Annular Cartilages may likewise appear in them.*

EEE *The like Branches cut open, that the Holes and streight muscular Fibres may be seen.*

FF *The Stumps from which the* Tracheal *Branches being cut are removed, that Room may be granted to the rest expanding themselves after their Division.*

GGG *The secondary Lobules hanging upon the stems of the* Bronchia *like Grapes, which may also be subdivided still into lesser Lobules, all whose*

inner Ducts paſs out of the Bronchia *into the Ve ſiculary Cells.*

HHHH *The ſanguiferous Veſſels creeping through th ſuperficies of thoſe Lobules.*

Fig. III. Expreſſes a piece of a Pulmonary Lob wherein the membranous Interſtices bein blown up, all the Lobules appear in their pr per Figure, and ſomewhat repreſent a Leaf Polypody.

AA *A piece of the* Aſpera Arteria *complicat with the reſt of the Veſſels, upon which, made of them all, the Lobules grow like the Leaves a Tree.*

bbbb *The Lobules themſelves.*

cccc *The Blood-veſſels creeping through them.*

dddd *The membranous Interſtices of the Lobul through which the Blood-veſſels* eeee *alſo creep.*

Fig. IV. Repreſents the divarication of a Trach Branch diſtributed within one Lobule, and Ramification into the Tubes and orbicu Bladders.

AA *The ſtem of the* Aſpera Arteria.

bbbb *The leſſer twigs proceeding from that ſtem.*

cccc *The tranſit of theſe twigs into the orbicu Bladders which ſeem like bunches of Grapes.*

dd *Sanguiferous Veſſels diſtinct from the Pneu nick, which creep upon the* Trachea *and ſerv nouriſh it.*

CHA

CHAP. XIV.

Of the Neck and the Parts contained in it, viz. *the* Larynx, Pharynx, Tonsillæ, *&c.*

HAving now dispatched all the parts of the middle Venter or *Thorax*, we should next proceed to the highest, *viz.* the Head; but betwixt these two is the Neck situated, like an *Isthmus*, which therefore we must take in our way, and describe the parts contained in it. *The Neck.*

It is called *Collum*, either *à Colendo*, because it used to be adorned with Chains, *&c.* or because it riseth out of the Trunk of the Body *instar Collis* like an Hill. *Collum* is a general name for the whole Neck, but the hinder part of it is particularly called *Cervix*. *Its name.*

The parts of it are either *containing*, or *contained*. The *containing* are the same which are found in the rest of the Body, and like them, saving that the *Membrana carnosa* seemeth to be more fleshy. *Parts containing.*

The Parts *contained* are these. *Contained.*

1. The *Larynx*, which is the upper part of the Wind-pipe, and the Instrument of forming the Voice. 1. Larynx.

It is almost round and circular in *Figure*, onely getting out a little before, (and something flattish behind,) to give way to the Gullet in swallowing. *Its Figure.*

Its *Bigness* differs according to Age, Sex, and Temperament, whence proceeds the great diversity of Voices. Such in whom it is narrow, as in younger People, have shrill and small Voices; such as have it wide and are come to Maturity, *Bigness.*

have fuller and more hoarſe. The Voice is alte red alſo in reſpect of the length or ſhortneſs o the *Larynx*, and as the Air is more ſtrongly o weakly expelled.

Veſſels. It has *Arteries* from the *Carotides*, *Veins* fron the external Jugulars, and *Nerves* from the re curring Branches of *par vagum.*

Subſtance. Beſides the Membranes which are common t it with the reſt of the *Trachea* (deſcribed before Chap. 12.) it is made up of five Cartilages an thirteen Muſcles.

Cartilages. The *firſt* Cartilage is called θυρεοειδὴς, *ſcutifor mis*, or *Buckler-like*; for within it is hollow, bu without imboſſed or convex: that part whic ſticketh out is called *pomum Adami*, from an idl Fable, That part of the fatal Apple by God's judg ment ſtuck in his Throat, and that this Cartilag being thereby diſtended was made to jet out, an the protuberance propagated to Poſterity. It i greater in Men than in Women. In its corner it has four Proceſſes, two longer ones above whereby it is joined to the lower ſides of the *hyoides* by the help of a Ligament; and two be low, by which it adheres to the Cartilage nex below it. At the ſides of this Cartilage, an the following, are the Glands placed, called *thy reoideæ*, which Dr. *Wharton* ſays, are of the ſhap of a Pear or Fig, being ſomewhat hollow on tha ſide next the *Aſpera Arteria*, and ſomewhat cop ped on their outer ſide. Their ſubſtance is mor ſolid than that of other Glands, and liker to mu cular fleſh, though it be not fibrous. They con tribute to the roundneſs of the Neck by fillin up the empty ſpaces about the *Larynx*; and th humour ſeparated in them ſeems to ſerve for th lubricating of the *Larynx*; whereby the voic may be made more ſmooth and ſweet.

Th

The *second* Cartilage is called κρικοειδὴς, *annularis*, becauſe it is like a Turkiſh *ring*, and compaſſeth the whole *Larynx*; in the hinder part it is broad and thick.

The *third* and *fourth*, becauſe of the Membrane that inveſts them, ſeem but one; but it being removed, they appear to be two. However they have but one name which is ἀρυταινοειδὴς, *guttalis*, becauſe when their two proceſſes are joined together, they are *inſtar gutturnii*, like to that part of the neck of a Jug or *Ewer* at which we pour out the water. For by their juncture they frame a *rimula* or little chink (for the modulating of the voice) called *Glottis*.

The *fifth* is called *Epiglottis*, becauſe it is placed above the *Glottis* or Chink, and covereth it. It is of the form of a Tongue, and is appointed to hinder the falling down of any thing which may prove offenſive unto the Windpipe, when we eat or drink. It is preſſed down by the weight of the things which are ſwallowed, for they ſlip over it down into the *Gula*. *Steno* takes notice of little holes or pipes perforating this Cartilage, which, he ſays, ſpring from certain caruncles on its upper ſide, from whence they evacuate an humour on the other ſide looking towards the *Larynx*.

The *Muſcles* by which theſe Cartilages are moved in forming the voice, are thirteen in number: but as for their names and deſcription, the Reader may pleaſe to conſult Book V. Chap. 11. *Muſcles.*

The ſecond part contained in the *Neck* is the upper part of the Gullet, which is called *Pharynx*, from φέρω, becauſe it conveyeth the meat and drink towards the Stomach. It is continued to the *Fauces*, (or indeed is the greateſt part thereof) 2. Pharynx.

of) reaching up behind to the *Uvula*, on th
ſides to the *Tonſillæ*, and before to the *Epiglottis*
It is membranous; but not purely ſo, for it i
thick and in ſome ſort carnous. It has ſeve
Muſcles, to aſſiſt it in ſwallowing, three pair t
open it; and an odd one, which is called it
Sphincter, to ſtraiten it; of which afterward
Book V. Chap. 12.

3. Tonſillæ. The next parts are the *Tonſillæ*, commonl
called *Almonds*, which are two Glands ſeated
the root of the Tongue, on each ſide of the *Uvul*
and at the top of the *Larynx*, covered with th
common Membrane that inveſts all the Mout
Dr *Wharton* ſays, that though they ſeem tw
yet they are really but one, being continued t
one another by a thin and broad productio
which is of the ſame glandulous ſubſtance wit
themſelves. He ſays they are of a yellowiſh co
lour, and compares their ſubſtance to concrete
Honey, only they are of a more firm conſiſte
cy, but they look ſandy like it: They have ſma
Veſſels from the Jugular *Veins* and *Arteries*, ar
Nerves from the fifth pair.

Their Duct. They have each a large oval common Duct
Sinus that opens into the Mouth, ſo wide in
Oxe that one may put the tip of the little fing
into it. Into this many leſſer open, and by
diſcharge into the Mouth, *&c.* the liquor that
ſeparated in the Gland. *Fallopius* hath obſerv
this aperture or *Sinus* to look like a ſmall ulc
when the Gland has been ſwelled, and ſometim
by unskilful Perſons to have been treated as ſuc
when it has only been forced to gape a little t
much through the too plentiful defluxion of H
mours upon the Gland.

T

The *Use* of these Glands was by the Ancients supposed to be only to separate a certain mucous or pituitous matter from the Blood, for the moistening and lubricating of the *Larynx*, Tongue, *Fauces* and Gullet: but Dr. *Wharton*, and as many as attribute a fermentative quality to the *Salina*, ascribe a more noble use to them; *viz.* to make a Ferment to further the concoction of the Stomach: yea, Dr. *Wharton*, (but I think mistakingly) thinks that they are the chief Instrument of Taste. *Use.*

Besides these there are other *Glands* in the Neck, which from their situation Dr. *Wharton* calls *Jugulares*; for they are seated by the sides of the Jugular Vessels. He says he has observed them to be fourteen on each side, besides another longish one separated from the rest, lurking on each side at the root of the *processus styloides* between the Muscles of the Neck and Jugular Vessels. The uppermost are palest of colour, and the lower the redder. They grow in knots as it were, and are of an unequal bigness, varying from the smalness of Coriander-seed to the bigness of a Bean. They have no proper excretory vessel, and so are of the nature of conglobate Glands, which return the *Lympha* by the Lympheducts into the Blood. Among or near unto these Glands are commonly those strumous swellings that are so frequent in the Neck. 4. Glandulæ Jugulares.

As for those other Glands which are commonly reckoned as Parts contained in the Neck, *viz.* the *Maxillar* and *Parotides*; because their excretory Vessels discharge that liquor that is separated in them into the Mouth, we shall defer the description of them to the *Twenty sixth Chapter* of the *Third Book* which treats *of the inner parts of the Mouth.* Neither shall we here mention the Veins

and

and Arteries that paſs through the Neck to the Head, having deſcribed them before, in Chap. 9. and 11.

And as to other Parts that make up the Neck, *viz.* the ſeven *Vertebræ*, and eight Muſcles, thoſe will come to be treated of in their proper Books: And therefore omitting them here, we ſhall paſs on to the *Head.*

The End of the Second Book.

The

The Third Book.

OF THE HEAD.

CHAP. I.

Of the Head in general, and its common containing Parts.

NOW followeth the third and higheſt *Venter* of the Body, called *Caput*, the Head. This is the moſt noble Cavity of the three, containing the Brain, wherein the rational Soul more eſpecially operates, and whereby all the animal motions of the whole Body are moderated and determined; as well as performed by means of the Spirits elaborated in it, and ſent into all the parts by the Nerves. *The Head.*

It is *ſeated* in the higheſt place of the Body, because it contains the Organs of the Senſes, moſt of which perform their office more advantageouſly by this ſublime ſituation. For from hence the Eyes can behold things remote, as from a Watch-tower; here the Ears draw in the ſounds that fly aloft; and the Noſtrils receive the aſcending Odours. *Its Seat.*

Its *figure* is ſpherical; yet ſomewhat flattiſh, and longiſh. *Figure.*

It

Bigneſs. It is *bigger* in Man than in other Creatures, conſidering the proportion of their Bodies; as his Brain that is contained in it, alſo is.

Parts. The *parts* are of three ſorts, for they are either 1. diſtinctive, or 2. expreſſive of the regions, or 3. conſtitutive of the whole.

The parts *diſtinctive* are two, the hairy ſcalp called *Calva*, and that without hair called *Facies*.

The parts which *expreſs* the regions (of the firſt,) are four: 1. *Sinciput* or the fore-part, reaching from the Forehead to the coronal future. 2. *Occiput* the Noddle, or hinder part, beginning at the future *Lambdoïdes*, and reaching to the firſt *vertebra* of the Neck. 3. *Vertex*, the Crown, which is ſituated on the top of the Head between the bounds of the *Sinciput* and *Occiput*. And 4. the lateral parts deſcending from this on each ſide between the Ears and Eyes, called *Tempora*, or the Temples.

The parts *conſtitutive* are either *containing*, or *contained*. The *containing* are either *common* or *proper*. The *common* are thoſe we treated of in Chap. 3. of the Firſt Book. The *Cuticula* is thinner and ſofter; but the Skin thicker than in any other part of the Body, yet porous, that room may be left for the Hair to grow, and for its nouriſhment to paſs to it. The *Membrana carnoſa* in ſome aboundeth ſo with Muſcular Fibres, and cleaveth ſo cloſe to the Skin, that they can move it at their pleaſure.

We ſhall not need to ſay more here of theſe or of other the *common* containing parts, but refer the Reader to the above-cited place: and now proceed to the *proper*, having firſt diſcourſed a little of the *Hair*.

CHAP

CHAP. II.

Of the Hair.

THE *Hairs* of the *Head* are called in Latin *Capilli*, quasi *Capitis pili*, and differ not from the Hairs in any other part of the Body, save in length. *The Head. Its name.*

Now an *Hair* may be defined to be a *body cold and dry, small, thread-like, hard and flexible, budding from the Skin.* *Definition.*

The Hairs are seldom round, but generally four-square, as the stalks of some Plants; sometimes triangular, but always porous, the pores running length-ways. All these things may be observed by the help of a good Microscope. They are sometimes curled, and sometimes hang ank. *Figure.*

Hairs are commonly divided into *Congeniti*, such as we bring into the World with us, as those of the Head, Eyelids, and Eyebrows; and *Posteniti*, such as begin to grow at certain seasons in our life-time, as the Beard, the Hairs growing about the *Pudenda*, on the Breast, in the Armpits, and the like. *Division.*

They are no parts of the Body, and therefore have no *Animal* life; yet they have a *Vegetative* life, and that peculiar to themselves, and not owing to the life of the Body, seeing they continue to grow after a Man is dead, as has been observed in embalmed Bodies. *Diemerbroeck* (and before him *Malpighius*) ingeniously compares them to Polypody, or some other Plant growing upon an old Tree, which continue to grow after the Tree is dead as they did before, because they have *Life.*

have a proper life distinct from the form or *anima* of the Tree out of which and in which they grow.

Generation & Nourishment.

The matter out of which they are *bred* and *nourished* is commonly reputed to be a moist, fuliginous, crass, earthy and somewhat viscid excrement of the third concoction. *Spigelius* thinks they are nourished by Blood: which opinion he grounds on an analogy he supposes there is between Hair, and the Feathers of Fowl; and these latter he says are apparently nourished by Bloud, for if one pull one from off a young Fowl, its end is bloudy. *Diemerbroeck* dissents not much herefrom, but thinks the Bloud to be prepared and concocted in a specifical manner into a crass, earthy and viscid juice. Whatever the matter of their *nourishment* be, it is attracted by the white roots of the Hairs, and is carried even to their very ends by the pores; just as Plants receive nourishment out of the Earth by their Roots, and communicate it to their outmost parts. *Malpighius* says, their head or root being round and mucous, is set in a kind of Oval-Case, (as in a Flower-pot) to which case a Nerve is evidently propagated.

Colour.

The *colour* of them differs according to the Climate, or to the natural constitution of the party, or to the diversity of those humours that are mixed with the juice whereby they are nourished. In those of cold flegmatick constitutions they use to be of a light colour; in cholerick, reddish, *&c.* They are most commonly streight in those which are born in cold Countries, but curled in those who inhabit hot Climates.

Why Hair turns white.

And as the reason of the difference of the colour of the Hair in several persons is from different temperaments, *&c.* so the reason why Men ir

old Age grow *grey*, whenas their Hair before as of another colour, seemeth to be the predominance of flegm in that juice that nourisheth em: whence also the Hairs of the Head and ice sooneſt turn white, because the Brain does ore abound with pituitous humours than any her part of the Body. But it is not so easie to ve a reason of some Mens turning grey in one ghts time, when they have been under great ars; (of which there are many instances credibly ported.) Yet *Diemerbroeck* gives a reason somehat probable, *viz.* "That in great fear and terrour, the heart by accident is in great anguish, whence it beats little and very weakly, so that some from this cause fall into a swoon: by reason of the weak pulse little blood is impelled into the outer parts, whence by and by they grow cold and stiff; blood failing in the Skin, the colour also in the juice that nourisheth the Hair, is by and by changed from that which before was induc'd upon it from the humours mingled with the blood: Then if by chance whitish pituitous humours stuck before in the Skin, they will presently infect the juice that nourisheth the Hair with the prevalency of their own colour, which juice passing through the Hair continually even to their end, and nourishing them, their Colour may from hence be changed in a short time, and become white, seeing their substance is diaphanous as it were, easily admitting of any Colour which is communicated to it with the nourishment.] See his *Anat. corp. human.* p. 559, 560. where he answers ne Objections that may be made against this pinion.

Their Use. The Hairs have three *Uses*: for they serve, 1. for Defence, 2. for Beauty, and 3. shew the temperature of the whole Body and Skin.

CHAP. III.

Of the proper containing Parts.

THE *proper containing* Parts are six; to w the *Muscles*, the *Pericranium*, the *Periosteum* the *Cranium*, and the two *Meninges*. Look f the *Muscles* in the *Fifth Book*, and for the *Cr nium* in the *Sixth*. Of the other here. An First,

The Pericranium. The *Pericranium* (which is so called from being extended περὶ τὸ κρανίον *about the Skull*) i Membrane somewhat thin, dense and white, exquisite sense, immediately seated under t *Membrana carnosa*. It covereth the whole Sk next above the *Periosteum*, except where t temporal Muscles lie upon the *Cranium*, for is stretched over *them*; and seeing it is very ser ble and tender, it causeth horrible pain a inflammation, when the temporal Muscle wounded.

Its Connexion. It is *knit* to the *Dura Mater* by some nerv Fibres, which pass from it to within the Skull its sutures, to stay firmly the *Dura Mater*, and a the Brain which it invests, from violent conc sion. For though in Infants new-born these strongly united and in a manner continued, in much that the *Pericranium* is said by some to spri from the *Dura Mater*; yet in process of ti they part so, as to be knit to one another on by these nervous Fibres, by which yet, inflamm

ns may be communicated from the *Pericranium* o the Brain.

Next under the *Pericranium* is ſpread the *Perioſteum*, which immediately cleaveth to the Skull, nd gives it that ſenſe which it hath. It ſelf is very thin and nervous Membrane, and of very cute ſenſe. All the Bones of the whole Body except the Teeth) are inveſted with ſuch alike lembrane, and owe their ſenſe to it. Dr. *Havers* thinks, "there is little reaſon to make the *pericranium* a diſtinct membrane from the *perioſteum* of the Skull. For although it be divided at the temporal Muſcles; this is no more than what the ſeveral ſeries of fibres do make the *perioſteum* capable of in the Leg, or any other part; and I have upon the ſhin-bone of an Ox divided it into four or five ſeveral membranes, if I may ſo call them, when it has been dried.] To this I anſwer, that though the *rioſteum* may every where be *diviſible*; Yet ature having *divided* it in no other place, I ink 'tis more reaſonable to adhere to the former pinion, than to believe ſhe does any thing ſingular ere. Perioſteum.

Theſe two Membranes outwardly inveſting the *ranium* have *Arteries* from a branch of the exrnal *Carotides*, and *Veins* from the external Julars. *Their Veſſels.*

The *Meninges* follow, called by the *Arabians* *latres*; as if all the Membranes of the Body ere propagated from them. Theſe are immeately within the Skull, as the other were with-t; but adhere not cloſe thereto, as thoſe do. hey are two in number: the *Craſſa Meninx* or *ura Mater*, and the *Tenuis Meninx* or *Pia later*. The Meninges.

Dura Mater. The *Dura Mater* is the outer, that is, is nex to the Skull, through whose Sutures sending Fi bres to (or receiving them from) the *Pericranium* it is suspended thereby; for in other places it looſe from the *Cranium*, saving in its *basis*, t which it is so firmly knit, that it can hardly b pulled from it; or where it is suspended by Ves sels entring into it from the perforations of th Skull; or lastly where it adheres to the *Os cribri forme* at the top of the Nose, and sends jag through its holes. It is thicker and harder tha the inner, whence it has the Epithet of *Dura* hard. It consists of a double Membrane, th outer of which is more rough, towards the *Cra nium*, having very small and hardly visible fibres the inner on its superficies next the *Pia Mater* more smooth and slippery, being bedewed with kind of water, and has very strong and larg fibres. This inside is looſe, saving that near th *Sinus*'s it is knit to the *Pia Mater* by the inserti ons of the Veins, and in the *Basis* of the Sku by the Arteries and Nerves.

Its Holes. It has many *foramina* or holes for the transit o the Vessels; and besides, one very large one i its *Basis* for the descent of the spinal Marrow and another small one which forms the uppe orifice of the *Infundibulum*.

Vessels. It has *Arteries* from the larger branches of th
Arteries. internal *Carotides*, (entring into it through th holes of the wedge-like Bone) and *Veins* fro
Veins. the internal Jugulars. The Veins Dr. *Ridley* (i his Anatomy of the *Brain*) sayes, run for som space betwixt its two *laminæ* (as he calls them) o membranes, after the manner of the Ureters i the bladder, in large trunks, before they ente the *sinus*'s by and by to be described. Dr. *Will* observes, That its *outer superficies* has no whe

many twigs of Veins as of Arteries; but that out its four *ſinus*'s (which are the venous receptacles the Blood) more Veins go forth through its *in-r ſuperficies*, which being preſently inſerted into e *Pia Mater* are diſperſed all over it, and every here meeting the Arteries aſcending from the *aſis* of the Head, and being branched with them, ake manifold *plexus* of Veſſels. Dr *Ridley* ſayes, is Membrane has plenty of *Nerves* from the remoſt branch of the fifth pair, and is thereby ade very ſenſible. *Nerves.*

At the Crown of the Head it is doubled; d its duplicature deſcending inwards, di-des the Brain into the right and left ſide: t its deſcent is not quite to the *Baſis* of e Brain, but only through the cortical part; for ward the *Baſis* both ſides of the Brain are con-guous to one another, making one continued Bo-, namely that part of it which is called *Corpus lloſum*, of which in the next *Chapter*. This du-icature, becauſe it is broader backwards, and ows narrower forwards, and ſo reſembles in me manner a Reaper's Sickle, is called *Falx*. ow this *Falx* reaches as far forwards as to the p of the Noſe, where it is knit to the upper pro-ſs of the *Os cribriforme* that ſtands up betwixt e *Proceſſus mammillares*, and is called *Galli criſta* Cock's Comb. But its hinder and broader part wards the *Occiput* being ſevered, deſcends to-ards both the right and left ſide, and parts the *rebellum* from the *Cerebrum*. Falx.

In the ſaid duplicature are formed four *Sinus*'s Cavities, three pretty large, and one little ie, which (as alſo the reſt which he mentions) r. *Ridley* looks upon no other than large Veins. he firſt, which is the higheſt and longeſt runs ong the upper part of the *Falx*, from the Sinus.

top of the Nose lengthways of the Head towards the *Occiput*, where it is divided into two lateral *Sinus's* which descend by the sides of the Lambdoidal Suture to the *Basis* of the *Occiput*. And at the said division the fourth short *Sinus* proceeds inwards from it betwixt the Brain and Cerebel to the *Glandula pinealis*. This place where all the *Sinus's* are continuous to one another, is called *Torcular*, the Wine-press. Some Anatomists describe several other.

Their uses. Into these Cavities the Mouths both of Arteries and Veins are said to open; by the former whereof Blood is extravasated into them, and absorbed again out of them by the latter. Whence if one open the Skull of a live-Creature one may observe a beating in the long uppermost *Sinus*, from the Blood discharged into it by the Arteries. Dr. *Highmore* thinks, that much blood being sent to the Brain by the *Carotides*, all which is not fit to have Animal spirits elaborated out of it; *that* part of it which is less fit and necessary for this purpose, is discharged into the *Sinus's* to be returned by the Veins; even as a notable branch of the Cœliack Artery (when it is come just to the Spleen) is implanted into the *Ramus splenicus* of *Vena portæ*, by which that Arterial blood that is unmeet or unnecessary for the making of that juice (whatsoever it be) which is excocted in the Spleen, may be remanded back again. And some are of opinion that the Veins also convey some blood into these *Sinus's*, which being superfluous to the nourishment of the *Brain* and *Meninges*, is poured in hither by the Veins from their respective parts, and is imbibed again by other Veins whose mouths gape into the *Sinus's* (namely the branches of the internal Jugulars) to be returned to the Heart.

The second (and inner) Membrane investing the *Brain* is called *Tenuis Meninx* or *Pia Mater*. This is of most exquisite sense, and endowed with very many Arteries and Veins. It immediately cloaths the *Brain*, and hinders it from running out, and also involves all its windings and circuits, and tying their summities together makes all the superficies of the Brain plain as it were: which upper connexion being loosed, the windings of the Brain, being all invested apart with this Membrane, may easily be separated and laid open. But (according to most Anatomists) it is only the Cortical part of the Brain which this Membrane cloaths thus; for the inner surface of the expanded Brain (which is called *Corpus callosum*) is not invested by it; but instead of it (Dr. *Willis* says) "Many *plexus* of Vessels, commonly called *Choroïdes*, are suspended within its complicature, and fluctuate as it were freely. But within all the other recesses of the *Brain*, and besides, within the *Plicæ* or *Lamellæ* of the Cerebel, yea, within the interstices of each of them and of the *Medulla oblongata*, does this Membrane insinuate it self.] Yet Dr. *Ridley* affirms, that it is extended also over the *Corpus callosum* itself (though loosly.) Pia Mater.

This Membrane consists also of two coats (or *laminæ*) betwixt which the blood-vessels run, and make many admirable *plexus*. The *Arteries* are four, *viz.* two *Carotides* and two *Vertebrals*. The *Vertebral* Arteries being united at the *Basis* of the Skull, and making a single trunk, it meets and joins with the *hinder branches* of the *Carotides*; and from the place of their coalition a very remarkable branch ascends on either side under the *limbus* of the Brain, which being carried above the *crura* of the *Medulla oblongata* is divided into very many *Its Vessels and their* Plexus.

ſlender and as it were capillary twigs, ſome o which aſcend to the Glands ſeated behind the Ce rebel, and the reſt make the Arterial part of th *Plexus Choroïdes*. The *fore* branches of the *Caro tides* do alſo unite one with the other; and botl before and after their joining ſend forth twigs al over this Membrane, but chiefly in the fore-par of the Brain. Its *Veins* ariſe from the four *Sinus* of the *Dura Mater*, (as was obſerved above fror Dr. *Willis*) and theſe meeting with one another ar diverſly interwoven one with another and wit the Arteries, and return the ſuperfluous Bloo by the Jugular Veins to the Heart.

Note, That theſe two Membranes (the *Dura* an *Pia Mater*) not only inveſt the Brain, but the Spi nal Marrow alſo, and all the Nerves that ſprin from either: And that the inner coat of the *Pi Mater* yields a covering to every ſingle *Fibrill* that each Nerve is made up of, whence come the conſent betwixt part and part, and betwixt a and the Brain.

CHAP. IV.

Of the Brain in general.

The Brain. THE *Pia Mater* being taken away, the *Brai* occurs next; by which here we mean in th general, all that ſoft ſubſtance which is contair ed within the whole Skull, and which the Greek comprehend under the word ἐγκέφαλον. It is th general Organ of ſenſe, *in* which the Soul, th Governour of the Body, perceives and judget of the Senſations of all ſentient Parts; and o *of* which, as out of a Fountain, it communic teth the Animal Spirits (bred in the Brain) t

th

ie Ducts or Rivulets of the Nerves to all the ntient parts of the Body, and thereby endows em with the Faculty of performing Animal ctions.

The *Brain* being of so loose a Substance, and e Skull wherein it is inclosed, so hard, that the w or Chizzel are necessary to break through it, e Brain must needs be very much shatter'd and ncussed thereby; and after the Skull is divided, the very pulling of it off, the vascular connexion the *Dura Mater* and it with the *Pia Mater* d *Brain*, (and that also of the one with the her) being torn in sunder, the parts into which e Vessels are inserted, are necessarily much vio- ted: and lastly, after the covers are removed, veral parts of the Brain being of such difficult cess, that others must be quite spoiled, before ie can come to a view of them, and these also ereby in part violated: Upon all these ac- unts a true Anatomy of the Brain, as to its ntiguities, Connexions, Cavities or Ventricles, c. must be very difficult; so that 'tis no won- r the observations of Anatomists are so diffe- nt, and so opposite to one another. But this the bye. Pass we on now to discourse of the *rain* more generally.

The difficulty of dissecting it.

If by *Brain* we understand the whole *Ence- alos*, (or all that which is contained within the ull) it is not of one *Substance*, but divers: And distinguished by the particular names of the *Ce- brum*, (in special) the *Cerebellum*, and the *Medul- oblongata*. Nor is the *Cerebrum* (*properly* so cal- d) it self of a like substance, but consisting of a ortical, and a Medullar part, (called *Corpus Callo- m*) these differ in their nature, colour and consi- ence. Which difference *Malpighius* thus de- cribes. The *Cortex* (being of an Ash-colour) he says,

Its Substance.

ſays, " is glandulous. The outſide of the Gland
" is covered with the *Pia Mater*, and its Blood
" veſſels, which penetrate deep into their Sub
" ſtance; (each Gland having a twig of both a
" Artery and a Vein:) their inner ſide ſend
" forth a white nervous Fibre, like a proper Ve
" ſel as it were, ſo far as their brightneſs an
" whiteneſs permit one to diſcover. Theſe F
" bres make up all the *Pith* (or *Corpus calloſum*
" which is of a more cloſe and ſolid Subſtanc
" than the *Cortex*. They are flattiſhly roun
" and are not unlike thoſe white Bodies, c
" *Inteſtinula*, which the Teſticles are made u
" of; and in the Ventricles of the Brains of Fi
" they are ſo apparent, that if you hold them b
" twixt you and the light, they repreſent th
" ſmall teeth of an Ivory Comb. He ſaith the
" are inſerted by their ends into (or rather ari
" out of) the *Cortex* or aſh-coloured outer pa
" of the Brain, and ſeem all of them to ha
" their egreſs out of (or rather ingreſs into) th
" trunk of the ſpinal Marrow within the Skull.
Whether they be hollow or not, or whether
they are collected into a bundle they have n
Pores and Interſtices ariſing therefrom, whic
tranſmit a peculiar juice into the Nerves cont
nued to them, he leaves undetermined; becau
they neither admit of ligature, nor can ſen
make any diſcovery thereof. Dr. *Ridley* (fro
Lewenhoeck) offers at a yet finer deſcription
theſe two parts of the Brain, which the curio
Reader may find in his *Anatomy of the Brain*,
89, &c. As for the other parts of the *Encephal*
viz. the Cerebel and *Medulla oblongata*, the
Subſtance ſhall be treated of afterwards, when w
come to their Deſcription.

T

The *Brain* receives Blood by *Arteries* derived *Veſſels.*
om the *Carotides* and Cervical, whoſe Capil-
ries are diſperſed chiefly through its cortical
art. Theſe Arteries are ſo large and numerous,
hat a third part at leaſt of the whole Maſs of
lood is conveyed hither by them; which ſeeing
hrough the ſmallneſs of the Brain it cannot be
onſumed in its Nutrition, *Malpighius* thinks it
robable that the coagulative (or concreſcible)
erum is filtred as it were in the *Cortex* (or glan-
ulous part) of the Brain from the Arterial
lood, and that the Fibres of the *Corpus Calloſum*,
ſo many roots implanted into the ſaid *Cortex*,
mbibe this *Serum* and convey it to the *Medulla*
Oblongata as the trunk, from whence it is derived
nto the Nerves as the branches, and is there the
ſuccus Nervoſus, if not the Animal Spirit it ſelf.
art nouriſhes the Brain it ſelf, and what is ſu-
erfluous to both theſe Uſes, is partly reſumed
y the *Veins* of the *Meninges* (whoſe twigs reach
o the ſeveral Glands of the *Cortex*) and partly
epoſited in the *Sinus*'s of the *Dura Mater* by the
rteries themſelves, out of which it is reſorbed
y the internal branches of the Jugulars, and
hereby conveyed back to the Heart. The Arte-
ies inoſculate one with another (*i. e.* the right
Carotides with the left) and ſo do the Veins alſo;
ut not the Arteries with the Veins. It is from
he Pulſe of the Arteries altogether, that the
eating (or *Syſtole* and *Diaſtole* as it were) of the
rain proceedeth.

A Man of all other living Creatures hath the *Bigneſs.*
iggeſt Brain; for it weigheth four or five pound
n ſome; and is as big again as an Oxe's
rain.

The outer ſurface is full of Windings, like *Figure.*
hoſe of the Guts, which are ſeverally inveſted
with

with the *Pia Mater*, as alſo tied together by it
The whole Brain is much of the ſame *Shape* wit
the Head, *viz.* roundiſh, but with bunchings ou
towards the Forehead.

Of its *Action* we ſhall ſpeak in the Ninth
Chapter.

CHAP. V.

Of the manner of diſſecting the Brain: of th Brain properly ſo called, the Fornix, Sep tum, *and the three Ventricles.*

THere are ſeveral methods of diſſecting th
Brain; ſome beginning at the Crown
which was the old way; ſome on the right ſid
as *Sylvius*; and ſome behind, as Dr. *Willi*
whoſe Anatomy of the Brain being much mor
accurate than that of any before him, we wi
endeavour to give a ſhort but faithful abſtra
of it.

The manner of diſſecting the Brain. Having taken out of the Skull the whole *Enc phalos*, or all that which is contained under th name *Brain* taken in a large ſenſe, firſt of all l the hinder *limbus* or bordure of the Brain prope ly ſo called, where it is knit to the *Cerebellu* and *Medulla oblongata*, be freed as clear as m be from its coheſion with the ſubjacent part cutting aſunder the veſſels and the membranes o every hand, for by theſe onely is it joined them. Its hinder part being thus looſened, li it up and turn it forwards, whereby the *Cru* of the *Medulla oblongata* will lie bare, and t *three Ventricles* of the Brain, commonly ſo calle will become *one empty ſpace*, as being a vacui reſultin

ſulting merely from the complication of the rain. Moreover one may then ſee, how the o tips of the *Crura* of the *Medulla oblongata* e knit in two places to the *Corpus calloſum* or edullar part of the Brain; as alſo obſerve the *rnix* ſo called, how it is like a *ſubtenſa*, or line awn under the arch of a circle, which beginng before, where the aforeſaid tips of the *ura* adhere to the Brain, runs to the Brain's ider bordure, to which it is united by two fetched out arms as it were, and ſo keeps the ole *compages* of the Brain in a ſpherical figure, ndring it from ſpreading into a plane, and ties ifirmly to the *Crura* of the *Medulla oblongata*.

This is Dr. *Willis*'s manner of diſſection, erein the parts occurr to the Diſſectors inſection in this order.

Firſt the *Brain* it ſelf, whoſe outer ſurface is a full of windings, like the convolutions of the ots: It is exactly divided by the *Falx* (above-deſcribed) into two hemiſpheres, a right and left; d theſe are imperfectly ſubdivided each into o Lobes, a fore and an hinder, by a large anch of the Carotid Artery running croſs the ddle of them. How deep the *Falx* enters into e Brain, and of what ſubſtance the Brain is, has en ſhewn in the former Chapters: We ſhall ly further note here concerning its ſubſtance, at its medullar part (or *Corpus calloſum*) is both icker and cloſer by much in the fore parts of ch hemiſphere than any where elſe; and that ere it is thickeſt, it adheres on each ſide to the os of the *Crura* of the *Medulla oblongata* (called *pora ſtriata:*) but from theſe tips, as from its e, being expanded towards the hinder parts, it ows thinner by degrees, and towards its outer rdure its under ſide is knit to the *Caudex* or trunk

The Brain properly ſo called.

trunk of the *Medulla oblongata* by membranes a
veſſels.

Fornix. Which membranes and veſſels being cut in ſu
der, and the Brain turned up forwards as abov
directed, on its inner or under *ſuperficies* the
appears a medullar Proceſs called *Fornix*, whi
ſpringing forth of the *Corpus calloſum* with
double root, is united into one broad Proc
near the place where the tips of the *Crura* of t
Medulla oblongata adhere to the under-ſide or m
dullar part of the Brain, and ſerves as a *Subter*
to its Arch, (as was noted before.) Under t
double root of the *Fornix* there lies a medull
Trunk, like a large Nerve, running croſs t
Brain and joyning one *Corpus ſtriatum* to the oth
And out of the middle ſuperficies of the *Forn*
there ſtands up a thin and pellucid *Septum* or P
tition, which is faſten'd to the roof or arch
the *Corpus calloſum* almoſt through its wh
Duct.

Septum. This *Septum Columbus* affirms to be membr
nous, and *Malpighius* will have it to conſiſt
ſtreight Fibres running lengthways from befo
backwards. And thus while the three-ſided *F*
nix doth ſubtend the Arch that ariſes from t
complication of the Brain, it divides its Cavi
as it were into *three Partitions*, and makes th
look like ſo many *Ventricles*, by which name th
have been deſcribed by former Anatomiſts.

Three Ventricles. To theſe three *Ventricles* thus accidentally fo
med, the Ancients have attributed a noble Uſ
determining them to be the Work-houſe of t
Animal Spirits, where they are both generate
and perform the chief works of the Anim
Function. *Fracaſſatus* (who calls the Brain
Wind-Inſtrument, ſomewhat analogous to t
Lungs) thinks that a purer ſort of Air aſcen
throu

rough the *Os cribriforme* into the two fore Ventricles, (where it is ethereized) and passes out of them into the third, and thence into the fourth (to be described in Chap. 7.) by which it is conveyed into the spinal Marrow, where being mixed with the nervous juice, it therewith constitutes the Animal Spirit, and likewise promotes its motion. Where, and whereof the Animal Spirits are generated, we shall consider, Chap. 9. and shall here shew a more probable Use of these Ventricles. They have been commonly distinguished to *two anterior*, and *one posterior*. But the truth is, there is but one Cavity or *Vacuum*, and instead of that noble Use heretofore ascribed to it, the Anatomists make it only as a sink or common-sewer for excrementitious matter to be collected in, and to be discharged out of again by convenient ways. This excrementitious matter is generally a serous humour (or rather *lympha*) which is separated from the Blood in the adjacent *Plexus choroïdes* by the help of those many Glands that that *Plexus* is beset withal, and of the *Glandula pinealis* which the *Plexus* hangs upon and is woven about like a button. As to the exit of this serous humour, formerly it has been supposed to flow from hence to the *Processus mammillares*, and from them to destill through the *Os cribriforme* into the Nose. But Dr. *Lower* denies any such office of the *Os cribriforme*, affirming that the holes in it are only for the transit of the Nerves and Membranes going forth from the *Processus*, and that these fill them so close that nothing can flow through them. And says, That the flux of Rheum through the Nose, and upon the *Uvula*, or into the Mouth, *&c.* Catarrhs, falls not from the Head, but is separated from the Arteries in the Glands of the respective parts, as into the Nose through the Glands of

of its inveſting Membrane, *&c.* And as to the ſe rous matter that is poured into theſe *Sinus*'s in th Brain, he ſays, it is all abſorbed again by the Ve ſels gaping into them, and returns by the Jugul Veins to the Heart.

CHAP. VI.

Of the Medulla oblongata *and its* fore *part viz.* Crura, Corpora ſtriata, Nervoru opticorum Thalami, Nates *and* Teſte *with the* Vulva *and* Anus; *as alſo of t* Glandula pinealis, Plexus choroïdes, *a* Infundibulum.

THE *Brain* continuing turned up forwards, above-directed, the *Medulla oblongata* li open to view, whoſe Parts, *&c.* we ſhall deſcri in this Chapter.

The Riſe of the Medulla oblongata.

The *Medulla oblongata* ſeems to ariſe from t *Corpus calloſum* by two Heads reſembling the le ter Y, and the united Trunk by and by deſcen out of the Skull down the Spine, wherein it is ca led the *ſpinal Marrow*, of which afterwards. *Fr caſſatus* queſtions whether the Brain, and the C rebell alſo be not rather appendices of, or prop gated from the *Medulla ſpinalis* and *oblongata*, th theſe from thoſe; ſeeing in the *Embryo* or fir lineaments of a Chicken in the Egg, if you pri the *Carina* (or long thread that afterwards b comes the back) with a pin, it will contract ſelf, whilſt in the Seat of the Brain there is n thing but a *Lympha* not yet fixed into a Brai But this by the bye.

T

The *Substance* of the *Medulla oblongata* is not ke that of the *Brain*, consisting of an outward r cortical part of an ashy colour, and of an in- er medullar and white; but its whole *compages* medullar; yet it is not pure and shining, but usky from its many Fibres that hold a various ourse; for in some parts they are striated or idious as it were; in others direct, running ngthways, and in others circular. *Its Substance.*

Its two heads or beginnings are called its *Cru-*, and the tips or extremities of these *Crura* e called *Prominentiæ lentiformes*, or otherwise *orpora striata*, from the course that their Fibres ep. Their ends are blunt, and by a pretty rge space of their surface adhere to the medul- r substance of the Brain where it is thickest. If e cut them in sunder lengthways, then may observe their *striæ*, which have a double ten- ncy; for some descend from their tip towards e *Medulla oblongata*, and others seem to ascend om their lower part towards the medullar part the Brain, the one meeting the other. So that r the help of these Fibres there seems to be a ee passage for the Animal Spirits from the Brain the *Medulla oblongata*, or back again, as there occasion. We observed above in the former *apter*, how there is a medullar process that run- ng a-cross joins one *Corpus striatum* to the other; d shall onely note here further, That just behind e lower end of these Bodies the *Processus mami- illares* or smelling Nerves have their rise from e *Medulla oblongata*. Crura *and* Corpora striata.

When these Nerves are arisen out of it, its *ura* rise into uneven protuberances, out of hich spring the Optick Nerves, and therefore ese protuberances are called *Nervorum opticorum halami*: (what course both the Olfactory and Thalami nervorum opticorum.

Optick Nerves hold towards the Nose and Eye shall be shewn in *Ch.* 10.)

On the outside of these, Dr. *Ridley* sayes he has always found and often shewed a very fair medullary tract, running all along betwixt the *corpora striata*, and from the very hindermost extent of the *Corpora striata* forwardly, down to the very roots of the *Fornix*, to which they seem to be continuous.

Behind these *Thalami* the two *Crura* of the *medulla oblongata* unite into one trunk, upon whose upper side there grow four more notable protuberances, covering its surface for about the space of an inch, which yet they do not touch in the middle, having a cavity under them. These grow two on each side, the two formore of which are called *Nates*, and the two hinder *Testes*.

Nates *and* Testes. The *Nates* (or Buttocks) are the larger of the two, and the *Testes* seem onely to be an *Epiphysis* or accretion to these. They are all four like so many round hillocks, and are joined one to another by certain processes. Under them, or rather betwixt their junctures and the trunk of the *Medulla oblongata* that lies there-under, there is left a narrow but long cavity or chink, called by the fanciful name of *vulva*, into which there opens another passage called *anus*, and both run by a strait duct down into the *Infundibulum*. As to the Uses of the *Nates* and *Testes*, the learned Reader may do well to consult Dr. *Willis* large discourfing thereof, *in Cerebr. Anat.* p. 93, &c. but I shall not enter upon that Dispute, as being too conjectural and doubtfull.

Vulva *and* Anus.

Glandula pinealis. Betwixt the *Nates* and the *Thalami Nervorum opticorum*, in a valley as it were, is seated a Glandule, (of the conglobate or lymphatick kind

call

called in Greek κωνάειον, in Latin *Pinealis*, from its shape, arising from a broad Basis to a narrower coped top, somewhat resembling a Pine-apple. It's fasten'd to the subjacent part, sometimes by many slender Fibres, and sometimes by two notable medullar Roots. Its Substance is harder than that of the Brain, and of a pale colour. It is included in a Membrane (which is a portion of the *Pia Mater*) as in a bag or case: which Membrane being full of Arteries and Veins, some of these enter into the Gland it self. This Gland *Des Cartes* thinks to be the primary seat of the Soul, and that all Animal Operations draw their Origine from it: But that seems to be too noble an Use for it; and it is more likely that it is onely of the nature of other Glands which are seated near the concourse of sanguiferous Vessels, namely that it may receive into it serous humours deposited from the Arterial Blood, and retain them till either the Veins becoming more empty resorb them, or Lympheducts (where there are any) convey them away.

That this is the true use of the *Glandula pinealis* is the more probable, from that notable *plexus* of Blood-vessels that encompasses it, and hangs upon it as it were, called *plexus Choroïdes*, which is constituted after this manner. From each side of the *medulla oblongata*, where the *limbus* of the Brain is knit to it, there ascend in a streight course two Arteries arising from the hinder branches of the *Carotides* where they are joined to the Vertebral, which being by and by divided into very many small twigs, and being met by as many twigs of Veins coming from the fourth Ventricle of the *Dura Mater* (which descends upon the *glandula pinealis*) form this *plexus*, wherein both sorts of Vessels are very much interwoven one with

plexus choroïdes.

another, and which ſpreads it ſelf on each ha
(as by two expanded wings) upon the *crura*
the *medulla oblongata* as far as to the *corpora ſtria*
yet theſe Veſſels run almoſt onely upon the ſ
face of the *medulla*, making no deep inſertions
ther into it, or into the *corpus calloſum* un
which they are alſo ſpread. This *Plexus* is be
with very many ſmall glands, which are all
them red, and almoſt ſpherical, only a li
flattiſh.

Beſides the Veins and Arteries that conſtit
this *plexus*, Dr. *Ridley* mentions a third ſort
veſſel, *viz. Lympheducts*, which he firſt diſcove
in the Brain of a ſtrangled body, running in
ferent ramifications amongſt the reticulated
ſels and glands of this part. "Which obſervat
(ſayes he) "being added to that of the gr
"Anatomiſt *Anthony Nuck*, (who in that curi
"piece called *Adenographia*, ſayes, he ſaw
"coming from the *glandula pinealis*, and that
"Friend, another Anatomiſt, ſent him wo
"he ſaw another not far from the afore
"place,) may be of ſufficient authority to evi
"the real exiſtence of theſe Veſſels hitherto
"much enquired after, in the Brain, as well a
"other parts of the body.

Its Uſe. According to Dr. *Willis*, it has a dou
uſe: *firſt*, he ſays, that the more watery p
of the Blood deſigned for the Brain, is
into the veſſels of this *Plexus*, that the remain
may be more ſincere and defecate for the mak
of Animal Spirits: which watry part, if it be
plentiful that it cannot be all received into
Veins, to be returned to the Heart, it is then
ceived into the ſmaller glands wherewith
Plexus is beſet, but eſpecially by the *glandula*
nealis juſt now deſcribed, by which it is either
tain

ined; or if it abound, may deſtil from them into the ſubjacent cavity, as into a ſink. (But there is no need of its either being retained in the Glands, or elſe of its deſtilling into the ſubjacent cavity, ſeeing the Lympheducts juſt now mentioned are proper reductory veſſels for it.) A *ſecond* uſe is, to preſerve within the plicature of the Brain (or in the *corpus calloſum*) an heat, which is raiſed from the Blood (as from a fire) that circulates in the complications of the veſſels of the *Plexus*, and which cauſes the Animal Spirits to circulate in the *corpus calloſum*.

Thus far as to the parts which appear on the *upper ſide* of the *medulla oblongata*, betwixt the *protuberantia ſtriata* and cerebel. But within this ſpace in the *baſis* of the ſame *medulla* there are other things obſervable, eſpecially the ſituation and ſtructure of the *Infundibulum*. Now this *Infundibulum* is a tube-like receptacle, outwardly covered with a thin membrane ariſing from the *Pia Mater*, and within fenced with a medullar ſubſtance, which deſcends behind the coalition of the two Optick Nerves, betwixt the *crura* of the *medulla oblongata*: Its upper orifice is between the *crura*, and from thence a ſhort tube or pipe deſcends upon the *glandula pituitaria*, (to be deſcribed in the next Chapter) upon which, ſerous humours (or *Lympha*) flow down from the upper cavities of the Brain this way; whence it has its name of *Infundibulum* or Tunnel. Which humours Dr. *Ridley* thinks to be condenſed vapours ariſing from the Arteries of the *plexus Choroïdes*. Infundibulum.

And thus we have done with the *fore* part of the *Medulla oblongata*, which only lies bare by the turning up of the Brain properly ſo called: In the next Chapter we ſhall examine its *hinder*

part, which comes to our view by raiſing up t
Cerebel; but of the Cerebel it ſelf firſt.

CHAP. VII.

Of the Cerebellum, *and the fourth Ventricl as alſo of the* hinder *part of the* Medu oblongata, *of the* Rete mirabile *and* Gla dula pituitaria.

BEfore we can take a view of the *hinder* part the *medulla oblongata*, it is neceſſary to move the *Cerebellum* that is placed upon it, (the Brain is upon the *fore* part) which theref we ſhall firſt of all deſcribe.

The Cerebellum, *its figure and ſubſtance.*

The *Cerebellum* is ſeated in the hinder p of the Head, being of ſomewhat a glob *figure* as well as the Brain it ſelf, and unev in its ſurface (like it) by reaſon of certain c volutions, both the ridges and furrows wher the *Pia Mater* is ſpread over, tying their ſu mities together, covering their deep furro and reaching *Plexus* of veſſels to them all. I its convolutions are not ſo various and uncert as thoſe of the Brain, but are diſpoſed in a cert order like ſo many ſemi-circles; the *lamellæ* plates lying upon and environing it in a para courſe. All theſe *lamellæ* have a cortical p and a medullar, which ſeem to be of like ſubſta with the *cortex* and *corpus calloſum* of the Br deſcribed before, Chap. 4.

Its Proceſſus vermiformes.

Both regions of the *Cerebellum*, *viz.* the and *hinder*, terminate in a *worm-like proceſs*, wards which the *lamellæ* or circles are ſhort leng

engthning by degrees towards the middle or top.

The *Cerebellum* has a great many *plexus* of veſ- *Veſſels and*
els beſet with Glands, like the *plexus choroïdes* of *Glands.*
he Brain, which come into ſight by ſeparating he *Pia Mater* from its hinder part; for there the *lexus* creep upon each ſide by the worm-like proeſs, conſiſting on each ſide, of a branch from the ertebral artery, and of venous ducts ſent out of ach lateral *ſinus* of the *Dura Mater*. To theſe *lexus* and Glands Dr. *Willis* aſcribes the ſame uſe s to thoſe of the Brain, *viz.* that the Glands erve to ſeparate the ſuperfluous phlegm from the terial Blood, and to retain it; and that both ie Arteries and Veins not only running on the rface of the Cerebel, but ſending twigs into its ner ſubſtance, the moſt ſubtile and ſpirituous art of the Blood being conveyed through long indings and ſerpentine ducts of veſſels, and ſo blimed into Spirit, is received and retained ithin, whilſt the more impure and feculent part ſent back by the twigs of Veins that are alſo eeply inſerted into the Cerebel.

It reſts upon the trunk of the *medulla oblonga-* Pedunculi.
, or rather ſeems to ſtand upon each ſide of by two *feet* or *ſtalks*, betwixt which feet on ie ſides, the *cerebellum* above, and the *medulla longata* underneath, there is formed a cavity hich is commonly called the *fourth Ventricle*, of hich by and by.

In each of theſe feet that ſuſtain the Cerebel, *Their Pro-*
ere are *three* diſtinct medullar *proceſſes*; the *ceſſes.*
rſt of which proceeding from the *Nates*, aſcends bliquely; the ſecond deſcending ſtreight from ie Cerebel, and paſſing acroſs the former, enompaſſes the *medulla oblongata*; and the third eſcending from the hinder region of the Cere-

bel, is inserted into the *medulla oblongata*, encreasing the thickness of its trunk.

The annular protuberance. The second of these Processes, *viz.* that which descends streight, is it which makes the *annular protuberance* (otherwise called *Pons Varolii*) upon the *medulla oblongata*, which it forms in this manner. Descending streight upon the *medulla*, assoon as it touches its sides, it seems not to be presently implanted into them, but growing into a greater bulk, encompasses the surface of the said *medulla* with divers circular Fibres. So that the Fibres of the Process of one side meeting those of the Process of the other side underneath, or at the *basis* of the *medulla*, make this circular protuberance. Which that it may be seen, as also the three Processes of each foot of the *Cerebellum*, &c. 'tis necessary to cut the Cerebel through the middle, from one Worm-like Process to the other, for then they will all appear plainly.

The office of the Cerebel. The *office* of the Cerebel has generally been reputed to be the same with that of the Brain, *viz.* to elaborate the Animal Spirits, which Anatomists have not used to distinguish into different kinds, till of late Dr. *Willis* has taught, that some Spirits assist *natural* motion, and others *spontaneous*. Accordingly he makes two Laboratories of the Spirits, appointing the Brain for the confection of such Spirits as flow into those Nerves that perform *spontaneous* motions, *viz.* such which we are conscious of, and can moderate or determine, as the moving of the Hand, &c. and the Cerebel for the making of such as flow into those Nerves by which *involuntary* or natural motions are performed, *viz.* such as are done in a constant manner without our knowledge or will, as the pulse of the Heart, &c. To which opinion of his some have made these objections: *First*, That Fowl have no

Cerebe

Cerebel, and yet their Heart, *&c.* moves. *Secondly*, The motion of the Heart, called natural, depending (in a great measure) on the influx of the Animal Spirits conveyed by the *par vagum* which arise out of the *medulla oblongata*, one cannot easily conceive how the Animal Spirits should flow into these Nerves from the Cerebel, and not as well those generated in the Brain; or if they altred them alone, why, *Thirdly*, not only the natural motion of the Heart should be performed by the said pair of Nerves, but voluntary motions also, as those of the *Larynx*, *&c.* He that would be satisfied of the grounds of Dr. *Willis*'s Opinion, may consult his *Cerebr. Anat. capp.* 15, 16, 17.

We said a little above, that betwixt the two feet of the Cerebel standing on each side, and the Cerebel it self above, and the trunk of the *medulla oblongata* below, the *fourth Ventricle* was formed, which we need not further describe, only speak a word of its *use*; which some have thought to be, for the *perfecting* of the Animal Spirits (as they were *prepared* by the three other) and therefore they have called this *the noble Ventricle*. But as was said above of the other three, that they seemed not to be designed purposely by Nature, but resulted only accidentally from the conformation of the circumjacent parts, and served only as Sinks to receive serous humours separated in the Glands: so we believe that this results in like manner, and is of the same vile use. *The fourth Ventricle.*

Having now removed the Cerebel from off the trunk of the *Medulla oblongata*, we come to have a view of the *hinder* part of the *Medulla*. Now, omitting to speak of the *vertebral arteries* that run up by its sides, (as having mention'd them often before) *The hinder part of* Medulla oblongata.

before) as also of the pairs of *Nerves* that ari
out of it (which we shall describe afterwards)
shall only in this place take notice of the *tr*
medullar *pyramidal Bodies* adhering to its side

Corpora pyramidalia. These proceed from the *annular protuberance* for
med about the *Medulla* by the second Processes
the feet of the Cerebel, near the *basis* of the *m*
dulla, and being distinct from the rest of the me
dullar trunk, they tend streight towards the sp
nal Marrow, and in their progress by little an
little becoming narrower, after about the spac
of an inch, they end into sharp points pyramida
wise, whence they have their name. Dr. *Will*
thinks them to be ducts or chanels of the An
mal Spirits from the annular protuberance, o
which is all one, from the Cerebel, to the Nerve
that spring out of the *Medulla oblongata*, ther
whereabout these pyramidal bodies end.

We have now done with all the parts of th
Encephalos, whether relating to the Brain, *Medu*
la oblongata, or Cerebel, from whence we migh
proceed to the *action* of the Brain; but we wil
first describe the *Glandula pituitaria* seated in th
cavity of the wedge-like Bone, with the notabl
Plexus of vessels spread about it in some creature
called *Rete mirabile*; and in the next Chapter trea
shortly of the *spinal marrow*, as being an *appendi*
or continuation of the *Medulla oblongata*.

Glandula pituitaria. This *Glandula pituitaria* has a proper seat of it
own made for it in the middle of the wedge-lik
Bone, in a cavity commonly called *Sella equin*
It is not so big in Men, as in many other Crea
tures, being hardly bigger than a large Peas
Its substance is far differing from that of othe
Glands: "In consistence indeed (as Dr. *Ridle*
sayes) "'tis the same with most of the conglo
"bate kind, if not somewhat harder; bu
"the

" then being preſt or ſqueezed, it emits much " more water than any of them. In its circumference 'tis almoſt four-ſquare, above ſomewhat hollow, and below convex. It is covered with a very thin Membrane from the *Pia Mater*, proceeding from the *Infundibulum*, and by means of this Membrane it is knit very cloſely to the *Sella*.

Its Uſe. It has been heretofore a current opinion, that on this gland is poured by the *Infundibulum* that ſerous humour that is collected in the Ventricles of the Brain above; and that from this Gland it diſtils through the holes of the wedge-like Bone upon the Palate, ſo to be ſpit out by the Mouth. But Dr. *Lower* denies this, appealing to the ſtructure of the parts, and his often experiments upon Calves Heads: " In which, he ſays, the wedge-" like Bone lying under the *Glandula pituitaria*, is " ſometimes perforated in divers places, at leaſt " by one large duct, which being divided into " two, does on each ſide open into the Jugular " Veins: ſo that if Milk or Ink be injected thro' " thoſe ducts by a Syringe, it preſently paſſeth " through on each ſide into the ſaid Veins; and " nothing of Tincture will appear about the Pa-" late, Noſtrils, Mouth, *Fauces* or *Larynx*. So " that in a Calf the Humour that proceeds from " the Brain, returns all again into the Veins. " And the ſame thing he ſays he has lately tryed " in a Man's Skull, wherein though the wedge-" like Bone be never perforated, yet Nature has " framed other ducts, whereby all the *Serum* may " be again derived out of the Ventricles of the " Brain into the Blood: for there are two Veſ-" ſels ſeated on each ſide the *Sella Turcica* (to be " deſcribed Book VI. Chap. 6.) which with gaping

" Mouths

" Mouths as it were receive all the Water deſtil-
" led out of the *Glandula pituitaria*, and depoſite
" it on each ſide into the Jugular Veins without
" the Skull; whoſe ducts will eaſily appear, if
" Water or Milk be ſquirted forcibly out of a
" Syringe into either Jugular Vein near the Skull,
" for the liquor will by and by break out near the
" *Glandula pituitaria*; which makes it evident,
" that whatever *Serum* is ſeparated into the Ven-
" tricles of the Brain, and iſſues out of them thro'
" the *Infundibulum*, deſtils not upon the Palate,
" but is poured again into the Blood, and mixed
" with it.] So that according to this opinion,
the Rheum that iſſues ſo plentifully ſometimes in-
to the Mouth and *Fauces*, *&c.* falls not from the
Brain, but, as was noted above, is ſeparated from
the Arteries immediately by the Glands of the
reſpective parts.

Rete mirabile. In thoſe creatures that have the *Glandula pituitaria* large (as in Calves for inſtance) the two Carotid Arteries meeting about the *Sella* of the wedge-like Bone preſently divide themſelves into ſmall twigs, which being interwoven with like (though not ſo numerous) twigs from the internal Jugular Veins, and alſo with nervous Fibres from the larger trunk of the fifth pair of Nerves, make on each ſide a notable *Plexus*, called *Rete mirabile*. There enter into this *Rete* ſome twigs alſo from the Cervical Arteries; and there paſs out of it ſeveral twigs into the *Glandula pituitaria*. So that in theſe Creatures that Gland ſeems to be of the ſame uſe to the *Rete mirabile*, as the *Glandula pinealis* is to the *Plexus choroïdes*, *viz.* to ſeparate a ſerous matter from the arterial Blood. But in Man (according to moſt Anatomiſts) this *Rete* is wholly wanting; ſo that there paſſing only ſometimes a twig or two, and ſometimes none

from

from the trunk it ſelf of the Carotid Artery into the *Glandula pituitaria*, that Gland is of leſs uſe in him than in other Creatures that have the *Rete*. Yet Dr. *Ridley* affirms, that he never found this *Rete* wanting, or with any difficulty diſcoverable in Men, ſpringing from and lying on the inſide of each Carotid Artery. But confeſſes that it is far ſmaller in them than in Brutes; for which difference he thus accounts. "Brutes by reaſon of "their prone poſition, would, but for this *Rete*, be "in danger of having their Brains deluged as it "were with an over-great quantity of the influ-"ent Blood, and of a rupture of the veſſels, by its "violent ingreſs; and this danger ſo much the "more threatned, by how much the ſame cauſe "which brings it into the Brain with that force, "is equally as great and effectual to hinder its "proportionable return: For the relief of which "inconveniency Nature hath contrived a means of "its more eaſie and ſafe deſcent into the Brain, "by turning that one large ſtream of Blood (which "through its being pent in one chanel becomes ſo "rapid) into many more, (by which means the "Carotid trunk above the *Dura Mater* in thoſe "Creatures is very ſmall to what it is beneath; "whereas that Artery in Men, *&c.* hath the ſame "bigneſs on both ſides that membrane) and they "not only reticulated and contorted for the "more ſlow and laborious (which contrivance "the Ancients thought was only for a more exact "preparation of the blood for Animal Spirits) de-"ſcent of the blood, but alſo many of them by "their inſertion into the *Glandula pituitaria*, at-"tended with ſmall Veins iſſuing thence, to take off "ſome part of the burden too..... And that to the "aforeſaid poſition of ſeveral Creatures ought chief-"ly to be aſcribed the variety of magnitude of this

"*Rete*

" *Rete* in ſeveral of them, its ſize in *Dogs* ſeems
" highly to evince; in whom, by reaſon of their
" Horizontal poſition, being neither ſo prone as ſe-
" veral Brutes who feed on graſs, nor ſo erect as
" Man, this *Rete* is found ſmaller than in the firſt,
" and larger than in the laſt.

CHAP. VIII.

Of the Spinalis Medulla.

IT has been our method, whenſoever we have come to the riſe or origine of any part that is extended through ſeveral regions of the Body, to give a general deſcription of it through its whole extent, as if it all belonged to that region where its riſe is. Thus, for inſtance, we gave a general deſcription of all the Arteries of both Head and *Abdomen* as well as of the *Thorax* in our Anatomy of the middle Venter, becauſe they have all of them their riſe from the *Aorta*, that ſprings out of the left Ventricle of the Heart ſeated in that Venter. In like manner having deſcribed the *Medulla oblongata* within the Skull, we ſhall proſecute it in its deſcent down the *vertebræ* of the Neck, Back, Loins and *Os ſacrum*, wherein it is called the *ſpinal marrow:* But this very briefly.

Medulla ſpinalis.

We ſhewed above how its head (the *medulla oblongata*) was joined by the *corpora ſtriata* to the *corpus calloſum* of the Brain, as alſo by thoſe many protuberances that are upon it, both to the Brain and Cerebel, from and through which the Animal Spirits are derived into it. Its trunk within the Brain (after its *crura* are united) is generally about an hands breadth long: but its length

it

the ſpine is very different according to the various ſtatures of Men.

Its *Subſtance* is fibrous (which appears by the help of a Microſcope) as if it were compoſed of innumerable ſlender long filaments, which whether they are hollow or no cannot be diſcovered through their fineneſs. *Its Subſtance.*

If one cut through its Subſtance, there will appear innumerable little ſpecks or ſprinklings of Blood but the Veſſels are ſo ſmall that they cannot be diſcovered. But there are plainly diſcoverable very many twigs of *Arteries* and *Veins* running through the Membranes that inveſt it (being principally branches of the *Cervical*) from which Arteries the Blood is infus'd into the pores of the *Medulla*, as it is imbib'd again from thence by the Veins. *Veſſels.*

It is round and long, and decreaſeth not in its thickneſs by the Nerves that go out of it. But on the contrary (as Dr. *Willis* obſerves) "Where "the moſt and the largeſt Nerves ſpring from it, "it is there thickeſt, at the riſe "of the Brachial and Crural Nerves. Of which he gives this reaſon, "becauſe within the medul-"lar tracts the Animal Spirits do not run down "and paſs by ſwiftly, but for the moſt part iſſu-"ing leiſurely from their fountains, when they "have filled all ſpaces, they keep their aboad in "them; and where more ſpirits are wont upon "occaſion to be ſpent on any work, there are "provided larger receptacles or ſtore-houſes for "them.] Only towards its end in the *Os ſacrum* it grows ſmaller and ſmaller. *Figure.*

It hath three *Membranes*. The firſt is that which immediately cloaths it. This ſpringeth from the *Pia Mater*, and paſſeth through its middle (dividing it into two parts) alone without the outer. *Membranes.*

outer. The twigs of Arteries and Veins run mostly through this. The second covereth the first and springeth from the *Dura Mater*. There no distance between them, as there is in the Brain but one toucheth another close, being knit together by Fibres. The third, proceeding from the Ligament which tieth together the fore parts of the *Vertebræ*, covereth both these.

Its division. It is *divided* all along from the very first meeting of its *Crura* within the Skull, to the end *Os sacrum*, by a membranous partition parting into two; but this division is not apparent in the Spine, because of the *Dura Mater* that covers it but it may be discovered if that be taken off, and the *medulla* severed in the middle. The partition is made of the *Pia Mater*, and by means of it is that the use or motion of *one side* onely sometimes taken away in the Palsie.

As for the *Nerves* that spring out of it, those shall be described after we have done with those of the Brain.

CHAP. IX.

Of the Action of the Brain, and the (supposed) Succus nutritius *of the Nerves.*

IT is generally agreed that the proper *Action* of the Brain (taken in a large sense) is the elaborating of Animal Spirits; and that they are sent from it by the Nerves into the several parts of the Body, for performing both natural and animal Actions. But what and of what nature these Animal Spirits are, and in what particular pa

art of the Brain they are generated, is not greed upon by learned Men.

Steno thinks it not improbable, that the Animal Spirits are of the same nature with the matter of light. Dr. *Ridley* calls them *fluidum Animale*, of which he thinks there is no reason to form any other *Idea* than what we ordinarily have of the purest liquors. And he looks upon his Animal fluid onely as a body consisting very minute and flexile particles, contain- p. 108. d in such a space as allowes them a capacity being agitated on all sides by vertue of the p. 155. btil matter or ethereal *globuli* they swim in, *&c.* r. *Willis* supposes they are spirituo-saline, and at in the Muscles they do effervesce with a *tex* of a contrary nature supplied by the lood, whence the Muscle grows turgid, and nsequently contracts. Some are of opinion at they differ in no other regard from the Vi-l, but only as they are conveyed by proper ssels, and minister to other purposes, and are a cooler temperament; but that there is no ecifical difference betwixt them. Others on the her side think they differ *in specie*, and agree in thing, but only that the Vital Spirits and Blood e the matter out of which the Animal Spirits e formed. Another sort deny the Arterial Blood be the matter of these Spirits, and affirm that e Nerves of the Stomach, *&c.* absorb a part of e Chyle, of which they are made, and besides, a Nutritious Juice, *(* of which by and by. *)* And ne there are that suppose Air also to be an Ingedient, which either ascends into the Brain ough the *Os cribriforme*. (and fills the Ventrics, according to *Fracassatus*) or insinuates it lf into the Blood as that circulates through the Lngs. We cannot stand upon the examination

The Animal Spirits when, and of what made.

Anat. of the Brain.

and refutation of several of these Opinions here but upon a due consideration of the Argument urged for each, we think that the Animal Spirit are specifically distinct from the Vital, but tha the Vital, with the Arterial Blood, their Vehicle are the true and onely matter, out of which the are elaborated.

Where elaborated. And there is no less difference in what part o the Brain the Animal Spirits are made. Som deputing to that office the *Sinus* of the *Falx* others the four Ventricles of the Brain, especiall the fourth, a third sort the *Plexus choroïdes* an *Rete mirabile*; *Des Cartes* thinks, that they are se parated out of the Arteries of *Plexus choroïdes* i the *Glandula pinealis* into the Ventricles; an others lastly assign the substance of the Brain an Cerebel (especially their cortical part) for th place of their confection. As to the *Sinus* of th *Falx*, the Use of that was shewn above, *Chap.* And as to the Ventricles, seeing they are ofte almost *quite full* of watérish humour, but alway have *some*, they seem very unfit for the making o storing up such subtile and volatile Spirits as th Animal are. As for the *Plexus choroïdes* and *Re mirabile*, there is no Vessel that goes out of eith which contains any thing but under the form Blood; so that seeing there are no *Vasa deferent* (or call them what you will) to convey the Spiri from these *Plexus* to the origin of the Nerves, v cannot reasonably ascribe to them such an Actio We must therefore subscribe to the last Opini that ascribes this work to the very substance the Brain and Cerebel, and is performed in th manner. The Heart is like the *Primum mobile* the Body, to which the motion of all the h mours, that have once past it, is owing. Th by its *Systole* impells the Blood, as into all oth

par

arts, ſo into the Brain by the ſeveral branches f the *Carotides*, whoſe innumerable twigs run iefly through the outer *Cortex* or greyiſh part of ie Brain and Cerebel, and partly into the inner iedullar or white ſubſtance. Theſe twigs of rteries ſpring partly from the *Plexus choroïdes*, id *Rete mirabile* (in thoſe Creatures that have) and partly from the *Carotides* themſelves im-ediately. The ſuperfluous *Serum* is ſeparated om the Blood contained in the Arteries before ey enter into the Brain and Cerebel, by the lands above deſcribed; and that Blood which not elaborated into Animal Spirits in theſe rts, is returned again to the Heart by the Veins. ut thoſe particles that are fit, and proper to be nverted into them, are extravaſated into the ry *Parenchyma* of the Brain and Cerebel, (*viz.* eir Cortical Part) or at leaſt are diſtributed rough it by inviſible Capillaries, in which be-g perfected into Spirits, theſe by help of the bres or Filaments which the inner medullar ſub-ance of the Brain and Cerebel chiefly conſiſts of, e conveyed to the *Medulla oblongata* by the *rpora ſtriata* and other proceſſes whereby the *edulla* adheres to the Brain and Cerebel; out which *medulla* they enter the Nerves, whoſe ner ſubſtance is fibrous like the *medulla* from hence they ſpring. And the reaſon of this ſuc-ſſive motion from one to another, is the Pulſe the Heart, whereby that which comes behind, ways drives forward what is before. Whence e true cauſe of an Apoplexy (wherein motion d ſenſe are almoſt quite aboliſht) is very pro-bly from the obſtruction or compreſſion, *&c.* the Arteries in the Brain and Cerebel; where-both little Blood and Vital Spirit can be con-yed thither to make Animal Spirit of, and alſo

when it is made, it is not impelled thence int the *medulla oblongata*, nor out of it into th Nerves, to enable them to perform their functi ons.

The Succus Nutritius *of the Nerves.*

There is no leſs controverſie about the *Nutriti ous Juice* of the Nerves: ſome contending for i to that height, as to affirm that all the parts o the Body are *onely* nouriſhed by *it*, and not at a by the Blood, which by its rapid motion they ſa is liker to wear and carry away ſomething fro the parts through which it paſſes, than to adher to them for their reſtauration. Others are mor moderate, and ſuppoſe that nouriſhment is di penſed onely to the ſpermatick parts by th Nerves, which the Nerves receive not from th Blood, but imbibing the moſt thin part of th Chyle out of the Stomach and Guts, they carry i up to the Brain, from whence it is conveyed agai by the ſame or other Nerves to the parts to b nouriſh'd by it. *Diemerbroeck* is of opinion, tha the juice of the Nerves (which is as a Vehicle t the Spirits) being ſomewhat acid, does contribut or yield aſſiſtance to the nouriſhment of the ſpe matick parts, not as it is the matter of, but as ſeparates from the Blood ſuch particles as are f for, their nouriſhment. Whence it is, he ſay that ſuch parts of the Body as are moſt exerciſe and by conſequence into which moſt Animal Sp rits flow, grow the ſtrongeſt, having more ſuch particles of the Blood as are fit for their r ſtauration, ſeparated in them. So they that a uſed to walk, will endure it better, than othe that are not ſo uſed, tho' otherwiſe much ſtronge And hence the right Arm is uſually ſtronger th the left, in thoſe that are right-handed (as v ſay.) But he thinks that the Nerves have jui

uice in them which they did not firſt receive from he Blood. Dr. *Willis* is much of his Opinion, aving as to this laſt particular; for he ſays, it is ithout doubt that the nervous Fibres and Fila-nents which cloath the ſenſory of the taſte, and he Bowels that ſerve concoction, do immediately ake ſome taſte of the Aliments for the ſupply of he Brain, eſpecially at ſuch times as the Spirits re much waſted in too long faſting or over much xerciſe. But then that juice that may be ſuppo-d to be made thereof in the Brain, and to be iſpenſed by the Nerves into all the parts of the ody, he believes not to be the matter of the ouriſhment of any part whether ſpermatick or nguineous: but that it is as the *form* onely, and ne Blood the *matter*, whoſe ſeveral particles be-ig analyſed or ſevered by the ſaid juice, are di-ected and adapted by its *directive faculty* or *pla-ick power*, as it were, to ſuch parts reſpectively they are ſuitable for. And from hence he draws reaſon why paralytick parts do waſte ſo much, nough the Blood flow plentifully enough into nem, *viz.* becauſe the Nerves being obſtructed, nd no Animal Spirits (with their Vehicle) paſſing them, the particles of the Blood are not ſepa-ated for the ſupply of ſuch parts.] As for the ervous juice, it muſts needs be very little in quan-ty, ſeeing if one make a Ligature upon the erve, it will not ſwell betwixt the Head and igature; nor if one cut the Nerve in ſunder, will ny thing diſtil out of it. So that it ſeems very bſurd to think that it ſhould be ſufficient for the ouriſhment of *all* the parts of the Body, according the firſt opinion. Nor does it ſeem reaſonable imagine that the Chyle ſhould aſcend from the omach, *&c.* to the Brain by the Nerves, whiles his nervous juice that is contended for, with the

Animal Spirits, is descending by the same; for one cannot conceive how such contrary motions of liquors in the same Vessel can be at the same time. Though from the sudden refection that persons ready to faint receive from spirituous liquors, *&c.* it be probable that certain *Effluvia* or subtil and spirituous vapours do enter the nervous filaments of the Mouth and Stomach, and recruit the Animal Spirits immediately, without fetching that compass that I believe all the Chyle does. And as the Nerves imbibe no Chyle from the Stomach, *&c.* so receive they no more from the Arteries, than some of its most spirituous and volatile particles elaborated in the Brain into Animal Spirits, which have indeed some little moisture accompanying them as a Vehicle, but which is neither of a suitable nature nor of proportionable quantity for the nourishment even of the spermatick parts only. For seeing the Nerves have no conspicuous Cavity, but only imperceptible Pores, by which any liquor can drill along them; such liquor must needs be most thin and watery, and therefore unfit to be assimilated to any part. And lastly, as to the Opinion that it separates the particles of the Blood, and so distributes those that are respectively proper for unto, each part, as the sulphureous to the fat *&c.* or is to the Blood as the form is to the matter; it is an ingenious Hypothesis I confess, but whether true, I dare not affirm. I shall only add what Dr. *Havers* sayes on this subject, *viz.* "I do not suppose that the *succus Nutritius* of the "Body is from the Nerves; yet they have, as "other parts, a supply of it for their own nourish"ment, which I take to be all the *succus Nutritius* "they have.]

CHA

CHAP. X.

Of the Nerves arising from within the Skull; and first of the first and second Pairs.

WE have now done with all the parts of the *Encephalos* wherein the Animal Spirits are either elaborated or stored up, and have also described the nature of the Spirits themselves: it remains, that we shew by what and how many instruments they are dispensed to the parts for the performance of whose functions they are necessary. These Instruments are the *Nerves*, all of which spring either out of the *Medulla oblongata* within the Skull, or out of the *Medulla spinalis* in the Spine. They all of them arise by *Pairs*, so that they are not reckoned to be so many *Nerves*, but so many *Pairs* of Nerves. As for the *Pairs* within the Skull, they were formerly reckoned to be but *seven*, summ'd up in these Verses,

Optica prima; oculos movet altera; tertia gustat:
Quarta, & quinta audit; vaga sexta; at septima linguæ est.

But stricter Examination has found them to be more; Dr. *Willis* particularly has encreased them to the number of *Ten*, holding the *Processus mammillares* to be the *olfactory* Nerves, and the *Par vagum* and *Intercostale* to be two distinct pairs: and lastly, describing a tenth pair, which descending out of the Skull with the *Medulla*, emerges betwixt the first and second *vertebræ* of the Neck. We shall adhere to this account, and de-

ſcribe the *Olfactory* and *Optick* in this Chapter, and the reſt afterwards in order.

Nervi Olfactorii, *the firſt pair.* *Their riſe.* Of all the *pairs* of Nerves that riſe within the Skull, the *Olfactory* or ſmelling pair ariſe the foremoſt, and are therefore reckon'd for the firſt. The ſpring from the *Crura* of the *Medulla oblongata* betwixt the *Corpora ſtriata* and the little hillock or eminences out of which the optick Nerves riſe (called by *Galen* their *Thalami.*) Though *Diemerbroeck*, that (following the Ancients) denies them to be Nerves, affirms that they ſpring not from the ſaid *Medulla*, but from the globous marrow of the Brain (properly ſo called) and its fore Ventricles.

Progreſs. From their riſe they run forwards under the *baſis* of the Brain, (encreaſing in bulk as they go) as far as to the *Os cribriforme* at the top of the Noſe, growing there into round proceſſes like Paps, being therefore called *Proceſſus papillares* or *Mammillares.*

Cavity and Subſtance. They are manifeſtly hollow in their whole progreſs, and their ſubſtance is very marrowy and ſoft.

Inſertion. Having arrived at the *Sinus* of the ſieve-like Bone, they there acquire coats of the *Dura Mater* with which being clad, Dr. *Willis* ſays, they are divided into many Fibres and Filaments, which paſs out of the Skull through the holes in the ſaid Bone into the caverns of the Noſtrils, running through the Membrane that inveſts thoſe caverns.

Uſe. Dr. *Willis* aſcribes a double *uſe* to them, making them both the true Organs of Smelling, and alſo Emunctories to the Brain, thinking that when too much *Serum* is collected in its Ventricles, theſe deriving it thence, ſend it forth by their filaments through the *Os cribriforme* into the Noſtrils. *Diemerbroeck* believes they have only this latter uſe

only

nly that the *Serum* or *Lympha* diſtils from
iem as well upon the *Fauces* and their Glands,
s into the Noſtrils. Dr *Lower* grants only the
rmer; and ſays, that "It is incredible that the
humour that is contained in the cavity of theſe
proceſſes ſhould iſſue out by the Nerves, (or
Nervous Filaments) into the Noſtrils, for if it
did, the ſenſe of Smelling muſt needs be much
prejudic'd thereby. And beſides, if this water
could diſtil by and out of the Nerves, much
more might the Spirits, that are thinner, and
more ſubtil, fly away. And as to the humour
contained in the cavity of the Proceſſes, he
ſuppoſes it to be of very great uſe: namely,
that when *Effluvia*, or moſt ſubtil Particles ex-
haling from an external object, are delivered to
the *Olfactory Nerves*, that their Species may
reach the Brain the better, it was neceſſary
that theſe Nerves or *Proceſſes* ſhould be made
hollow from their very riſe, and be filled with
a limpid humour: Not that I believe, *ſays he*,
that the Species themſelves are conveyed
through their cavities into the ventricles of the
Brain, or that the Animal Spirits are lodged in
thoſe Ventricles, as the Ancients thought;
but that they are therefore hollow and moiſten'd
within with water, that their marrowy Bodies
may ſerve the better both for retaining and
conveying Smells into the Brain: For as things
ſmelled are better perceived from moiſt Bodies
and in a moiſt Air, than in a dry ſeaſon from the
parched ground (as Huntſmen know too well)
ſo it is likely that in the ſame manner as they
are beſt perceived outwardly, they are alſo beſt
conveyed inwardly, *&c.*] And indeed, if we
will allow them to be Olfactory Nerves, (as I
think there is great reaſon) it is very incongru-

ous

ous that they ſhould ſerve for an Emunctory t the Brain, to diſcharge its ſuperfluous *Seru* And therefore we think it fit to acquieſce in th Learned Phyſician's Opinion; and to believe th the *Lympha* or *Serum* gathered in the ventricles the Brain, is emptied by thoſe ways we before o ſerved out of the ſame Author, and not at all t the nervous Filaments that paſs from theſe Pr ceſſes through the *Os cribriforme* into the N ſtrils.

Nervi optici, *the ſecond pair. Their riſe.*

The *ſecond pair* are the *Optici* or *Viſorii Nerv* which beſtow upon the Eyes the faculty of ſeein They ſpring from the upper ſides of thoſe un qual protuberances of the *crura* of the *Medulla o longata*, which are called *Nervorum opticorum th lami*; from whence being carried forward, ar ſomewhat downwards, after having fetcht a cor paſs, they meet one another about the *Infun bulum*, upon the *ſella* of *Os ſphenoides*; whe they are united by the cloſeſt conjunction, b not confuſion, of their Fibres, which run parall lengthways in theſe Nerves, as they do in a other.

Cavity.

They are obſcurely hollow until they be un ted; but after, their hollowneſs cannot be diſce ned. This hollowneſs may be ſhewed in a lar Beaſt newly killed, and in a clear light.

Thus do *Riolanus*, *Gliſſon*, *&c.* teach. But *V ſalius*, *Aquapend. &c.* deny that they have ar manner of cavity. *Malpighius* ſays, "They ha "not one cavity only, but ſundry; but that the "cavities reſult only from the neceſſity of the "ſtructure, all their inner or medullar part co "ſiſting of round *Inteſtinula* or Fibres runnir "lengthways, which cannot be ſo cloſely fitte "to one another, but that there will reſult lor

De Cerebr. p. 22.

Interſtice

Interſtices, which yet perhaps are of no uſe, nor of the nature of Ducts, but only accidental. But whether the *Inteſtinula* or Filaments themſelves have not little chanels in them, (like to Blood-veſſels) he thinks may be doubted of: But ſeeing ſenſe has not yet diſcovered any ſuch, 'tis probable that there are to be admitted only little Pores and Interſtices in the medullar ſubſtance, by means whereof the nouriſhing and vivifying juice may be propagated.

Inſertion. After their unition they are ſeparated again, d each of them running further forwards, paſs through an hole of *Os cuneiforme*, and is inſerd obliquely into the centre of the Eye of its vn ſide.

Veſſels. Dr. *Willis* ſays, they receive not only nervous bres from the third pair of Nerves, but alſo vigs of Arteries from the fore-branches of the *arotides*, which run upon them as far as the *yſis* of the Eye. Whence, he thinks, a Reaſon ay be aſſign'd, why, when a man grows ſleepy afr plentiful eating or drinking, he preſently feels notable heavineſs or oppreſſion as it were about is Eyes. For when the Blood becoming very rgid fills the veſſels that run through the Brain, ore than uſual, and by diſtending them ſtops e pores of the Brain; theſe Nerves alſo in their hole courſe are compreſſed by the Blood that is come turgid in their Blood-veſſels likewiſe.

Dr. *Ridley* ſayes, that he has ſeen the bloudeſſels to run not only upon or with them, but alo in injected bodies exactly quite through the edullary ſubſtance of them, into the reticular oat of the Eye, wherein they end in an infinite umber of the moſt capillary ramifications, which y an injection of that Artery, made with Mercury,

cury, becomes very delightfully conſpicuous t the Eye.

Subſtance and parts. They are very ſoft, ſo long as they are withi the Skull, but having paſs'd the *Os ſphenoides*, the become ſomewhat more firm and hard. The re ſon of which alteration ſeems to be, that withi the Skull they are only clad with the *Pia Mate* but as they go out, they aſſume a ſecond coat fro the *Dura Mater*.

They make the proper tunicles of the Eyes. From the whole ſubſtance of theſe Nerves, *viz* from their two Membranes and the inner medu lar and fibrous ſubſtance, are the three (proper Tunicles of the Eyes framed; for the *Cornea* c *Sclerotica* doth proceed from the *Dura Mater*, th *Choroïdes* or *Uvea* from the *Pia Mater*, and th *Retina* from the marrowy ſubſtance.

CHAP. XI.

Of the third, and fourth Pairs.

The third pair. Their beginning. THE *third Pair* are termed *Motorii Oculorum* becauſe they move the Muſcles of the Eye They have their beginning at the innermoſt par or *baſis* of the trunk of the *Medulla oblongata* be hind the *Infundibulum*.

Why both the Eyes are directed to the ſame object. This pair is united at its riſe; whence is com monly drawn a reaſon why one Eye being mo ved towards any object, the other is directed al ſo to the ſame. But though this conjunction ma be a reaſon why the Spirits ſhould flow equall to the Muſcles of each Eye; yet it ſatisfies no why they ſhould flow at the ſame time, into dif ferent Muſcles. As for example; Why, whe one would look to the right ſide, the Spirits ar preſentl

resently determin'd into the *external muscle* of the right eye, and into the *internal* of the left; and not into the external, or internal of both. And therefore a truer reason of both Eyes being moved together to one object, is the intention of the mind, which aiming only to have a view of the object at one time, directs the spirits to those Muscles only that serve to turn the Eye towards that object, *&c.*

They are smaller and harder than the former, and presently parting one from the other, they pass along by the optick pair, and penetrating the second hole of *Os cuneiforme*, are carried towards the globe of the Eye, where each is divided into four branches. The first whereof mounting above the Optick, is bestowed upon the attollent Muscle, and the Eye-lid. The second is inserted into the adducent Muscle by sundry small twigs. The third by many Fibres is inserted into the deprimient Muscle. The fourth passing further in a single trunk, is implanted into the middle of that Muscle that draws about the Eye obliquely downwards to the inner corner. At that place where this Nerve divides it self into four branches, it forms a little round *Plexus*, out of which many under twigs arise that creep through the trunk of the Optick Nerve, serving perhaps to widen or straiten it as there is occasion. *Their substance and branches.*

The *fourth Pair* proceed from the top of the *Medulla oblongata*, (contrary to all others, which arise either from its *basis*, or sides) behind the round protuberances called *Nates* and *Testes*: thence bending forwards by the sides of the *Medulla oblongata*, they presently hide themselves under the *Dura Mater*; under which proceeding a while, they pass out of the Skull each in a single *The fourth pair. Their beginning, march and insertion.*

gle trunk at the ſame hole with the others deſigned for the Eyes, (communicating with no other Nerves in their whole progreſs) and are beſtowed wholly (as Dr. *Willis* affirms) on that Muſcle of the Eye called *Trochlearis*, which ſerves to roll the Eye about. Which motion of the Eye being generally attendent upon or expreſſive of ſome *paſſion* of the Mind, as Love, *&c.* theſe Nerves are thence called *Oculorum pathetici*.

CHAP. XII.

Of the fifth, ſixth, and ſeventh Pairs.

The fifth pair. Their riſe.

THE *fifth pair* ſpring from the ſides of the *Medulla oblongata* where it is encompaſſed with the annular proceſs or protuberance of the Cerebel, (or, as Dr. *Willis* will have it, from that proceſs it ſelf.) Each trunk is very large and broad, conſiſting of very many Fibres, ſome ſoft, and ſome hard: So that it ſeems to be not one ſingle Nerve, but a collection or bundle of many ſmall ones, ſome of which are deſigned for one part, ſome for another; ſome ſerving for motion, and others for ſenſe. And the reaſon why they are *all* united together in their riſe, the ſaid Author thinks to be, that there may be a ſympathy and conſent of actions in the ſeveral parts to which they are diſtributed. Whence it is that ſeeing or ſmelling what is pleaſing to the Appetite makes ones Mouth water, *&c.* becauſe this pair of Nerves ſends twigs both to the Eyes, Noſtrils, Palate, and Tongue, *&c.*

Diviſion and progreſs.

Each trunk is divided into *two* notable branches, ſometimes before, but oftener after it has pene-

trat-

uted the *Dura Mater*. The *first* whereof tending ſtreight downwards, and paſſing out of the ſkull by its proper hole, in its deſcent towards the lower Jaw (for whoſe parts 'tis chiefly deſign'd) is divided into many leſſer Branches, which provide for the temporal Muſcle, as alſo for the Muſcles of the face and cheeks. From theſe alſo there go twigs to the Lips, Gums, roots of the Teeth, *Fauces*, Tonſils, Palate and Tongue. The *ſecond* Branch of this fifth pair, being the larger, goes a little ſtreight forward by the ſides of the *Sella Turcica*, and over againſt the *Glandula Pituitaria* ſends little twigs to the trunk of the *Carotides*, or to the *Rete mirabile* in ſuch creatures as have it: then inoſculates with the Nerve of the ſixth pair, and afterwards ſends back a ſlip or two, which being united with another ſlip returned from the Nerve of the ſixth pair, conſtitute the root or firſt trunk of the *Intercoſtal pair*, which we ſhall reckon for the ninth, and ſpeak of it by and by. After this it is divided into *two* notable branches: The *leſs* and *upper* whereof tends towards the globe of the Eye, and being again divided ſends forth two other, the firſt of which is parted into two more, that go one to the noſe, and the other to that Muſcle of the Eye which is proper to Brutes; and the ſecond into four or five ſlips, that are moſtly ſpent on the Eye-lids, but partly on the *Uvea tunica* and the Glands of the Eye. The *greater branch* (of its ſecond diviſion) being carried towards the orbit of the Eye, is divided into two new branches. The *lower* whereof bending downwards, is beſtowed on the Palate and upper region of the *Fauces*; and the *upper* being carried beyond the orbit of the Eye, paſſes through an hole of the upper Jaw,

Jaw, with the Vein and Artery which it twiſ about, and ſends many ſlips to the Muſcles of th Cheeks, Lips, Noſe, and roots of the upp Teeth. From its twiſting about the ſanguif rous Veſſels deſigned for the Cheeks, and oth parts of the Face, may a reaſon be drawn wh one bluſhes when he's aſham'd: for the Anim Spirits being diſturbed by the imagination of ſon uncomely thing, as if they took care to hide th Face, enter this Nerve diſorderly; ſo that i twigs embracing theſe ſanguiferous Veſſels, b compreſſing and pulling of them cauſe the Bloo to flow too impetuouſly into the Cheeks and Fa by the Arteries, and detain it there ſome time b conſtringing the Veins.

The ſixth pair. Their riſe and inſertion.

The *ſixth* pair riſe juſt by (but below) th fifth, and each preſently ſinking under the *Dur Mater*, goes out of the Skull by the ſame hole wit the Nerves of the third and fourth pairs, and carried by a ſingle trunk towards the orbit of th Eye; but ſo, as by the ſide of the *Sella Turcica* i inoſculates with the ſecond or greater branch o the fifth pair, (as was noted in the former Para graph:) whence ſending back ſometimes on ſometimes two twigs, theſe being united with th recurring twigs of the fifth pair (above-mention ed) make the beginning of the *Intercoſtal Nerv* Afterwards going forwards, near the orbit of th Eye it is divided into two Branches; of whic *one* is inſerted into the abducent Muſcle of th Eye placed in its outer corner; and the *other* be ing cleft into many Fibres, is beſtowed on th ſeventh Muſcle proper to Brutes, whereby the defend the Eye from external Injuries accidental ly occurring, when they are ſaid *nictitare* (whic I think we have no word to expreſs in Engliſh.)

Th

The *seventh* pair, by the Ancients commonly reckon'd for the fifth, minister to the sense of hearing. Each Nerve has two Processes, one soft, and the other harder, which might seem to be two distinct Nerves, but they are usually accounted for one. They spring a little behind the former, out of the sides of the *Medulla oblongata*. Dr. *Willis* says, the *softer* process arises from the lower side of the annular protuberance, from whence it ascends; and the harder from its upper part, from whence descending it meets the other. The *soft* part or process (that is properly the auditory Nerve) is carried through an hole of the *petrosum* into the cavern of the Ear, which it cloaths with a most thin Membrane. By this are sounds conveyed to the common Sensory. The *harder* process serves rather for motion than sense; which passing out also through the *Os petrosum*, by its proper hole, presently admits a twig from the *Par vagum* or eighth pair, after which it is immediately divided into *two* branches; *one* whereof tending downwards, is bestowed on the Muscles of the Tongue and *Os hyoides*; and the *other* winding about the auditory passage, and riding upwards, is divided into three twigs; of which the *first* corresponding to the Nerve of the first division, bestows certain slips on the Muscles of the Lips, Mouth, Face and Nose, and so animates some outward organs of the Voice, as the former some of the inner; the *second* is distributed to the Muscles of the Eye-lids and Forehead, and the *third* to the Muscles of the Ears. Whence upon some unusual and astonishing sound, or a certain natural instinct, the Ears prick up, and the Eyes open. As also the voice does officiously answer as an Echo to those sounds that are perceived by the Ears, from the community of

The seventh pair. Their rise and insertion.

the Nerves distributed to the organs of the voic and Hearing.

CHAP. XIII.

Of the eighth, ninth, and tenth Pairs.

The eighth pair.

THE next *Pair* in order is the *eighth*, whi has used to be reckon'd for the sixth, a is otherwise called *par vagum*, or the *wandri pair*, from their being distributed to sundry par

Their rise.

They spring below the auditory Nerves, o of the sides of the *Medulla oblongata*, the root each Nerve consisting of twelve Fibres at le (in Man) to which a notable Fibre, or rath *Nerve* (much greater than any of these twelv coming from the spinal Marrow as far as from bout the sixth or seventh *vertebra* of the Neck, joyned, and both are invested with the same C from the *Dura Mater*, as if they grew into c Nerve; but if their common Coat be remov this accessory Nerve, and many of the other bres remain still distinct, and after they are g out of the Skull together, are dispensed to se ral parts; the accessory Nerve to the Muscles the Neck and Shoulder-blade; and one nota Fibre of the eighth pair to the harder proces the Auditory or seventh pair, as also two oth to the Muscles of the Gullet and Neck. But other Fibres of this *par vagum* continue unit and instead of those companions they have p ted with, each Nerve entertains a new c namely a branch from the *Intercostal* or *ninth* p whereby is made a notable *Plexus* (which Nerve is like the Joint of a Cane, or the K

u

pon the Trunk of a Tree where a Bough goes it, whence they are called *ganglioformes*) and at of the same *Plexus* there springs a considerable branch, which being carried towards the *Larynx* is divided into three twigs, of which one goes to the sphincter of the Gullet, a second to the upper Muscles of the *Larynx*, and the third going under the *Cartilago scutiformis*, meets the top of the recurring Nerve and is united to it. Below the aforesaid *Plexus* of this *par vagum*, each trunk goes streight down by the sides of the ascending *Carotides*, on which they bestow some slips. And at the bottom of the Neck each receives a second branch from the Intercostal, (*viz.* from its first *Plexus*) and near thereto the left Nerve of this pair sends out another twig into the recurrent Nerve, but so does not the right. From hence both trunks descend without any notable commification, till they be come over against the first or second Rib; where out of a second *Plexus* (or knot) many Twigs and Fibres go towards the Heart and its appendage, from whence this *Plexus* is called *Cardiacus*. There is one notable difference (which we cannot but note) of the two *recurring Nerves* that spring out of the trunks of this eighth pair, *viz.* That that on the right side arises out of it higher, and windes about the Subclavian Artery; whereas that on the left springs much lower therefrom, and twisting about the descending trunk of the *Aorta* returns back from thence. Dr. *Willis* says that the *recurring Nerve* is really a distinct Nerve from the *Par vagum* from the very Original, and was onely included in the same case or cover for the more convenient and safe passage. The branches of the *Par vagum* do frequently unite with others of the Intercostal pair about the *Præcordia*. And when *Progress.*

their two Trunks are descended as low as over against the Heart, many twigs go out of them into the Lungs, *&c.* Whence both trunks descending by the sides of the Gullet are divided into two branches, *outer* and *inner*: The outer unite with the outer, and the inner with the inner, and both descend to the Stomach, in which *End.* they terminate, but are spent chiefly upon its upper orifice. As for their more particular distribution, we have spoken thereof while we treated of the parts themselves on which they are bestowed.

The ninth Pair. We are next to describe the *ninth pair* (which before Dr. *Willis* was not distinguished from the going before.) It is called the *Intercostal*, because as its Trunks march down by the roots of the Ribs, betwixt every Rib they receive a branch *Their Rise.* from the spinal pairs. They have no proper root of their own, but each trunk is compounded of two or three recurring branches of the fifth and sixth pairs, (near their origine) as was noted *Progress.* when we treated of those pairs. Being thus formed they pass out of the Skull by their proper holes, and presently each has a *Plexus* near those of the *Par vagum*, into which, two nervous processes from the tenth pair of the Brain are inserted, and out of which there goes a twig into the sphincter of the Gullet, and into the *Plexus* (aforesaid) of the *Par vagum*. Whence descending by the *vertebræ* of the Neck, by that time they arrive at the middle, each has another greater *Plexus*, into *which* a large Nerve from a neighbouring vertebral pair is inserted; and *from which* proceed many twigs that uniting with others of the *Par vagum* are distributed all about the *Præcordia*, also one single one a little lower. This *Plexus cervica*

rvicalis out of which ſo many branches ſpring, is
oper to Man, being not found in Brutes. From
e Neck they deſcend by the *Claviculæ* into the
horax, where having arrived at the ſecond Rib,
ch receives three or four branches from the ver-
bral Nerves next above, whereby is made ano-
er notable *Plexus* (commonly called the *Inter-
bal.*) From whence as they paſs down by the
ots of the Ribs, in every one of their Interſti-
s and even as low as *Os ſacrum*, from every
inting of the *vertebræ* each receives a vertebral
nch. Aſſoon as they are deſcended out of the
rity of the Breaſt, and are come over againſt
e Stomach, each ſends forth a notable branch,
hich tending towards the Meſentery, make its
ief *Plexus*, which are in number *ſeven*, *five*
ge ones which are *upper*, and *two leſs* that are
wer. For each branch is preſently divided into
o other, and every one forms one *Plexus*,
hich make four; and the fifth is in the middle
f theſe, being the largeſt, and like the Sun a-
ongſt the Planets (as Dr. *Willis* compares it.)
nd theſe are the *five upper*. The *two lower* are
rmed of branches that ſpring from the trunks
deſcended as far as the lower part of the Loins,
nd are diſtinguiſhed by the names of *Plexus Infi-
us*, and *Minimus*. As to the parts that all the
rigs which ſpring from theſe ſeven *Plexus* are
distributed to, it may be learned from the deſcrip-
on of the parts themſelves in the *Firſt Book*, in
hich we conſtantly mentioned from whence
ch part had its Nerves. Laſtly, when this In-
coſtal pair is come to the *Os ſacrum*, its two
runks bend toward each other, and ſeem to
e knit together by two or three Proceſſes, and
t length each of them *ends* in ſmall Fibres *End.*
hat are diſtributed into the Sphincter of the
ani,

The tenth Pair. Their Rise and Progress.

We are now come to the *tenth* and last pair of Nerves that rise from the *medulla* within the Skull. This pair spring from the sides of the *medulla*, behind all the rest, and descending with it out of the Skull into the *vertebræ* of the Neck, they come out betwixt the first and second *vertebræ* thereof. Presently after their egress each sends forth a branch into the *Plexus* of the Intercostal Nerve of its own side: but their main trunks being carried downwards, and each receiving a twig from the ninth pair, they are bestowed on the Muscle *sternothyreoïdeus*, and some other Muscles of the Neck. So that though this pair rise within the Skull yet it seems to be more of the nature of the Vertebral Nerves, as bestowing some branches on the Intercostal, and being all the rest of it spent upon the Muscles of the Neck.

And thus we have done with all the Nerves that proceed from the *Medulla* within the Brain, in describing of which we have followed Dr. *Willis* for the most part, that most accurate Tracer of them.

Tab. XV.

Fig. I. Representeth the outer or upper superficies of the Brain taken out of the Skull; when the *Limbus* of the Brain being loosed from its coherence with other parts by Membranes, is lifted up and bent forwards, that the *Crura* of the *Medulla oblongata*, the *Fornix*, *Nates* and *Testes* with the *Glandula pinealis*, and other processes may be clearly and distinctly seen, (from Dr. *Willis.*)

AA *The* Limbus *of the Brain, which in its natural Situation was contiguous to the* Cerebellum.

Fig. 1.

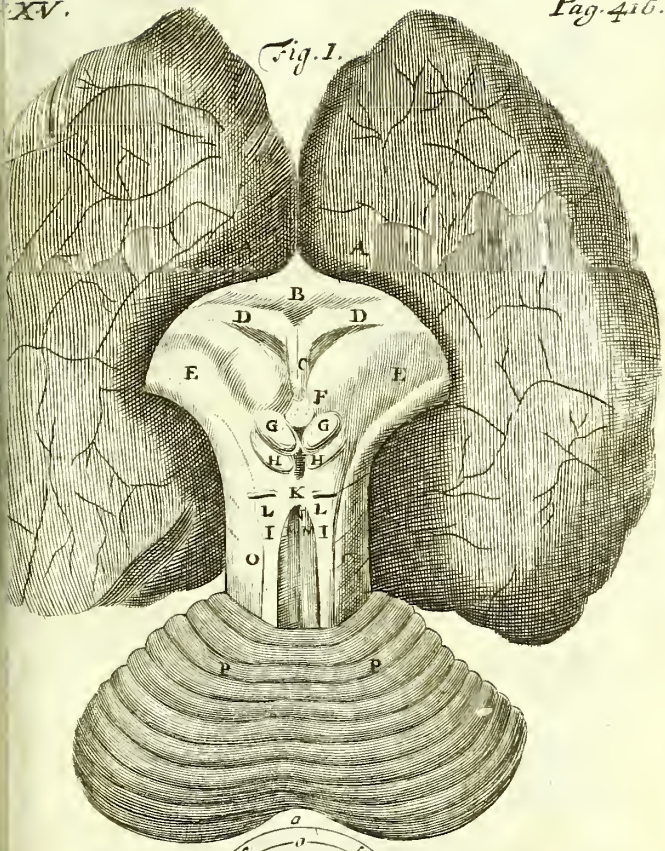

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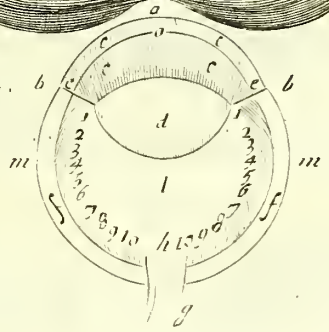
Fig. 2.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B *The Bordure or Margent of the* Corpus callosum *spread over both Hemispheres of the Brain, which in its natural Situation lay upon the* Glandula pinealis.

C *The* Fornix.

DD *Its Arms embracing the* Crura *of the* Medulla oblongata.

EE *The* Crura *of the* Medulla oblongata, *(out of which the optick Nerves proceed) whose Ends (being placed further out of sight) are called* Corpora striata.

F *The* Glandula pinealis, *betwixt which and the root of the* Fornix *is the chink that leads to the* Infundibulum.

GG *The orbicular Protuberances called* Nates.

HH *The lesser Protuberances called* Testes, *which are Processes of the former.*

II *The Medullary Processes, which ascend obliquely from the* Testes *to the* Cerebellum, *and make a part of each of its* Meditullia.

K *The joining of those Processes by another transverse Process.*

L *The Rise of the pathetick Nerves (or fourth pair) out of the joining of the aforesaid Processes.*

MM *A portion of the* Medulla oblongata *lying under the aforesaid Processes and Protuberances.*

N *The* Foramen *of the Ventricle or Cavity that lies under the orbicular Protuberances.*

OO *A portion of the annular Protuberance let down from the* Cerebellum *and embracing the* Medulla oblongata.

PP *The outer and upper Superficies of the* Cerebellum.

Figure II.

Representeth the Eye cleft in two (from behind forwards) that the divers Situation of the humours may appear, (from Dr. *Briggs.*)

b a b *The* Tunica cornea, *or fore and more convex arch of the Eye.*

e e *The* Tunica uvea (*whose* Foramen o *is called the* Pupilla) *swimming in the watry humour* cccc.

d *The Crystalline humour* in situ.

f f *The* Tunica choroides, *which in this Figure (as being too much separated from the* Sclerotica mm) *cannot be duly represented.*

g *A portion of the Optick Nerve.*

h *Some of its small Fibres cut off near the* exit *of the Nerve.*

I *The Centre of the* Humor Vitreus, *and of the* Retina.

1, 2, 3, 4, 5, &c. *The* Capillamenta *of the Optick Nerve, whose ends on each side being cut off did adhere to the* Ligamentum ciliare (*namely by the Region of the Crystalline humour.*)

Tab. XVI.

Fig. I. Represenleth the Basis of an Humane Brain taken out of the Skull, with the Roots of the Vessels cut off short, (from Dr. *Willis.*)

AAAA *The fore and hinder Lobes of the Brain.*

BB *The* Cerebellum.

CC *The* Medulla oblongata.

DD *The Olfactory Nerves, or first Pair.*

EE *The Optick Nerves, or second Pair.*

FF *The Motory Nerves of the Eyes, or third Pair.*

GG *The Pathetick Nerves of the Eyes, or fourth Pair.*

HH *The fifth Pair.*

II *The sixth Pair.*

Fig. 1.

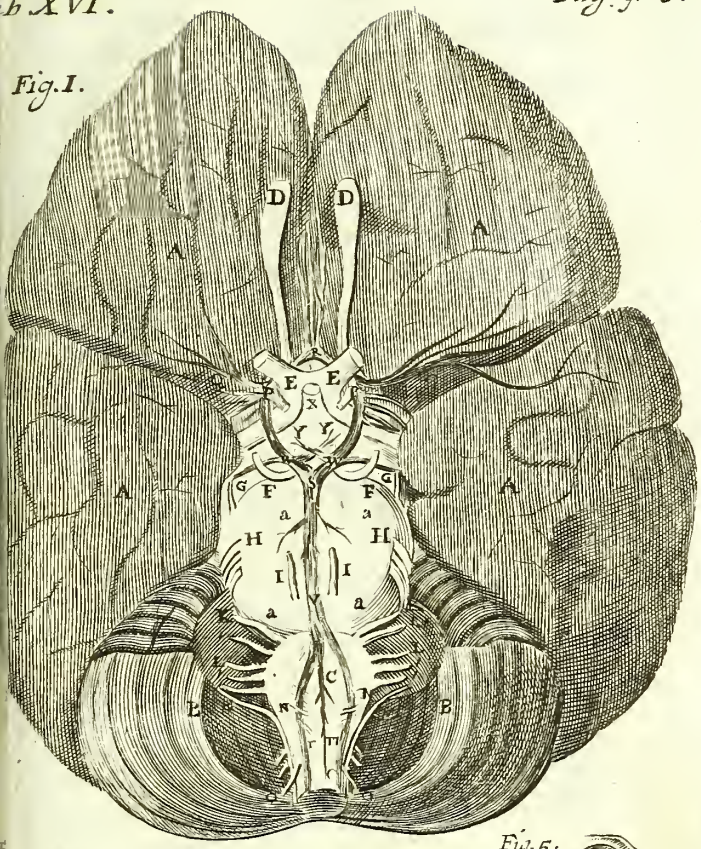


Fig. 2.

Fig. 3.

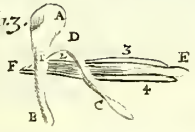


Fig. 4.

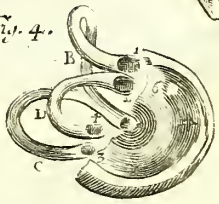


Fig. 5.

KK kk *The Auditory Nerves, and their two Processes on each side, the seventh Pair.*

LL lll, &c. *The* Par vagum *or eighth Pair, consisting of several Fibres.*

MM *The Spinal Nerve coming from afar to the Origine of the* Par vagum.

NN *The ninth or Intercostal Pair, consisting also of many Fibres (that tending downwards, unite into one Trunk) which emerges a little above the Process of the* Occiput.

OO *The tenth Pair tending downwards.*

PP *The Trunk of the Carotid Artery cut off, where it is divided into the fore and hinder Branch.*

QQ *Its Branch passing betwixt the two Lobes of the Brain.*

R *The fore Branches of the* Carotides, *being united, part again, and proceed to the Fissure of the Brain.*

S *The hinder Branches of the* Carotides *united, and meeting the Vertebral Trunk.*

TTT *The Vertebral Arteries, and their three ascending Branches.*

U *The Branches of the Vertebral Arteries uniting into the same Trunk.*

WW *The place where the Vertebral and Carotid Arteries are united, and a Branch on either side ascends to the* Plexus choroides.

X *The* Infundibulum.

YY *Two Glands placed behind the* Infundibulum.

aaaa *The annular Protuberance, which proceeding from the* Cerebellum *embraces the Trunk of the* Medulla oblongata.

Fig. II. Exhibits a side-view of the Anvil and Stirrup (two bones in the first cavity of the Ear) *in situ*, from Monsr. *du Verney*.

A *The*

A *The thick part of the Anvil.*
B *The ſhort Branch which in this ſituation we behol fore-right.*
C *The long Branch.*
D *The Head of the ſtirrup which is joined with th long Branch, the fourth little bone coming between.*
E *The Muſcle that is inſerted into the Head of th Stirrup.*

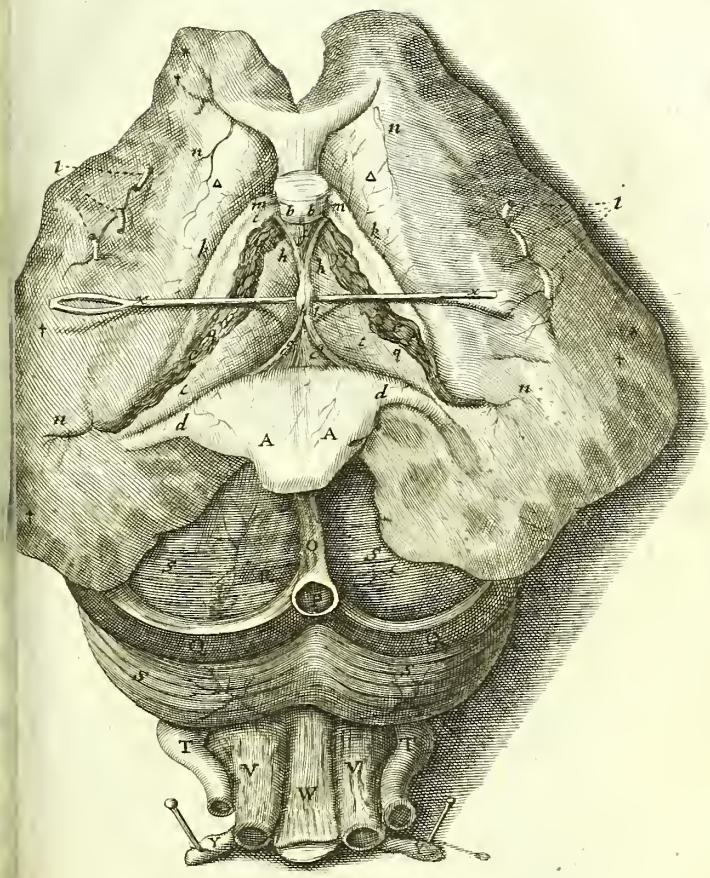
Fig. III. Repreſents the Hammer (a third Bon in the ſame cavity) on its fore-ſide with it Muſcles *in ſitu*, from the ſame Author.

A *The Head of the Hammer.*
B *The Handle.*
C *The external Muſcle of the Hammer.*
D *Its Inſertion.*
E *The internal Muſcle.*
F *The place where it is fitted for its Inſertion into th Handle of the Hammer underneath the externa Muſcle.*
1. *The great Proceſs of the Hammer in a direc View.*
2. *The ſlender Proceſs into which the external Muſc is inſerted.*
3. 4. *The nervous Covering of the internal Muſc opened in the middle, that the Muſcle may be ſee*

Fig. IV. Shews a portion of the *Veſtibulum* entrance of the Labyrinth (a ſecond cavity the Ear) with its three ſemicircular Canal from the ſame Author.

A *The lower part of the* Veſtibulum.
B *The upper Canal.*
C *The lower.*

D T


A
A
T
V
W
Y

) *The middle.*
. *The entrance of the upper semicircular Canal.*
:. *The first entrance of the middle Canal.*
;. *The entrance of the lower Canal.*
+. *The other entrance of the middle Canal.*
;. *The common entrance to the upper and lower Canals.*
5. *The first Hole that gives a passage to one of the Branches of the soft part of the auditory Nerve.*
1. *The second Hole that gives a passage to another Branch of the same Nerve.*

ig. V. Shews the *Cochlea*, which the foresaid Author makes a part of the Labyrinth, but other Anatomists call a third Cavity.

Tab. XVII.

Representeth the Brain in a middle section, the Blood-vessels being first injected with wax, (from Dr. *Ridley*.)

AA *The* Fornix *cut off at its roots and turned back.*
b b *Its roots at the beginning of the* Thalami Nervorum opticorum.
c c &c. *The* Thalami Nervorum opticorum.
d d *That part of the* crura Fornicis *which growing somewhat thicker as it turns off towards the Lateral Ventricles, runs over the* crura Medullæ oblongatæ, *which being very prominent in Sheep and Calves, help to thrust it up into such a protuberance as the Ancients called* Bombyces *or* Hippocampi.
e e *That part of the* Plexus Choroeides *which is made of the first branch of the Cervical Artery, sometimes seeming as though it came from the communicant branch in the lateral Ventricles.*

f *The place where thoſe two* Plexus's *on each ſide meet under the* Fornix.

g g *That other part of the* Plexus *which is made of the ſecond branch of the Cervical Artery joined with the firſt by a communicant branch not to be ſeen here, lying under the* crura Fornicis, *which is expanded all over the* Iſthmus, *becoming glandulous near to, and eſpecially under the* Glandula pinealis *covered here with the* Fornix.

h h *Two large Veins coming from the top of the upper part of the* Plexus *down to the other branch of the* Plexus, *all the length of the third Ventricle, and then terminates in the fourth* Sinus.

i i *The trunks of ſeveral Arteries appearing as they were cut off in dividing the medullary* † *and cinericious* * *part of the Brain.*

k k *A venous branch on each ſide entring the* Plexus Choroeides, *from whence there are many ſlips branched upon the* corpora ſtriata.

Δ Δ *The* corpora ſtriata *whole.*

l *The* rima *of the third Ventricle.*

m m *A long medullary tract between the* Thalami Nervorum opticorum *and* corpora ſtriata.

n n, &c. *The Centrum ovale of* Vieuſſenius.

O *The fourth* Sinus *of the* dura mater.

P *The* Torcular *where the* Sinus's *meet.*

Q Q *The lateral* Sinus's.

R *A large Vein entring the lateral* Sinus *on one ſide*

S S, &c. *The* Cerebellum *covered with the ſecond proceſs of the* dura mater *on its uppermoſt part.*

T T *The vertebral Arteries.*

V V *The Vertebral* Sinus's.

W *The* Medulla Spinalis *with its integuments.*

X X *The ſtyle ſupporting the large Veins of the* Plexus Choroeides *in the third Ventricle.*

q q *The Lympheducts of the* Plexus Choroeides.

Y Y *Two of the Cervical Nerves ſpringing from the* Medulla oblongata. † † *The*

† *The medullary part of the Brain.*
** *The cineritious part of the Brain.*

CHAP. XIV.

Of the Nerves of the Spinalis Medulla ; *and first of the Nerves of the Neck.*

WE obſerved above, that when the *Medulla oblongata* is deſcended out of the Skull into the Spine, it loſes its name of *Oblongata*, and acquires that of *Spinalis*, (which name it borrows from the *Spine* through which it paſſes) but is of the ſame fibrous or filamentous ſubſtance as it was within the Brain. And now we come to deſcribe the Nerves that ſpring out of it, which aſſiſt the motion of all thoſe parts, which thoſe 1 pair already deſcribed, that ariſe within the Skull, reach not to.

In its whole progreſs from the Skull to the *Coccyx*, there ſpring out of it *thirty* pair of Nerves : *ſeven* of which are of the Neck, *twelve* of the *Thorax*, *five* of the Loins, and *ſix* of *Os ſacrum*. *Nerves ſpringing from the* Spinalis medulla.

The *firſt* and *ſecond* pairs of the *Neck* come not out of the ſides of the *Vertebræ*, as all the reſt do ; but becauſe of the peculiar articulation of the two uppermoſt *vertebræ*, ſpring out before and behind.

The *fore* Nerve of the *firſt* pair cometh out between the bone of the *Occiput* and the firſt *vertebra* of the Neck, and is beſtowed upon the muſcles of the Neck which lie under or behind the *Oeſophagus*, and on the Skin of the Face. The *hinder* Nerve cometh out of the hole which is com- *Seven of the Neck. The firſt pair.*

common to the *Os occipitis* and the first *vertebra* of the Neck. This hath two twigs: The smaller is bestowed upon those Muscles which lie upon the *Occiput*, and upon the skin of the Head as high as the Crown; the bigger is inserted into the Muscle which lifteth up the Shoulder-blade.

The second. The *fore* Nerve of the *second* pair (which is smaller) cometh out between the first and second *Vertebræ*, and is bestowed upon the Skin of the Face. The *hinder* cometh out of the sides of the hinder process of the second *Vertebra*, but presently is parted into two twigs. The thicker of which is bestowed upon the whole Skin of the Head even to the Crown; The smaller upon the greater streight, and the lower oblique Muscle which stretch out the Head. Dr. *Willis* says, that the first and greatest root of the *Nerve of the Diaphragm* ariseth from the second pair of the Neck of which Nerve we shall speak more by and by.

The five remaining pairs of the Neck, as also all the pairs of the Back and Loins, and the first of *Os sacrum*, come out of the lateral holes betwixt the *Vertebræ*, and immediately after their *exit* are divided into the *fore* and *hinder* branches and are distributed as followeth.

The third. The *third* pair come out of the *lateral* hole between the second and third *Vertebræ*, and each being immediately divided into two branches, the *formore* thereof have each four twigs: The first is inserted into the *long* Muscle, or the first of the benders forward of the Neck; The second descending is bestowed upon the Muscles which lie under the *Oesophagus*, being first united to a twig of the fourth pair; The third ascending goeth to the Skin of the back-part of the Head, having first joined with the thicker twig of the hinder Nerve of the second pair: The fourth is bestow-

e

upon the tranſverſe Muſcles of the Neck, and e Muſcle which lifteth up the Shoulder-blade. he *hinder* Branches are beſtowed upon the ſe- nd pair of Muſcles which heave up or widen e Breaſt.

The *fourth* pair come out of the holes common t the third and fourth *Vertebræ*, the *formore* bran- es whereof are each divided into three twigs: he firſt of which uniting with a twig of the third ir is beſtowed on the firſt of thoſe Muſcles ich bend the Neck forward called *Longus* (as oveſaid;) The ſecond upon the tranſverſe Muſ- e of the Neck, and the *Cucullaris* of the Shoul- r-blade; The third being ſlenderer than the her two, is joined with a twig of the fifth pair, d both with one of the ſixth, and laſtly all tree (according to Dr. *Willis*) with that of the ond pair above-mentioned: and the Trunk nde up of all theſe deſcendeth by the ſides of e Gullet down the Neck and *Thorax* without y branchings till it come to the Diaphragm, here it is divided again into three or four twigs, each ſide, and is inſerted into its fleſhy or muſ- lar part, being known by the name of *Nervus aphragmatis*, or *Phrenicus*, (of which we have ſcourſed more largely in Book II. Chap. 3. *Of e Midriff.*) The *hinder* branches go back to the ine under the Muſcles of that part, upon which ey beſtow twigs, and going down between the uſcles of each ſide of the Neck, each is carried the *Muſculus quadratus* of its own ſide that aweth the Cheek down. *The fourth.* Nervus phrenicus.

The *fifth* pair iſſue out between the fourth and th *Vertebræ*, the *formore* branches whereof have ch four twigs: The firſt goeth to thoſe Muſcles at bend the Neck forward: The ſecond is that hich joineth with the twigs of the ſecond, fourth *The fifth.*

and

and ſixth pairs, and makes up the *Nervus phrenicus:* The third goeth to the Muſcle *Deltoïdes* The fourth goeth to the ſame *Deltoïdes*, and t the *Coracohyoideus*, or the third Muſcle of the O *hyoides.* The *hinder* branches bend back to th Spine, and are beſtowed upon the Muſcle there, as the like branches of the fourth pai were.

The ſixth. The *ſixth* pair come out between the fifth an ſixth *Vertebræ.* Their *formore* Branches ſen forth firſt one twig to make the Trunk of th *Nervus phrenicus*; then proceeding further the are united with the like branches of the three fol lowing pairs, namely, the laſt of the Neck an two firſt of the *Thorax*, making on each ſide on *Plexus* with them, out of which thoſe Nerve proceed that are carried to the Arms. The *hin der* branches go to the Muſcles behind, whic ſtretch out the Neck and Head, or bend then backward.

The ſeventh. The *ſeventh* pair come out of the holes com mon to the ſixth and ſeventh *Vertebræ.* The *for more* and larger branches are joined with the lik of the ſixth of the Neck and two firſt of the *Tho rax*, as aforeſaid, furniſhing Nerves to the Arm The *hinder* and ſmaller are beſtowed upon th Muſcles of the Neck, and quadrat Muſcles whic pull down the Cheeks.

Nervus ad par vagum acceſſorius. About where theſe ſixth or ſeventh pairs o Nerves riſe, there ſprings on each ſide anothe Nerve, deſcribed by Dr. *Willis*, and by him cal led *Nervus ſpinalis ad par vagum acceſſorius.* The riſe ſmall out of the ſides of the ſpinal Marrow and aſcend up by the ſides of it, growing thicke as they go (but without being inſerted an where into the Marrow) till having enter'd th Skull they are joined to the Fibres of the *par va gu*

um or eighth pair. Their progress from thence e observed in Chap. 13. when we described the ghth pair.

CHAP. XV.

Of the Nerves of the Vertebræ *of the* Thorax.

FROM the Marrow of the *Vertebræ* of the *Thorax* spring twelve pair. In all of which t formore branches are bigger; and the hin- d which are bestowed upon the Muscles seated o the Back, smaller. *Twelve of the* Thorax.

The *first* pair spring out of the lateral holes which are common to the seventh *vertebra* of the Neck, and the first of the *Thorax*, and therefore t indifferent whether they be esteemed to belong the Neck or *Thorax*, some reckoning them to the eighth pair of the Neck, and others (as w do here) the first of the *Thorax*. Each Nerve s resently divided (as all the rest are) into two nches; the *formore* of which are united to the ll branches of the sixth and seventh of the Neck, as was noted in the fore-going *Chapter*, and o re all spent on the Arms, except one little ig that springing out of the beginning of each cheth forward towards the *Sternum*, and be- reth twigs on the *Musculus subclavius*, and he Muscles which arise from the top of the *eum*; and another that goes to that Muscle ch fills up the hollowness of the Shoulder- de. The *hinder* branches creeping under the cles which cleave to the *Vertebræ*, are bestow- *The first Pair.*

ed upon the Muſcles of the Neck, Head and Shoul-
der-blades.

The ſecond. The *ſecond* iſſue out of the holes between th
firſt and ſecond *Vertebræ* of the *Thorax*, the *fo*
branches whereof are united with the like of th
firſt of the *Thorax*, and together with them a
joined to the *fore* branches of the ſixth and ſeven
of the Neck, and theſe all together make o
Plexus on each ſide (called Axillar) that ſende
forth all the Nerves to the Arms that they hav
(as ſhall be further explained *Book* IV. *Chap.* 3.
But before the *fore* branches of this pair uni
with the others, each ſends a twig alſo to t
Intercoſtal Nerve (or ninth pair) deſcendi
down the *Thorax*, (as alſo does every one of t
remaining ten pair) and from that twig before
join with the Intercoſtal there proceed ſmall fli
to the Muſcles that lie upon the *Thorax*. T
hinder branches have the ſame diſtribution wi
the hinder of the foregoing pair.

The reſt of the Pairs. The reſt of the ten pair come out of the late
holes betwixt the *Vertebræ*, and are all immedia
ly divided on each ſide into two branches; whe
of the *former* being larger, always ſend each
them one twig to the Intercoſtal Nerve, and
remainder of them is beſtowed on the Interco
Muſcles internal and external, and on thoſe t
lie on the *Thorax*; as alſo on the obliquely
ſcending Muſcles of the *Abdomen*, &c. The
der bend backward to the Spine, and are ſp
upon the Muſcles and Skin of the Back.

CHA

CHAP. XVI.

Of the Nerves of the Vertebræ *of the Loins.*

OUT of the Marrow contained within the *Vertebræ* of the Loins, arise five pair of Nerves. The *fore* branches being greater go to the Muscles of the Belly: The *hinder* to those which rest upon the *Vertebræ*. The *formore* (as *Spigelius* affirms) are joyned together, the first with the second, the second with the third, the third with the fourth, and the fourth with the fifth, as the two last of the Neck and two first of the *Thorax* were. *Five of the Loins.*

The *first* pair come out of the lateral holes between the last *Vertebra* of the *Thorax*, and the first of the Loins. The *fore* branches are bestowed upon the fleshy part of the Midriff, especially its hinder processes that are knit to the *Vertebræ* of the Loins, and on the Muscles *Psoæ*. Whence when there is a large stone in either Kidney, (the lower ends of the Kidneys resting upon the heads of these Muscles) this Nerve is compressed thereby, and from thence is a numbness extended to the Thigh of that side, because these Muscles terminate in the Thighs. These *fore* branches do each of them also send a twig along with the *Arteria preparans* to the Stone, according to *Spigelius*. From whence it is, partly, that too immoderate Venery causeth a weakness in the Loins. The *hinder* are bestowed upon the *Musculus longissimus* of the Back, *Sacrolumbus*, &c. *The first pair.*

The *second* come out between the first and second *Vertebræ* of the Loins, under the Muscles *Psoæ*, (which are the first pair of those that bend *The second.*

the Thighs.) The *formore* branches are beſtowe upon the ſecond pair of thoſe Muſcles that be the Thighs, which fill up the cavities of *Oſſa Il* and on the *Muſculi faſciales* and the Skin of t Thighs. The *hinder* are beſtowed upon the *Mu culi glutæi*, and the membranous pair of Muſcl which extend the Leg. Each of thoſe twi which from this pair join with the Intercoſta goeth to the *Teſtis* of its own ſide (according *Veſalius*, &c.)

The third. The *third* paſs out of the holes between the cond and third *Vertebræ*, under the *Pſoæ* al The *formore* branches each of them ſend one tw to the Knee and the Skin thereof, and anoth which doth accompany the *Saphœna* down t Leg. The *hinder* turn back, and are b ſtowed upon the Muſcles which reſt upon t Loins.

The fourth. The *fourth* iſſue out between the third a fourth *Vertebræ* being the largeſt of the Ner of the Loins, and marching under the *Pſoæ* a *Oſſa pubis*, accompany the Crural Veins and A teries.

The fifth. The *fifth* come out between the fourth a fifth *Vertebræ*. The *fore* branches paſs throu the holes that are between the bones of the *Cox dix*, *Pubes* and *Ileum*, (one on each ſide) and beſtowed upon the *Obturatores Muſculi* of Thigh, the Muſcles of the *Penis*, and on the n of the Bladder, and of the Womb. The *hi* are beſtowed upon the Muſcles and Skin wh lie upon the *Vertebræ*.

CHA

CHAP. XVII.

Of the Nerves which arise from the Marrow of Os sacrum.

FROM the Marrow of *Os sacrum* six pair of Nerves spring. *Six of* Os sacrum.

The *first* issue out between the last *Vertebra* of the Loins, and the first of *Os sacrum*, in the same manner as those that spring out of the *Vertebræ* of the Loins, and like them are each divided into two branches. The *fore* branches are a great part of them mixed with those other of the Loins that go towards the Thighs, yet each sends forth a twig that is dispensed to the Muscles of the Belly, and to the second bender of the Thigh. The *hinder* are bestowed upon the Skin of the Buttocks, and the greatest *Glutæi*. *The first pair.*

The other *five* pair spring after a different manner from the foregoing. For before they come out of the *Os sacrum*, they are every of them double on each side; and so from each one either side there arise two Nerves, one of which is carried into the fore or inner, and the other into the hinder or outer side. The *three uppermost* or *more* Nerves go towards the Thighs, as the greatest part of the first pair did: The *two lower* to the Muscles of the *Anus* and Bladder; in Men to the *Penis*, in Women to the neck and *vagina* of the Womb, and so to the outward Privity. All the *five hinder* Nerves are distributed to the Muscles of *Ossa Ilea* and *sacrum*, towards the back part, which are *Longissimi*, *Sacrolumbi*, *Sacri*, and the *Glutæi*. *Of the other five pair.*

How the *Brachial* and *Crural* Nerves are formed out of the Nerves of the Spine, ſhall be more particularly, but briefly, ſhewn in the next Book.

And thus we have done with all the *thirty pair* of *Nerves* that ariſe out of the *Spinal marrow*, having ſhewn which way they paſs, and to what parts they are diſtributed: which ſhould be diligently noted, that we may the better know to what place to apply Remedies when from an outward Cauſe, as from a fall, bruiſe or the like any part has loſt either ſenſe or motion, or both. For the Medicine is to be applyed always to the beginning or riſe of that Nerve that paſſes to the part, and not to the place in which the ſymptom appears. And the ſame thing is to be obſerved in Palſies, when the uſe of ſome particular Limb is taken away from an inward cauſe.

The Blood-veſſels of the Spinal marrow.

Having finiſhed our diſcourſe of the Veſſels that *ſpring from* the Spinal marrow, we will add a word to what was ſaid above, Ch. 8. of the *Blood-veſſels* that are *diſperſed through* it, from Dr. *Willis*. Theſe are of three ſorts, *Arteries*, *Sinus* and *Veins*. It is ſupplied with *Arteries* after one manner *above* the Heart, and after another *below* it. For *above* it, ſeeing the trunk of the *Aorta* is preſently cleft into many branches, which depart from the Spine; therefore from its Axillar branches there ſpring a *Vertebral Artery* on each ſide, which aſcending ſtreight to the *Occiput*, ſends a twig in at every joynting of the *Vertebræ*: But below the Heart, inaſmuch as the *Aorta* in its whole deſcent lies upon the Spine, there are received into the Spine two Arteries from its back ſide, betwixt every joyning of the *Vertebræ*. But both above and below, the Arterial branches that are carried toward the ſpine, being preſently divided each into two, one two is beſtowed on the neighbouring Muſcles, and the oth-

ther enters in at the joynting of the *Vertebræ*, within whoſe cavity it is ſubdivided into three ther twigs, two of which are beſtowed on the *Medulla* (with its two Membranes) and the third n the Membrane that lines the inſide of the *Vertebræ* before. How theſe branches of Arteries inſculate with one another, may better be conceived by the ſaid *Author*'s draught of them in his *Tab.* 13. than by a verbal deſcription. I therefore emit the Reader thither. The *Sinus*, he ſays, are ontinued from the lateral *Sinus* of the Brain, and ll along the Spinal marrow they lie under the Arteries, having one Veſſel to receive the Blood from he Arteries, and another to deliver it to the Veins, erving for the ſame uſes as thoſe of the Brain lid, which were ſhewn above in Chap. 3. of this Book. Its *Veins*, like the Arteries, are communicaed to it different ways *above*, and *below* the Heart. *Above*, a branch ariſing from the trunk of *Vena ava* below the ſubclavian, accompaines the Vertebral Artery up to the *Occiput*, ſending a twig in t every jointing of the *vertebræ*: but *below* the Heart, becauſe the trunk of *Vena cava* does not, ike the *Aorta*, lie immediately upon the Spine, nd ſo cannot immit twigs into it directly, therefore it ſends out of it ſelf *Vena ſine pari*, out of whoſe trunk two branches ſpringing, and each of thoſe being divided into two, one of them is beſtowed on the neighbouring Muſcles, and the ther enters the Spine. Yet below the Kidneys, when there is lieve given to the *Vena cava* to be carried near the Spine, the *Vena ſine pari* ends, nd the *vaſa Lumbaria* proceed immediately from the Trunk of the *Vena cava* as well as from the Trunk of the great Artery. The branchings of the *Sinus* and *Veins* within the Spine and their *anaſtomoſes* are curiouſly delineated in the

aforesaid *Tab.* 13 which deserves to be consulted by the Reader.

CHAP. XVIII.

Of the Face and its Parts.

IN the former *Chapters* we have discoursed of that part of the Head that is decked with Hair called *Calva*, of the Brain, *&c.* contained within it, of the *Medulla oblongata* arising out of it and prolonged into the *Medulla spinalis*, with the Nerves that spring out of the same both within the Skull and in the Spine, all which we have considered as Appendages to the Brain, seeing both the Marrow out of which they arise, spring out of it, and also all the Nerves have their Animal Spirits from it. Next we come to speak of the smooth or unhairy Part, called *Facies*, the Face.

Now though all the parts of the Body sufficiently shew the Wisdom of the Creator; yet both the beauty of the Face, and its admirable consent with the Mind doth epitomise as it were the comelinesse and dignity of all the other parts, and exhibits their affections as in a Glass. For from it are not only taken signs of health, diseases and imminent death; but also most clear tokens of the very disposition, manners and affections of the Mind. For as shame and frightednesse betrayes themselves in the *Cheeks*; so do anger, joy, sadness, hatred, and especially love, in the *Eyes*. So from the *Fore-head* are known ones gravity and humility: from the *Eye-brows* (or *Supercilia*) pride; from the *Nose*, sagacity or blockishness

&c.

rc. from the *motion* of the Face, wiſdom or oliſhneſs, honeſty or wickedneſs, civility or invility, good-will or hatred; from its *colour*, the emperament of the whole Body. Beſides, the x, the age, the ſtock, and one Man from another may be diſtinguiſhed by the Face.

The *Parts* of the Face are either *containing*, or *contained*. *The Parts of the Face.*

The *containing* are *proper*, or *common*.

The *common* are ſufficiently deſcribed in *Book* I. *hap.* 3. as not differing from the common integuments in other parts of the Body. Only here e *Membrana carnoſa* from the Eyes to the Chin ſo thin that ſome have affirmed there is none: t in the Brows it is thicker, and cleaves very oſe to the Skin.

The *proper* are the *Muſcles*, *Bones* and *Cartilas*, which ſhall each be deſcribed in their proper aces.

The parts *contained* are the Eyes, Ears, Mouth d Noſe, and many beſides, which ſhall be treated in the following *Chapters* of this *Book*.

The Face is divided into its *upper* and *lower* rt. The *upper* is from the Hair of the Skull to e Eye-brows, and is called *Frons* the Fore-head, hich while the Body is intire belongs to the ce, but in a Skeleton to the Skull. This is not be treated of here, as conſiſting of no proper rts but *Muſcles* and a *Bone*, which are to be ſcribed in their proper Books. The *lower* is tended from the Eye-brows to the Chin, and cludes all the parts betwixt them; and to the ſcription of theſe we now proceed.

CHAP.

CHAP. XIX.

Of the Eyes in general, and their outward containing Parts.

THE Eyes (in Latin *Oculi*, from *occludo* shut, or *occulto* to hide, because they lie h under the Eye-lids) are the Organs of sight, co sisting of many similar parts; and are as the tw Luminaries of the Microcosm, to afford us ligh or like two Watch-men placed in the upper pa of the Body as in a Watch-tower, to give notice any approaching Danger.

Their Number. They are in *Number* two, partly to make t sight stronger; and partly that one being hu the other might perform the function of seei in some measure, though more imperfectly.

Figure. The Eye alone, divested of its Muscles, is o round or sphærical *shape*, both that it might mo the better in its orbit, and also that it might mo conveniently receive the visible Rays.

Colour. The *Colour* of the Eyes in *Men* is sometim grey, sometimes browniſh, sometimes blac which variety is most conspicuous about the *P pilla* in the *Iris*, and proceeds from the colour the *Uvea*. *Brutes* of the same species have n that diversity of Colours.

Bigness. Some have much larger Eyes than others; t those which are largest and stand much out, ha not so acute and piercing a sight as those that a less and stand further in.

Consent. There is a great *Consent* betwixt them, so th one being moved towards any Object, the oth is moved towards the same. The Reason where we inquired before *Chap.* 11.

So

Some think they have a kind of congenit or ibred *Light*, without which they could not ſee; ven as the Ears have a congenit Air within their avities, without which they could not hear. *Light.*

They are each *placed* in a large Cavity, called *rbita* (or a Socket) on each ſide the Noſe, hich is hollowed out of the bones of the Skull. nd theſe orbits are inveſted on their inſide with ie *Pericranium*, to which the fat and origins of ie Muſcles cleave firmly. Theſe may be recned the firſt *containing* parts of the Eye; as ay alſo, in the ſecond place, *Situation.*

The *Palpebræ* or *Eye-lids*, which ſerve as Curins to the Eyes, by which duſt and troubleſome nokes and vapours, too much light and the inries of the Air are kept out, and the outward unicle of the Eye called *Adnata*, but eſpecially iat called *Cornea*, which covereth the *Iris* and *upilla*, is moiſtened, wip'd and clean'd. They onſiſt outwardly of a very thin Skin which has o fat under it; inwardly they are lined with the *ericranium*, that is here moſt thin and ſmooth. etwixt theſe parts comes the *Membrana carnoſa*, hich is alſo very thin. Each Eye has two. In lan the lower is leſs, and is but very obſcure- moved in compariſon with the upper: but in irds the lower is the larger, and in moſt ſeems nly to be moved, the upper remaining unmoveble. *Steno* mentions ſeveral *puncta lachrymalia* in ieir inner Membrane, which run on each ſide in- one Duct, (called by him *Colliciæ*) whereby the uperfluous moiſture of the Eye-lids is conveyed nto the Noſtrils. At their edges they have little oft Cartilages, (called *Cilia* in Latin) to ſtrengien them, and that they may meet the more exctly. Upon theſe Cartilages there grow Hairs, hich having attained to a certain length, will *The Eyelids.* Cilia.

natu-

naturally grow no longer, ſo that they never need to be cut. Thoſe on the upper Eye-lid turn ſomething upwards, and thoſe on the lower downwards. Above the upper Eye-lid grow alſo a Set of Hairs, betwixt it and the Fore-head, out of the *Supercilia* or Eye-brows; theſe lie pretty flat bending from within outwards, and hinder ſweat from the Brow, duſt or other things from falling into the Eyes.

Supercilia.

Canthi. The Eye-lids have two corners called *Canthi*.

Their Glands. The *outer* of theſe is leſs, and in its upper part it has a Gland placed (uſually called *Innominata*, or nameleſs, but might be named *lachrymalis*, as affording the moſt of that *Lympha* that makes the Tears.) This Gland is conglomerate, being made up of many leſſer, and has ſmall twigs of Arteries that creep to it, and depoſite *Serum* or *Lympha* in it to ſupply matter for *Tears* upon occaſion. But the ordinary uſe of this *Lympha* is to moiſten the inſide of the Eye-lids, and the Superficies of the Eyes, that they may move more glibly. *Steno* has obſerved that in a Calf the fore part of this Gland is elegantly divided into Lobes (being indented on its edge) and that betwixt the intervals of theſe there paſs out excretory Veſſels from the Gland, which running forward within the inner coat of the Eye-lid make little holes in it at a little diſtance from the *Cilia*, thro' which they diſcharge their humour. And he doubts not but there are ſuch Veſſels in Men, in whom he calls them *vaſa lachrymalia*. *Diemerbroeck* having reckoned eight opinions concerning the cauſe, origin and matter of tears, rejects them all, and this we have mentioned with the reſt: and thinks that their matter is the more ſerous and thin particles of the pituitous humour collected in the Brain and flowing to the Eyes upon its contractio

Whence Tears proceed.

throu

through the *Foramen lachrymale* ſeated at the inner corner of the Eye. Which the Reader may ſe defended in his *Anat. lib.* 3. *cap.* 15. There is another ſpongy and ſoft Gland in the inner *Canus* or Corner, ſeated upon the *Foramen lachrymale*, which helps the former in its office, but is not above a third part ſo big. Dr. *Briggs* ſays, there are two or three lymphatick Veſſels that receive *Lympha* from it, and end in the inſide of the Eye-lid, and that eight ariſe out of the former Gland, and end in the *Tunica adnata*, where they continually depoſite ſomething of *Lympha*, to keep the Eye moiſt. *Nerves* come to them from the *fifth* pair, which communicating with the *Intercoſtal*, are much irritated in the paſſions of ſudden joy or of ſadneſs, and ſo twitch and compreſs theſe Glands that the *Lympha* is ſqueezed or milked as it were out of them, as Dr. *Willis* ingeniouſly ſuppoſes. *Steno* thinks, that in weeping, the flux of tears is principally owing to the contraction of the capillary Veins, by which means the Blood and *ſerum* cannot be ſo quickly carried back from theſe Glands as they are brought to them by the Arteries, and therefore the *ſerum* ouzes out (as blood has alſo been obſerved to do ſometimes.) Which Opinion differs not much from Dr. *Willis*'s, if we will ſuppoſe the contraction of the Veins to be owing to the Nerves, as it is reaſonable we ſhould.

As for the *Muſcles* of the Eye, they ſhall be described in the Fifth Book.

CHAP.

CHAP. XX.

Of the Tunicles of the Eye.

HAving done with the outward or *containing parts* of the Eye, we come now to the *Eye* it self, and first of its *Tunicles.*

The Tunicles of the Eye, one common.

The outmost *Tunicle* of the Eye is *common*, and is called *Adnata.* It springs from the *Pericranium*, and is spread over all the White of the Eye above the *Sclerotica*, reaching as far as the *Iris.* By this the Eye is kept firmly within its orbit, from whence it is also called *conjunctiva.* It is of very exquisite sense, and has many capillary Veins and Arteries creeping through it, which are most conspicuous in an Ophthalmy or inflammation of the Eyes. Under this Tunicle are the Tendons of the Muscles extended and expanded to the circumference of the *Iris*, which increase its whiteness; and some take them for a second Tunicle calling it *Innominata.*

Three proper.
1. Sclerotica.

The *proper* Tunicles of the Eye are three, according to the threefold substance of the Optic Nerve. For this Nerve (as all the other) consists of two Tunicles springing from the *Dura* and *Pia Mater*, and an inner marrowy substance. From the *Dura Mater* springeth the outmost coat of the Nerve, and from this the Tunicle that is spread next under the *Adnata*, called *Sclerotica* from its hardness; but in its forepart where it covereth the *Iris* and *Pupilla*, it is named *Cornea* from its transparency; though sometimes the latter name includes the whole Tunicle, as we have behind and on the sides, as before.

Th

That which lieth next under the *Cornea* is much 2. Choroïdes.
inner than it, and is called *Choroïdes*, from its
ſembling the Membrane *Chorion* wherein the
ætus is included in the Womb. Its fore-part is
herwiſe called *Uvea*, becauſe it is ſomewhat of
e colour of a Grape. This ſprings from the
a Mater, and is ſpread from the bottom or cen-
e of the Eye behind, all over the Eye to the
pilla; to whoſe circumference when it is come,
becomes double, making with one part the *Iris*,
ith the other the *Ligamentum ciliare*. On the
ſide it is of a duskiſh colour, (in Man) but
lacker on the outſide. But where it makes the
is, it is of divers colours reſembling the Rain-
w, from whence is borrows its name: yet in
me it is more blue, in others black, in others
ey. This Tunicle is perforated before as wide
the *Pupilla* (or ſight of the Eye) to permit the
ys of viſible ſpecies to paſs in to the cryſtalline
mour. Next unto which cryſtalline humour lies
e *Ligamentum ciliare*, the ſecond part of the du-
icated *Uvea*. This conſiſts of ſlender Filaments
Fibres, (like the Hairs of the Eye-lids) run-
ng like ſo many black lines from the circumfe-
nce of the *Uvea* to the ſides of the cryſtalline
mour, which they encompaſs, and widen or
nſtringe as there is occaſion, by contracting or
ening the *Foramen* of the *Uvea*.

The third Tunicle is made of the medullar 3. Retiformis.
bſtance of the Optick Nerve, and is called *Reti-* *This the principal Organ of ſight.*
r or *Ketiformis* (Net-like:) This ſeemeth to be
e principal Organ of Sight. For, as Dr. *Briggs*
ell argues, neither the cryſtalline humour,
rough which the rays paſs much refracted; nor
e Tunicle *Choroïdes*, are at all fit for this uſe.
r this latter part (as ariſing from the *Pia Mater*)
annot communicate the impreſſions of the rays

to

to the medullar part of the Brain, which it doe not at all touch. Whereas the medullar Fibre of the *Retina* have communication therewith, a ſpringing therefrom, and therefore can well per form that office. The Fibres of this Tunicle ar extended from the bottom or inner centre of th Eye, where the Optick Nerve enters it, as far a the *Ligamentum ciliare*, (to which it affords Ani mal Spirits for the continuance of its motion.) I one take this *Tunica Retina* and put it into warı water, ſhaking it a little, to waſh off the mucou ſubſtance that cleaves to it, and then hold it u to the light, theſe Filaments will appear very nu merous like the threads of the fineſt Lawn.

CHAP. XXI.

Of the Humours and Veſſels of the Eye.

The humours of the Eye three.

NExt to the Tunicles of the Eyes are the *Humours* contained in them to be conſidered And theſe are in number three, *viz. Aqueus*, *Cryſtallinus*, and *Vitreus*. The ſecond weighs as muc again as the firſt, and yet not ſo much as the thir by a ſixth part. The Cryſtalline is the moſt denſ of conſiſtence by much; and the glaſſie mor denſe than the watry.

1. Aqueus. The *Aqueous* humour is outermoſt, being pel lucid and of no colour (as neither are the othe two.) It fills up that ſpace that is betwixt th *Cornea* and the Cryſtalline humour before. If an thickiſh particles ſwim in it, then Gnats, Flie Spiders webs and the like will ſeem to be flyin before the Eyes. But if thoſe particles grow ſti thicker, and cloſe together ſo as to make a film

as

nd this be ſpread before the hole of the *Pupilla*, hen is the ſight quite taken away, which diſeaſe s called a *Cataract*. This Humour is very clear, nd thin, and therefore eaſily diſſipable; but by hich way its expence ſhould be ſupplied, is diffi- ult to determine. Some think it is fed by the rteries out of which this water iſſues through I now not what Glands: others derive it from ie Nerves, and a third ſort from the Lymphe- ucts. But Dr. *Ant. Nuck* refutes all theſe Opi- ons; the firſt from the non-appearance of any lands; the ſecond from the no (or at the oſt a very ſmall quantity of) liquor that at any ne can be obſerved in the Nerves: whereas if e *tunica cornea* be prick'd, and all or the great- t part of this aqueous humour be let out, he is found by repeated Experiments that it will recruited again in ſix hours ſpace. The third pinion he refutes from the general office of mpheducts, which is, to bring back from the rcumference to the centre, and not contrarily, cauſe the valves wherewith they every where ound cannot admit of that motion. Wherefore ploding all theſe Opinions, he eſtabliſhes a new e of his own, upon the ſcore of the new Veſſels at he has obſerved to terminate in the *tunica rnea*, (which he calls *ductus oculorum aquoſi*, hich we ſhall deſcribe from him by and by) af- ming, that theſe Ducts are the Conduits by hich this humour is fed, and that they ſupply ordinarily with ſeveral drops daily, becauſe of e continual tranſpiration of it by pores looking om within outwards. As to the particles of is Humour, from ſeveral Experiments he has ade, he thinks it is demonſtrable; 1. that it ntains in it a very limpid and pellucid water. 2 Viſcid and tenacious particles. 3. A ſalt and

an acid. 4. Earthy particles. 5. That it want not alſo its volatil ſpirit.

2. Cryſtallinus. The *Cryſtalline* humour (ſo called from its be ing as clearly tranſparent as Cryſtal) is place betwixt the aqueous and the vitreous, but no exactly in the middle or centre of the Eye, bu rather towards its fore-part. It is incloſed in th boſom as it were of the vitreous humour, and flattiſh on the fore-ſide, but rounder behind. is more bright and ſolid than either of the othe two. It has been the common Opinion that it incloſed in its proper Membrane, which is calle either *Cryſtallina* from its tranſparency, or *Ar nea* from its moſt fine contexture. But Dr. *Brigg* a very accurate Anatomizer of the Eye, deni any ſuch Tunicle, affirming that it is meerly ac ventitious when the humour is expoſed for ſom while to the Air, or is gently boiled. As to th collection or reception of the rays of things v ſible, this humour is the primary inſtrument ſight: though as was ſaid before, the *tunica ret na* is the principal as to perception, becau through it the rays are communicated to t common ſenſory.

3. Vitreus. The third and laſt Humour of the Eye is t *Vitreous*, ſo called becauſe it is like to molt Glaſs. This is thicker than the Aqueous, b thinner than the Cryſtalline; and much excee them both in quantity, for it fills up all the i ner or hinder hemiſphere of the globe of the Ey and a pretty deal (toward the lateral ſuperficie of the formore. It is round behind, but hollo ed in the middle forwards, to receive the Cr ſtalline into its boſom. This humour is alſo ſa to be ſeparated from the other two by a prop Tunicle called *Vitrea*, which the aforeſaid ing nious Author likewiſe denies.

See the Situation of theſe Humours repreſent-
ed in *Fig.* II. of *Tab.* 15. inſerted *p.* 417.

The Eyes have *Arteries* from the *Carotides*, which beſtow twigs on their Muſcles, and on their Tunicles. And theſe are accompanied with *Veins* ſpringing from the Branches of the Jugulars. As for their *Nerves*, they either aſſiſt the ſenſe of ſeeing, and are called the Optick Nerves, which we have reckoned for the ſecond pair, and deſcribed before *Chap.* 10. or ſerve for the moving of them, being inſerted into their Muſcles, and to this purpoſe ſerve the third and fourth pair, and ſome twigs of the fifth. As to their *Lympheducts*, we have ſpoken of them above, *Chap.* 19. when we diſcourſed of the Glands placed at each *Canus* or Corner of the Eye-lids. Beſides theſe Veſſels, Dr. *Ant. Nuck*, whom we cited but juſt now, has diſcovered a fifth ſort of Veſſel, called by him *Ductus oculorum aquoſi*, which he believes do requit the continual conſumption of the watry humour of the Eye. He ſays they are of an uncertain number, and may be plainly diſcerned to run along the *tunica ſclerotica*, and to penetrate at length the *cornea*, where their Orifices have ſuch a Valve as the Ureters have in the Urinary Bladder, or the *porus bilarius* in the *veſica fellea*. In the *tunica ſclerotica* and *cornea* they are of a dusky colour, but not before they arrive thereat. They admit of a Probe of a pretty bigneſs, and are of a stronger make than Lympheducts. He has taken great pains to trace them to their Origine, but has not yet been able to follow them further than to the Optick Nerve. So that he knows not whether their riſe may be from ſome Gland not yet diſcovered, or whether the *Glandula pituitaria* may not ſend forth ſome ſhoots that conſtitute theſe Ducts. *The Veſſels of the Eye.*

The Action of the Eyes. The *Action* of the Eyes is *Vision.* Which is very well defined by *Diemerbroeck. viz.* That it is *a sense whereby, from the various motion of visible Rays collected in the crystalline and vitreous humour, and darting upon the* tunica retina, *the Colours of visible Objects are perceived, with their site, distance, greatness, figure and number*;] the *medium* by which perception is the light. But we shall not enter upon a discourse of Vision here, as being more proper for a Philosopher than an Anatomist.

CHAP. XXII.

Of the Auricula.

The Ears. AS the *Eyes* are placed in the upper part of the Body like two Watch-men to descry approaching danger; so are the *Ears* there seated also, that they might give information of what the Eyes cannot discover either in the night for want of light, or through the interposition of some thick and opaque Body which the Sight cannot penetrate. And as the Eyes contemplate the wonderful works of God, whereby the Mind may conceive of his infinity; so the Ears are the Inlets or Receivers of Verbal Instruction in Wisdom and Science. For they are the Organs of Hearing, and are in number two, that the one failing, yet we might hear with the other. They are placed in the Head, because Sounds ascend.

Their Parts. Auricula. The *Parts* of the Ear are either *outward* or *inward.* The *outward* is called *Auricula*, which is onely an adjuvant Instrument of Hearing, being spread like a Van to gather and receive the sound

s upper part is called *Ala* or *Pinna* the Wing; and its lower or soft Lobe, usually *Infima Auricula.* It has several protuberances or eminences, and cavities. Its outmost *protuberance* that makes its circumference, from its winding is called *Helix*; and that which is opposite to it, *Anthelix:* but that next the Temple, because in some it is hairy, is called *Hircus* or *Tragus*; and that which is opposite to it, to which the soft Lobe of the Ear is annexed, *Antitragus*, which likewise in some is hairy. Its *Cavities* are three. The inmost because of the yellow Ear-wax (as we call it) that is gathered in it, is named *Alveatium*; as also *Meatus Auditorius*; (of which more in the next Chapter.) The next to this outwards which is bigger, from its tortuosity or winding is called *Concha.* The third is that betwixt the *Helix* and *Anthelix*, which has had no Name imposed on it. *The Names of its Parts.*

The *constituent Parts* of the *Auricula* are either *common* or *proper.* The *common* are *Cuticula*, *Cutis*, and *Fat* in the Lobe. The *proper* are the *Muscles*, *Veins*, *Arteries*, *Nerves*, the *Cartilage*, and *Nervous Membrane* or Tegument which immediately embraces the whole Cartilage, which some reckon to the *common* Parts. As concerning the *Muscles*, they are set down in their proper Treatise. The *Veins* come from the external Jugulars; the *Arteries* from the *Carotides*; the *Nerves* from the second Pair of the Neck, being joined with the harder process of the seventh Pair. As for the *Cartilage*, it is a substance that is fittest for this place. For if the Auricle had been bony, it might by many Accidents have been broken off; or if it had been fleshy or only membranous, it would not have stood so spreading, but have sunk down. Whereas a Cartilage is not in dan- *Its constituent Parts.*

ger of breaking, and yet it is ſtiff enough to keep this outer part of the Ear expanded. It is tied to *Os petroſum* by a ſtrong Ligament which riſeth from the *Pericranium.*

Uſes. The *Uſes* of the *outward* Ear or *Auricle* are theſe: Firſt, it ſerveth for Beauty. Secondly, it helps the receiving of the Sounds. For firſt, it gathereth them being diſperſed in the Air. Secondly, it doth moderate their *Impetus*, ſo that they come gently to the *Tympanum.* Such as have it cut off upon any occaſion, are very much prejudic'd in their Hearing, which becomes confuſed with a certain murmur or ſwooing like the Fall of waters.

Parotides. Both behind and below each Ear, there are ſeveral Glands outwardly under the Skin, that are called *Parotides.* But there are two more notable than the reſt, near one another; of which one is leſſer, and is *conglobate*; but the other bigger conſiſting as it were of many leſſer, and is *conglomerate.* From the *conglobate*, according to *Steno* there ariſe Lympheducts, returning the *lymph* that is ſeparated in them into the Jugular Veins; and in the *conglomerate* the *ſaliva* is ſeparated which is conveyed into the Mouth by proper Ducts: but of theſe more by and by, in Chapter 26.

CHAP. XXIII.

Of the inward Part of the Ear.

THE inward Part of the Ear is that which we properly call *Auris*, and begins at the *Meatus Auditorius*, or that inmoſt Cavity of the Auricle in which the Ear-wax is collected. The

Meatus Auditorius.

Cavi

Cavity aſcends ſomething with a winding Duct, that the vehement *Impetus* of Sounds may be a little infringed before they vibrate upon the *Tympanum*. Monſ. *du Verney* (that has lately writ a particular Treatiſe of the Ear) ſays, that this *meatus* or tube that reaches from the *Concha* to the *Tympanum*, conſiſts partly of a Cartilage, and partly of a Bone. The Skin that covers it, he ſays, is furniſhed with an infinite number of Glandules of a yellowiſh colour, each of which has its Tube opening into this *Meatus*, by which they ſend that yellow glewy ſubſtance which is ordinarily found in it, and hinders Inſects from creeping into the Ear, entangling them like Bird-lime. *The Ear-max.*

Before its inner end is ſpread the *Tympanum* or Drum, which is a nervous, almoſt round and pellucid Membrane, of moſt exquiſite ſenſe, diviling the *outward* from the *inner* Ear. Some will have it to ſpring from the *Pericranium*, others from the *Pia Mater*, a third ſort from the *Dura Mater*, a fourth from the ſofter proceſs of the Auditory Nerve expanded. And laſtly, ſome think that it has a proper ſubſtance, ſpringing from no other Membrane, but made in the firſt formation of the parts. It is very dry, that it might give the better ſound. It is ſtrong, that it should the better endure external Harms. It is inchaſed in a chanel or rift made in the cricumference of the outer end of the Bone that joins to the Cartilage which forms the largeſt part of the *Meatus*, and it has a Cord that runs croſs it behind, which ſome take for a Ligament to ſtrengthen it; but *du Verney* ſays it is a branch of the ſeventh pair of Nerves, which ſupplies twigs to the Muſcles that move the *Tympanum*: (for it hath two *Muſcles* to move it, which ſhall be deſcribed in the Fifth Book, Chap. 8.) *The Tympanum.*

The first Cavity. When it is taken away, there appears a *Cavity* on the inside of it, which by some is also called *Tympanum*, but by *du Verney*, the *Barrel*. He says, it is a quarter of an inch long, and half an inch wide. It is encompassed round with Bone and clad within with a Membrane that is interwoven with a great number of Vessels.

Its four little Bones. In this Cavity are contained *four* little *Bones* that are moveable, and conduce much to Hearing. They have no Marrow in them, nor are covered with any Membrane or *Periosteum*; yet at their extremities where they are joyned, they are bound with a small Ligament one to another. And they have this also peculiar to themselves that they are as big in Infants as in grown persons, as are also the Bones of the *Labyrinth* and *Cochlea*, according to *Vessingius* and *du Verney*.

1. Malleolus. The *first* is called *Malleolus*, the little Hammer. It hath a round Head, which is inarticulated into the Cavity of the Anvil by a loose Ligament. This Head is continued into a small Neck or Handle, which reaching beyond the middle of the *Tympanum*, adhereth to it. About the middle it hath two processes: The one of which, being shorter but thicker, has the Tendon of the internal Muscle inserted into it; and the other being longer but smaller, the Tendon of the external, whereby this Bone immediately, but mediately the *Tympanum* is moved, as shall be further explained in the aforesaid *Chapter* of the Fifth Book. And see *Tab.* 16. before-going wherein all these four Bones with the Muscles are represented.

2. Incus. The *second* is called *Incus*, the Anvil, having one Head, and two Feet, being somewhat like one of the grinding or double Teeth that has two roots, onely one of its Feet is considerably longer than the other. The Head is pretty massie, having

ng in the top of it a little ſmooth cavity, which ceiveth the knob or head of the Hammer. The nalleſt (but longeſt) Foot is tied to the top or ead of the Stirrop by a looſe but firm Ligament; at the thickeſt, broadeſt and ſhorteſt reſteth up- n the *Os ſquamoſum.*

The *third* is *Stapes*, or the Stirrop. This is not compact and ſolid as the two former, but more rous. In Figure it is almoſt triangular, in the iddle hollow, to give way to the paſſing of the ir to the *Labyrinth.* In the upper part of it is a ry ſmall and round knob, upon which the long- t foot of the Anvil reſteth. Its Shape is much a- pted to the *Feneſtra ovalis* (which opens into the abyrinth) about which it is tied round ſomewhat oſely, ſo that it may be driven to within its *Sinus*, t cannot without violence be pulled outwards. 3. Stapes.

The *fourth* Bone was found out by *Franc. Sylvi-*, and from its round ſhape is called *Orbiculare.* is tied by a ſlender Ligament to the ſide of the *apes*, where the *Stapes* is joined to the *Incus.* *u Verney* ſays, that this Bone comes betwixt the ng foot of the Anvil and the knob or head of e Stirrop: And that on that ſide next the Head the Stirrop it is convex, being received into a tle Cavity of the ſaid Head; and on that ſide xt the Foot of the Anvil it is a little hollow, ceiving the ſaid Foot into it ſelf. Os orbiculare.

From the lower ſide of this *firſt inner* Cavity, herein theſe Bones are contained, there is a und *Meatus* or Chanel to the Palate of the Mouth ar the root of the *Uvula*; and another from its per ſide that runs to the cavity of the Noſtril, has formerly been taught; but the aforeſaid uthor deſcribing it to be much wider, but a great eal ſhorter than the other, ſays, That it pene- ates to within the ſinuoſities of the mammillary proceſs *Two Chanels.*

proceſs of the Temple-bone. Thoſe who thoug
it to run to the Noſtrils, ſuppoſed it to convey th
ther pituitous Matter collected within this fir
Cavity; but *du Verney* thinks its uſe to be, to pe
mit the internal Air to retire into the ſinuoſities
the aforeſaid proceſs when the *Tympanum* is driv
inwards by the external Air, and that the inte
nal Air returns from thence again upon the r
laxation of the *Tympanum*. And as to the form
chanel, he calls it an *Aqueduct*, and ſays, that its fir
and ſhorter part is bony, but the ſecond and long
partly cartilaginous and partly membranou
which part paſſing near the root of the Noſe is l
ned with a glandulous skin that is a continuatic
of that which cloaths the inſide of the Noſtrils. S
that he believes that part of the Air which
drawn in at the Noſe penetrates this chanel (an
ſo may aſcend to the Ear) and on the contra
thinks that aqueous humours deſcend by it int
the mouth by its aperture in the Palate; for h
denies that there is any Valve in it which migl
ſtop any thing from paſſing either way. Othe
Authors (not denying this latter uſe, but nc
ſuppoſing that it had any communication wit
the Noſtrils; inſtead of the former uſe derive
from thence) have thought, that air and all
ſounds might paſs through it in at the *Mouth* t
the Ear, by obſerving that thoſe who are thick
hearing do uſually hold their mouths open whe
they liſten attentively, which they do probabl
becauſe they are partly aſſiſted thereby in the
hearing.

Two holes. In the middle alſo of this cavity oppoſite to th
Tympanum, in the *os petroſum* there are two hole
the greater and higher of which is ſhut by the ba
ſis of the *Stapes* (when no ſounds affect the Ear
and is of an oval figure, whence it is called *Fene*
ſtr

ra ovalis, and opens inwards or backwards Fenestra ovalis.
etty wide into the Labyrinth. The other is
ſs and lower, and is of a round ſhape, whence
iis called *Rotunda*. The Orifice of this is open, Rotunda.
t within the middle of its chanel it has a rift
nerein is inchaſed a thin, dry and tranſparent
lembrane like that of the *Tympanum*. Behind
nich it is divided into two Pipes divided by the
ſquamoſum, one of which tends to the *Cochlea*,
e other to the Labyrinth.

This *Labyrinth* is the *ſecond inner* cavity, being *The ſecond Cavity or Labyrinth.*
r leſs than the former, and was firſt ſo called by
llopius, from the hollowed bony ſemicircles
cloathed with a thin membrane) returning cir-
larly into the ſame cavity. The *Feneſtra ovalis*
d *rotunda* open into it out of the firſt cavity:
d beſides theſe holes it has five others, one of
hich opens into the end of the larger *Gyrus* or
inding of the *Cochlea*: The other four are ſo
all that they hardly admit an hair, through
hich the moſt ſlender Fibres of the auditory
erve proceed to the inner membrane that en-
mpaſſes this cavity.

The *third* and laſt *inner* cavity is called *Cochlea*, *The third Cavity called* Cochlea.
cauſe in its ſpiral winding it reſembles a Snail's
ell. It is leſs than the Labyrinth, and has two,
metimes three or four ſpiral windings, which
e cloathed inwardly with a moſt thin Mem-
ane, into which, as into the Labyrinth, the ſlen-
r Fibres of the auditory Nerve enter, through
ree or four very ſmall holes.

Du Verney makes but two *inner cavities*, *viz.*,
e *Barrel* (which we deſcribed above) and the
abyrinth. But then he divides the Labyrinth in-
three parts: the foremoſt of which he calls
e *Veſtibulum* or Entrance; the ſecond compre-
ends the three ſemicircular conduits or chanels,
which

which (he says) are on that side of the Vestibl which is towards the hinder part of the Head and the third is the *Cochlea*, which is on the othe side. But this new distinction is of less moment and therefore I pass it over. As for the shape of th *Labyrinth* and *Cochlea*, it is shewn before in *Tab* 16. But they are represented much larger tha according to nature, as are also the Bones in th first cavity, that their parts might appear mor plainly.

The congenit Air. These three inner Cavities are all formed with in the *Processus petrosus* of the Temple-bone, an in them is contained a most pure and subtil *Air* which some think to be included in them in th very first formation of the parts, and therefor call it *Aer Insitus* and *Congenitus*. Some suppos it to be Animal spirit, effused into them by th auditory Nerve.

The vessels of the Ear. This inner part of the Ear has *Veins*, *Arteries* and *Nerves* from the same origines as the outer only the *harder* process of the auditory Nerv goes to the *outer*, and the *softer* to this *inner*, which coming by the hinder *Meatus* of the *Os pe trosum* is inserted into and dispersed through th circles of the *Cochlea* and *Labyrinth*.

Hearing what, and how performed. All the parts of the *Auricula* and *Auris* concu to the perfecting the *Hearing*, which is a *Sens whereby sound is perceived from the various trembling motion of the external Air, beating upon the* Tym panum, *and thereby moving the internal Air wit the Fibres of the auditory Nerve, and communicate to the common Sensory.* Now *Sound* that is the ob ject of it, is nothing else but a quality arising fro the Air or Water beat upon and broken by th sudden and vehement concussion of solid Bodies And the diversity or greatness of such sound i distinguished by the four Bones that stand on th inside

side the *Tympanum*: For as from the greater or ss, gentle or harsh impulses of the external so- orous Air (fluctuating like Waves caused by a one thrown into the Water) the Membrane the *Tympanum* is accordingly driven or shak'd ainst the *Malleus*, the *Malleus* against the *Incus*, d the *Incus* against the *Stapes*; so, as the same apes and *Os orbiculare* open the *Fenestra ovalis* ore or less, is there a freer or straiter passage anted to the internal Air out of the first inner vity into the Labyrinth and *Cochlea*, in whose rtuous and unequal windings it is variously in- inged and modulated, from whence the *species* found that is made thereby, (according to the versity of the external impellent) is sometimes ore acute, sometimes more full, sometimes more rsh, sometimes more gentle, sometimes bigger, metimes less: the *Idea* of which *Species* is car- ed to the common Sensory, (and so represented the mind) by the auditory Nerve that expands self through the Membrane that invests the id Labyrinth and *Cochlea*.

CHAP. XXIV.

Of the Nose.

THE Organs of *Seeing* and *Hearing* being described in the foregoing Chapters, we come ow to the Instrument of the third Sense, *viz.* *melling*, which is the *Nose*. *The Nose.*

The parts of the *Nose* may be distinguished in- to the more *external*, and the more *internal*. The ore *external* parts are these, the Cuticle and kin, Muscles, Veins, Arteries, Nerves, Lympheucts, a proper Duct, Bones and Cartilages. First, *Its external parts, viz.*

the

Skin. the *Skin* cleaveth ſo faſt to the Muſcles and Ca
tilages, that it cannot be ſevered without ren
Muſcles. ing. Secondly, as for the *Muſcles*, they are ſ
down in the deſcription of the Muſcles, Book
Veins, Arteries and Nerves. Thirdly, the *Veins* come from the external Jug
lars, as the *Arteries* from the *Carotides*. Fourth
ly, the *Nerves* ſpring from the fifth pair. Fifth
ly, *Steno* has obſerved in Sheep and Dogs a *Lym
phatick* Veſſel in each Noſtril; and 'tis probab
there are the ſame in men. Sixthly, Both *Ste*
and Dr. *Needham* deſcribe a *Meatus* or Duct, h
ving two *foramina* in the *canthus* of the Eye, b
opens but by one into the Noſe: and Dr. *Nee
ham* has obſerved another paſſage going out
the middle of this, toward the Palate. By whic
Ducts any one may perceive that in weeping,
great quantity of water doth flow from the Eye
Bones. Seventhly, the *Bones* are deſcribed in Book V
Cartilages. Chap. 6. Eighthly, the *Cartilages* are in numbe
five; the two *upper* are broader, and adhere t
the lower ſide of the Bones of the Noſe wher
they are broader and rough, and being joine
to one another paſs from thence to the tip
the Noſe, making up one half of the *Alæ*: th
two *under* make up the other half, being joine
to the upper by a membranous ligament; th
fifth divideth the Noſtrils. Theſe Cartilages ar
moved by the Muſcles.

Its inner parts. A glandulous Membrane. The *inner* parts of the Noſe are theſe: Firſt
the Membrane which covereth its inſide, whic
ſome think proceedeth from the *Dura Mater*, pa
ſing through the holes of the *Os cribriforme* wit
the nervous Fibres. This Membrane on its bac
ſide hath abundance of little *Papillæ* or Glands
in which the *Serum* or Rheum is ſeparated tha
runs out by the Noſe, (though *Diemerbrocc*
thinks them to be the true Organ of Smelling.

Secondly

Secondly, the *Hairs*, called in Latine *Vibrissi*, which hinder the entrance of insects and of dust in a great measure, as one draws his breath in at his Nose. Thirdly, the red fleshy spongious substance, with which the holes of the *Os spongiosum* in the upper side of the Nostril are filled up; from which the *Polypus* springeth. *Hair.* *Spongie flesh.*

The *length* of a comely Nose is the third part of the length of the Face. *Length.*

The upper part of the Nose which is bony, is called *Dorsum Nasi*, or the ridge. The lower lateral parts *Alæ* or *Pinnæ*. The tip of the Nose, *Globulus*, and *Orbiculus*. The middle cartilaginous partition, *Septum*; and the fleshy part, that at the bottom of the *Septum* reaches from the tip of the Nose to the root of the upper Lip, *Columna*. The two holes that are caused by the partition, are called *Nares* the Nostrils. And these about their middle are each divided into two, one of which goes up to the *Os cribriforme*, to convey scents thither: the other descends down upon the Palate to the *Fauces*, by which Rheum falls down either of its own accord if it be very thin; or by snuffing the Air up strongly in at one's Nose, if it be thick, which we may hawk and spit out at pleasure. *The denomination of its parts.*

The *Nose* is an *external adjuvant* organ of Smelling, as the *Auricula* is of Hearing. For when smells exhale out of odoriferous bodies into the air, by taking our breath in at the Nose, the scents accompanying the air ascend up the Nostrils to the top of their Cavity, *viz.* to the *Os cribriforme*, through whose holes the olfactory Nerves (otherwise called *processus mammillares*) issue out by their Fibres, and are dispersed through the Membrane that cloaths the inside of the Nostrils, especially its upper part: which Nerves, *Its use.*

Fibres

Fibres and Membrane are the *inward* immediat and *adequate* organ of Smelling. Other inferio *uſes* the Noſe has alſo: as firſt, ſometimes to tak in our breath by, that we may not keep o Mouth always open for that purpoſe. Secondl to help the Speech, which is very much impai ed by the loſs of it. Thirdly, it ſerves for t ſeparation and diſcharge of the mucous humou in the Blood.

CHAP. XXV.

Of the external parts of the Mouth.

The outer parts of the Mouth. THE next part to be deſcribed is the *Mout* whoſe parts are either *External* or *Interna* The *External* are the *Cheeks* and *Lips*.

The Cheeks. As to the *Cheeks*, their ſubſtance being Mu cular, this is no proper place for their deſcript on (but Book V.) only we ſhall note from *Sten* that betwixt their Muſcles and the inner invel ing Membrane of the Mouth there is ſpread each ſide towards the lower Gums a large co

Their glands. glomerate *Gland*, from whence many ſmall Duc open into the cavity of the Mouth, pouring *S liva* thereinto. And as to their *parts* we ſha obſerve this further, that their upper part ne under the Eyes, that jets out a little and is cor monly higheſt of colour, is called *Malum* or *P mum faciei*, in Engliſh commonly the Ball of t Cheek; and their lower part that is ſtretch out in blowing of a Trumpet or the like, is ca led *Bucca*.

The Lips. The *Lips* are framed of a carnous ſoft fungo ſubſtance, and of the Muſcles, covered with th

in Skin, under which, on the inside, especially the lower Lip, there lie numerous Glands, whose excretory Vessels penetrate the Skin, pouring forth their *Saliva* into the Mouth. They are in number two, the upper and the lower. (Of their *Muscles* see Book V.) The upper Lip has a little dimple in its middle which is called *Philtrum*; and its sides are named μύσακες, whence the hair that grows thereon is called *Mustaches*.

The *Uses* of the *Lips* are these: First, they help to retain the Meat in the Mouth, while it is chewing. Secondly, they serve for beautifying of the Face, if they be well fashioned. Thirdly, for the containing of the Spittle in the Mouth, that it should not drivel out constantly, but be spit out when we please. Fourthly to keep the Gums and Teeth from external Injuries. Fifthly, for framing of the Speech. *The uses of the Lips.*

CHAP. XXVI.

Of the inner Parts of the Mouth.

THE *inner* Parts of the Mouth are these: The *Gums*, the *Teeth*, the *Palate* or *Roof* of the *Mouth*, the *Almonds*, the *Uvula*, the *Tongue*, the *Glands* and *salival Ducts*. *The inner Parts of the Mouth.*

The *Gums* (*Gingivæ*) are two, made up of a hard fleshy substance, destitute of motion, set like a Rampire about the Teeth for the keeping of them in their Sockets. 1. *Gums.*

As for the *Teeth*, look for them in Book VI. Cap. 8. 2. *Teeth.*

The Roof of the Mouth is its upper part, something concave like a Vault, formed in the *Os sphe-* 3. *Palate.*

noides, and ſerves partly for perfecting of th Voice by repercuſſing the Air, and partly aſſiſ the Senſe of Taſting. It conſiſts of Bones (which, Book VI. Chap. *6.)* of a peculiar glandu lous Fleſh and a thick Tunicle, full of little hol for the *Saliva* that is ſeparated in the Glands t deſtill through into the Mouth. *Steno* calls th glandulous fleſh, the *palatine Gland*, and ſays, it conglomerate, and continued to the *Tonſils*; a that there ſpring out of it innumerable ſlend Ducts, which perforating the Membrane make like a Sieve. The ſame Author mentions al two holes that it has in its fore-part, juſt with the Teeth, which come from the Noſtrils.

4. *Almonds.* Of the *Tonſillæ* or Almonds we have ſpok before in Book II. Chap. *ult.*

5. Uvula. The *Uvula* is a red, ſpongy and longiſh C runcle, that being ſomewhat broad at its Ba hangs down from the middle of the Palate (whe the Noſtrils open into the Mouth) with a ſm but bluntiſh End. It is covered with a very l and ſoft Skin, and is often ſwelled with Deflu ons of Rheum, hanging down flaggy, which called the falling of the *Uvula*, and by ignora People, the falling of the Roof of the Mouth.

6. *Tongue.* The *Tongue* (*Lingua*, *à lingendo*, from *lickin* is the Inſtrument of Taſte and Speech. It long and broad, thicker at the Root than t wards the Tip.

Its Membranes. It is cloathed with two *Membranes*; The ou covers onely the upper part of the Tongue, a is very porous, being pretty ſmooth in Men, l in ſome Brutes it is rough, by reaſon of ab dance of copped bodies which ariſe out of upper ſurface of the Tongue, and are cloath with this Membrane. Which Bodies are of a c tilaginous ſubſtance, and ſtand like the Teeth

Wo

Vooll-cards, bending towards the root of the ongue. This Membrane has a line that runs ngthways of it in its middle, dividing the Tongue to two parts. The *inner* covers the whole ongue, the lower side as well as the upper. his is thin and soft, and has many *Papillæ* proberating out of it, which in the upper part of e Tongue intrude themselves into the pores of e outer. *Malpighius* makes the outer Membane to be that which cloaths the sides and unr side of the Tongue as well as its upper side: d this which we call the second, he names a rvous and papillar body, running through the per surface of the Tongue like a Membrane.

As to the *substance* of the Tongue there is eat diversity of Opinions. Some think it to be Gland; others, that it has a peculiar substance; *ligelius*, that it is truly a Muscle; and so does r. *Wharton* call it *verus Musculus*, though toards its root (he saith) it hath something of a ndulous substance. *Malpighius* (*exercit. Epistol. lingua, p.* 9.) says, it is rather muscolous than ndulous, and describes its substance thus. *Substance.*

"Immediately under the aforesaid Membranes "there lie streight fleshy muscular Fibres, where"by the Tongue is drawn inwards and shortned. "But the centre of the Tongue consists of a ma"nifold kind of Fibres, long, transverse and ob"ique, which riding one upon another are in"erwoven like a Mat. This inner part is softer "nd more luscious to the taste than the outer; "ot that it is of another substance, but because "t is loosened and larded as it were by a cer"ain luscious fat that (especially toward the ba"is) fills up the Interstices of the Fibres; and "here are moreover on the sides of the Fibres "n this place a sort of miliary Glands which

" give it the more pleaſant reliſh.] But though this be its ſubſtance, yet it cannot properly be called a Muſcle, both becauſe no Muſcle ſerves to move it ſelf, but ſome other part; and alſo becauſe one Muſcle is not moved by another, as the Tongue is by ſeveral pair, to be deſcribed Book V.

Connexion. It is *connected* to the *Os hyoides*, *Larynx*, and *Fauces*, and by a membranous Ligament to the parts under it. The extremity of which Ligament is called *Frænum*, which being too ſhort or extended to the tip of the Tongue, hindreth ſucking in Children, when they are ſaid to be Tongue-tied.

Veſſels. Its *Veins* proceed from the external Jugulars and are very apparent under the Tongue, where they are called *Ranulares*. The *Arteries* come from the *Carotides*. *Nerves* it hath from the fifth and eighth pairs.

Actions and uſes. The *actions* and *uſes* of the Tongue are theſe. Firſt, it is the Inſtrument of Taſting; eſpecially the *Papillæ* in its inner Membrane, which have nervous filaments (running amongſt the fleſhy fibres) inſerted into them. Secondly, it forms eth or modulateth the Speech. Thirdly, it helpeth the chewing of meat, by toſſing of it to and fro, and turns it down into the Gullet.

7. *Glands.* Beſides the *Glands* already mentioned there are ſeveral others, ſome of which are placed in the Mouth, and others, though not ſeated there in, yet diſcharge into it by proper Ducts that liquor that is ſeparated in them, and therefore are properly enough to be treated of here.

Parotides. The firſt are the *Parotides*, which are of two ſorts, *Conglobate* and *Conglomerate*, and are both ſeated in the hollow under the Ear. The *Conglobate* are ſituated on the upper and fore-ſide of the Conglomerate. The *Conglomerate* are of an irregu-

egular ſhape, ſuch as the inequalities and emi-ences of the circumjacent parts grant to them. They were both of them formerly reputed E-unctories of the Brain, and ſuppoſed to ſerve kewiſe for the ſuſtentation of the Veſſels that cend this way. But *Steno*, and from him others ive found out more noble and genuine uſes for em. The *Conglobate* ſeparate the *Lympha* from e Arterial blood, and conduct it by Lympheducts into the Jugular Veins. The *Conglomerate* ve not only inſerted into them Veins and Arries from the external Jugulars, and *Carotides*, d Nerves from the harder branch of the ſeenth pair; but alſo there ſprings out of each a culiar Veſſel commonly called a *Salival duct*, om the liquor it conveys. This Veſſel ariſes ct of it by many ſmall roots, that preſently ite into one Trunk, which running on the oute of the upper Jaw-bone by a ſtreight courſe (a man) as far as to the centre of the *Muſculus bccinator*, there opens into the cavity of the outh, into which it diſcharges the *Saliva* which had imbibed out of the *Parotis* of its own ſide. his is called *Ductus ſalivalis Stenonianus*, from its ventor *Steno*; or otherwiſe *Superior*, to diſtinguiſh it from the maxillar which is the lower. s to the origine and uſe of the *Saliva*, we ſhall eak thereof by and by. *Their ſalival ducts.*

The ſecond Glands I call *Nuckianæ*, being ely firſt deſcribed, with the Salival ducts proceding from them, by Dr. *Ant. Nuck* a Dutchan. They are ſeated in the orbit of the Skull herein the Eye is placed, betwixt the abducent uſcle of the Eye, and the upper part of *Os jugale*. Their ſhape is various, in ſome oblong, in thers flattiſhly round, in others oval, and in thers ſomewhat triangular. Each weighs com- Nuckianæ.

monly half a dram or ſomewhat more. The have *Arteries* from the *Carotides*, *Veins* from th *Jugulars*, *Nerves* from the *motory pair* of the Eyes and he thinks there is no doubt but they hav *Their ſalival ducts.* *Lymphaticks.* Each has a *Salival Duct* ſpringin out of it by many roots, which deſcends ſtreigh downwards on the outſide of the Jaw-bone, ti it come to the upper part of the Gum in the u per Jaw near to the ſecond double Tooth reckor ing from behind forwards, where it empties ſelf very near the *Stenonian* one. He calls the *Ductus ſalivales ſuperiores alteri*, to diſtinguiſ them from the foregoing.

Maxillares. The next Glands are the *Maxillar*, which a either *External*, or *Internal*. The *External* are leſs moment, being very ſmall. They are ſeate outwardly about the middle of the lower Jaw where the outer branch of the Carotid Arter and the external Jugular Vein, with a remark able branch of the fifth pair of Nerves aſcend i to the Muſcles of the Face. It is probable the have no other uſe, but to ſeparate *Lympha*, an to convey it into the neighbouring Jugular Vein The *Internal* are ſeated immediately within th lower Jaw. Their hinder ſide which is next t the *Parotides* and Jugular Glands, is much thick er and rounder, as alſo redder: but as they reac forwards, they wax thinner by degrees, and a extended betwixt the Jaw and the Muſcles of th Tongue as far forward as to the Chin, as D *Wharton* affirms. They are Conglomerate, an *Their ſalival ducts.* have each a proper Veſſel (firſt found out by th ſaid Author) ariſing out of them as the congl merate *Parotides* had: which Veſſels are calle the *inner* or *lower Salival ducts*, as thoſe ſpringin from the *Parotides*, the *outer* or *upper*; theſe ru ning on the inſide of the lower Jaw, as thoſe d

n the outside of the upper. These Vessels spring y many small roots out of the thicker and hinder art of the Glands, and run streight forwards owards the Chin, but in their passage each trunk oes here and there receive new twigs springing ut of the Gland. When they are come to the iddle of the Chin, they end there just within ie Gums, and have each a certain *papilla* affixed their Orifice, whereby they can easily discharge themselves, and yet nothing return out of ie mouth into them.

The last Glands to be treated of are the *Sub-linguales*, to the first discovery whereof and of their proper Salival ducts, several pretend. They e underneath the Tongue on each side, and each them sends forth a proper excretory Vessel salival Duct, which running parallel with ose of the internal maxillar Glands, open in ie same *papillæ*, but have a peculiar Orifice of eir own, straiter than that of the other. Sublinguales.

Now the *use* of all these Glands is to separate ie *Saliva*, and to convey it into the mouth by ie salival Ducts. As to the Origine of the *Saliva*, it is most probably derived from the Arterial blood. For as the Arteries pour nutritious lood into all other parts, so they do into the lands also; part of which they convert into eir own nourishment, part is returned by the eins in the circulation, and part (*viz.* of what serous) they separate, and bestowing a subacid uality thereupon make *Saliva* (or Spittle) of it. *The use of the glands and* saliva.

To the composition whereof (if not for the paration of it) some think a nervous juice is contributed, the rather because larger and more numerous twigs of Nerves are communicated to the lands than to most other parts, which yet have more exquisite sense than these. But in refu-

tation of this Opinion, the above-mentioned Dr *Nuck* alledges this Experiment: "That if th "Nerve that runs to any Gland be either har "tied or cut in sunder, yet the secretion of th "*Saliva* will not thereupon cease, but will onl "proceed more slowly;] which slowness may b attributed, not to the want of any constitutiv principle of the *Saliva*, so much as to the wan of that motion in the Gland (that to be sure de pends as well upon the Nerve as upon the pulsa tion of the Artery) which is necessary for th quicker dispatch of the *Saliva* through or out o the Gland. I shall not need to discourse of th manner of the secretion of the *Saliva* in th Glands, seeing it proceeds like the secretion o other parts, (*v. g.* of the Kidneys) *viz.* from th conformity of the particles of the liquor to th pores in the Gland or the mouths of the excre tory Vessel. After its separation, its motio into and along the Lympheducts is much fur thered by the muscular motion of each part re spectively. Now the *Saliva* is not to be reputed a meer Excrement, for it is believed by all mo dern Anatomists, that it serves for the furtherin of the fermentation of Meats in the Stomach, i it be not the main ferment of it, as was shewe in Book I. Chap. 7. That it has a fermentativ quality *Diemerbroeck* proves by this Experiment That if a piece of white Bread be chewed an moisten'd with much Spittle, and then be mixe with Wheat-paste kneaded with warm Water it will make it ferment. Dr. *Nuck* thinks it i an universal ferment for Meats and Drinks, par taking of divers qualities (or particles) but o none in any excessive degree. That it is acid he demonstrates by this familiar Observation "That if when Milk is a boiling, one tak "a Spoon

a Spoonful to taſte of, and then preſently whilſt it is moiſt with the *Saliva*, put it into the Milk again (ſtill a boiling) the Milk will break as if ſome acid liquor were mixed with it.] That it is endued with a volatile Salt, he thinks is evident from its curing the Itch, Tetters, *&c.* That oleous particles are mixed with the acid, he ſuppoſes muſt be concluded from its killing Quickſilver. And whereas it uſually becomes frothy in the mouth upon its being agitated by the motion of the Muſcles of the Tongue, and thoſe which move the lower Jaw, that he thinks proceeds from its being endued with a lixivial ſalt and ſpirituous oleous and acid particles, (while the volatile ſpirit vaniſhes.)

The End of the Third Book.

The

The Fourth Book.

Containing

A Deſcription

OF THE

Veins, Arteries and *Nerves*

OF THE

L I M B S:

With an APPENDIX of the *GLANDS* thereof.

CHAP. I.

Of the Veins of the Arm.

IN the three former Books we have finiſhed the Deſcription of the three Cavities or Ventricles of the Body: out of which thoſe *Veſſels* ariſing that are propagated to the *Limbs*, it ſeems convenient to ſubjoin thereunto a ſhort Treatiſe of the courſe that thoſe Veſſels keep in theſe Parts. In

In Book II. Chap. 9. treating of the Aſcendin Trunk of the *Vena cava*, we ſhewed, that when arrived at the top of the *Thorax* it was divide into two branches called *Rami ſubclavii*; whic running obliquely under the *Claviculæ*, aſſoon they were paſt them and come to the Arm-pi were called *Axillares*. Now each of theſe par eth it ſelf into two Veins, the *Cephalica* ar *Baſilica*. But before their Diviſion they ſe forth two ſmall Veins, *viz. Scapularis inter* and *externa*; whereof the firſt paſſeth to the Mu cles that lie in the cavity or inſide of the *Scapul* the latter to thoſe on the outſide.

Cephalica. The *Cephalica* paſſeth through the upper outward part of the Arm, to the bending of t Elbow, where it is divided into two branche of the which one, joining with the *Baſilica*, mak the *Mediana*, which is very frequently opene when one is let blood in the Arm: The othe marching along the *Radius*, reacheth to the Han through which it is ſpread; but chiefly in th part which is between the Ring-finger and t little Finger, where it is called *Salvatella*.

Baſilica. The *Baſilica* paſſeth through the inner an lower part of the Arm, accompanied with t Artery and Nerves.

About its beginning there ſpring out of it t *Thoracica ſuperior* and *inferior*, (though ſometim theſe ariſe from the Axillar before its diviſion) which the former runs to the inſide of the Pecto ral Muſcle, *&c.* the latter to the *Muſculus lati ſimus* of the Back, and all over the ſide of t *Thorax*, where 'tis ſaid to inoſculate with t twigs of *Vena ſine pari*.

Its Branches. *Baſilica* about the bending of the Elbow is d vided into two; one of which is called *Subcute ne*

a, running just *under the Skin*; and the other *Profunda*, because it lies hid *deep* in the flesh.

The *Subcutanea*, or shalloweſt branch, near its origine turns up to the outer part of the *Ulna*, and is carried along it to the Hand. Subcutanea.

The *Profunda* descends between the *Ulna* and *Radius*, (but towards the Wrist is carried by the outer part of the *Ulna*) to the Hand also. Profunda.

The *Mediana* is also double, *profunda* and *subcutanea*; both which run by many Twigs through the Muscles of the Cubit to the Hand and Fingers. The Mediana.

Note, That since the Circulation of the Blood has been generally believed, it is held indifferent which of these three Veins (the *Cephalica*, *Basilica*, or *Mediana*) are open'd in blood-letting; for they all receive their *Blood* from one common Artery, *viz.* the Axillar, which returns by them all indifferently towards the Heart: onely it is best to open that which is faireſt.

CHAP. II.

Of the Arteries of the Arm.

AS soon as the *Subclavian* Branches of the ascending Trunk of the *Aorta* are past out of the *Thorax*, they are called *Axillar*, (like the Veins) as we shewed in Book II. Chap. 11.

This Artery before it arrive at the Arm sends out of its *upper* part *Humeraria*, which is bestowed on the Muscles of the Shoulder: and out of its *lower*, *Thoracica superior*, *inferior* and *scapularis*, which run to the same parts with the Veins of the like denomination in the foregoing Chapter.

Chapter. Then having communicated ſmall twi to the Glands in the Arm-pit, it accompanie the *Baſilica* along the Arm, (for there is no C phalick Artery.) When it is come to the ben ing of the Elbow, it is parted into *two* Branche which paſs almoſt wholly to the inner ſide of t hand; for the backſide hath no Artery but fro a ſmall twig that runs betwixt it and the bone the Thumb.

The *one* of theſe reſting upon the *Radius*, that which beats about the Wriſt, and is co monly felt by Phyſicians.

The other marcheth by the *Ulna*, and with t former is ſpread through the Hand.

CHAP. III.

Of the Nerves of the Arm.

THE *Nerves* that ſpring from betwixt t two loweſt *Vertebræ* of the Neck, and t firſt two of the Back, (ſome ſay, three of t Neck and three of the Back) do every one ſe a branch towards the Arm; all which for the greater ſtrength uniting with one another, a again ſeparating are carried under the *Clavicu* to the Arm-pit, where they unite together aga and are called *Axillar*; but they paſs out fro thence again ſeparate one from another. The fi of them goes to the Muſcle *Deltoides*, to t ſecond Muſcle of *Os hyoides*, and to the Sk of the Arm. All the other five are beſtow wholly on the Muſcles and Skin of the Arm a Hand.

CHA

CHAP. IV.

Of the Veins of the Thigh, Leg, and Foot.

THE Iliacal Branches of the *Vena cava* after they are descended as far as the Thigh (here we left them *Book* I. *Ch.* 13.) are called *Crurales*, which being past the Groins are each divided into six more notable Veins, *viz. Saphœna, Ischias major* and *minor, Muscula, Poplitea* and *Tibialis*. The first called *Saphœna* descends down the inside of the Thigh and Leg betwixt the Skin and *Membrana carnosa*, and appears pretty large on the inside of the Ankle, where it is frequently opened in Diseases of the Womb, and may with great safety, having neither Artery nor Nerve accompanying of it. The *Ischias major* is that which runs down on the outside of the Ankle (where it is wont to be opened in the *Sciatica*, or other distempers of the Hips;) but the *minor* goes no further than the Muscles of the Hip. The other three are spent on the Muscles, Skin, *&c.* of the Thigh, Leg and Foot.

CHAP. V.

Of the Arteries of the Thigh, Leg, and Foot.

IN *Book* II. *Ch.* 11. describing the descending Branches of the *Aorta*, we traced them to the Thighs, where the *Rami Iliaci* begin to be called *Crurales*, as was said of the Veins. The Crural Artery

Artery is leſs than the Vein, and before it arri
at the Ham ſendeth forth three Branches, *vi*
Muſcula cruralis exterior, *interior*, and *Poplite*
The firſt enters the fore Muſcles, the ſecond t
inner Muſcles of the Thigh; and the third ru
down the hinder Muſcles as low as the Ha
whence it has its name. When the trunk of t
Crural Artery is paſt the Ham, it ſends out thr
more called *Tibiæa exterior*, *poſterior elatior* a
poſterior humilior, which are beſtowed on t
Muſcles, Skin, *&c.* of the Leg and Foot; a
what remains of it deſcends to the Foot, up
which it is ſpent.

CHAP. VI.

Of the Nerves of the Thigh, Leg, and Foot.

THE three lower pair of Nerves of t
Vertebræ of the Loins, and the four u
permoſt of *Os ſacrum* conſtitute the Cru
Nerves. For all theſe very near their Ri
joining together, and proceeding united for
while, make four Nerves. The *firſt* and *thi*
enter the Muſcles that lie upon the Thigh-bo
whether for *its* Motion, or of the Leg. T
ſecond accompanies the Crural Vein and Arte
down by the Groins and the inſide of t
Thigh, on whoſe formore Muſcles it is m
of it ſpent, but ſends one notable Branch dov
the Leg, as far as to the great Toe. T
fourth is the thickeſt, hardeſt, and ſtrongeſt
all the Nerves in the Body. This diſtrib
teth Twigs to the Skin of the Buttocks a
Thig

Thigh, to the Muſcles of the Thigh and Leg, and being deſcended to the Ham is divided into the outer and inner Branches, which beſtow Twigs on all the Muſcles and Skin of the Leg and Foot, to which there comes no other Nerve, but the aforeſaid Branch of the Second.

AN APPENDIX TO BOOK IV.

Of the GLANDS of the Limbs.

HAving finiſhed the Deſcription of the Veſſels of the Limbs, this ſeems the fitteſt place to mention the *Glands* of the ſame, ſeeing they miniſter to thoſe, either as ſupporting them in their paſſage, according to the Ancients; or as ſeparating *Lympha* from the Arteries, according to ſome Moderns, (or Superfluities from the Nerves, according to others) and returning the ſame by Lympheducts into the Veins.

The moſt conſiderable of theſe *Glands* are *Glands of the Groin and Arm-pit.* in the *Groin* and *Arm-pit*. The former are called *Bubones*, (not only when ſwelled, but in their natural ſtate) and are commonly but eight. The latter are called *Axillares*, from their ſituation. Theſe are ſmaller than the

other, and fewer in number, ſeldom exceed three.

Their Uſe. The Groins and Arm-pits the Ancients cal Emunctories; the one of the Belly, the other the Breaſt. And, beſides the ſupporting of diviſions of the Veſſels, all the *Uſe* aſſigne theſe Glands, was to imbibe a moiſture from Blood for the nouriſhment of the Hair that gr in theſe parts. But ſeeing in the Groins wl the moſt and largeſt Glands are, there grows tle or no hair, (moſt of that, growing upon region of the *Os Pubis* where are no Gland all) this ſeems not to be the proper uſe of th and indeed it is too trifling and vile. The Uſe, as of all other conglobate Glands (of w ſort theſe are) is, to ſeparate the *Lympha* f the Arterial Blood, and to tranſmit it by Lympheducts into the Veins, in which it is veyed back together with the Venal Blood to Heart.

The Pope's Eye. In the middle of the Thigh on the inſide (a the middle of the length of the *Muſculus ſarto* is a pretty conſiderable Gland, which we monly call in Sheep *the Nut* or *Pope's Eye.* Th of the ſame kind and uſe with the former. A the *Mucilaginous Glands* of the *Joints*, lately f out and accurately deſcribed by the ingenious ſedulous Dr. *Havers*, they ſhall be particularl ken notice of in the VI. Book *of the Bones*, the reſpective Joints to which they belong, deſcribed.

The End of the Fourth Book

The Fifth Book.

CONTAINING

A Treatise of all the MUSCLES Of the BODY.

CHAP. I.

Of a Muscle in general, and of its parts.

A *Muscle* in Greek is called μῦς, a *mouse*, (of which *Musculus* in Latine is but a diminutive) either because it resembles a flay'd mouse; or else from μύω, to *contract*, which is its action. And under this denomination is understood all that which is properly called flesh; which is not one continued substance through the whole Body, but consists of divers parts or parcels, that have no continuation of substance, but lie only contiguous to one another in such convenient and decent order and situation, as may conduce to the comelinesse of the Body, and the performance of each one's particular office. *A Muscle. Its name.*

Definition. Now a Muſcle is rightly defined to be a *diſſi-lar* or *organical part*, (framed of its proper Me brane, fibrous fleſh, a Tendon, Vein, Art and Nerve) *appointed by nature to be the Inſtrun of free motion.*

By which definition ſeeing it appears to b diſſimilar part, conſiſting of many ſimilar, ſhall in the firſt place examin what theſe They are either *common* or *proper*. The *comm* are three: The Vein, the Artery and the Ne The *proper* as many, *viz.* the fibrous fleſh, Membrane and the Tendon.

Conſtitutive parts, viz. common and proper. The common are Arteries, Veins, and Nerves.

The *Arteries* convey to the Muſcles, (as to the other parts of the Body) Vital heat and n riſhment; and according to Dr. *Willis*, a *l* that in motion efferveſces with the Animal rits; the *Veins* carry back from them what bl is not aſſimilated to them; and the *Nerves* bi Animal ſpirit whereby their action is perform And theſe Nerves ſpring either from *medulla oblongata* within the Brain; or from *ſpinalis*, ſo called after it is deſcended out of Skull into the Spine. Dr. *Willis* is of opin that the Nerve which enters every partic Muſcle, is ſingle and peculiar from its very ginal, though it be included in a common with many others: otherwiſe he cannot conc how the Animal ſpirits which are directed by Soul along the Trunk of any Nerve, for ſuc ſuch a particular motion, ſhould hit the way one branch rather than another. As ſoon a hath entred into the ſubſtance of the Muſcle, divided into innumerable twigs, which in a l ſpace from its inſertion become ſo very fle and fine, that they eſcape the ſight. Some n Lymphatick Veſſels common parts of a Mu but according to *Steno*'s obſervation, though

ru along their surface, they do not enter into hm.

Now these are called the *common* parts of Mus- *Why called common.*
cle, because they are common to *them* with *other* parts of the Body that are endowed with the same kind of Vessels. But as to each particular Muscle they have every one their peculiar and proper Vessels, numerically distinct. That is, though those twigs of Vessels that are inserted into one Muscle, be propagated from the same Trunks with which other twigs pass to other Muscles; yet those twigs, whether of Arteries, Veins or Nerves, that are bestowed on one Muscle, are wholly spent thereon, and pass not out through the investing Membrane again to any other.

The *proper* parts are so called, because they are *The proper why so called.*
proper and peculiar to a Muscle, and not common to any other part.

The first of these is *fibrous flesh*, or *fleshy fibres*, *These are,*
which some distinguish into two parts, *fibres* and *1. Fibres.*
flesh: and fibres again into *fleshy*, and *membra-* *(1.) Fleshy.*
nous.

A *Fibre* is thus defined by Dr. *Glisson* in Cap. 4. de Concentric. *A Body in figure like a thread, slender, tenacious, tensile, and irritable, made of spermatical matter, for the sake of some motion and strength.* Which he thus explains; "*In figure like a thread*] "i. e. oblong and round; *slender*] like a Spider's "web: *tenacious*] whose parts firmly cohere and "are not easily broken; *tensile*] viz. that may be "extended as to longitude, its latitude being les-"sen'd, and in like manner that may be thicken'd "as to latitude, its longitude being shorten'd; "*irritable*] i. e. which by irritation may be excited to contract it self, and the irritation ceasing, "to be remitted of its own accord; *made of spermatick matter*] namely if it be a bare Fibre;

"but if it be ſtuft with a *parenchyma*, perhaps
"is not always made of only ſpermatick matte
"(for the ſtuft Fibres may be divided into ſa
"guineous and ſpermatick; of the former ki
"are thoſe of the Muſcles; of the latter, th
"of the Stomach and Guts:) *for the ſake of ſo*
"*motion and ſtrength*] for in that it is tenacious
"adds ſtrength to the part, and that which
"apt to be extended and contracted, is deſti
"for ſome motion.]

Their courſe. Theſe *fleſhy fibres* are commonly *ſtreight*, l
not *always*, for ſometimes they run *round*, as
the Sphincters.

(2.) Membranous. Beſides theſe fleſhy Fibres, ſome later Ana
miſts deſcribe another ſort which they call *me*
branous, running from Tendon to Tendon ov
thwart the other, cloathing them and knitti
them to one another; and make them to co
municate to the fleſhy ones their motory inſtin
and alſo to convey to the Tendons the Spi
which flow into the belly of the Muſcle by
Nerves, as likewiſe the ſame Spirits from
Tendons back again to the belly of the Muſc
as there is occaſion.

Fleſh what, and of what made. The Fibres being ſtuft in their Interſti
with a ſanguineous *parenchyma*, are that which
properly call *fleſh*. For (ſaith Dr. *Croone*) all
fleſh of a Muſcle (which makes the greateſt p
of it, and of which the bulk of the whole B
chiefly conſiſts) ſeems to be nothing elſe but t
portion of the blood that flows through the int
vals of the Fibres, which thickning by their co
neſs is ſtaid amongſt them. *Steno* denies any
renchyma; and ſays, that every Fibre is tendin
at both ends, and carnous in the middle:
that the ſame Fibres which being ſtraitly knit
one another, make the Tendon; being m

lo

losly joyned, make that we call flesh. With him consent most of the more modern Anatomists, who will have all the fleshy fibres vascular or tubular, and to be filled with a fluid. But though we should grant they are, yet I think it is necessary, besides them, to allow of a *parenchyma*; otherwise, the Muscles of slaughter'd Animals would more considerably abate of their bulk, for a good part of this fluid must needs be derived out of the pores, and be evacuated together with the bloud. For nothing can come into the fibres, but out of the bloud; and upon depletion of the bloud-vessels, what should hinder the same from returning out of the fibres into those vessels again? And a *parenchyma* is further demonstrated, in that in some muscles in fat people the (lean) flesh is interlarded with fat, which fat yet is not a necessary part of a Muscle, seeing it is not in all Muscles even in fat persons; and in very lean, in none.

Every Muscle hath a proper *Membrane* that invests it, and distinguishes it from others. Where- 2. *A Membrane.*
to its Origine is owing, is difficult to determine. 'Tis most probable, that 'tis made out of the fibres expanding themselves at their ends; to conceive which we must understand that the fibres run not lengthways of the Muscle so as to reach from one end of it to the other; but from one side of it to another, yet not directly but a little sloping. Notwithstanding (so long as they continue fleshy) they are streight in figure, if you consider them apart, and run parallel one by the side of another. But supposing this to be the Origine of this Membrane, (which I propose as doubtful) we must not conceive that the fibres are wholly spent thereupon so as to terminate there; for under this Membrane they run

(being diveſted of their *parenchyma*) lengthway of the Muſcle, and conſtitute its Tendon.

3. *A Tendon. Its definition.* The laſt *proper* part of a Muſcle is the *Tendon* which *Spigelius* defines thus: *It is a ſimilar and ſimple part, of a peculiar kind, diffuſed through the whole body of the Muſcle lengthways, which in ſome part thereof is united,* (and there it is white with a kind of brightneſs, denſe, hard and ſmooth) *and in ſome divided and ſtuffed with fleſh* (where it is not eaſily diſcernible:) *and ſeeing it is very much adapted for contraction, when it is contracted at one's pleaſure, it moves together with it ſelf that part into which it is inſerted.* *Steno* affirms the riſe of a Muſcle to be tendinous, as well as its inſertion; and defines a Tendon to be a body continued from the beginning of Muſcles to their end.

Which Muſcles have Tendons. All Muſcles which are appointed for the moving of bones, have Tendons which are inſerted into thoſe bones they are to move: but commonly thoſe which move other parts, as the Tongue, Lips, *&c.* as alſo the Sphincter of the Bladder, and *anus*, have none, or however ſuch are not eaſily diſcoverable; for indeed ſome affirm (as Dr. *Croone*) that every Muſcle has its Tendon.

Of what they are framed. There are ſundry Opinions as to the *ſubſtance* of a Tendon. *Spigelius* (as appears by the foregoing definition) thinks it to be a *ſimple* part, that is, *truly* ſimilar, and not appearing ſo to the Eye only. He ſays, it is neither a Nerve, nor a Ligament, nor is it a ſubſtance mixt of both; but it is a part of its own proper kind, ſofter than a Ligament, and harder than a Nerve. *Veſalius* on the other hand affirms (with *Galen*) that it is a diſſimilar body, compoſed of a concourſe of Fibres, Ligaments, and very ſlender Nerves, growing by degrees into one body. *Diemerbroeck* doubts no

ot but that the Nerve which enters into any Muscle, is extended as far as its Tendon (though cannot be traced by the Eye thither) because of he very acute sense of the Tendon; and yet the Tendon, he says, is not a meer Nerve, but 'tis kely that the Fibres and Membrane with a Liament are intermixed with it.] I think 'tis most robable, that it is only a production or prolonation of the Fibres freed from their *parenchyma*, nd clothed with the investing Membrane of the Muscle, which it self seems also to be derived om the Fibres, as was noted above. But whatver its substance be determin'd to be, it has alays been held to be the principal part of the Muscle, and the chief instrument of its action; hough according to *Steno* it is not it self that ontracts, but the fleshy Fibres by its means. Dr. *Willis* thinks that the Animal Spirits which reside the Muscle, do in cessation from motion re're into the Tendons, and in motion are darted om thence into the *parenchymatous* or fleshy part, here they are joyned with more, flowing in by he Nerves.

The Tendons are sometimes round, as in the *Musculus biceps*; sometimes broad, as in the obque and transverse Muscles of the Belly. *Their figure.*

These are the *parts constitutive* of a Muscle. It ith besides these, parts derived from the *Posion* (or rather from its action) and those are ree: The Head, the Tail, and the Belly. The *Head* or beginning is that part of the Muscle that ises from the part *unto* which the contraction is ade: the *Tail* or *end* is that part of it which is serted into the part which is moved: the *Belly* all that (fleshy) part that lies betwixt the Head nd Tail. *Steno* thinks the *Head* and *Tail* of a Muscle *The parts distinguished from the position.*

Muſcle are better expreſt by the *two Extremes* ſeeing if that be the Head to which the contra ction is made, then neither extream, but th middle or *belly* is the head, becauſe both the ex treams in contraction move towards *it :* or if an will contend that one end is moved towards th other, the ſame end is not always the quieſcer one in all the motions of every Muſcle; an therefore the ſame end in ſeveral motions bein ſometimes the Head, and otherwhiles the Tai this diſtinction breeds but a confuſion.

The uſe of a Muſcle. The *uſe* (or rather *action*) of a Muſcle was ir timated in the laſt part of the definition, in tha it was ſaid to be the inſtrument of *free* motion which word we rather make uſe of than of *volun tary*, becauſe Beaſts have Muſcles and motion unto whom *Will* properly ſo called is denied, bc cauſe it ſuppoſeth Reaſon. But hereof more i the next Chapter.

CHAP. II.

Of the Differences and Action of the Muſcles.

The differences of Muſcles. THE *Differences* of Muſcles are taken fro ſundry things: *Firſt*, from their *Subſtance* ſo ſome are fleſhy, as moſt of the Tongue an *Larynx*: ſome are membranous, as the *Conſtr ctores* or internal *Adducents* of the Noſe: and ſom art partly fleſhy, and partly nervous, as the tem poral.

Secondly, from their *quantity*: whence ſome ar *long*, as the ſtreight Muſcles of the *Abdomen*, th longeſt of the back, *&c.* others *ſhort*, as the py ramida

amidal at the bottom of the *Abdomen*: ſome *road*, others *narrow*: ſome *thick*, others *thin* and ender, *&c.*

Thirdly, from their *ſituation*: from hence ſome re called *external*, ſome *internal*; ſome *oblique*, ome *ſtreight*, ſome *tranſverſe*.

Fourthly, from their *figure*: as *Deltoides*, beauſe it reſembleth the Greek letter Δ *delta*; ſome *ound*, others *ſquare*, *&c.*

Fifthly, from their *beginning*: ſo ſome proceed rom *bones* one or more: ſome from *Cartilages* or riſtles, as thoſe of the *Larynx*; and ſome from he Membrane that inveſts the Tendon of ſome ther Muſcle, as the *Lumbricales* of the Hands nd Feet.

Sixthly, from their *inſertion*: ſome being inerted into *bones*, as moſt are; ſome into *Cartilaes*, as the Muſcles of the Eye-lids, *&c.* others into a *Membrane*, as thoſe of the Eye, *&c.*

Seventhly, from their *compoſition* or *variety of parts*; ſo ſome are called *bicipites* and *tricipites*, having two or three heads; others *biventres* having two bellies.

Eighthly, from their *action*: from whence four differences of Muſcles are taken: for *firſt*, ſome are hence called *fraterni* or *congeneres*, brotherly, becauſe they aſſiſt one another in their Action; ſome *antagoniſtæ*, Adverſaries, becauſe they have an oppoſite motion. *Secondly*, ſome only move themſelves, as the Sphincters; ſome other parts, as the reſt. *Thirdly*, ſome have one only action, as the greateſt part of the Muſcles; ſome have divers actions, as the *maſſeter* and *trapezius*. The *fourth* difference is taken from the variety of the action; ſo ſome are called *flexores*, others *extenſores*; ſome *elevatores*, others *depreſſores*; ſome *adductores*,

adductores, others *abductores*. Others *ſuſpenſores*, *rotatores*, &c.

Thus much of the *Differences* of Muſcles one from another: in the next place proceed we to their *Action*, in which they all agree.

Their action.

Now the proper *Action* of a Muſcle is the *contraction* of it ſelf, whereby it brings the part from which it ariſes and that into which it is inſerted, nearer to one another. But whether this contraction be from the repletion, or from the inanition of its Fibres, or by both theſe, or which way elſe, we ſhall not ſpend time to Philoſophize, nor is it agreed on among learned men.

The efficient cauſe, and mediate inſtrument thereof.

The *Efficient cauſe* of this Action is the Soul or the Loco-motive, Animal Faculty, which being invited, or offended by ſome object, moves the whole body, or ſome member of it, in purſuance or avoidance thereof; of which motion the Muſcle is the *immediate* inſtrument, but the Nerves conveying the Animal Spirits to the Muſcle, are the *mediate*.

The differences of their motion.

I ſaid even now that the *proper* action of a Muſcle is contraction, but that is not the only motion it is capable of, for Anatomiſts commonly aſcribe to it four different motions: The *firſt* is that already mentioned, *viz.* contraction; the *ſecond* is the perſeverance of the contraction: the *third*, the relaxation of the contraction; and the *fourth*, the perſeverance of the relaxation. The perſeverance is called *motus tonicus*, whenas the member is ſtill kept in the ſame poſture.

Theſe four motions are common to every particular Muſcle: but there are others which agree ſome to one, ſome to another, in reſpect of their ſituation, or the courſe of their Fibres: So a ſtreight Muſcle hath a ſtreight motion;

notion; a tranſverſe, a tranſverſe motion; an oblique, an oblique; and a ſphincter, an Orbicular.

As for the *reaſon* and *manner* of motion, where- *The reaſon and manner of motion.*
of different Authors have invented various *Hypo-theſes*; as it would be too *large* a task to examine theſe; ſo I think it too *difficult* to explain thoſe. And therefore waving all ſuch ſpeculative and conjectural Diſcourſes, and frankly declaring with *Steno*, That to me *non liquent*, I proceed to the Deſcription of the Muſcles themſelves, wherein I may appeal to the Hand and Eye of any skilful Diſſector.

CHAP. III.

Of the Muſcles of the Eye-lids and Fore-head.

THE upper Eye-lids are moved very manifeſtly, the lower more obſcurely; wherefore the upper have each a Muſcle that the lower want, which is called *rectus* or *aperiens*, ſerving to pull it up. It is placed in the upper region of the orbit of the Eye, and ſpringeth from the ſame origin with the *Elevator* of the Eye, (above it) namely at the hole through which the optick Nerve paſſes into the orbit, and holds the ſame courſe with it, being of the ſame Figure and Subſtance, *viz.* fleſhy, till at laſt parting from it, with a pretty broad but thin Tendon, it is inſerted into the Cartilage of the upper Eye-lid, which it ſerves to lift up, and ſo to open the Eye. *The Muſcles of the Eye-lids, viz.* Recti,

Theſe, I ſay, are proper to the *upper* Eye-lids; but the following belong to the *lower* as well as upper.

They

And Semi-circulares. They are called *Claudentes*, or ſhutters of th Eye-lids, as alſo *ſemicirculares*; (others call ther *Circulares*, taking them for one.) They are place between the *membrana carnoſa* and the inner Mem brane of the Eye-lids that is extended from th *Pericranium*. That which draweth down or ſhut teth the *upper*, is the larger, and ariſeth from th inner corner of the Eye and that part of the *Supe cilium* that is next to the Noſe, with a ſharp b ginning: from whence it paſſeth tranſverſly t ward the outward corner, growing preſentl fleſhy and broader, ſo that it filleth up all th ſpace betwixt the Eye-brow and the loweſt edg of the Eye-lid on which the Hairs grow, (which called *Cilium* or *Tarſus*) and at length is inſerte into the outer corner. That which moveth th *lower* (though but obſcurely) in order to ſhut i is leſs, being membranous and thin, ariſing fro the ſide of the Noſe with a ſharp beginning as th other; whence being carried tranſverſly it com to the middle of the Eye-lid, where becomin ſomething fleſhy it continues its courſe to the ou er corner which it turns about, and aſcending t the upper Eye-lid is inſerted into it with a broa end. Theſe two Muſcles being contracted ſhu the Eye, the greater drawing down the uppe Eye-lid, and the leſs pulling up the lower. Bu the lower has no Muſcle to pull it down again ſeeing its own gravity and the relaxation of i Fibres is ſufficient for that purpoſe: whereas th upper, as was obſerved before, has a peculia Muſcle to pull it up.

The Fron-tales. Yea, beſides the *Recti* aforeſaid, there ſometim concur, when we would open our Eyes ver wide, the *Muſculi frontales*, or Muſcles of the for head, which ſpring from the Skull near the co ronal future, and having their outer edge knit t th

he temporal Muſcles, are contiguous to one ano-
her with their other ſide upon the middle of the
ore-head, upon which they deſcend with ſtreight
ibres to the Eye-brows, where they terminate.
y the help of theſe we draw up and wrinkle the
ore-head, and by conſequence pull up the upper
ye-lid a little. The Skin grows very cloſe to
heſe Muſcles.

Some deſcribe another pair of Muſcles of the ore-head, called *Corrugantes*, whoſe Fibres de-ending a-ſlant from the lower part of the *Frons* etwixt the Eye-brows towards the top of the ſoſe, (where they meet one another) help to nit the Brows (as we call it) when we frown. ut theſe ſeem to be onely a part of the frontal Iuſcles, having their Fibres running in this place little obliquely. Corrugantes.

CHAP. IV.

Of the Muſcles of the Eyes.

THE Muſcles of each *Eye* are in number ſix; four *ſtreight*, and two *oblique*. The *ſtreight* ove the Eyes upwards and downwards, to the ight hand and to the left: the *oblique* move them bliquely. The *ſtreight* are more thick and fleſhy han the *oblique*. *Each Eye hath ſix Muſcles.*

As to their beginning, (*viz.* of the *ſtreight*) hey have all the ſame origine; as to their pro-reſs, the ſame ſtructure; and as to their end, he ſame inſertion. Their *Origine* is contiguous nd acute, being at the hole through which the ptick Nerve enters the orbit of the Eye, from vhoſe Membrane they ſpring. Their *middle*, or belly, *Four ſtreight.* *Their Riſe and Inſertion.*

belly, is fleſhy and almoſt round. Their end is a moſt thin and membranous Tendon, whereby they are inſerted into the *tunica cornea*, where it is pellucid, near the *Iris*, and ſo do encompaſs the whole Eye before as far as it is white.

The *firſt* of the *ſtreight* is called *attollens* or *Elevator*, becauſe it moveth the Eye upwards; and it is ſomewhat larger than the ſecond that moveth the ſame downwards, becauſe it requireth greater force to pull any thing upwards than downwards. This firſt is otherwiſe called *ſuperbus*, becauſe that motion of the Eye is owing to it, when we are ſaid to look high. For which reaſon the *ſecond* has the name of *humilis*, becauſe by it we look down; whence alſo it is otherwiſe named *deprimens*. The *third* is called *adducens*, becauſe it moveth the Eye inwards towards the Noſe; and alſo *bibitorius*, becauſe we are wont to uſe it to look into the glaſs or cup when we drink. The *fourth* is called *abducens*, from its drawing the Eye outwards from the inner corner to the outer; and alſo *indignatorius*, becauſe that motion or caſt of the Eye (as we call it) is proper to Men in the Paſſion of Anger.

The firſt is placed in the upper region of the orbit, the ſecond in the lower, (oppoſite to the upper) the third in the inner corner of the Eye, the fourth in the outer.

Two oblique. Their Riſe and Inſertion.

The *oblique* Muſcles are called *circumagentes*, winders or rollers about, and *amatorii*, or amorous; and are in number two. The *firſt* is *obliquus major*, or *ſuperior*, the upper and larger. This beginneth at the hole by which the Optick Nerve enters into the orbit of the Eye, as the four foregoing Pair did, and paſſing to the upper part of the inner corner of the Eye, endeth in a ſmall and round Tendon, which paſſeth thro' a tranſverſe cartilage

rtilage there placed, (called by *Fallopius Trochle-*) as a cord through a pully, and is inserted into e upper side of the *Cornea*, betwixt the *attollens* d *abducens*. This seems to be a very considera- e Muscle, seeing the fourth pair of Nerves (call- *Nervi pathetici*) are wholly spent upon it, ac- rding to Dr. *Willis*. The *second* is *obliquus minor*, *inferior*, the lower and smaller. This spring- es from the lower and almost outer part of the bit, (namely at the juncture of the first bone of e upper Jaw with the fourth) with a carnous ginning. It is slender but not quite round, and sseth obliquely to the outer corner of the Eye, hich having turned about, it ends in a short ndish and nervous Tendon, which meeteth with e Tendon of the other oblique Muscle, and is serted obliquely near the *Iris* betwixt the Ten- ns of the *attollens* and *abducens*, with the other, that both seem to have but one Tendon. This leth the Eye towards the Nose, as the other weth it from it.

Before you shew the Muscles of the Eye, cut off the fat with your scissers, then shew first the *obli- us major*, then the *obliquus minor*, and last of all the four streight Muscles. Nevertheless let the *liquus major* remain last, when all the rest are en away, that you may shew how the Tendon of passeth through the *Trochlea* or pully the more inly. *How these Muscles are to be shewed.*

Which *Trochlea* is thus described by *Spigelius*: *s a little round Cartilage, hollowed like a Pipe or e of a straw, that is suspended by a Ligament in the er corner of the Eye*, through which the Tendon the greater oblique Muscle passing, procures o that Muscle the name of *Trochlearis*. Trochlea.

CHAP. V.

Of the Muſcles of the Noſe.

The Noſe hath four Pair.

THE *Noſe* is not all of it moveable, but o its lower griſtly parts, which are called or *Pinnæ*. And theſe are either drawn toget to ſhut the Noſtrils, which is performed by *adducent* Muſcles; or drawn aſunder to open Noſtrils, which is done by the *abducent*. there are two Pair to ſerve each Office.

Before I enter upon the Deſcription wher I deſire it may be noted, (once for all) that tho all the Muſcles of the Body be double (except Sphincters) ſo that they are commonly recko by *Pairs*; yet in their Deſcription we ſhall ſp of them in the ſingular number, as if there w but one of a ſort. Which method (after this vertiſement) can occaſion no miſtake or incon nience, ſeeing all the particulars that agree one, agree to its fellow likewiſe.

Two abducent.

The *firſt* of the *abducent* or opening Muſcle ſmall, rather Carnous than Membranous, ari from the upper Jaw-bone, near the firſt pro Muſcle of the Lips, and is inſerted partly into lower part of the *Ala* of the Noſe, and partly i the upper part of the upper Lip, by the dimpl its middle which is called *Philtrum*. The *ſe* covering the ſide of the Noſe, begins at its near the *foramen lachrymale*, with an acute fleſhy Origine, and deſcending obliquely by bone of the Noſe it ends in a broad Baſis, and remaining fleſhy is implanted into the *Ala*. is near of a three-ſquare or triangular ſhape,

he Greek Letter Δ *delta*, whence it is called by ome *deltoïdes*. Theſe two by drawing the *Ala* pward widen and open the Noſtril.

The *adducent* or cloſing Muſcles are very ſmall nes, ſo that they can hardly be diſcovered or di- inguiſh'd exactly but in them that have large loſes. The *firſt* of theſe is *external* and fleſhy, ſing about the root of the *Ala*, which it aſcends, eeping tranſverſly over it to the ridge or tip of e Noſe, into which it is inſerted. The *ſecond internal*, and is hid in the cavity of the Noſtril der the inner coat that covers it: it is mem- anous, and ariſes from the extremity of the one of the Noſe, where the Cartilage is joined it, and is inſerted into the *Ala*. The former ing contracted depreſſes the *Ala*; the latter aws it inwards, and ſo cloſes or conſtringes the oſtril. And to the ſame end or purpoſe there is other that ſerves, (which is common) namely e *orbicularis* of the upper Lip, which by draw- g the Lip downwards, doth at the ſame time nſtringe the Noſtrils. *Two adducent.*

Bartholin writes, that beſides theſe Muſcles, he s ſometimes found a ſmall carnous Muſcle rea- ing ſtreight down from the frontal Muſcle (with road Baſis, but preſently growing narrower) d ending about the Cartilage of the Noſe. Such have this Muſcle can draw their Noſe (eſpeci- y its skin) a little upwards: which motion we e, when (as *Horace* ſpeaks) *ſuſpendimus aliquem ſo*, we jeer or ſcoff at one.

CHAP. VI.

Of the Muſcles of the Lips and Cheeks.

Muſcles common to the Cheeks and Lips.

THE Muſcles of the *Lips* are either *common* to the *Cheeks* and *Lips*, or *proper* onely t the *Lips*.

1. Detrahens quadratus.

The *common* are two on each ſide. The *firſ* is called *detrahens quadratus*: this is a thin bu broad Muſcle, reſembling a Membrane interlace with fleſhy Fibres. It hath its beginning fro the hinder ſide of the neck, the ſhoulder-blade the *clavicula* and the breaſt-bone, and mountin up by oblique Fibres to the Face, is implanted in to the Chin, Lips, and root of the Noſe; whic parts it draws obliquely downwards. Sometime it proceeds alſo to the root of the Ear, and i reckoned for one of its Muſcles. It is calle *quadratus* or four-ſquare from its ſhape. When convulſion happens in this Muſcle, it cauſes th *ſpaſmus cynicus*, which we can imitate voluntaril by drawing down one ſide of the Mouth.

2. Contrahens.

The *ſecond* is called *contrahens*, or *Buccinat* the Trumpeter. This lieth under the former, i the upper part of it. It makes up all that pa of the Cheek which is diſtended in blowing har It ſprings from the Gums of the upper Jaw, an ends in thoſe of the lower. Moſt Anatomiſts de ſcribe it to be of a round figure. It is thin an membranous, interlaced with divers Fibres, ar is knit ſo cloſe unto the Membrane which cove eth the inſide of the Mouth, that it can hardly b ſevered from it. This Muſcle is not only of u to move the Cheeks with the Lips, but when is contracted, it turneth in the meat upon th

Teet

teth again, that had got to betwixt them and the Cheek, in chewing of it.

The Muſcles *proper* to the Lips, are *five* Pair, and one odd one. The *Firſt* is *par attollens*. If both of theſe act together, they draw all the upper Lip directly upwards and outwards; but if only one, then is but one ſide of the Lip drawn up obliquely. Each ſpringeth from the firſt bone of the upper Jaw, where the Ball of the Cheek is At its Riſe it is broad and fleſhy: from thence arching obliquely to the fore-part, it is inſerted into the ſide of the upper Lip near to the Noſe. *Muſcles proper to the Lips.* 1. Attollens.

The *ſecond* is called *abducens*, and aſſiſteth the action of the former, or rather draweth the upper Lip more to one ſide. It ariſeth out of the cavity that is under the Ball of the Cheek with a fleſhy but ſlender and round beginning, and being covered with much Fat, it is implanted into the *frænum* where the Lips meet, at the corner of the Mouth. 2. Abducens.

The *third* Pair is called by *Riolanus*, *Zugomaticus* or *Jugale*, becauſe it ariſes outwardly from the Jugal Proceſs. It is fleſhy and round, and deſcending obliquely through the Cheek, is terminated near the corner of the Mouth, and ſerves to draw both Lips upwards ſide-ways; for it is common to them both. 3. Jugale.

The *fourth* Pair is the *deprimens*, which pulleth down the lower Lip. It ſpringeth broad and fleſhy from the lower and fore-ſide of the Chin, from whence aſcending obliquely, it is inſerted into the middle of the under Lip, continuing broad from its Origine to its End. 4. Deprimens.

The *fifth* Pair may be called *obliquè detrahens*, for it draws the lower Lip obliquely downwards and outwards. It ſprings from the lower ſide of the lower Jaw with a fleſhy and broad beginning, 5. Oblique detrahens.

(being ſometimes extended to the middle of t
Chin) from hence it goes upwards, and growi
narrower by degrees it is inſerted obliquely in
the lower Lip near its corner. Some make t
one of this and the immediately fore-going;
alſo one other of the ſecond and third, but th
are indeed diſtinct.

6. Conſtringens. And theſe are all of them Pairs, one on e
ſide: but this which follows is ſingle, namely t
Orbicularis or *Conſtringens*, and is common to b
Lips. It is otherwiſe called *Oſculatorius*, beca
it contracteth the Lips in Kiſſing. This is t
which makes the proper figure and ſoft ſubſta
of both the Lips, encompaſſing the whole Mo
like a Sphincter, which by its orbicular Fibre
conſtringes or purſes up when one is ſaid to ſi
per. It is cloſely knit to the skin of the Li
through which it looks red when we are w
and pale when we are ſick. Some ſuppoſe t
to be no Muſcle, but a ſpongy ſort of fleſh,
dued with no true muſcular Fibres, *viz.* ſuc
are capable of true muſcular Contraction. B
think there is reaſon enough to acknowledg
for a true Sphincter Muſcle, ſeeing the purſ
up of the Mouth can be performed by none
the other Muſcles that belong to the Lips.

CHAP. VII.

Of the Muſcles of the lower Jaw.

THE *lower Jaw* (for the *upper* is immovea
and therefore has no Muſcles) is moved
wards, downwards, towards the right and
ſides, and backwards. For the performance
t

hese motions *five* Pair of Muſcles are appointed, of which there is only one Pair that draweth the Jaw downwards, all the others in ſome meaſure upwards, but chiefly the firſt Pair or Temporal. The reaſon why there is ſo ſlender a proviſion for pulling the Jaw down is, becauſe upon the relaxation onely of thoſe Muſcles that draw it up, its own gravity is ſufficient to make it fall down; but yet that that motion may be perfor-med the more quickly and nimbly in chewing or ſpeaking, Nature has appointed one Pair of Muſ-cles to promote it. *The lower Jaw hath five Pair of Muſcles.*

The *firſt* Pair of the *Shutters* or drawers up is called *Temporale*, and is the ſtrongeſt and largeſt. It ſpringeth from the bones of the *Frons*, *Sinciput* and Temples, and from *Os ſphenoides*, with a fleſhy, large and ſemicircular beginning, and on its out-er ſide is covered with the *Pericranium*, its inner lying next the *Perioſteum*. Its Fibres the further they are from its middle, the more obliquely are they carried towards its Tendon, for the further it deſcends, the narrower (but thicker and more sinnous) it grows; and at length paſſing under the *Os jugale*, it embraceth and is inſerted into the thin and broad Proceſs of the lower Jaw (cal-ed κορώνη) with a ſhort but very ſtrong Tendon. *Spigelius* ſays, this Tendon is extended through the whole Muſcle, in the midſt of its fleſhy ſubſtance. Whence it is, that if this Muſcle be wounded, and inflamed, moſt bitter pains and dangerous ſym-ptoms enſue, partly becauſe the Tendon paſſeth to; partly becauſe it is covered with the *perica-nium*. This Muſcle forcibly pulleth up the lower Jaw, and ſo ſhutteth the Mouth. 1. Tempo-rale. *Why the wounds of the tempo-ral Muſcle are dange-rous.*

The *ſecond* is called *maſſeter*, becauſe it ſerveth for chewing by moving the Jaw to the right and left ſides: from its ſituation it may be called *late-rale*. 2. Maſſe-ter or la-terale.

rale. This hath two beginnings; one of whic is nervous, large and ſtrong, ſpringing from th ſuture, where the firſt bone of the Jaw is joine to the fourth; the other fleſhy, proceeding fro the *Os jugale*, from whence marching toward the Chin, it is implanted into the whole breadt of the lower Jaw ſtrongly. The Fibres of th Muſcle, by reaſon of its two beginnings, cro one another; ſo that it does not only move th Jaw laterally, but backwards and forwards a ſo: upon which account ſome eſteem it a doubl Muſcle.

3. Aliforme externum, *or* maxillam abducens.

The *third* pair is called *pterygoideum (* or *aliforme) externum*, or *maxillam abducens.* This hat alſo a double beginning, partly nervous an partly fleſhy; ſpringing partly from the uppe external ſides of the wing-like proceſs of the *ſphenoides*, partly from the rough and ſharp lin of the ſame bone. Whence marching down witl ſtreight Fibres, it becometh greater and thicke And at length is inſerted by a ſtrong Tendo into the inſide of the *condyloides* proceſs of th lower Jaw, under the Tendon of the tempora Muſcle. This moveth the Jaw forward, where by the Teeth of the lower Jaw are made to ſtan further out than thoſe of the upper.

4. Aliforme internum, *or* maxillam adducens.

The *fourth* pair is termed *maxillam adducens* or *pterygoideum internum.* This draweth the Jaw towards its head, or backward. This, in the be ginning being nervous, doth ſpring from the in ner cavity of the wing-like proceſs of the *os ſphe noides*; then becoming fleſhy, large and thick and marching down by a ſtreight paſſage, it i inſerted into the inner and hinder part of th lower Jaw by a nervous, broad and ſtrong Ten don. Beſides its more proper action of drawin the Jaw backwards, it alſo helps the tempora

Muſcl

Muſcle to draw it up, and ſo do the ſecond and third pair in ſome meaſure, wherefore we rank all theſe four amongſt the *Shutters*.

The *fifth* and laſt pair *opens* the Mouth by pulling down the Jaw, whence it is called *Depriens*, and otherwiſe *digaſtricum* or *biventre*, becauſe it hath two bellies. Anatomiſts commonly reckon this for the ſecond pair of the Movers of the lower Jaw; but ſeeing it has a diſtinct office from the other four, we have plac'd it laſt. It has its beginning from the *Styloides* proceſs of the Temple-bone, where it is nervous and broad; and afterwards becoming fleſhy, ſmall and round, it paſſeth downwards, and in its middle where it cometh to the flexure of the lower Jaw-bone, it loſeth its fleſhy ſubſtance, and degenerates into a nervous and round Tendon; but by and by it becomes carnous again, and going along the inner ſide of the lower Jaw is inſerted into its forepart under the Chin. It loſeth its fleſhy ſubſtance and becomes tendinous in its middle, that it may give way to the Jugular Vein aſcending in that place. This Muſcle, as hath been ſaid, draws down the Jaw, in which action ſome think it is partly aſſiſted by the *par quadratum* deſcribed in the foregoing Chapter.

5. Depriens, *or* biventre.

CHAP. VIII.

Of the Muſcles of the Ear.

THE *Ear* conſiſts of an *outer* and an *inner* part; and each has its proper Muſcles.

The *outer* part is moved but very obſcurely, becauſe in Men the Muſcles are exceeding ſmall;

ſo

so that *Galen* calls them, only lineaments or r
The auricula *hath four Muſcles.* ſemblances of Muſcles. There are commonly rec
oned *four* of them, which by their ſituation ſee
fit to move this *outer* part of the Ear (called *au*
cula by *Spigelius*, to diſtinguiſh it from the *in*
part called *auris*) four manner of ways.

1. The *firſt* is called *attollens*. This ariſes at t
outer edge of the frontal Muſcle (where it is co
tiguous to the temporal) with a thin and mer
branous beginning; and in its deſcent lies up
the temporal Muſcle, by degrees becoming na
rower, and is inſerted into the upper part of t
Ear, which it moveth upwards and forwards.

2. The *ſecond* is called *detrahens*. This ariſe
broad and carnous from the mammillary Proceſ
and growing narrower is inſerted into the ro
of the Cartilage of the Ear, ſometimes by tw
ſometimes by three Tendons. It draweth th
Ear upwards and backwards.

3. The *third* is called *adducens ad anteriora*, where
by the Ear is drawn forward and downward. Thi
is but a particle of the *Muſculus quadratus*, tha
pulleth down the Cheeks, deſcribed before, whic
aſcending with its Fibres, is implanted into th
root of the Ear.

4. The *fourth* is *abducens ad poſteriora*, whic
draws the Ear backward. This hath its begin
ning in the back-part of the Head, from the Tu
nicles of the Muſcles of the *occiput*, above the *pro*
ceſſus mammillaris, where it is narrow, but waxin
broader it is carried downward tranſverſly, an
is inſerted into the Ear behind. All theſe Muſ
cles in Horſes, Oxen and the like, are very larg
to what they are in Men, (yea they have mor
than theſe) whereby they can move their Ear
more ſtrongly and apparently, to ſhake off Flie
or any thing that offends them.

Monſ

Monſ. *du Verney* only reckons two Muſcles of the Auricle, the firſt of which, he ſays, is made up of certain carnous Fibres ariſing from that part of the *pericranium* that covers the Temporal Muſcle, from whence deſcending in a ſtreight line it inſerts it ſelf into the upper and back-part of the *Concha*. The ſecond, he ſays, likewiſe conſiſts of five or ſix carnous Fibres, that take their riſe from the upper and foremoſt part of the proceſs *Mastoides*, and deſcending obliquely for about an inch terminate at the middle of the *concha*.

The auris *three.*

In the *inner* part of the Ear (called *Auris*) there are three. The firſt is called *externus*. It is ſmall, ſpringing pretty broad from the upper part of the *meatus auditorius*; then becoming narrower it grows into a very fine and ſmall Tendon, which being carried contiguous to the *tympanum*, is inſerted into the longer proceſs of the *malleus*. The handle of which *malleus* adhering to the *tympanum*, when the *malleus* is moved by this Muſcle, the *tympanum* is ſo alſo, both of them being drawn a little outward and upward. 1.

The *ſecond* is called *internus*. This is very ſmall, and is placed within the *os petroſum*. It hath its beginning in the *baſis* of the wedge-like bone, there where it is joyned with the *proceſſus petroſus*, and at about its middle it is divided into two ſmall Tendons, whereof the one is inſerted into the ſhorter proceſs of the *malleus*, and the other into the neck or handle of it. This draws the head of the *malleus* obliquely forward, and pulls it inward from the *incus*, and together with the *malleus*, it draws the *tympanum* alſo inwards, to which the handle of the *malleus* is affixt. 2.

Theſe two *du Verney* reckons for Muſcles of the *Malleus*, and he deſcribes a *third* belonging to the *Stapes*, which (I think) no former Anatomiſt 3.

tomiſt hath obſerved. He ſays, it is hid within a quill-like cavity formed in the *os petroſum* almoſt at the bottom of the barrel, from whence it takes its riſe. Its belly is thick and carnous, and in a little ſpace it ends in a very looſe Tendon which inſerts it ſelf into the head of the *Stapes*. The cavity which contains the belly of the Muſcle is about the ſixth part of an inch long, and is much wider than the hole by which the Tendon of the Muſcle paſſes.

CHAP. IX.

Of the Muſcles of the Tongue.

THE *Tongue* being the chief Inſtrument of Speech, and a part which ſerves to roll the Meat in the Mouth this way and that way, hath all manner of motions, being moved forward and backward, upward and downward, to the right hand and to the left; it is alſo ſtretched out broad, or contracted. Its Muſcles are either *proper* to it ſelf, or *common* to it with the *os hyoides* (to be deſcribed in the next Chapter.)

The Tongue has five pair.

It has *five* pair of *proper* Muſcles. The *firſt* is *geniogloſſum*, ſo called from its riſe and inſertion (γένειον the *Chin*, and γλῶσσα the *Tongue*) as moſt of the reſt are. This pulleth the Tongue forward without the Teeth and Lips. It ſpringeth from that rough part of the lower Jaw-bone which is in the middle of the Chin, in the inner and lower ſide of it; and is inſerted into the lower ſide, and towards the root of the Tongue. 1.

The *ſecond* is called *Ὑψιλογλοσσum* (on the ſame account.) It ariſeth from the middle and upper part of the *os hyoides* or *ὑψιλοειδες*, and ends in the middle

ddle of the Tongue, which it draws ſtreight
ckwards or inwards.

The *third* is called *Myloglosſum.* This ſpringeth 3.
om the inner part of the lower Jaw, where the
theſt *grinding Teeth* are, (whence it has its
ne) and is inſerted into the Ligament by which
e Tongue is tied to the *fauces.* Authors differ
out the uſe of this pair; ſome thinking that it
aws the Tongue downward; others, that if
h of them act together, they draw the tip of
Tongue ſtreight upward and backward to
Palate and upper Teeth; if but one, that it
ws it obliquely upward towards its own ſide.

The *fourth* is called *Ceratogloſſum*, becauſe it 4.
eth from the *horn* of the *Os hyoides.* It is in-
ed into the ſide of the Tongue. If both of
ſe be contracted at once, they draw the Tongue
ight downward and inward; but if only one,
n is the Tongue drawn obliquely to that ſide.

The *fifth* pair is called *Styloglosſum*, becauſe it 5.
eth from the *ſtyloides proceſſus* of the Temple-
e; from which ſpringing fleſhy and ſmall, but
rwards becoming broader and thicker, it is in-
ed into the ſide of the Tongue, at about the
ldle of its length. If both theſe act together,
y pull the Tongue upward and inward; but if
only, then to the right hand or to the left.

CHAP. X.

Of the Muſcles of the Bone of the Tongue, called Os Hyoides.

THis Bone is moved upwards, downwards,
forward, backward, and towards the ſides,
he Tongue is; for ſeeing it is fixed to the root

of

of the Tongue, they muſt needs accompany o
the other in their motions; ſo that the Muſc
that are inſerted into this bone, moving t
Tongue alſo, they are eſteemed *common* to both

Os hyoides *hath four pair.*

To perform theſe motions it hath *four* pair
Muſcles. The *firſt* is called *Sternohyoideum.* Th
ſpringing from the upper, but inner part of t
1. *ſternum* with a broad and carnous beginning, a
aſcending under the Skin of the Neck by t
Wind-pipe, ſtill keeping the ſame largeneſs a
ſubſtance is inſerted in the root or *baſis* of t
hyoides, which it moveth (and the Tongue wi
it) downward and backward.

2. The *ſecond* is oppoſite to this, and is called
niohyoideum. This ſpringing from the inner p
of the Chin, (by the *geniogloſſum*) fleſhy a
broad, is inſerted into the upper part of the *ba*
of the Bone, where a cavity is made to recei
its Tendon, and draweth it ſtreight upwards a
a little forwards.

3. The *third* is called *Coracohyoideum.* It ariſe
from the upper ſide of the *Scapula* near the *Co*
coides proceſſus, having a carnous beginning, a
lurking under the *Levator* of the Shoulder-bla
called *Muſculus patientiæ*, it aſcends under the
maſtoides that bends the Head, where it loſeth
fleſhy ſubſtance, and degenerates into a nerv
and round Tendon. But as ſoon as it is paſt th
it becomes carnous again, and ſo continues till
is inſerted into the horns of the *Os hyoides.* Co
ſidering its ſlenderneſs it is the longeſt Muſcle
the Body, and has two Bellies like the *par dep*
mens that pull down the lower Jaw. The reaſ
of its becoming tendinous in the middle, *Spigel*
thinks to be, that it may make way for the
maſtoides, as being more worthy than it ſelf: b
Dr. *Crone* is of opinion, that the reaſon is, th

may give way to the *Carotides* aſcending under it. Its office is to pull the Bone obliquely downwards.

The *fourth* is *ſtyloceratohyoideum*. This riſeth from the root of the *proceſſus ſtyloides*, and endeth at the root of the horn of the *Os hyoides*, which it draweth obliquely upward. 4.

CHAP. XI.

Of the Muſcles of the Larynx.

THE *Larynx* conſiſts of four Cartilages (beſides the *Epiglottis*) of which we have treated in Book II. Chap. 14. Of theſe only three are moveable, *viz.* the *Thyreoides* or Buckler-like, which is one, and the *Arytænoides* or Ewer-like which are two. By theſe latter is the *Rimula* of the *Glottis* formed, for the widening and ſtraiting, or opening and ſhutting whereof the Muſcles of the *Larynx* ſerve. Theſe are divided into *common* and *proper*. The common ſpring from other parts, but are inſerted into one of the Cartilages; the proper both ariſe from and are inſerted into them. The *common* are *two* pair, *viz. hyothyreoideum* and *ſternothyreoideum*. *The* Larynx *hath two pair of common Muſcles.*

The *Hyothyreoideum* ſpringeth from the whole back almoſt of the Bone of the Tongue, having a broad and carnous beginning; from whence deſcending with ſtreight Fibres, and covering all the outſide of the Cartilage *Thyreoides*, it is inſerted into its under-ſide. When this is contracted, it draws the buckler-like (or *thyreoides*) Cartilage upwards and inwards, and thereby ſtraiteneth the Chink of the *Larynx*. 1.

The

2. The *Sternothyreoideum* ariſeth from the upp and inner-part of the *ſternum* with a carnous ar broad beginning, from whence aſcending wi ſtreight Fibres up by the ſides of the Wind-pip (continuing the ſame largeneſs and ſubſtance) is at laſt inſerted into the lower ſide of the buc ler-like Cartilage, by drawing down which opens or widens the Chink. *Diemerbroeck* aſſig clear contrary actions to theſe Muſcles, *viz.* th the former widens, and this latter ſtraitens t *Rimula* of the *Larynx*.

Five pair of proper.

The *proper* are *five* pair, (or only nine Mu cles, as ſome reckon, eſteeming the fifth pair be a ſingle Muſcle.)

1. The *firſt* pair is called *Cric thyreoideum anticum*. This ſpringeth from t fore-part of the *Cricoides* or ring-like Cartilag (*viz.* that which is immoveable) and is inſert into the lateral parts of the *Thyreoides*, which moves forwards, and ſo widens the *Rimula*, f the forming of a big voice. *Bartholin*, fromt inſertion of the Nerve, ſays, it ariſes from t *Thyreoides*, and is inſerted into the *Cricoides*. Al if this pair be very broad, he ſays, it may be d vided into two pair, (which *Riolanus* has don and then the ſecond may be called *Cricothyreoid um laterale*.

2. The *ſecond* pair, which is called *Cricoarytæno deum poſticum*, ſpringeth carnous from the hind and lower part of the *Cricoides*, and aſcendin with ſtreight Fibres is inſerted with a nervo end into the lower ſide of the *Arytænoides*, ſe ving to pull its two Cartilages ſideways, an thereby to open and widen the *Larynx*.

3. The *third* is *Cricoarytænoideum laterale*, whic ſpringeth from the ſide of the *Cricoides*, where is broadeſt, with a ſlender beginning, but grow ing preſently larger, it is implanted into the ſid

the *Arytænoides*, in that part that the foregoing
d not cover. This openeth the *Larynx* by draw-
ig the Cartilages obliquely aſide, and ſo aſſiſteth
e action of the former.

The *fourth* pair is called *Thyreoarytænoideum.* 4.
his is internal, carnous and broad, ariſing from
e fore interiour part of the *Thyreoides*, and is in-
ted into the ſide of the *Arytænoides*, whoſe car-
ages it draws the one towards the other, and
ſtraitens the *Larynx.*

The *fifth* and laſt is reckoned by ſome for a 5.
r, and by others but for one Muſcle. It is called
ytænoides, becauſe it has its riſe from and inſer-
n into the Cartilage ſo called. Its riſe is at the
nder Line of the Cartilage, from whence being
ended with tranſverſe Fibres, it is inſerted in-
the ſide of the ſame, and by conſtringing of it
raitens the *Larynx.*

Theſe are the Muſcles that perform the moti-
of the *Larynx*; but as to the uſe of each par-
ular, Authors diſagree very much. Dr. *Croone*
es this general rule to underſtand their uſes,
at thoſe which lie on the foreſide of the *La-*
x, ſerve to open or widen the *Rimula*; and
ſe which lie on the hinder-ſide, to ſtraiten or
t it. To whoſe Opinion great deference is owing.

As for the *Epiglottis*, which is reckoned for the
h Cartilage of the *Larynx*, though in ſome
ites it have Muſcles, yet Anatomiſts generally
ee that in Man it has none, nor is moved with
voluntary motion, but is only depreſſed by the
ight of what is ſwallowed, and by the drawing
the Tongue backward or inwards; which mo-
n being over, the *Epiglottis* ſtands up again in
natural and proper poſture, and ſo opens the
Larynx.

CHAP. XII.

Of the Muſcles of the Uvula, *Palate and Throat.*

The Uvula *ſaid to have two Pair of Muſcles.*

THE *Uvula* is ſaid by *Veſlingius*, *Riolan* *&c.* to have two Pair of Muſcles to hold up; of which one is called *Pterygoſtaphilinum e ternum*, which ſpringeth from the upper Jaw, little below the furthermoſt Grinder, and is i ſerted into the ſide of the *Uvula*: the other *P rygoſtaphilinum internum* proceeding from the lo er part of the internal wing of the *pterygoi Proceſſus*, and inſerted into the *Uvula* in like ma ner. But theſe Muſcles are very hard to diſc ver: and indeed there ſeems no occaſion for the ſeeing the *Uvula* has no apparent motion, a its own frame ſeems ſufficient to ſuſpend it.

The Palate hath one Pair.

From the aforeſaid wing-like Proceſs (of t *Os cuneiforme*) does there another Pair of Mu cles ariſe, firſt found out by Dr. *Croone*, and him called *Pterygopalatinum*. Its Inſertion is in the Roof of the Mouth by the ſide of the pal tine Gland (deſcribed in Book III. Chap. *ult.* fr *Steno.*) Its Uſe is very obſcure; but perhaps ſtrong hawking it may ſerve to compreſs the ſ Gland a little, and to ſqueeze out of it ſome that humour that is ſeparated in it.

The Throat hath three Pair and a Sphincter.

The *Throat*, or the beginning of the *œſophag* called *pharynx*, hath ſeven Muſcles, to wit, *th* Pair and a *Sphincter*.

I.

Of the Pairs, the *firſt* is *Sphenopharyngæu* This ſpringeth from the ſharp point of the *ſphenoides* with a ſmall and nervous beginni and paſſing downward, ends in a fine Tend wh

which is inſerted obliquely into the lateral part of the Palate and *Pharynx*, which it widens in ſwallowing.

The *ſecond* pair is called *Cephalopharyngæum*, and ſpringeth from that part where the Head is joyned to the firſt *Vertebra* of the Neck; from whence marching down, it is ſpread about the *Pharynx* with a large *plexus* of Fibres, and ſeemeth to make its Membrane. This ſtraitens the Throat in ſwallowing. 2.

The *third* is *Stylopharyngæum*. This ſpringing from the *Styloides* Proceſs of the Temple-bone, is inſerted into the ſides of the *Pharynx* to dilate it. 3.

That Muſcle which hath no fellow is called *Oeſophagiæus*. This ariſes from one ſide of the *Hyoides* Cartilage, and circularly encompaſſing the *Pharynx* with tranſverſe Fibres, is inſerted into the other ſide of the *Thyreoides*; and ſerves to contract the Mouth of the Gullet, as the *Sphincters* of the *Anus* and Bladder do thoſe parts. 4.

CHAP. XIII.

Of the Muſcles of the Head.

THE Muſcles of the *Head* are either *common*, or *proper*. The *common* are thoſe which move the Head together with the Neck, which are to be deſcribed in the next Chapter. *The Muſcles of the Head are common or proper.*

The *proper* are thoſe which only move the Head, the Neck remaining unmoved, and theſe are in number ſixteen, or eight pair, and move it *The proper are eight pair.*

either forward or backward, to one ſide or th other, or about.

1. The *firſt* pair, called *Maſtoideum*, bend th Head forward, if both act together; but on on ſide obliquely, if but one. Theſe have each double beginning; one nervous from the top the *Sternum*, the other carnous from the uppe ſide of the *Clavicula*; which origins joyning, becomes wholly carnous, and aſcending oblique by the Neck, at laſt is inſerted with a carnous en into the Mammillary (or *maſtoides*) proceſs the Temple-bone. This is the only pair that placed in the forepart, and bows the Head fo ward; all the reſt are ſeated behind, of whi the five next bend it backwards if both ac (which is called extending of the Head) or little ſideways if but one; and the two laſt ſer to turn it about.

2. The *ſecond* pair is called *Splenium* or *Triang lare*. It riſes with a nervous beginning from t Spines of the five uppermoſt *Vertebræ* of the *Th rax*, and of the five lowermoſt of the Neck from whence aſcending and becoming thick a carnous, it is implanted into the *Occiput* with broad and fleſhy end.

3. The *third* is called *Complexum* or *Trigeminu* becauſe it has ſo plainly a *threefold* beginning, th it ſeems to be a compound of three Muſcles. beginning is from the tranſverſe Proceſſes of t fourth and fifth *Vertebræ* of the *Thorax*, a *ſeco* from thoſe of the firſt and ſecond of the ſan and a *third* from the Spine of the ſeventh *Ver bra* of the Neck: All which in their aſcent ing united into one, are inſerted into the *Oc put* ſometimes by one, and ſometimes by a tri Tendon.

T

The *fourth* pair is called *Parvum & craſſum*, 4.
cauſe it is but a *little* one, yet pretty *thick*. This
th under the third pair. It ariſes nervous from
e tranſverſe Proceſſes of the ſix uppermoſt *Ver-*
bræ of the Neck, and is inſerted into the hin-
r root of the Mammillary Proceſs.

The *fifth* pair is *Rectum majus*. Theſe ſpring- 5.
g from the tip of the Spine of the ſecond *Ver-*
ra of the Neck, are inſerted into the *Oc-*
ut.

The *ſixth*, *Rectum minus*. Theſe lie under the 6.
rmer, and proceeding from the back-part of the
ſt *Vertebra* end into the *Occiput*.

Theſe five laſt ſerve all to bow the Head back-
ard or extend it: the two following turn it
out, as was obſerved before.

The *ſeventh* is *Obliquum ſuperius*. This pair lies 7.
der the two *Recta*, anſwering to them in ſub-
nce and form. It ſprings from the tranſverſe
oceſs of the firſt *Vertebra* of the Neck, and is
iplanted into the *Occiput* by the outer-ſide of the
cta. Some ſay its riſe is here, and its inſertion
o the *Vertebra*.

The *eighth*, *Obliquum inferius*. This riſes from 8.
e Spine of the ſecond *Vertebra* of the Neck, and
inſerted into the tranſverſe Proceſs of the firſt
rtebra of the ſame. So that having both its riſe
d inſertion in the Neck, it might juſtly be reck-
ed for a Muſcle thereof, and ſo ſhould have
en deſcribed in the next Chapter: but we have
nked it amongſt thoſe of the Head, partly
m the authority of moſt Anatomiſts who ge-
rally have done ſo, and partly becauſe the firſt
rtebra into which it is inſerted, always follows
e motion of the Head, as ſhall be ſhewn in the
xt Book, Chap. 10. Of the uſe of theſe two laſt
irs we have ſpoken already.

CHAP. XIV.

Of the Muſcles of the Neck.

The muſcles common to the head and neck are four pair.

THE *Head* is not only moved by the *proj* Muſcles aboveſaid primarily, but ſecond rily alſo by theſe of the *Neck*, which are thei fore called *common*, and are eight in number, each ſide four. The firſt and ſecond pair be the Neck, and together with it the Head dire ly backward, or obliquely; the third and four directly forward, or to one ſide, as both one act.

1. The *firſt* is called *Spinatum.* This proceedi from the roots of the *Spinæ* of the ſeven upp *Vertebræ* of the *Thorax*, and of the five loweſt the Neck, is inſerted ſtrongly into the whc lower ſide of the Spine of the ſecond *Vertebra* the Neck.

2. The *ſecond*, *Tranſverſale.* This riſing from t tranſverſe Proceſſes of the ſix upper *Verteb* of the *Thorax*, is inſerted into the out-ſide of the tranſverſe Proceſſes of the *Vertebræ* of t Neck.

3. The *third*, *Longum.* This being placed behi the *Oeſophagus*, doth ſpring from the bodies of t fifth and ſixth *Vertebræ* of the *Thorax*, and as aſcends is knit to the ſides of the bodies of all t *Vertebræ*, till it come to the firſt or higheſt of t Neck, where each touching other they are bc inſerted into its Proceſs, which anſwers to t body of the other *Vertebræ*.

4. The *fourth*, *Triangulare*, or *Scalenum.* It pr ceeds carnous from the firſt rib, and is inſert into the inſide of all the tranſverſe Proceſſes

he Neck, except ſometime the firſt and ſecond. t is perforated to make way for the Veins and Arteries which paſs to the Arms. The uſes of ll theſe pairs were ſhewn at the beginning of the Chapter.

CHAP. XV.

Of the Muſcles of the Thorax.

HAving done with the Muſcles that belong to the Head, the higheſt *Venter*, we come now o thoſe of the middle or *Thorax* which aſſiſt Reiration. Of theſe ſome dilate the Breaſt in Inſpiration, ſome contract it in Expiration.

The Dilaters.

Of the *Dilaters*, the *firſt* is called *par Subclavium.* This ariſeth fleſhy from the inſide of the *Clavicula* near the Shoulder-point, and paſſing obliquely (or almoſt tranſverſly) is inſerted into the rſt Rib, near to the *Sternum.* 1.

The *ſecond* is *Serratum majus anticum.* This riſes from the inſide of the *baſis* of the Shoulderlade, and the two uppermoſt true Ribs, and is inſerted into the five loweſt true Ribs, and two ppermoſt baſtard Ribs, before they end into artilages. It is called *Serratum* or Saw-like, beauſe its unequal *extremities* being intermixed ith the like unequal *beginnings* of the obliquely eſcending Muſcle of the *Abdomen*, imitate the eeth of a *Saw.* 2.

The *third* is *Serratum poſticum ſuperius.* This ing under the *Rhomboides*, (or fourth Muſcle of he *Scapula*) ſpringeth membranous from the pines of the three loweſt *Vertebræ* of the Neck, 3.

and of the firſt *Vertebra* of the Back, and is inſert ed into the three or four uppermoſt Ribs.

4. The *fourth* is *Serratum poſticum inferius.* Th ariſeth from the Spines of the three loweſt *Verte bræ* of the Back, and of the firſt of the Loins, an is inſerted into three or four of the loweſt (ſhort Ribs.

5. *Fifthly*, *The eleven external Intercoſtals*, whic perform the office but of one Muſcle. The ſpring from the lower part of the upper Rib, ar are inſerted into the upper part of the lower R obliquely.

There is another Muſcle beſides theſe that a ſiſts the widening of the Breaſt, namely the *Di phragm:* but of it we ſpoke at large in *Book* I *Chap.* 3. where the Reader may find its Deſcript on and Uſe.

The Con-tractors. Theſe that follow *contract* the Breaſt. *Firſ* the *par triangulare.* This ariſing from the midd

1. Line of the *Sternum*, is inſerted into the bony en of the third, fourth, fifth and ſixth true Rib (where they are joyned to the Cartilages.) *Ste* ſays, its riſe is from the *Sternum*, and inſertic into the Ribs.

2. The *ſecond* is *Sacrolumbum.* This ariſeth fro the edge of *os Ileum*, the upper part of *os ſacrum* and the Spines of the *vertebræ* of the Loins; a aſcending up to the Ribs, is implanted into ea of them in their lower ſide, about three Finge breadth from the Spine, by a particular Tendo *Diemerbroeck* deſcribes another pair oppoſite this (which he calls *cervicale deſcendens*) ſprin ing from the third, fourth, fifth, ſixth and ſeven *vertebræ* of the Neck, and is inſerted into the u per ſide of each Rib as the *Sacrolumbum* is into t lower. And ſays, that this pair by pulling t Ribs upwards in inſpiration widens the Brea

the other by drawing them down in expiration raitens it.

Thirdly, *The eleven internal Intercoſtals*, which 3. e as one Muſcle. Theſe paſs obliquely from the wer to the upper Rib. Their Fibres run a contary courſe to thoſe of the external, croſſing of tem like the ſtrokes of the Letter X.

I place the *Internal* Intercoſtals among the *The uſe of* ontracters of the Breaſt, as alſo the *External* *the inter-* along the Dilaters, becauſe moſt Anatomiſts have *coſtal Muſ-* ne ſo; though ſome there are that think the *cles.* ternal dilate it, and the external contract it. Ya, Dr. *Mayow* is of opinion, that they both of tem dilate it. For going upon this ſuppoſition, hat the *Thorax* is widened by drawing the Ribs ward, he thinks them both equally adapted for tit action. For ſeeing in all muſcular motion te part that is leſs firm, is moved towards that hich is more firm, and that each lower Rib ſucceſſively is joynted looſer than that immediately ove it, it muſt needs be, that the internal upe their contraction draw the Ribs upwards as ell as the external, and that not obliquely, but rectly. For by their croſſing one another they nder the *obliquity* of one anothers motion (for hich each ſeverally is fitted) and ſo perform the ne motion as if their Fibres deſcended *ſtreight* om the upper Rib to the lower; which courſe Fibres was not convenient here, becauſe of the all ſpace betwixt one Rib and another, which ould not permit them to have that length which e nature of Muſcles requires.] Thus that ingeous perſon diſcourſes, I think, very probably.

Theſe Muſcles of Reſpiration are much aſſiſted their action, ſecondarily, by the Muſcles of the *bdomen*, *Scapulæ* and Arms, which ſhall be deribed in their proper Chapters.

CHAP.

CHAP. XVI.

Of the Muſcles of the Back and Loins.

THE *Back*, but eſpecially the *Loins*, bei
moved diverſly, *viz.* backward and fo
ward and to the ſides, into every *Vertebra* th
The back and loins have four pair. are Tendons of Muſcles inſerted, as if th
were a great many Muſcles in all. But there a
but four (proper) pair to aſſiſt the motion
both.

1. The *firſt* pair are two triangular Muſcles, whi
being joyned together make a kind of a quad
ture, and are therefore called *par quadratu*
Theſe ariſe broad and thick from the hinder u
per cavity of *Os Ileum*, and the inner ſide of
Sacrum, and are inſerted into the tranſverſe Pr
ceſſes of the *Vertebræ* of the Loins even up to t
loweſt Rib. If both theſe act together, they b
the *Vertebræ* of the Loins ſtreight forward; if o
alone, obliquely forward.

2. The *ſecond* and principal pair are the *Muſc*
longiſſimi. This ſprings from all the Spines of
ſacrum and of the *Vertebræ* of the Loins, and a
from the inſide of *Os Ileum* where it is joyned
the *Sacrum*; from whence it aſcends all up t
Spine, and terminates in the *proceſſus mammil*
ris of the Temple-bone, in its way lying up
the tranſverſe proceſſes of the Lumbar *Verteb*
and beſtowing Tendons on the tranſverſe Proc
ſes of all the *Vertebræ* of the Back, (whence ſo
have divided this Muſcle into as many as th
are *Vertebræ*.) It is almoſt confounded with
two following from its riſe till the loweſt *Ver*
bra of the *Thorax*, where it begins to be ſepa

tl from them and leaves them. But ſo far as tey accompany it, it is ſo very difficult to ſepa-re and diſtinguiſh them, that ſome account all tree but for one.

The *third* pair are the Muſcles called *Sacri.* 3. his ariſes behind from the *Os ſacrum*, with an a te and fleſhy beginning, and ends in the Sine of the loweſt *Vertebra* of the *Thorax*, and f the moſt part alſo is inſerted, by the way, i o the Spines and oblique Proceſſes of the *Ver-træ* of the Loins. This helpeth the action of t: former.

The *fourth* and laſt pair are the *Semiſpinati.* 4. his ſprings by a nervous beginning from all the Sines of *Os ſacrum* and the Loins, and ends in e tranſverſe Proceſſes of the *vertebræ* of the Lins, and of the lowermoſt of the *Thorax*. *Spi-gius* ſays, it ariſes from the Spine of the loweſt *rtebra* of the Back, and ends in the Spine of the fi t; by the way beſtowing Tendons on all the *Snes*, as the *Longiſſimi* did on the *tranſverſe* pro-ceſſes. Others deſcribe it otherwiſe. The truth i, it is ſo almoſt impoſſible to ſeparate and raiſe t:ſe Muſcles of the Back and Loins, that 'tis no vonder Authors differ ſo much in their number ad deſcription.

But how many ſoever they be, or whereſoever b their riſe and inſertion, the uſe of them all is t erect the Trunk of the Body by bending the Ick and Loins backward, except the firſt pair vhich bow it forward, in which action they are ich aſſiſted by the *Recti* of the *Abdomen*, which : ſhall deſcribe in the next Chapter.

CHAP.

CHAP. XVII.

Of the Muſcles of the Abdomen.

IN the firſt *Book*, *Chap.* 3. where we diſcourſ of the *common containing* parts of the *Abdom* or loweſt Venter, we only barely mentioned Muſcles, deferring the deſcription of them t this place, where it ſeems more proper.

The Abdomen *hath five pair.* 1.

The *Abdomen* then hath ten Muſcles, five each ſide. The *firſt* pair is *Obliquè deſcendens.* ſpringeth from the lower ſide of the ſixth, ſeven eighth, ninth, tenth, and eleventh Ribs, (befc they paſs into Cartilages) by ſo many diſti acute beginnings: and each preſently ſpreadi it ſelf, in a ſhort ſpace they grow into one M cle. Theſe ſeveral beginnings appear ſomewl like the Teeth of a Saw, and are intermixed w the Saw-like Tendons of the *Serratus major an cus* of the *Thorax*, as when one thruſts the F gers of one Hand betwixt thoſe of the other. I ſides theſe origins, it is ſaid alſo to ſpring fr the tranſverſe Proceſſes of the Lumbar *vertebr* but Dr. *Croone* thinks that to be a miſtake, b cauſe thoſe Proceſſes are ſo covered with otl Muſcles, eſpecially with the *Latiſſimus dorſi*, tl this can by no means ſpring therefrom. Whereſc he aſſigns to it in this place another origin, nam from the inveſting Membrane of the ſaid *lati mus*, as he does alſo to the following pair, w have been alſo ſaid to ariſe from the ſaid Proc ſes. Laſtly, it ſprings from the upper edge of *Ileum*; from all which places its Fibres deſce obliquely forward, and it endeth by a brc Tendon in the middle of the Belly in the *Li*

all

ta; which Tendon cleaves so fast to that of the obliquely ascending (lying next under this) that they cannot be separated without tearing. The *Linea alba* in which these Tendons end, is a white part or Line running from the *Mucronata cartilago* at the pit of the Stomach, down the middle of the Belly by the Navel to the *Ossa pubis*, and is made of the concourse of the Tendons of the Muscles of the *Abdomen*; namely of this pair already mentioned, and of the *Obliquè ascendens*, the transverse and pyramidal. Linea alba.

The *second* is the *Obliquè ascendens*. This lies next under the former, and its Fibres ascending obliquely cross those of the other like an X. It springs from the transverse processes of the *vertebræ* of the Loins, (as hath hitherto been taught, but Dr. *Croone* says, from the investing Membrane of the *latissimus dorsi*) and the Spines of *Os sacrum* with a membranous beginning, and from the edge of *Os Ileum* with a fleshy. Ascending carnous from hence it is joyned to the Cartilages of the eighth, ninth, tenth and eleventh Ribs, and ends in the *linea alba* with a broad and nervous Tendon. 2.

Note, That the Tendons of both these oblique Muscles, (as also those of the transverse) are perforated in the bottom of the *Abdomen* for the descent of the Spermatick vessels into the *Scrotum*.

The *third* pair is the *Rectum* or streight. This arises fleshy from the lower part of the *Sternum*, from the side of the *Cartilago mucronata*, and from the Cartilaginous ending of four Ribs; and so marching streight down along the Belly, it is inserted by a strong Tendon into the *Os pubis*. It hath sometimes three, sometimes four transverse discriptions or intersections, that appear tendi- 3.

nous:

nous: whence ſome divide each Muſcle int
four or five Muſcles, accordingly as they hav
three or four interſections. And indeed if *G*
len's Rule be true, that whereſoever the Ner
is inſerted into the Muſcle, *there* is its head: w
muſt confeſs they are diſtinct Muſcles. F
Nerves are inſerted into both their upper ar
lower parts, and into each of thoſe that lye b
twixt the Interſections. And by ſuppoſing the
thus diſtinct, we may conceive how they m
better perform their primary action, which
ſtrongly to compreſs the Belly for the expulſi
of the *fæces* or *fœtus*. Under theſe Muſcles
the *Arteriæ* and *Venæ mammariæ* deſcend to abo
the Navel, as the *Arteriæ* and *Venæ epigaſtri*
aſcend under them to near the ſame place; ar
theſe were held to inoſculate one with anothe
(the deſcending with the aſcending) till of la
that ſuch inoſculation is diſcovered to be meer
imaginary.

4. The *fourth* pair is the *pyramidal*. Theſe Muſcl
are ſeated upon the lower part of the *Rect*
ſpringing carnous from the *Oſſa pubis* into whic
the *Recti* are inſerted. They are broader at the
baſis, and in their aſcent grow narrower and na
rower till they end in an acute Tendon, which
inſerted into the *linea alba*, and reaches ſom
times as high as the Navel, though their carno
part be but about an hands breadth long. The
are ſaid to aſſiſt the *Recti* in their action, and a
for that reaſon called otherwiſe *Succenturiati*. B
they ſeem to ſome more particularly to ſerve
compreſs the Bladder in making Water; thoug
conſidering the ſhortneſs of their carnous par
and their external ſituation, 'tis difficult
conceive how they can much aſſiſt that actio
which moſt probably is chiefly performed by t
pr

proper muſcular Fibres of the Bladder it ſelf, but perhaps may be ſomewhat promoted by all the muſcles of the *Abdomen* as well as this, while they conſtringe the Belly and ſo preſs the Guts againſt the Bladder; which preſſure is remotely owing alſo to the Muſcles of the *Thorax*, eſpecially the Diaphragm. Sometimes one, and ſometimes both of theſe pyramidal Muſcles are wanting, and then the ending of the *Recti* is broader and more carnous.

The *fifth* pair is the *tranſverſe*. Theſe cleave cloſe to the *Peritonæum* on their inſide: and they are called *tranſverſe*, becauſe their Fibres run croſs or athwart the Belly. They ſpring from a ligament that grows from the tranſverſe proceſſes of the *vertebræ* of the Loins, from *os Ileum*, and the inſide of the cartilaginous ends of the baſtard ribs, and end in a broad and membranous Tendon in the *linea alba*. 5.

The *uſe* of all theſe Muſcles hath been held to be *firſt*, when they act not, to defend the *viſcera* contained under them from external injuries, and encreaſe their heat: and *ſecondly*, when they are in action, firſt to further the excretion of the excrements; ſecondly, to help the excluſion of the Infant in labour; thirdly, to aſſiſt the Breaſt in ſtrong expiration and expectoration; and lurthly, to help to bend the Trunk of the Body forward in ſtooping, which is chiefly done by the *Recti*. But *Diemerbroeck* thinks that the ſtreight, pyramidal and tranſverſe are all that ſerve for the compreſſion of the Belly, and that the oblique do elevate or dilate it. And he endeavours to prove this to be their action; *firſt*, becauſe there will be no Muſcles to elevate the parts of the *Abdomen*, if theſe do it not; whereas it is both evident to every one's own obſervation in himſelf, that the *Their uſe.*

Abdomen

Abdomen is alternately elevated & depreſt, and
ſo ſuch an alternate elevation and depreſſion ſeem
neceſſary for the furthering the motion of the
liments and Humours through the parts contai
ed in the lower Belly. *Secondly*, he appeals to the
oblique ſituation, which is inconvenient for pre
ſing. *Thirdly*, he thinks their riſe and the leng
of their Tendons evince, that their uſe is not
compreſs. For he ſays, when their fleſhy pa
grows tumid, they draw the Tendons with t
linea alba outwards, and elevate them; and th
this Intumeſcence ordinarily concurs with that
the Muſcles that dilate the Breaſt. *Caſp. Ba
tholin* believes the tranſverſe chiefly conſpire wi
the Diaphragm to reſpiration. For demonſtr
ting that the Diaphragm is a digaſtrick or do
ble-bellied Muſcle, the nervous centre being t
Tendon intervening between the two Bellie
he has obſerved further (in Oxen) that the for
part of the Diaphragm extends a particular Te
don to the end of each of the *coſtæ nothæ*, wher
to the upper part of theſe tranſverſe Muſcl
firmly alſo adheres; and ſo he ſuppoſes th
there is a continuation of the one into the othe
the two bellies of the Diaphragm, and the tran
verſe Muſcles making on each ſide a trigaſtric
one. And upon this ſuppoſition he is of opinio
"That ſeeing in inſpiration, wherein the Brea
"is to be dilated, the Ribs ought to be drawn u
"ward, at which time alſo the fleſh of the ſa
"trigaſtrick Muſcle is relaxed, and the Di
"phragm, being from bowed become mo
"plane and relaxed, and thruſt toward the *Abd
"men*, permits the Ribs to be a little lift up a
"elonged for the dilatation of the Breaſt; whi
"when at length it is contracted by the fleſ
"Fibres of this trigaſtrick Muſcle, the Ribs r
"tu

turn to their former Angles with the *Vertebræ*, and the contracted Fibres of the Diaphragm from plane becoming bowed, do aſcend up further into the cavity of the Breaſt, which, by depreſſing the *Sternum* alſo, they ſtraiten, and ſo cauſe the Air to be expelled out of the Lungs.] So that he makes the chief Uſe of the tranſverſe Muſcles to be to aſſiſt Expiration.

CHAP. XVIII.

Of the Muſcles of the Genitals, both in Men and Women.

IN the Firſt Book, *Chap.* 23. *Of the Yard*, we deſcribed its Muſcles and their Action, whither the Reader may pleaſe to turn, and here we will but juſt name them. They are *two* Pair. The *The* Penis *hath two Pair.* are the *Erectores* or *Directores*, which ariſe from the inner knob of the *Coxendix*, and are inſerted into the nervous bodies of the *Penis*, near their beginning. The *ſecond* are the *Acceleratores*, which ariſe from the *Sphincter* of the *Anus*, and joining on the under ſide of the *Penis* (by the ſides of the *Urethra*) end about its middle.

The *Clitoris* in Women, (ſomething reſembling the *Penis* in Men) hath alſo *two* Pair of Muſcles, which having deſcribed *Book* I. *Chap.* 29. we will not inſiſt on here, but remit the Reader thither. *The* Clitoris *hath alſo two Pair.*

As to the *Cremaſter* Muſcles by which the *Teſtes* are ſuſpended in Men, ſee them deſcribed *Book* I. *Chap.* 31. As for Womens *Teſtes*, they have no Cremaſters.

CHAP. XIX.

Of the Muſcles of the Bladder and Anus.

THE *Bladder*, as was ſhewn in the Firſt Bo Chap. 19. conſiſts of three Membran whereof the middle is muſcular, being endu with carnous Fibres; yea by *Spigelius* it is reckо ed for a *Muſcle*, and called *Detruſor Urinæ.* I in the above-mentioned place we have deſcrib it under the notion of a *Membrane*; and what there ſaid of it may ſuffice, unleſs we would (ter upon a Controverſie of Names.

The Bladder hath but one Muſcle.

Excluding that Membrane therefore from number of *Muſcles*, the Bladder will have *one*, namely, its *Sphincter*, which encompaſſes Neck, (and environs the Proſtates alſo.) Men it is about two inches broad, and is ge rally eſteemed to be nothing elſe but the mid Membrane here grown more carnous than in reſt of the Bladder. Its Fibres are orbicular, a by the contraction of them is the Neck of Bladder conſtringed or purſed up, ſo that Urine cannot paſs out unleſs they be voluntar relaxed, or rather unleſs when they are ov power'd by the contraction and compreſſion of Muſcular Membrane, *&c.* for then they are f ced to give way to the Urine. In Women it not ſo broad, becauſe the Neck of their Bladde ſhorter, but it reaches to the hole by which Urine paſſeth into the *Vagina Uteri*, and ſer eth to form it.

The Anus *three.*

The *Anus* hath *three* Muſcles. The *firſt* the *Sphincter Ani.* This is fleſhy, and encom ſes the end of the ſtreight Gut, being two inc bro

road. Its Fibres are orbicular. It doth not pring from any adjacent Bone, but onely ad-eres to the *Coccyx*. It ſerves to purſe up the undament, and ſo hinders the involuntary Eva-uation of the *Fæces*. The *ſecond* and *third* are illed *Levatores*. Theſe ſpring from the inſide of ie Ligaments of the *Coxendix* and *Os ſacrum*, be-g broad and membranous, from whence paſ-ng by the ſides of the ſtreight Gut, they ſtick it, and are inſerted into the upper part of the *phincter*. Theſe draw up the Fundament again ter it is made to ſtrut out in ſtraining to ſtool; a they prevent its falling out, which ſometimes ppens upon their violation.

CHAP. XX.

Of the Muſcles of the Scapula *or Shoulder-blade.*

THUS we have done with the Muſcles of all the three *Venters:* now we come to oſe of the *Limbs*. And firſt of the *Scapula* or *oulder-blade*.

It is moved forward, backward, upward and downward, and for the performance of theſe moti- s hath four *proper* Muſcles. The *firſt* is called *apezius*, as alſo *Cucullaris*, becauſe it with its llow covering the Back reſembles a Monk's Cowl. ariſeth fleſhy from the lower part of the *Occiput* wards the Ear; but from the poſterior Proceſ- or Spines of the five loweſt *Vertebræ* of the eck, and of the eight uppermoſt of the *Thorax* it ringeth membranous. Being thus broad at its iſe, it grows narrower in its Progreſs, and is in-

Each Scapula *hath four Muſcles.* 1.

ſerted into the whole Spine of the *Scapula*, in the Shoulder-point, and broader part of the *Clavicula*. Now through its large beginning a indifferent narrow Tendon or End, it comes paſs that its fibres hold a various courſe; ſome them being *ſtreight*, others *obliquely deſcending*, a others *obliquely aſcending*. Whence it is alſo th it performs divers offices; for it draws the *Scapu* directly backwards by its ſtreight Fibres, (whi ſpring from about the firſt and ſecond *Vertebræ* the *Thorax*;) obliquely downwards, by the liquely aſcending, (which ariſe *below* the ſtreigh and obliquely upwards, by the obliquely deſcen ing, (which ariſe *above* the ſtreight.)

2. The *ſecond* is *Levator*, or *patientiæ Muſculus*, called from its helping to ſhrug up the Shoulde when we would intimate that there is no Reme but *Patience*. This hath its beginning from tranſverſe Proceſſes of the firſt, ſecond, third a fourth *Vertebræ* of the Neck; which beginni being united about the middle of the length of Muſcle, it is at length inſerted by a broad carnous Tendon into the upper corner of Shoulder-blade, which it draws upward, and Authors ſay) ſomewhat forward.

3. The *third* is *Serratus minor anticus*. This under the Pectoral Muſcle, and ſprings from four uppermoſt Ribs (except the firſt) bef they become cartilaginous, by four fleſhy po ons repreſenting the Teeth of a Saw, and is ſerted by a broad Tendon near to the Anchor-l Proceſs of the *Scapula*, which it draws forw towards the Breaſt.

4. The *fourth* from its Figure is called *Rhomboi* This is placed immediately under the *Cucull* It ſpringeth fleſhy from the hinder Proceſſes Spines of the three loweſt *Vertebræ* of the N

all ſo many uppermoſt of the *Thorax*, and is inſerted by as broad a fleſhy ending, as the beginning was, into the *Baſis* of the Shoulder-blade, which it draws backward.

Beſides theſe four *proper* Muſcles it hath others that are *common* to it with other Parts; which in ſome meaſure aſſiſt its Motions, as the *Serratus major*, deſcribed above, *Chap.* 15. and the *Deltoides*, which we ſhall deſcribe in the next *Chap-*

CHAP. XXI.

Of the Muſcles of the Arm.

THE *Arm* in common acceptation is meant of all the diſtance betwixt the Shoulder-joint or Neck of the Shoulder-blade, and the Wriſt; but we take it more ſtrictly here for that part onely that reaches from the Shoulder to the Elbow, (which it ſelf is otherwiſe called *humerus*) and conſiſts of one bone, which we ſhall call the *Shoulder-bone*. It hath five motions, for it is moved backward, forward, upward, downward, and circularly. *Each Arm hath nine Muſcles.*

It is moved upward by two Erectors, *Deltoides* and *Supraſpinatus*. *Firſt*, *Deltoides* (ſo called, becauſe in ſhape it reſembleth the Greek Letter *Delta* Δ) ſpringeth nervous and broad from the middle of the *Clavicula*, the top of the Shoulder, and the whole Spine of the *Scapula*, as from ſo many diſtinct beginnings. But preſently becoming nervous and thick, it grows narrower and narrower in its Progreſs, till it end in a ſtrong Tendon (nervous without and nervous within) which is *Erectors.* 1.

inserted transversely into the middle of th Shoulder-bone, and moves it either upwards, ar forward towards the Face, or else backwards, these or those of its fibres are contracted. Ar besides its moving of the *Humerus*, it helps al to draw up the *Scapula.*

2. The *second* is *Supraspinatus*, or *Superscapula superior.* This arises from the *Basis* of the *Scapu* and fills up the upper *Interscapulium*, *viz.* all th cavity that is betwixt its Spine and upper Edg and passing over the jointing of the *Scapula* w the Shoulder-bone, by a broad and strong Te don is inserted obliquely into the neck of the l ter. Some think this doth not only lift t Arm upward, but help to turn it about also.

Depressors. 1. It is pulled down by *Latissimus*, and *Rotun major. Latissimus* is so called from its largeness; with its fellow it covereth almost the whole Ba It is called also *Ani Scalptor*; or *Tersor*; beca those Offices are performed by the help of t Muscle. It springs by a broad membranous beg ning from the hinder Processes or Spines of the *Vertebræ* of the Back-bone, that are betw the sixth of the *Thorax*, and the middle of *sacrum*, as also from the upper edge of *Os ileu* then passing upwards when it is come to t part of the Back, where the Ribs begin to be it becometh fleshy, and is carried over the lov corner of the *Scapula*, (from which also it of receives many carnous Fibres) where becom narrower, it is inserted into the Shoulder-bo by a short broad Tendon, between the *Musc pectoralis* and this that follows, *viz.*

2. *Rotundus major*, or more properly, *Teres ma* (For *Rotundus* means a thing sphærical, but *T* long and round like a Thread, as this is.) springeth carnous from the whole lower edge

he *Scapula*, and is inſerted by a ſhort and ſtrong Tendon into the Shoulder-bone, a little below s Neck, and moves it contrary to the *Deltoides*, *iz.* downward and ſomewhat backward.

It is drawn forward by *Pectoralis* and *Coracoide-* *Movers forwards.*
s. Pectoralis hath a very large and for the greateſt art membranous beginning, ariſing from divers arts, yet is one and continuous. In its *upper* part riſes from the middle of the *Clavicula*: in its *iddle*, from the whole length of the *Sternum* and he Cartilages of the Ribs annexed to it; in its *weſt*, from the Cartilages of the ſixth, ſeventh and ghth Ribs. It preſently becomes carnous and nick, but narrower, and running towards the houlder it is inſerted into the Shoulder bone, a ttle below its Head, between the *Deltoides* and he *Biceps* of the Cubit. The Fibres of this Muſcle re of three ſorts, *viz.* obliquely deſcending, reight (or tranſverſe) and obliquely aſcending; nd accordingly it draws the *Os humeri* either di-ectly forward towards the Breaſt by its middle reight Fibres, or elſe obliquely forwards, *viz.* orward and upward, or forward and downward, s the obliquely deſcending, or obliquely aſcend-ng Fibres are contracted. 1.

Coracoideus or *Coracobrachiæus* ſpringeth from he *Coracoides* Proceſs of the *Scapula*, and endeth bout the middle of the Shoulder-bone, aſſiſting he obliquely deſcending Fibres of the *Pectoralis* n moving that Bone obliquely forward and pward. 2.

It is moved backward by *three*: *Infraſpinatus*, *Pullers backward.*
ubſcapularis or *Immerſus*, and *Rotundus minor*. *nfraſpinatus* or *Supraſcapularis inferior* ſpringeth rom the lower *Baſis* of the *Scapula*, and filleth up he lower *Interſcapulium*, *viz.* all that ſpace that s betwixt its Spine and lower edge, as the *Supra-* 1.

ſpinatus did that between the Spine and uppe edge. It is inſerted by a broad and ſhort Ter don into one of the Ligaments, that ſtrengthe the jointing of the Shoulder-bone with th *Scapula.*

2. *Subſcapularis* or *Immerſus* poſſeſſeth the who inner cavity of the *Scapula.* It ſpringeth fro the inner part of its *Baſis*, fleſhy, and ſo contin ing, paſſeth forward (but becoming ſtill narrow er) to the Neck of the *Scapula*, and at the laſt t a broad Tendon is inſerted into one of the Lig ments that ſtrengthen the aforeſaid Shoulde joint.

3. *Rotundus minor* ariſeth from the loweſt corn of the *Scapula* by a fleſhy beginning, and is in planted into the Neck of the Shoulder-bon Some make but one Muſcle of this and the *R tundus major.*

As to the circular motion of the Arm, that not performed by any particular Muſcle, but ſ veral of theſe contribute towards it, namely th *Supraſpinatus*, *Infraſpinatus* and *Subſcapularis*, an in ſome meaſure the others alſo.

CHAP. XXII.

Of the Muſcles of the Ulna.

THE lower part of the Arm from the Elbo to the Wriſt is called the Cubit, and con ſiſteth of two Bones, called *Ulna* and *Radius.* Th *Ulna* ſerveth for flexion and extenſion; but th *Radius* helpeth to turn the Cubit inward or ou ward, ſo as to make the back or palm of th Hand look upward or downward.

Th

The *Ulna* is bended by *two*, to wit, *Biceps*, and *Brachiæus internus*. *Biceps* is ſo called becauſe it hath *two heads*, both of which ſpring from the Shoulder-blade. The one is outward, tendinous and round, ſpringing from the upper brim of the *Acetabulum*, or cavity of the *Scapula*, into which the head of the Shoulder-bone is received; The other is broader, and is framed partly of a Tendon, and partly of Fleſh: it ſprings from the Anchor-like Proceſs of the Shoulder-blade, from whence deſcending by the inſide of the head of the Shoulder-bone, it meeteth with the former, and both together become a ſtrong fleſhy Muſcle: which lying on the inſide of the Arm, afterwards ends in a thick, round, and ſtrong Tendon, which is inſerted into the inſide of the head of the *Ulna*, (or of the *Radius*, as *Bartholin* will have it.) This Tendon is ſometimes pricked in letting blood in the Arm, and then it cauſeth great Pain. *Two Benders of the* Ulna. 1.

Brachiæus internus lieth under the *Biceps*, being ſhorter than it, and altogether fleſhy. It riſeth where the *Deltoides* endeth, *viz.* from the middle of the Shoulder-bone, unto which it cleaveth firmly, and is inſerted between the heads of the *Ulna* and *Radius*, in their fore-ſide. 2.

The *Ulna* is extended by *four* Muſcles, *Longus*, *Brevis*, *Brachiæus externus*, and *Cubitalis*. *Longus* hath two beginnings; the one is partly fleſhy and partly nervous, at the lower edge of the *Scapula*, near its Neck, (where it hath a peculiar hollowneſs to receive it:) this deſcends by the inſide of the Shoulder-bone, and when it is come as far as the inſertion of the *ani ſcalptor* (deſcribed in the foregoing Chapter) there ariſes another carnous beginning towards the outer ſide, that (according to *Spigelius*) joins with it and makes up one Muſcle, *Four Extenders.* 1.

which

which is inſerted into the inner ſide of the hinde Proceſs of the *Ulna* called *Olecranum.*

2. *Brevis* ariſeth from the hinder part of th Neck of the Shoulder-bone, and endeth in th outer ſide of the *Olecranum*; namely, in that par of the Elbow that we lean upon.

3. *Brachiæus externus* (ſo called by *Riolanus*, to di ſtinguiſh it from the *internus*) is placed toward the outſide of the Shoulder-bone, and is confour ded with the other two, and endeth where the do. This ſeemeth to be *Spigelius*'s ſecond begir ning of the *Longus*, which he ſays grows into or Muſcle with it.

4. *Cubitalis* or *Anconæus* ariſeth from the lowe end and hinder ſide of the Shoulder-bone, an paſſing over the Elbow-joint, it endeth by a ner vous Tendon in the ſide of the *Ulna*, a very littl below the *Olecranum* or *Ancon*, whence it is calle *Anconæus.* Some make one Muſcle of this and th *Brevis.*

Note, That the Fibres of both theſe Bender and Extenders of the *Ulna* keep all a ſtreigl courſe, and ſo only move the Cubit ſtreight wiſe.

CHAP. XXIII.

Of the Muſcles of the Radius.

The Radius *hath four Muſcles.*

THE *Radius*, the other Bone of the Cubit, moved *accidentally* (or in *common*) by th Muſcles of the *Ulna*, to which Bone it is faſten'd but it has beſides, *proper* motions of its own, an for the performance of theſe, two ſorts of Mu cles; of which ſome are called *Pronatores*, *vi* tho

hoſe that turn it inwards, and the Palm of the Hand upwards; and others *Supinatores*, which urn it outwards, and the Palm of the Hand lownwards.

The *Pronatores* are *two* in number. The *firſt* is, 1.
Pronator ſuperior rotundus or *teres*. This ſpringeth rom the root of the inner knob of the Shoulder-bone at the Elbow, and from the inner ſide of the *Ulna*, where it is joined to the Shoulder-one; and running obliquely on the inſide of the *Radius* endeth about its middle in a membranous Tendon.

The *ſecond* is *Pronator inferior quadratus*, which 2.
s altogether fleſhy. It ſpringeth from the lower nd inner part of the *Ulna*, two Inches broad; hen marching tranſverſly above the Ligament vhich joineth the *Radius* to the *Ulna*, it endeth in he inſide of the *Radius*. The ending is as broad is the beginning; wherefore it is called *quadratus* or four-ſquare.

The *Supinatores* are in like manner *two*. The *Two* Supi-
firſt is *Supinator longus*, ſo called, becauſe, of all natores.
the Muſcles which lie along the *Ulna*, it hath the 1.
longeſt Belly. This ſpringeth fleſhy from the edge of the outer knob of the Shoulder-bone; and marching obliquely under the *Radius*, is implanted by a membranous Tendon into the upper ſide of the lower end of the *Radius*, bending ſomewhat to the inner ſide.

The *ſecond* is *Supinator brevis*. This ſpringeth 2.
from the outſide of the ligament which ſtrengthens the jointing of the *Ulna* with the Shoulder-bone, and from the hinder Proceſs of the *Ulna*, as *Spigelius* deſcribes it; but as others, from the outer Proceſs of the Shoulder-bone; from whence it paſſeth on obliquely, being without membranous,

membranous, and within fleſhy, and is inſerted into the middle of the *Radius*.

Note, That though for orders ſake we have deſcribed the Muſcles of the *Radius* next to thoſe of the *Ulna*; yet when one would ſhew them in diſſection, the Muſcles of the Fingers, Thumb and Wriſt are firſt to be raiſed, and then theſe of the *Radius* after thoſe are taken away.

CHAP. XXIV.

Of the Muſcles of the Wriſt.

The Wriſt hath four Muſcles.

THE *Carpus* or *Wriſt* has three Motions: It is either bended, extended, or moved ſideways. For its flexion and extenſion it has proper Muſcles: but as for its motion ſideways, that is not performed by any proper Muſcles, but by a Bender and an Extender of that ſide to which it is moved, if they act together. The Benders lie on the inſide of the Cubit, and the Extenders on the outſide.

Two Benders.

The *Benders* of the Wriſt are *two*; of which

1. the *firſt* is *Cubitæus internus*: this ariſeth by both a fleſhy and nervous beginning from the inner tubercle or knob of the Shoulder-bone; then paſſing fleſhy the length of the *Ulna* or *Cubitus*, (to which it immediately adheres) it ends by a Tendon, partly nervous, and partly fleſhy, in the fifth bone (ſome ſay the fourth of the firſt rank) of the Wriſt.

2. The *ſecond* is *Radiæus internus*: this ariſing from the ſame tubercle, paſſes along the *Radius* (adhering to it;) and before it comes to its lower end, turns into a round Tendon, which proceeding

ng forward grows to the tranſverſe Ligament of he Wriſt: but ſtill paſſing further and waxing roader, it is at laſt inſerted into that Bone of he back of the Hand which is ſet before or ſuſ- ains the fore-Finger.

The *Extenders* are alſo *two*. *Two Extenders.*

The *firſt* is *Radiæus externus*, or *bicornis*: this 1. riſeth by a double origine from that bony tip of he Shoulder-bone, and from the outer knob of he ſame: then becoming more fleſhy, it paſſeth long the *Radius* to its middle, where it turneth nto a ſtrong Tendon, which preſently is divided nto two almoſt round Tendons. Both theſe paſs little aſunder by the *Radius* under the Ligament of the Wriſt, and are one of them inſerted into hat Bone of the back of the Hand which ſtayeth he fore-Finger, and the other into the Bone vhich ſtayeth the middle Finger.

The *ſecond* is *Cubitæus externus*: this hath its 2. beginning from the root of the external knob of he Shoulder-bone: it paſſeth along the *Cubitus* or *Ulna*, and when it is come to the Wriſt, it end- eth in a ſtrong round Tendon, which is inſerted into the upper part of that Bone which ſtayeth the little Finger, not far from the Wriſt.

CHAP. XXV.

Of the Muſcles of the Palm of the Hand.

THE *Palm* of the Hand is ſaid to have *two* Muſcles. The *firſt* is *Palmaris*, which ari- ſeth from the inner knob of the Shoulder-bone, round and nervous, but preſently becoming fleſhy it continues its courſe along the *Ulna*, under all *The Palm hath two Muſcles.* 1.

all the other Muſcles; but about the middle c the ſaid Bone it turns into a round Tendor which paſſing over the tranſverſe or annular lig ment of the Wriſt, is afterwards dilated into broad nervous membrane, which cleaveth firml to the skin of the Palm of the Hand, (cauſing to be of moſt exquiſite ſenſe) and endeth in th inſide of the firſt joint of the Fingers. This Mu cle ſpreading its Tendon thus in the Palm, b ſides that it adds much to its ſenſiblenes helps to contract and wrinkle the sk thereof, for the taking the faſter hold in gra ping of a thing.

2. The *ſecond* is *caro quædam quadrata*, or a fou ſquare fleſhy ſubſtance: this ſpringeth from th *Membrana carnoſa* that covereth that regio where the eighth bone of the Wriſt is placed. Fro thence it is carried under the dilated Tendon the *Muſculus palmaris*, to the middle of the Pal of the Hand, and there ends. *Spigelius* ſays, is inſerted into the outſide of the Tendon of th Muſcle which moveth the little Finger outward It looks as if it conſiſted of two or three Muſcle and ſerveth (as ſome think) for the hollowing c the Palm of the Hand, by drawing the outſid of it towards the Ball of the Thumb; bu according to *Spigelius*'s Opinion, it ſerves ra ther to withdraw it, and ſo to ſpread the Pal open.

CHA

CHAP. XXVI.

Of the Muſcles of the four Fingers.

THE *Fingers* are bended, extended, and moved laterally. By *the Fingers* we mean only he four, excluding the Thumb, whoſe motion iffers very much from that of the other; and herefore we ſhall deſcribe its Muſcles in the ext Chapter, as being altogether diſtinct from heſe.

The Fingers are bended by *three* Muſcles, (or ather by ſix.) The *firſt* is called *Sublimis*, or *perratus*. This ſpringeth ſomewhat nervous, from he inner knob of the Shoulder-bone, and deends fleſhy betwixt the *Ulna* and *Radius* till ear the Wriſt, where it is cleft into four fleſhy ortions, which preſently paſs into ſo many round endons, all whereof are involved together in ne common, thin, and mucous Membrane, that hey may march the more ſafely. Thus they are arried under the tranſverſe Ligament of the Vriſt, and along the Palm to the ſecond joynt f the Fingers (growing there broader and thiner) into which they are inſerted, one into ach. *Spigelius* notes, That as they paſs along he firſt Joynt, they run under a tranſverſe Ligaent (that ſprings from one ſide of the bone, nd is inſerted into the other) as under an arch: vhich Ligament hinders them upon their conraction from ſtarting up out of their places. Near their end each has a Fiſſure or perforation, o give way to the Tendons of the *profundus* paſing through. *Three benders of the Fingers.* 1.

The

2. The *ſecond* is named *profundus* or *perforans*. This ariſeth from the upper parts of the *Ulna* and *Radius*, a little below the joint of the Elbow, and being cleft at the Wriſt into four Tendons, theſe run (inveſted in a common Membrane) under the annular ligament of the Wriſt, and alſo the tranſverſe ones of the firſt joint of the Fingers; and laſtly through the clefts of the Tendons of the *Sublimis*, and are implanted into the third joint of the Fingers.

3. The *third* ſort of Muſcles are called *Lumbricales*, one to each Finger. Theſe are very ſmall and ariſing from the Tendons of the *Muſculus profundus*, end each in a round Tendon in the firſt joint of the Fingers, being confounded with the Tendons of thoſe Muſcles that move the Finger laterally; yea ſometimes they proceed further along with them by the ſides of the Fingers, to the third joint, and aſſiſt their lateral motion. The firſt of theſe Muſcles bends the ſecond joint of the Fingers, the ſecond the third, and the *Lumbricales* the firſt.

Three Extenders. The Fingers are extended by *three* Muſcles whereof one is *common* to all the four Fingers, and two *proper* to two particular.

One common. The *common* is *Extenſor magnus.* This ariſing from the outer knob of the Shoulder-bone, a little above the Wriſt is divided into four Tendons which paſſing the Wriſt like the foregoing are inſerted into the ſecond and third joints of the Fingers. Some make two of this, ſuppoſing that Tendon that is inſerted into the little Finger, to be the Tendon of a Muſcle that is diſtinct from that from which the Tendons are propagated to the other three Fingers; but grant it has the ſame origine, and keeps the ſame courſe.

Th

The two *proper* are one of them called *Indicator*, becauſe it belongeth to the fore-Finger. It ariſeth from the middle of the *Ulna* on its outſide, and by a double Tendon it endeth in the ſecond joint of the fore-Finger: but one of the Tendons becometh one with the Tendon of the *Extenſor magnus*. *Two proper* 1.

The other is named *Auricularis*, becauſe it belongeth to the little Finger. It ariſeth from the upper part of the *Radius*, and marching between the *Ulna* and the *Radius* it is inſerted by a double Tendon into the backſide of the little Finger, of which Tendons one coaleſces with that of the common Extender. 2.

The Fingers are moved laterally two manner of ways: for either they are brought to the Thumb, or they are carried from it. Theſe Motions are performed by *eight* Muſcles, called *Interoſſei*, becauſe they are placed between the Bones of the *Metacarpium*. That is, ſix of them are placed in the three Interſtices of the four Bones of the *Metacarpium*, one on the outſide of that Bone which ſuſtains the fore-Finger, and another on the outſide of that which ſuſtains the little Finger. They are fleſhy and round, and ſpring from the Bones of the *Metacarpium*, to which they also adhere, as they paſs along them. When they are come to the Roots of the Fingers, they paſs into Tendons, which cleave to the ſides of the Fingers, and end in the laſt joynt of the Fingers near the root of the Nails. When the Tendons of the *Lumbricales* join with theſe, they may be reckon'd amongſt the Movers of the Fingers laterally, and then there will be twelve in all, the *Lumbricales* being four, and theſe *Interoſſei* eight: but uſually the *Lumbricales* ſerve onely to bend the firſt Joint of the Fingers, as was ſhewed above. *Movers laterally, eight.*

Abducing Muſcles, two.

Beſides theſe Muſcles, the fore-Finger and the little Finger are ſaid to have each one *proper* Muſcle. That of the fore-Finger may either be called *Abducens* in reſpect of the middle Finger from which it draws it; or *Adducens*, in reſpect of the Thumb towards which it draws it. It ſprings from the inſide of the firſt Joint of the Thumb and ends in the Bones of the fore-Finger, which it pulls towards the Thumb.

1.

2. That of the little Finger is called *Abductor* (by ſome *hypothenar*) and ſprings from the third and fourth bone (of the ſecond rank) of the Wriſt whence proceeding along the palm of the hand, it is implanted by a ſmall nervous Tendon into the outſide of the firſt Joynt of the little Finger, which it draws outwards from the reſt.

CHAP. XXVII.

Of the Muſcles of the Thumb.

Two Extenders of the Thumb.

THE *Thumb* is extended by *two* Muſcles. The *firſt* is called *Longior*. This ariſeth fleſhy from the outſide of the *Ulna*, near the membranous Ligament which tieth together the *Ulna* and *Radius*. From thence it is carried obliquely upon the *Radius*, and before it come to its *Appendix*, turneth into a round Tendon; which paſſing under the annular Ligament of the Wriſt marcheth along that ſide of the Thumb, which is next to the fore-Finger, and is inſerted into the third bone.

1.

2. The *ſecond* is named *Brevior*. This ariſeth from the ſame origin with the other, and paſſeth obliquely above the *Radius*. By *one* Tendon it is implanted

mplanted into the root of the firſt Joynt of the Thumb, (which anſwers to the bones of the *Metacarpium* that ſuſtain the Fingers;) the *other* becoming membranous, cleaveth faſt to its ſecond and third bone.

It is bended alſo by *two* Muſcles; *one* of which bringing from the upper part of the *Radius*, is inplanted into the firſt and ſecond Joynt of the Thumb; the *other* being leſs, proceeds from that one of the *Carpus* which ſuſtains the Thumb, ring under the other, and reacheth to the middle of the Thumb. Theſe two are all the Benders cknowledged by *Bartholin*, *Diemerbroeck*, &c. but *pigelius*, *de hum. corp. fabric.* l. 4. c. 19. deſcribes wo which bend the firſt Joynt, four the ſecond, nd one the third. Theſe two which bend the rſt Joynt, together with the *Abducens* of the me, he ſays, make the *monticulus pollicis* or ball f the Thumb, or as Chiromancers call it *monti-ulus Lunæ*.

Two Benders.
1.
2.
Monticulus lunæ.

It is moved laterally by *two* Muſcles. The *firſt* called *Thenar* (by *Riolanus*) or *Abducens*. This ringeth from the inner part of that bone of the Vriſt, which ſtayeth the Thumb, by a nervous eginning: then becoming fleſhy, it is inſerted nto the firſt Joynt of the Thumb by a membranous Tendon, and draweth it from the fore-Finer. Some make three of it.

Movers laterally, two.
1.

The *ſecond* is *Antithenar*, or *Adducens*, which eth in the ſpace between the Thumb and fore-inger. This doth ariſe from the outſide of that one of the *Metacarpium* which ſuſtaineth the ore-Finger; and being fleſhy is inſerted into the hole inner ſide of the firſt joint of the Thumb, nd ſendeth a membranous Tendon to the ſeond. This draweth the Thumb to the fore-inger. Some deſcribe a ſecond *Adducens* ariſing

2.

from the inner ſide of the bone of the Wriſt that ſuſtaineth the Thumb, and ending in its ſecond joint.

Authors differ very much as to the Number, Riſe, and Inſertion of theſe Muſcles of the Thumb, which is occaſioned partly by their ſmalneſs, and partly from their croſſing and being entangled one with another, ſo that 'tis very difficult to trace and raiſe them.

CHAP. XXVIII.

Of the Muſcles of the Thigh.

THE *Thigh* hath four manner of motions: it is either bended (and that forwards, or backwards) or drawn inward or outward, or moved round.

Two Benders forward of the Thigh.

It is bended forward by *two* Muſcles. The 1. *firſt* is called *Pſoas*, or *Lumbaris*: this lieth in the inner part of the *Abdomen*, upon the *Vertebræ* of the Loins, *&c.* It ariſeth fleſhy from the ſide of the Bodies and from the tranſverſe Proceſſes of the two lowermoſt *Vertebræ* of the *Thorax*, and two or three uppermoſt of the Loins, from whence deſcending by the inſide of *Os ilium*, where it is come to the *Os pubis*, it turns into a round and ſtrong Tendon, which is inſerted into the leſſer *Rotator* of the Thigh-bone.

2. The *ſecond* is *Iliacus internus*: This ſpringeth with a ſlender and fleſhy beginning from the inner Cavity of *Os ilium*, and being joined to the *Pſoas* by its Tendon, it endeth before betwee the greater and leſſer *Rotator*.

It is bended backward or extended by the three *Glutæi*, which make up the Buttocks, and serve to go backward withall, or else to raise the body up streight after sitting. The *first* which is the greatest, and lieth outmost, is called *Glutæus major*. It springeth very carnous from the *Coccyx*, from the Spine of *Os sacrum*, and from all the circumference of the *Costa* or edge of *Os ilium*, and is inserted by a strong Tendon four inches below the great *Rotator*. *Three Benders backwards.* 1.

The *second* lies in the middle, whence it is called *Glutæus medius*. It springeth from the foreart of the *Costa* and back of *Os ilium* a little lower than the former, and is inserted into the outer and upper part of the great *Rotator*. 2.

The *third* lies undermost, and is called *Glutæus minor*. It springeth a little lower than the former, (from the outer or backside of *Os ilium*) lying wholly under it, and is implanted into the upper and inner part of the great *Rotator* by a broad and strong Tendon. 3.

It is drawn to the inside by the *Musculus triceps*. This is the thickest of all the Muscles of the Body, and might more justly be called *quadriceps*, seeing it has four beginnings; but they that imposed the name of *triceps*, made a particular Muscle of the first of its four Heads, and called it *Pectineus* or *lividus*. The *first* Head doth proceed nervous from the upper part of the *Os pubis*, and is inserted into the rough line of the Thighbone. The *second* springing from the lower side of the same bone, being lesser is inserted a little higher up into the said line. The *third* arising from the whole lower part of the *Coxendix*, is inserted a little under the lesser *Rotator*. The *fourth* springing from the *Apex* or tip of the *Coxendix* is implanted into the inner and lower Tu- *One Drawer to the inside.*

bercle of the Thigh by a round Tendon, which i joyned with the ſlender Tendon of the firſt pa of this Muſcle.

Four turners towards the outſide.

It is turned towards the outſide by *four* ſma Muſcles called *Quadrigemini.* They are place behind upon the articulation of the Thigh, o by another. The *firſt* is called from its ſituatic *Iliacus externus*, and from its figure *pyriformis* it is longer than the reſt, and ariſeth from t outſide of the three loweſt *vertebræ* of *os ſacru*

1. 2. The *ſecond* ariſeth from the knob of *os iſchiu*

3. The *third* ariſeth from the ſame part. The three are inſerted into that dent that is in t top of the great *Rotator* ; or as *Bartholin* ſays, i to that ſpace that is betwixt the two *Rotators.* T

4. *fourth* is called *Quadrigeminus quadratus*, and more fleſhy and broad than the reſt : it lieth tv inches diſtant from the third, ariſing from the i ſide of the knob of the *iſchium*, and is implant into the outſide of the great *Rotator.*

Two turners about obliquely.

It is turned about obliquely by *two* Muſcles c led *Obturatores.* The *firſt* is *Obturator internus*, t turneth it outward. It ariſeth from the inn circumference of the hole that is between the *chium* and *os pubis*, from whence paſſing tranſve ly outwards over the *Coxendix*, it is inſerted in the aforeſaid dent or cavity of the great *Rotat*

1. 2. The *ſecond* is *Obturator externus* : this ariſe from the outer circumference of the ſaid hol and turning about the neck of the Thigh-bone about a Pulley, it endeth in the ſaid Cav of the great *Rotator*, and turneth the Thigh ward.

Note, That though for orders ſake we have ſcrib'd the Muſcles of the Thigh before thoſe the Leg, yet the Diſſector cannot ſo eaſily conve

conveniently raiſe and ſhew them, till thoſe of the Leg are firſt raiſed and removed.

CHAP. XXIX.

Of the Muſcles of the Leg.

THE *Leg* is made up of two Bones as well as the Cubit, *viz. Tibia* and *Fibula*; but Anatomiſts have not diſtinguiſhed their Muſcles like thoſe of the *Ulna* and *Radius*, but call them all, *the Muſcles of the* Tibia *or Leg.* *Five Benders of the Leg.*

Now the *Leg* is either bended, extended, or moved obliquely.

There are *five* that bend it. The *firſt* is *Longiſſimus.* This ariſeth from the inner knob of *Os Ilium*, and deſcends outermoſt juſt under the skin on the inſide of the Thigh, running obliquely over the other Muſcles, and a little above the Knee ending in a Tendon, which is inſerted under the Knee, into the fore and inner ſide of the *Tibia.* It is otherwiſe called *Faſcialis*, becauſe it embraces the Muſcles that lie upon the Thigh like a *Swadding-band*; and alſo *Sartorius*, becauſe it helpeth one to ſit croſs-legg'd. 1.

The *ſecond* is called *Gracilis*, and ſpringeth with a nervous and broad beginning at the joynting of the *Os pubis*; from whence it runs down the inſide of the Thigh, and is implanted by a round Tendon into the inner ſide of the *Tibia*, near the inſertion of the firſt, but a little lower. 2.

The *third* is named *ſeminervoſus*, becauſe it is *half nervous* and half fleſhy; for it ariſes nervous from the knob of the *Iſchium*, and ſo continues 3.

till its middle where it becomes fleſhy, deſcendin
on the backſide of the Thigh; and when it i
come near the Ham, it turns into a round Ten
don, which is inſerted into the inner ſide of th
Tibia, towards the backſide, running as far as it
middle.

4. The *fourth* is called *ſemimembranoſus*, becauſe i
is *half membranous*. It proceedeth from the ſam
knob, partly nervous, and partly membranous
and endeth by a broader Tendon than the thir
in the hinder part of the *Tibia*.

5. The *fifth* is called *biceps*, becauſe it ſeems t
have *two Heads*: for firſt it ariſeth from the ſam
knob of the *Iſchium* nervous; and from thenc
being carried on the outſide of the Thigh, abou
its middle it becometh fleſhy, as if it begu
there with a ſecond head; from whence de
ſcending it is inſerted by a notable Tendon in
to the outer ſide of the upper Appendix of th
Fibula.

Five Extenders. The Leg is extended alſo by *five* Muſcles. Th
1. *firſt* is *membranoſus*: this proceeding fleſhy fron
the upper part of the ſpine of *Os ilium*, on th
outſide of the Thigh-bone near the great Pro
ceſs or *Rotator* turns into a broad membranou
Tendon, wherefore it is called *Faſcia lata*, for i
covereth almoſt all the Muſcles of the Thigh an
Tibia, and at laſt is inſerted a little below th
Knee, into the outer and foreſide of the *Tibia* an
Fibula.

2. The *ſecond* is *Rectus*: this ſpringing from th
lower part of the ſpine of *Os ilium*, and paſſin
with a carnous and round belly ſtreight down th
Thigh before, when it is come to the *Patella*, i
ends in a broad and ſtrong Tendon, by which i
adheres cloſe to the *Patella*, as if it would en
in it; but it paſſes further and is inſerte
int

ıto the foreſide of the *Tibia* a little below the Knee.

The *third* is named *vaſtus externus*: this ſpring- 3.
h from the root of the great *Rotator*, and de-ending along the outer and foreſide of the high endeth a little below the *Patella*, near the me place with the former.

The *fourth* is called *vaſtus internus*: this ariſeth 4.
om the root of the leſſer *Rotator*, and deſcend-g on the inner and foreſide of the Thigh endeth little below the *Patella* with the other. The *aſtus externus* deſcends on the *outſide* of the *ſtus*, and the *internus* on the *inſide* thereof, hence they have their name.

To theſe ſome add a *fifth* Muſcle called *Crure-*, 5.
, which ſpringeth from the fore-part of the high-bone, between the two *Rotators*, and ad-ering cloſe thereto in its deſcent, endeth in the me place with the former.

Note, That theſe four laſt Muſcles being joined gether about the Knee, make one common oad and ſtrong Tendon, by which they involve e *Patella* or Knee-pan, and which being inſer-d into the *Tibia*, tyes it and the Thigh-bone gether like a ſtrong Ligament. *Note* alſo, That e Muſcles which extend the Leg are ſtronger an thoſe which bend it, that the weight of the ody may be the more firmly upholden when we and.

There is alſo a ſingle Muſcle called *Poplitæus*, *One Mover* r *Subpoplitæus*, which moveth the Leg obliquely: *obliquely.* is lieth in the hollow of the Ham, and ſpring-h from the outer knob at the lower end of the high-bone, and is carried obliquely to the hin-er and inner ſide of the Appendix at the upper nd of the *Tibia*.

CHAP.

CHAP. XXX.

Of the Muſcles of the Foot or Tarſus.

THE *Foot* is moved according to the motio of the *Tarſus* or *Wriſt*, (or as ſome call the *Inſtep*, though that name is more proper to th *Metatarſus* or upper arched part of the Foot. Wherefore the Muſcles that perform theſe mc tions, are indifferently called the Muſcles of th Foot or *Tarſus*.

Two Benders of the Foot. The Foot then is either bended, extended, o moved ſideways, according to the motion of th *Tarſus*. It is bended when it is drawn forward or upwards. To perform which motion it hat

1. *two* Muſcles. The *firſt* is *Tibiæus anticus*: thi ariſeth from the upper Appendices of the *Tibi* and *Fibula*, and cleaving unto the whole *Os Tibia* about the middle of it it becometh narrower, an turneth by degrees into a Tendon, which paſſin under the annular ligament of the *Tarſus* or Wri that ſprings from the lower Appendices of th *Tibia* and *Fibula*, is commonly divided into two whereof the one is inſerted into the firſt of thoſ bones which are called *innominata*, and the othe into that bone of the *Metatarſus* or Inſtep tha is ſet before the great Toe. If the Tendon con tinue one, then it is implanted into the inner ſid of this laſt Bone.

2. The *ſecond* is *Peronæus anticus*: this ariſeth fron the outer and upper part of the *Perone* or *Fibu la*, and being carried through the fiſſure of th outer Ankle, it is inſerted into that Bone of th *Metatarſus* which ſuſtaineth the little Toe. I deſcends all along by the outſide of the fore

goin

oing Muſcle, and hath ſometimes two Tendons.

The Foot is extended when it is drawn downwards or backwards. To perform which motion it hath *three* Muſcles. The *firſt* is called *Gemellus externus*, being reckoned by ſome for *two*; alſo *Gaſtrocnemius externus*, becauſe it with the following maketh *the Calf of the Leg*, which in Greek is called *Gaſtrocnemia*. It hath two Heads, the firſt of which ariſes in the Ham, from the inner Head of the Thigh-bone, fleſhy and broad; from whence it marcheth down by the back and inner part of the *Tibia*, and when it is come to the middle of it, becometh tendinous. The other Head likewiſe ariſeth in the Ham, but from the outer Head or Prominence of the Thigh-bone, and paſſing down by the outward and back part of the Leg, becometh tendinous a little above the former, and joining with it they both grow into one ſtrong, broad, and nervous Tendon, which is inſerted into the hinder ſide of the Heel. *Three Extenders.* 1.

The *ſecond* is called *Gemellus internus*, or *Gaſtrocnemius internus*, becauſe it lieth under the former; and laſtly *Soleus*, from its reſembling the *Sole-fiſh* in ſhape. It is of a livid colour, ſpringing from the backſide of the upper *Appendix* of the *Fibula* by a ſtrong nervous beginning, and growing pretty bulky it continueth ſo till it hath paſſed the middle of the *Tibia*, when it becometh narrower, and tendinous; and a little above the Heel it is ſo united to the Tendon of the former *Gemellus*, that both ſeem to turn into one, which is inſerted into the Heel. 2.

The *third* is *Plantaris*. This ſpringeth from the outer head of the Thigh-bone in the Ham, very ſmall but carnous; from whence it deſcends 3.

but

but a little way before it ends in a very long an ſlender Tendon, which joining very cloſely wit thoſe of the two former is faſtened to the Heel but reaches as far as the middle of the ſoal of th Foot: (*Spigelius* ſays, as far as the Toes, and i inſerted into the firſt joint of each of them, imita ting the *Palmaris* of the hand.) The three Ten dons of theſe three Muſcles thus uniting make on moſt ſtrong and thick Tendon, uſually called *th great Cord*; and this being implanted into th Heel makes a wound there ſo very dangerous.

Two Mo- vers ſide- ways.

The Foot is moved ſideways by *two*. The *firſ* is called *Tibialis poſticus*, *adducens pedem*, or *Nau ticus*, becauſe Sailers uſe it much when the 1. climb up the Maſt. It ſpringeth both from th *Tibia* and *Fibula*, and from the Ligament whic tyeth them together; whence deſcending amon the hinder Muſcles, near to the inner Ankle i becometh tendinous: then paſſing by it, it goet to the ſoal of the Foot, and is inſerted into th under ſide of that Bone of the *Tarſus* which next to the *cubiforme*, *viz.* the third *cuneiform* This moveth the Foot inwards.

2. The *ſecond* is called *Peronæus* or *Fibulæus poſti cus*: this ariſeth from the upper and hinder pa of the *Fibula* or *Perone*, by a nervous and ſtron beginning; and in its deſcent becoming fleſh and round, it cleaves to the outſide of the *Fibul* having its outer part of a livid colour, but th inner of a red. When it is come to the middle c the *Fibula* it becometh tendinous, and deſcend with the *Peronæus anticus* by the fiſſure of the out er Ankle, but joins not with its Tendons, for i goes under the ſoal of the Foot, and is inſerte into the root of the firſt or greateſt of the thre *Oſſa cuneiformia*, that is ſeated before the grea Toe. Some

Sometimes, though ſeldom, there is another Muſcle, called *Peronæus tertius*, which being very under accompanies the *poſticus* in its whole progreſs, and is inſerted into the ſame place, aſſiſting in Action, which is, to bend the Foot outwards.

CHAP. XXXI.

Of the Muſcles of the Toes.

THE great *Toe* is moved by its *proper* Muſcles, as the Thumb of the Hand was: but the other four by *common*, which we will firſt deſcribe.

They are either extended, bended, or moved obliquely.

Two Extenders of the four Toes.

The Extenders are *two*. The *firſt* is *Tenſor longus*. This ariſeth by a nervous and acute beginning from the fore and inſide of the upper *Appendix* of the *Tibia*, and preſently becoming carnous, it goeth ſtreight down along the *Fibula*, and being come to the *Tarſus* it is divided into four Tendons, which paſſing under the annular or tranſverſe Ligament thereof, go each to one of the four leſſer Toes, and are inſerted into their ſecond and third joint on the upper ſide. As they run along the backſide of the Foot they are tyed one to another by a membranous Ligament, for the ſtrengthening of them. 1.

The *ſecond* is *Tenſor brevis*. This lieth under the former, having its beginning from the tranſverſe or annular Ligament of the *Tarſus*, fleſhy and broad, and by its four Tendons is inſerted into the firſt joints of the four Toes; (*Spigelius* ſays, into the ſecond.) 2.

The

Six Benders. The *Benders* of the four Toes are in like manner *two*, and *four Lumbricales*. The *first* is *Flexor*

1. *longus*, or *perforans*: it lieth under the *Gemelli internus* and ariseth from the upper and hind part of the *Tibia* by a long and fleshy beginning and passing down along the *Tibia*, (unto which it cleaveth) when it is past the middle of it, becometh tendinous: then running by the inn Ankle, under the Ligament of the *Tibia* and He to the Soal of the Foot, it is there divided in four Tendons, which passing through the ho of the *Flexor brevis*, are inserted into the third last joint of the four Toes.

2. The *second* is *Flexor brevis*, or *perforatus*: th springeth from the under and inner side of t Heel-bone, and when it hath passed the midd of the Foot, it is parted into four round Te dons, which are inserted into the second joint the four Toes, being perforated to give way the Tendons of the former Muscle to pass to t third joint.

Lumbricales. They are also bended by *four Lumbricales* which agree altogether with the *Lumbricales* the hand both in their use, Figure and Rise. Th spring from the Tendons of the two former, sm and round, (or rather from the membranous Lig ment that incloses them) and are inserted by a sm Tendon into the side of the first joint, whi they help to bend. The fleshy substance, whi riseth with two acute beginnings from the f part of the lower side of the Heel-bone, a reacheth to the Rise of these Muscles, seem much to further their Action, and to afford th their carnous Substance.

Ten Movers obliquely. The Toes are moved obliquely by the *Interossei*, which are so called, because they are plac *between the bones* of the *Metatarsus*. They are

i number, whereas there are but eight in the ck of the Hand, becauſe the *Metatarſus* hath ie bone more than the *Metacarpus*, there being e to ſuſtain the great Toe as well as the reſt; hereas the Thumb hath none. Each of them th ſpring from the under ſide of that bone up- which it is placed, but preſently turning to its e, it keeps its courſe along the interſtice of the nes till it arrive at the firſt joint of the Toe, in- the ſide whereof it is inſerted by a ſhort and newhat broad Tendon. If the inner be con- icted, the Toe is moved inwards; if the outer, twards. But if they both act together, then e the Toes extended. In the four diſtances be- een the bones, there are eight ſuch Muſcles; the outſide of the great Toe one, and another the outſide of the little Toe. But beſide *it*, e little Toe hath a proper *Abductor* to move it twards, which ariſing from the Heel paſſes on e outſide of the fifth bone of the *Metatarſus*. d is inſerted into the outſide of the firſt joint bone of this Toe.

The *great Toe* hath *five* peculiar or *proper* Muſ- es. The *firſt* is *Extenſor*: this ſpringeth by a ſhy beginning from the outſide of the *Tibia*, here the *Fibula* ſtands out from it: after a ſhort ace it paſſeth into a Tendon, which running un- r the annular ligament of the *Tarſus*, and march- g along the upper part of the Foot, is inſerted to the whole upper part of the great Toe, hich it extends. *One Extender of the Pollex or Great Toe.*

The *ſecond* is *Flexor*: this ſpringeth from the pper and back part of the *Fibula*, and deſcend- g by the ſide of the *Flexor longus* to the inner nkle, it there becometh tendinous, and run- *One Bender.*

ning

ning with the *longus* under that ligament the which tyeth the lower *Appendix* of the *Tibia* the Heel, it is inſerted into the third or laſt bo of the great Toe, by one ſtrong Tendon, ſervi to bend it. But ſometimes it is divided into tv Tendons, whereof one is inſerted as aboveſai and the other into the ſecond Toe: and wh this happens, the *Flexor longus* ſends but thr Tendons to the three laſt Toes, and none to t ſecond.

Three Movers ſideways.

The *three* following move it ſideways: which the *firſt* is called *Abducens pollicem*, becau it draweth the great Toe from the reſt, towa the inſide of the Foot. It ſpringeth nervous fro the Ligament which tieth together the Heel-bo and the *Talus* (or according to ſome, from the i ner ſide of the Heel it ſelf) and running fo wards on the inſide of the Foot, it is inſerted l a round Tendon into the outſide of the firſt joi of the great Toe.

1.

2. The *ſecond* is called *Adducens pollicem majo* drawing the great Toe towards the reſt. Th ſpringeth from the Ligament that ties thoſe tw Bones of the *Metatarſus* together which ſuſtai the little Toe and the next to it, and proceedin obliquely over the other Bones is is implanted in to the inner ſide of the firſt joint of the grea Toe.

3. The *third* is called *Adducens pollicem minor* (an otherwiſe *Tranſverſalis* from its running *a-croſs* th Foot.) This ariſeth from the Ligament that bind the firſt joint of the little Toe, and paſſing croſ the firſt bones of the other Toes it ends in th inſide of the firſt bone of the great Toe. Som think this ſerves onely to tie together the firſ bones of the Toes (like a Ligament:) But *Caſſe-*

riu

us (who firſt found it out) ſays it draws the eat Toe to the little one, and ſo makes the Foot llow, graſping the ground as it were, when we in ſtony and uneven places, to fix the Foot ore firmly.

Let not the Reader wonder, that he meets not this Diſcourſe of the Muſcles, with the ingenious *Cowper*'s new diſcoveries: For beſides the w Muſcles which he has found out, he differs very much in his deſcription of the old from mer Anatomiſts, that I have thought it better refer the Reader to his *Myotomia Reformata*, in to do him any injury by curtailing what is to be peruſed at large by the curious.

Having thus finiſhed our Diſcourſe of the Muſs, I have thought fit to ſubjoin two Figures, erein are repreſented as many of the Muſcles can conveniently be ſhewn in two poſtures of e Body. Which I have added, to let Beginners this Art of Anatomy ſee the manner of the ng of the Muſcles in their natural Situation, d of the running of their Fibres.

Tab. XVIII.

Repreſenteth the Muſcles as they lie to view the fore-part of the Body.

a *Sheweth the Frontal Muſcle.*
b *The Temporal.*
c *The Muſcle called* Maſſeter.
d *The* Maſtoideus.
e *The* Deltoides.
ff *The* Biceps.
g *The Extender of the Wriſt.*
h *The Bender of the Wriſt.*
* *The Bender of the Thumb.*
i *The Extender of the third Joint of the Thumb.*
kk *The Pectoral Muſcles.*
llll *The ſtreight Muſcles of the* Abdomen.
mm *The* Linea alba.
nn *The obliquely deſcending.*
oo *The* Muſculus ſartorius *or* faſcialis.
pp *The ſtreight Muſcles of the Thigh.*
qq *The* Triceps.
r *Part of the* Membranoſus.
ſſ *The* Vaſtus internus.
t *The* Vaſtus externus.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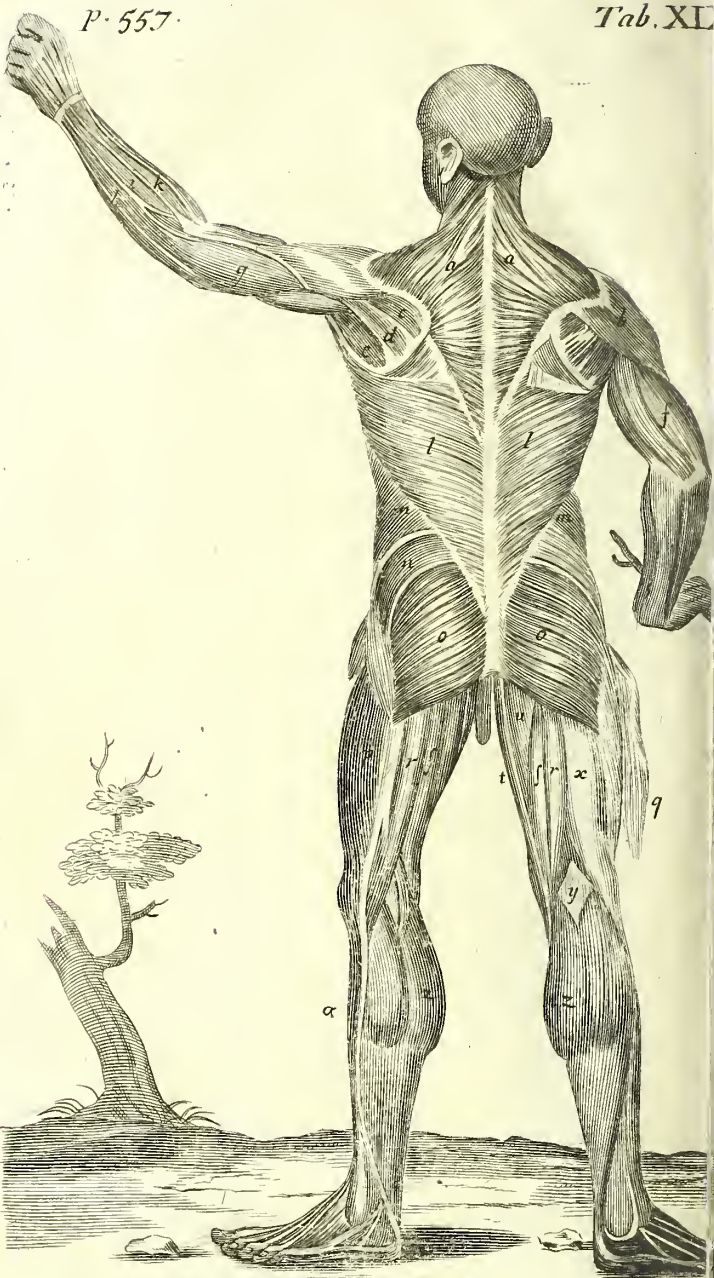
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Tab. XIX.

Repreſents the Muſcles as they lie to view in the hinder part of the Body.

aa *Shew the* Trapezius.
b *The* Deltoides.
c *The* Supraſpinatus.
d *The* Infraſpinatus.
e *The* Teres major.
f *The Extender of the Arm.*
g *The* Brachialis.
h *The outer Extender of the Wriſt.*
i *The other Extender of the Wriſt.*
k *The* Muſculus radii longus.
l l *The* Latiſſimus dorſi.
m m *The obliquely deſcending.*
n *The* Quadratus.
o o *The* Glutæus maximus.
p *The* Vaſtus externus.
q *Part of the* Membranoſus.
r r *The* Seminervoſus.
s s *The* Semimembranoſus.
t *The* Gracilis.
u *The* Triceps.
x *The* Biceps.
y *The* Subpoplitæus.
z z *The* Gaſtrocnemius.
& *The* Peronæus.

The End of the Fifth Book.

The Sixth Book.

OF THE BONES.

CHAP. I.

Of Bones in general, their conſtituent and integral parts.

A *Bone* is called in Greek ὀστέον, from ἵστημι, *to ſtand*; for according to *Hippocrates*, τῷ σώματι στάσιν, καὶ ὀρθότητα, καὶ εἶδος παρέχεται, *it affords ſtability, ſtreightneſs and form to the Body.* *Bones, their name.*

It may be defined to be a *ſimilar part, moſt dry, cold, and hard, inflexible, void of ſenſe, affording ſtabiliment and form to the whole Body.* *Definition.*

Bones have been commonly taught to be made of the more craſs, tartareous or earthy part of the Seed in the Womb, and that they are nouriſhed with the like particles of the Blood, and moiſten'd with their contained Marrow. And I ſee no reaſon to recede from this Doctrine, unleſs one would commence *litem de nomine*, brangle about a term: for though Women have no true Seed, and the Man's being only an active principle of generation, affords nothing of matter to the parts of the *Fœtus*, but only impregnates the *Ovum*, (as was ſhewn in B. I.) yet if we will but *Matter and nouriſhment.*

grant the name of *Seed* to the humour in the *Ovum*, (which we may do without absurdity) we may continue the old manner of speaking. Now though they are continually nourished, yet towards Manhood, by the increased heat of the Body, the primigenial moisture is so lessened, that the bones through their hardness are not apt to be any longer extended; and so Men cease to grow any higher of stature.

As to the integral and constituent parts of Bones, their *Periosteum* or investing Membrane, their *Substance*, *Pores*, *Marrow*, *Glands*, *Vessels*, *&c.* Dr *Havers* in his *Osteologia nova*, has far outdone all former Anatomists in his account thereof, which is very worthy the perusal of all that are curious in Anatomy. Thither therefore I refer the Reader, and shall here only exhibit a short Scheme of part thereof. And first as to the *Periosteum* that cloaths them.

Periosteum.

The *Periosteum* (he says) "has two sorts or series of Fibres, the under deriv'd from the *Dura* "*Mater*, the upper from the Membrane of the "Muscle that lies upon it: which Fibres lie one "upon the other, but are not interwoven one "with another.

"The under Fibres run all parallel directly "from one end of the bone to the other, and are "continued from one bone to another by means "of the Ligaments that joyn them together in "their articulations, upon which they pass.

"The outer hold the same course with the "Fibres of the Muscle from whence they are de"rived, sometimes streight, sometimes oblique "and sometimes transverse; and when they "have run so far as to make up their part of the "*Periosteum*, he thinks, they are inserted into the "bone, and are succeeded by others from some "other

'other Muſcles. Some of the Tendons of the 'Muſcles alſo propagate Fibres to make ſome 'part of the *Perioſteum:* but others penetrating 'it are immediately inſerted into the bone.

" The inner Superficies of the *Perioſteum* ſticks 'as cloſe to the bone as if it were glued to it; 'and beſides, the *Perioſteum* has little *fibrillæ*, or 'threads continued from it, that enter into the 'ſubſtance of the bone, which give them (proba-'bly) ſome internal ſenſe.

The *Uſes* he aſcribes to it, are, 1. "To be a te- *Its Uſes.* 'gument to the bones. 2. To convey Spirits in-'to the ſubſtance of the bones for maintaining 'their heat, for preſerving their ſenſibility, and 'to aſſiſt in the work of their accretion and nu-'trition, by means of the minute Fibres it immits 'into them. 3. To help to ſet limits to the 'growth and extenſion of the bones; as the 'Bark is ſometimes obſerved ſo to bind young 'Trees, that it is neceſſary to open it before "they can have the liberty of thriving. 4. It is "ſerviceable in the conjunction of the bones and "their epiphyſes, (while theſe are cartilagi-"nous) alſo of the bones which are joyned by "ſutures or harmony, and in the connexion of "the bones and their Cartilages. 5. To joyn "the Heads and Tendons of the Muſcles faſt to "the bones; namely, of ſuch Tendons as do not "penetrate it, (as ſome do not.)

Having done with the *Perioſteum*, he comes to the *ſubſtance* of the Bones, which he deſcribes af-ter this manner. He ſays, " they conſiſt of *La-* "*mellæ* or Plates lying one upon another, and "theſe of ſmall ſtrings or Fibres running length-"ways of the Bones, (like as we ſee in Whale-"bone.) Which ſtrings, though ſome of them "run to the very extremities of the Bones, and *The ſubſtance or make of Bones.*

" others approach near to them, do not terminate " there, ſo as to have diſtinct ends, but they are, " where they may be thought to terminate, " ſtill continued, and run tranſverſly and as it " were arched, that the ſtrings of one ſide of " the Bone proceed ſo as to meet and be united " to thoſe that are propagated from the oppoſite; " and this at both extremities, that they are a " continuation, though not of the Figure, yet " in the manner of a Ring. Therefore they are " not all of a length, but in every Plate they " fall one ſhorter than another.

" In ſeveral Bones the *Lamellæ* are diſpoſed di- " verſly: In thoſe Bones which have a large Cavi- " ty, they are on every ſide contiguous and cloſe- " ly united: But in thoſe which have not any " great Cavity, but are altogether ſpongious " within, many of the internal *Laminæ* are pla- " ced at ſome diſtance from one another in all " their length, having betwixt them a cavernous " ſubſtance or ſmall bony cells. And ſo have al- " ſo thoſe Bones which have a large Cavity, ſome " of theſe leſſer cells at both their extremities.

Their Pores. Next he comes to their *Pores*, and ſays, " That " in the Bones whoſe Plates are contiguous, there " are *Pores* through and between the Plates, be- " ſides thoſe which are made for the paſſage of the " Blood-veſſels: And theſe are of two ſorts: " The one penetrate the *Laminæ*, and are tranſ- " verſe, looking from the Cavity to the external " ſuperficies of the Bone: The ſecond ſort are " formed between the Plates, which are longitu- " dinal and ſtreight, tending from one end of the " Bone towards the other, and obſerving the " courſe of the bony ſtrings. The firſt kind are " formed not only in the firſt internal *Lamina*, " but in every one, even to the outermoſt; tho'

" the

" the nearer they are to the Cavity, the greater " is the number of the Pores. And as they pass, " they do not observe any such order as to lie di- " rectly one under another to form any continued " passage from the Cavity to the external Plate. " The second kind, *viz.* the longitudinal, are " not to be observed but by good glasses, unless " it be now and then in some particular Bones. " By these it is that the medullary Oil diffuses it " self, and is immediately beneficial to the Plates. " The other *(viz.* the transverse) are but subor- " dinate to these, and rather designed for the " passage of the Marrow into them, than for the " immediate communication of it to the substance " of the Bone.

The Marrow, and Glands.

" The *Medulla* contained in the Bones consists " (besides the Blood-vessels) of an investing " Membrane, in which are included membranace- " ous lobules or bags, and in these bags *Vesiculæ* or " glandular bladders, very much like the vesicu- " lar substance of the Lungs. And these glandu- " lar bladders serve both for the separation of the " medullary Oil from the Mass of Blood, and for " the reception and conservation of it. In an hu- " mane Bone which he had preserved till the me- " dullar Oil was wholly evaporated, he found " these *Vesiculæ* remaining dry, but intire, and " their substance representing in a manner a " Sponge. They seem to have Pores or immedi- " ate passages out of one into another (as have " also the bags) by which the Oil has a freer " course to the Joints, and Substance of the Bone, " for whose benefit it was designed. By the strict- " est enquiry he could never find any thing like " Ducts (as pass from other Glandules) and in- " deed these are not here necessary, because " the Oil is not carried from the glandular Vesi-

cles

" cles to any large receptacle, but flows out of the
" ſuperficies of the Marrow in as many places, as
" there are tranſverſe Pores in the internal
" Lamel. The *Medulla* ſerves to oil the ſubſtance
" of every Bone, which the drier it were, the
" brittler it would be: It lubricates alſo their
" Articulations, and hinders their ends from being
" worn, or overheated with motion; and it
" moiſtens likewiſe the Ligaments by which they
" are tyed one to another. But in theſe two laſt
" Uſes it is aſſiſted by the Mucilage which is ſepa-
" rated by the *Glandulæ mucilaginoſæ* (as he calls
" them) which he has obſerved in all the Articu-
" lations of the Bones, and are of the conglome-
" rate kind, of which more in the next Chapter.

" Now the manner of the medullary Oil's inſi-
" nuating it ſelf through a Bone; and its being
" diſpenſed to all the parts of it, is this: It firſt
" paſſes being liquid (as it all is while the Ani-
" mal is alive) out of the Cavity through the
" tranſverſe Pores of the firſt internal *Lamina*,
" and not having Pores of the ſame kind directly
" ſubjacent in the next Plate to tranſmit it to-
" wards the outſide of the Bone, it flows into
" the longitudinal ones formed between theſe
" two (the firſt and ſecond) Plates, and being car-
" ried along in them till it find ſome tranſverſe
" Pores in the ſecond Plate, it paſſes through theſe,
" which when it has done, it is again obliged to
" alter its courſe to run into and flow along the
" ſtreight Pores between the ſecond and third
" *Laminæ*. Thus it paſſes through and between
" the Plates ſucceſſively, till it has made its way
" to the external Plate.

" Thus the medullary Oil is diſpenſed in all
" the Bones to thoſe Plates which are contigu-
" ous, and have no intermediate Cavities to en-
" tertain

certain any medullary Glands of their own: But where the Plates ſtand at ſome diſtance (as they do in ſuch Bones as have not any great Cavity) there are the ſmall caverns (abovementioned) which are capable of containing ſome medullary Glands, from whence the Plates have more immediately, and without the former method of conveyance, the benefit of the Marrow.

"He divides the *Blood-veſſels* of the Bones into *nutritious* and *medullary*. The moſt conſiderable of the *nutritious* enter at the ends of the Bone, *viz.* the Artery at one end, and the Vein at the other. The *medullary* commonly enter the ſides of the Bones (and that obliquely, as the Ureters do the Bladder) both by one *Foramen*.] There are no *Nerves* that are inſerted into them (except into the Teeth) but theſe only run through the *Perioſteum* that inveſts them. *Veſſels.*

"Some Bones have *large Cavities* in them, as "*Os humeri*, and *femoris*, the *Ulna* and *Radius*, "*Tibia* and *Fibula*, the Bones of the *Metacarpus*, "and *Metatarſus*, of the Fingers and Toes, and "of the *Os hyoides*: to which may be added the "lower Jaw; though the Cavity compared with "the magnitude of the Bone hardly deſerves to "be ſtyled large. Beſides theſe large cavities "which are in the inſide of Bones, there are leſſer cells or caverns in their ſubſtance, which "are found in all the Bones, even thoſe which "have a large cavity.] But of theſe before, when we ſpoke of the diſtribution of the Marrow. *Large Cavities, and Caverns.*

Beſides the large Cavities and Caverns in the inſide or ſubſtance of the Bones, moſt have *ſuperficial Cavities* or *Sinus*'s, which Dr. *Havers* diſtinguiſhes into *Sulci* or Furrows (which are the long *Superficial Cavities and Foramina.*

long ones) and *Pits*, as he calls the ſhorter one And they have beſides, *holes* for the nutritio and medullary Veſſels, as was but juſt now ob ſerved.

Prominences, viz. On the outſide of the Bones there are al to be obſerved their *Prominences* or *Protuberances*, of which there be two kinds: for it is e ther a continued part of the Bone jetting manifeſtly above its plain Superficies, for the mo commodious Inſertion of the Muſcles, *&c.* and

Apophyſis, *or* called *Apophyſis*, a *Proceſs*; or elſe it is like an ad ditional Bone growing to another by ſimple ar immediate contiguity, (and generally ſofter an

Epiphyſis. more porous than it) and is called *Epiphyſis*, a *Appendage*. If the Protuberance of the Bone l round, it is called its *Caput*; under which is th *Cervix*, as in the upper end of the Thigh-bone If it be flat, it is called *Condylus*: if ſharp, *Coron* Other Protuberances or Proceſſes are named fro the ſimilitude they have to other things, as *Sty loïdes*, *Coracoïdes*, &c.

Uſe. Their *Uſes* are many: for they ſerve 1. for th firmitude and ſuſtentation of the Body, like beam and pillars in houſes: 2. for a defence to ſom parts; ſo the Skull defends the Brain, the Rib the parts contained in the Breaſt: 3. for progreſſion or walking, of which they with the Muſcle are the only inſtruments: 4. they give ſhape t the parts of the Body. Theſe are their *general* Uſes; as to their *particular* Uſes, thoſe will b ſhewn as we deſcribe them ſeverally.

CHA

CHAP. II.

Of the different conjunctions of Bones one to another.

Ones are joyned to one another either by *Articulation* or joynting; or elſe by *Symphyſis* growing together.

Articulation is either for *manifeſt*, or *obſcure* tion. The former is called *Diarthroſis*, beiſe the Articulation is looſe; the latter *Synarroſis*, becauſe it is cloſe and compact. *Articulation.*

Diarthroſis, or that looſe joynting which ſerves *manifeſt* motion, is threefold. Firſt, *Enarthroſis*, hich is, when a large head of a Bone is received o a deep Cavity, as the Thigh-bone into the p-bone. Secondly, *Arthrodia*, which is when e Cavity which receiveth is ſhallow, and the ad of the Bone which is received, flattiſh: ſuch the Articulation of the *Radius* with the Shoulr-bone, or of the Shoulder-bone with the *Scala*. The third is *Ginglymos*; when the ſame ne receiveth, and is received. This falleth t three manner of ways. Firſt, when the Bone received by another, and receiveth the ſame; is is ſeen in the Articulation of the Shoulderne with the *Ulna*. Secondly, when a Bone reiveth one Bone, and is received by another: hich is done in the Spondyls or *Vertebræ* of the ack, where the middle Bone receiveth the upr, and is received by the lower. The third , when the proceſs of the Bone being long and ound, is inſerted into another upper Bone, and is turned in the Cavity like an Axle-tree in a Wheel; 1. Diarthroſis.

Wheel; so is the second *vertebra* of the Neck joynted with the first.

Mucilaginous Glands.

Note, That in all these Articulations are placed those *mucilaginous Glands* above-mentioned, first discovered by Dr. *Havers*, and accurately described by him in his *Osteologia nova*, p. 187, &c. from whence take this short account of them. They are of *two* sorts: *some* are *small* and *numerous* in every Joint, which are set thick all over the membrane, excepting where there are any large glands, and they are all of an equal magnitude, so as to render it every where glandulous. But in some parts of the membrane, and in the *Sinus*'s of the bones in the Joints, these Glandules are so conglomerated, as to form *remarkable* Glands, which I reckon as a *second* sort. The colour of these is something transparent, when they are not discoloured with bloud-vessels. They are *soft* and pappy, but not tender and friable, so that they are not easily broken by compression. They are (as I have said before) *conglomerate*, though they do not consist of several lobules or bags of lesser glandules, as some other glands do; but of several membranes superstrated one over another, set thick with small round bladders, which not only lie contiguous, but tenaciously adhere one to another, as the several membranes likewise do.-----By the pores of these little bladders the mucilaginous liquor is percolated and distinguished from the rest of the mass of bloud, which is conveyed to them by the Arteries, and from them it flows into the interstices of the Joints by the excretory passages, which all these glandules have. The *figure* of the Glands is various, and accommodated to the *sinus* or cavity, in which they are seated. Their *situation* is different in the several Joints; and is, in general, such,

ſuch, that they cannot be injured by a compreſſion from the bones; and yet there is this contrivance, that the bone does either in the inflexion, or extenſion of the Joint lightly preſs upon them, ſo as to promote the excretion of the humour, which they ſeparate, into the Joints, when they are moved and ſtand moſt in need of it.] A more particular account of the ſituation (and *number* alſo) of theſe large mucilaginous Glands ſhall be given, when we come to ſpeak of the particular Articulations.

Synarthroſis or Articulation for *obſcure* motion, is ſuch as that of the Ribs with the *Vertebræ*, &c. 2. Synarthroſis.

Bones *grow together* either *without* ſome middle heterogeneous ſubſtance, or *with* it. *Without* ſome middle ſubſtance they are joyned three manner of ways. Firſt, by a ſimple line, as the Bones of the upper Jaw and Noſe; this is called *Harmonia*. Secondly, by a future, (or *Rhaphe*) as the Bones of the Skull. Thirdly, when one Bone is faſtned in another, as a Nail in Wood; and ſo are the Teeth faſtned in the Jaw bone: this is called *Gomphoſis*. Symphyſis.

If Bones grow together *by* a middle ſubſtance, it is either by a *Cartilage*, as the Share-bones are joyned; which unition is called *Synchondroſis*: or by a *Ligament*, and ſo the Thigh is joyned with the Hip-bone; this is called *Synneuroſis*, or more properly, according to *Spigelius*, *Syndeſmoſis*: or laſt of all by *Fleſh*, and ſo is the Bone of the Tongue by its Muſcles to the adjacent parts; this is termed *Syſſarcoſis*.

Spigelius reckons two other heterogeneous middle ſubſtances by which Bones are united; one when they are joined by a *Tendon*, as the Knee-

pan

pan to the Thigh-bone and *Tibia*, which unition he calls *Syntenoſis*; the other by a *Membrane*, as in Infants the Bones of the *Synciput* with the *Os frontis*; and this he calls *Synymenſis*.

CHAP. III.

Of the Skull in general.

WHEN all the Bones of the Body are artificially joined to one another and ſeated in their proper places, the whole ſtructure of them is called a *Skeleton*, from σκέλλω, *to dry*, becauſe they are then void of all moiſture.

This *Skeleton* is commonly divided into the *Head*, *Trunk* and *Limbs*.

The *Head* is again divided into the *Skull* or *Scalp*; and the *Face*.

The Skull. Its Name. The *Skull* is called in Greek κρανίον, *Cranium*, becauſe it defends the Brain *tanquam* κράνος, like an *helmet*; and in Latine *Calvaria*, *qu. calva capitis area*, becauſe it comprehends all that part of the Head upon which the Hair grows, and which is ſaid to be *bald* when the Hair falls off.

Figure. Its *Figure* is globous or round, but not exactly for it bunches out a little before and behind, and is more flat on the ſides, ſo that it is ſomewhat longiſh. The more it varies in any particular Perſons from this ſhape, the more preternatural is its figure. Some raiſe a nice queſtion concerning its ſhape, whether it be owing to that of the Brain included within it, or whether the ſhape of the Brain be owing to this of the Skull. 'Tis true that they anſwer one to the other in Figure, but whoſe is owing to the others is needleſs to enquire

quire; nor ſhall we ſpend time in ſuch a fanciful Diſpute.

In an Embryo its *Subſtance* is membranous, in Infants new-born 'tis bony, but ſoftiſh and flexible; but it grows harder and harder by degrees (like the other Bones) yet continues ſpongie in its middle. *Subſtance.*

It conſiſts of two *Laminæ*, Plates or Tables, (ſo called) the outer thicker and ſmoother, but the inner harder and furrowed on its inner ſuperficies, to give convenient and ſafe paſſage to the Veſſels that creep through the *Dura Mater:* yea in ſome places it is perforated for the tranſit of Veſſels from the ſaid *Meninx* to betwixt the *Laminæ* for the irrigating of the Pith that lies between them. *Tables.*

Which Pith is called *Diploë*, and is a ſpongie and cavernous ſubſtance containing a medullar and ſomewhat bloody juice for the nouriſhment of the Skull. It is more porous in young Bodies than in old; and in ſome places of the Skull than in others: for in ſome the two Tables grow ſo cloſe together that 'tis hardly diſcernible. Diploë.

Diemerbroeck writes that he has ſometimes obſerved (eſpecially in Venereal Perſons) a vicious Humour collected in this ſpongie Pith, which in tract of Time becoming more acrimonious and virulent, has eat through the very Tables, eſpecially the outer which is ſofter, and cauſed moſt tormenting pains in the *Perioſteum* and *Pericranium*; yea ſometimes the inner alſo, and ſo the whole Skull has been perforated.

CHAP. IV.

Of the Sutures of the Skull.

BEfore we come to deſcribe particularly the Bones which the Skull conſiſts of, we will treat in ſhort of their ſeveral manners of commiſſure or connexion one with another, or with thoſe that are contiguous to them, *viz.* the upper Jaw and the three Bones that are common to the Skull and upper Jaw, *viz.* the *Jugale*, *Cuneiforme* and *ſpongioſum*, and laſtly, of theſe common Bones with thoſe next to *them.*

Sutures are proper, or common.

Their connexions among themſelves and alſo with theſe other Bones, are both called *Sutures* (or Seams:) and theſe are divided into *proper*, or *common.*

Proper Sutures true, or counterfeit.

The *proper* are thoſe which join the Bones of the Skull one with another; and are either (*veræ*) *true* Sutures, or (*mendoſæ*) *counterfeit.*

Three true.

The *true* are when two Bones being mutually indented, cloſe one with the other, as if two Saws were joined together by their Teeth: whence they are called *ſerratæ*: and theſe are *three* in number: the *firſt* is *Coronalis*, which is ſeated in the fore part, and paſſeth from one Temple to the other tranſverſly, joining the *Os frontis* to the *Synciput.* The *ſecond* is *Lambdoïdes* oppoſite to this, reſembling the Greek letter *Lambda.* This beginning at the *Baſis* of the *Occiput* aſcends obliquely to either Ear, and joins the Bone of the *Occiput* to the Bones of the *Synciput* and Temples. The *third* is *Sagittalis*, which beginning at the top of the *Lambdoïdes*, comes ſtreight forward by the Crown to the middle of the

the *Coronalis*, and in Children for some years (sometimes in the adult) it runs to the top of the Nose, dividing the bone of the Forehead into two. *Spigelius* notes that these true Sutures are only in the outward *Lamina*, the inner being joyned only by *harmonia*.

Two counterfeit.

The *counterfeit* or *mendosæ* resemble a line only, and are more properly called *Harmoniæ* than Sutures. *Spigelius* reckons *five* of them, others more, but the chief of them are but *two*. The *first* passing from the root of the *Processus mammillaris* upwards, with a circular Duct circumscribes the Temple-bone, and descends down again to the *basis* of the Ear: this Suture joyns the bones of the *Synciput*, *Occiput*, and *Sphenoïdes* with the Temple-bone, this lying upon those like the Skales upon Fish, whence this Suture is called *Squamosa*. The *second* runs from the top of this Squamous conjunction obliquely downwards towards the Orbit of the Eye, to the beginning of the first common Suture, and joyns this bone *above* with the bones of the *Synciput*, and *below* with the bone of the Forehead.

Common Sutures.

The *common* sutures are those whereby the bones of the Skull (as also the common bones) are joyned to those which are contiguous to them. And of these by *Diemerbroeck* there are reckoned *five*. The *first* is that by which the outer process of the *Os frontis* is joyned with the first bone of the upper Jaw. The *second* is seated in the outer and lower part of the Orbit of the Eye. The *third* ascends obliquely from the inside of the Orbit to the top of the Nose. The *fourth* proceeds obliquely by the middle of *Os jugale*, joyning it (or rather the first bone of the upper Jaw) to the Temple-bone. The *fifth*, below in the cavity of the Nostrils, tends from be-

hind forwards: *Spigelius* says, this is common to the *Os cuneiforme* with the *Septum* of the Nose.

The uses of the Sutures. The *Sutures* have *three uses.* The *first* is to help to stay the Brain from slogging, and its parts from being misplaced in violent motions, by permitting some Fibres to pass through from the *Dura Mater* to the *Pericranium*, (or from this to that) by which the said *Mater* and the Brain invested in it are suspended as it were. The *second* is to permit the Vapours and Fumes of the Brain to evaporate. And the *third*, to hinder the Fissures that happen in the Skull from knocks or falls, *&c.* from extending any farther than through one bone, for they generally stop at the next Suture.

CHAP. V.

Of the proper Bones of the Skull.

Six proper bones of the Skull. THE Bones *proper* to the Skull are in number *six*, one of the Forehead, another of the *Occiput*, two of the Crown, and two of the Temples.

1. Os frontis. First, *Os frontis*, the Forehead-bone. It is bounded by the Coronal and first common Suture, before; and in the sides by the tempora Bones. It is but one in those of ripe age, but double in Children, being divided by a Suture passing down its middle from the Coronal to the Nose.

Its Cavity. Betwixt the *Laminæ* of this Bone at the top of the Nose, there is a large Cavity or Cavern, (often two) from whence two holes pass to the Nos tril

trils. The outer *Lamina* that conſtitutes this Cavity, makes the upper plane part of the orbit of the Eye; but the inner, on each ſide above the Eyes, forms a bunchy protuberance uneven with many jettings out like little Hills. The Cavity is inveſted with a very thin greeniſh Membrane, and contains a clammy humour. What its uſe may be, is hard to ſay; ſome think it gives an Echo to the Voice, making it more ſonorous; others that it receiveth the odoriferous air drawn in by the Noſe, to ſtay it awhile before it be ſent to the Brain. But theſe ſeem but vain conjectures.

It hath two *holes* in the middle part of the Eye-brow, which come from the orbit of the Eye, by which the firſt branch of the Nerve of the fifth conjugation of the Brain goes to the Muſcles of the Forehead, *&c.* Beſides theſe more manifeſt holes, Dr. *Havers* has obſerved "in this Bone, and in "the Bones of the *ſynciput* at thoſe Angles which "meet in the coronal ſuture, and all along on "both ſides the *ſutura ſagittalis*, numerous *Pores* "penetrating into their ſubſtance, which he con-"ceives to be *perſpiracula*, by which the offenſive "vapours, which ariſe and gather within the "*Cranium*, do perſpire. Which Opinion, ſays "he, may ſeem the more probable, if we conſider "how ſweats do eaſily and frequently ariſe in the "Forehead, even when they are not diſcernable "in other parts; to account for which we may "reaſonably ſuppoſe that there is ſome other way "of evacuation, beſides what is made from the "maſs of blood by the cutaneous Glands, which "are to be found in any part of the Skin as well "as there. *Holes and Pores.*

It hath alſo four *proceſſes*; the greater two are ſeated at the greater corner of the Eye, and the *Proceſſes.*

leſſer two at the leſſer, making the upper part of the orbit.

2, 3. *Two Bones of the Synciput.* The Bones of the *Synciput* or Crown are in number two. Before, they are joined with the Bone of the Forehead by the Coronal ſuture; behind, with the *Os occipitis*, by the *Lambdoïdes*; on each ſide to the Temple-bones, by the *Sutura ſquamoſæ*; and to one another in the middle of the Crown, by the ſagittal Suture. On the outſide they are ſmooth, but on the inſide uneven, for they have a great many furrows running along their inner *ſuperficies* for the paſſage of the Veins of the *Dura Mater*. Their ſubſtance is thinner and more rare even in the adult than that of the other Bones (for the better exhalation of vapours) but in Infants that abound with much humidity, they are membranous and ſoft, hardening by degrees.

4, 5. *Two Temple-Bones.* Below theſe on each ſide are the Bones of the *Temples*. They are joyned in their upper part to the outſide of the Bones of the *Synciput* by the *Suturæ ſquamoſæ*; before, to the proceſs of the firſt Bone of the upper Jaw; behind, to the *Os occipitis*, by a counterfeit Suture. Theſe Bones are even and thin in their upper part, like a Skale, (and conſiſt but of one *lamina*) but below thick, hard and unequal or craggy; wherefore they are called *Petroſa*.

Each has two ſinus. They have each two *Sinus*; the *outer* greater lined with a Cartilage, betwixt the *Meatus auditorius* and the proceſs that makes part of the *Os jugale*; this receives the longer proceſs of the lower Jaw: the *inner* leſs, common to it with the Bone of the *Occiput*, placed on the hinder ſide of the firſt named Proceſs.

One Appendix, viz. Styloïdes. By theſe *Sinus* there ſtands a ſlender, ſharp and longiſh *Appendix*, from its ſhape called *Styliformis*.

mis, which in Infants is cartilaginous, but in the adult becomes bony.

Beſide this *Appendix* they have three *Proceſſes*, two *external* and one *internal*. *Three Proceſſes.*

The *firſt external* is blunt, thick, and ſhort, a little hollow within, and becauſe it ſomewhat reſembles a Cow's Pap, it is called *Mammillaris*. 1. Proceſſus mammillaris.

The *ſecond* is carried forward from the *Meatus* of the Ear, and is joined with the firſt Bone of the upper Jaw, both of them framing the *Os jugale*, of which in the next Chapter. 2.

The *third*, that is *internal*, is called *Proceſſus petroſus*, and *Os petroſum*, from its hardneſs and craggineſs. It is pretty long, jetting out to the inner *Baſis* of the Skull, *within* which it has two Holes, through one of which an Artery, and through the other the auditory Nerve paſs to the inner Cavities of the Ear, that are excavated in this Proceſs, namely the *Tympanum*, *Labyrinthus*, and *Cochlea*: and *without* the Skull it hath three holes; the firſt of which is the *Meatus auditorius*; the ſecond is narrow, ſhort and oblique, near to the firſt, by which the Jugular Vein enters the inner Cavities; the *third* is ſeated betwixt the *Proceſſus Mammillaris* and the *Styloïdes Appendix*, and ends into that paſſage that goes from the Ear to the Mouth. 3. Petroſus.

As to the four little Bones that are contained in its firſt inner Cavity, *viz. Incus*, *Malleus*, *Stapes*, and *Os orbiculare*, we have ſpoken of them before in *Book* III. *Chap.* 23.

The *Os occipitis*, that makes the hinder and lower part of the Head, is five-corner'd, by two of which corners it is joyned in its upper part to the Bones of the *Synciput* by the *Lambdoïdes* Suture, by two other in its foreſides to the Temple-bones by a counterfeit or ſquamous Suture, and 6. Os occipitis.

by its fifth corner to the *Os cuneiforme*. It is but one in the adult, but it consists of four or more in Infants. It is the thickest and most compact of all the Bones of the Skull.

Its Sinus. It is said to have nine *Sinus*, two external, and seven internal. The external are one on each side of its great hole behind, by which the spinal Marrow descends. Of the internal the two largest are those that receive the Protuberances of the *Cerebellum*.

Processes. It has also five *Protuberances* or *Processes*, four of which are by the sides of the great *Foramen* aforesaid, and being all covered with a Cartilage are received into the *Sinus*'s of the first *Vertebra*, serving for the articulation of the Head: the fifth is larger than these, ascending inwards from the great *Foramen*, and parting the Protuberances of the Cerebel.

Holes. Lastly, it has five *Foramina*, of which the lowest and largest is that by which the *Medulla oblongata* passes out of the Skull into the *Vertebræ*. The rest are less, and are for the transit of the Vessels.

CHAP. VI.

Of the Bones common to the Skull and upper Jaw.

Three common Bones 1. Os Cuneiforme.

HItherto of the Bones *proper* to the Skull: Now follow those which are *common* to it and the upper Jaw. These are *three*: *First*, *Sphenoides* or *Cuneiforme*, the wedge-like bone; so called, quoth *Schneider*, "Not for the propriety "of its figure, for it endeth in a blunt point; nor, "as

Lib. 1. *de catarrhis*, p. 167.

" as many think, only upon the account of *Sciſſi-*
" *on* or cleaving; but eſpecially with reſpect to
" *an Arch* (of which this is the *Cuneus* or Wedge.)
" For the Bones of the Forehead, *Synciput*, Tem-
" ples and *Occiput* make the ſides of the Arch,
" and this Bone of which we ſpeak, does like a
" *Wedge* fill up that ſpace that lies betwixt thoſe
" riſing ſides.] Before, it is joined with the Fore-
head-bone; behind, to the *Os occipitis*. At the
ſides it doth accompany a good way the *Os petro-*
ſum. Above, it doth touch the firſt, fourth and
ſixth Bone of the upper Jaw; and below, the
Bones of the Palate of the Mouth by its wing-like
Proceſſes. It is thick in the middle, but thinner
at the edges, and in the adult it conſiſts of two
Lamina and a *Diploë*, like the other Bones pro-
per to the Skull. In Infants it conſiſts of three
or four.

It has four *external Proceſſes*, of which two, that are contiguous to the upper Jaw, are called *Pte-*
rygoïdes, *Aliformes* or Wing-like; and four *inter-*
nal alſo, which with the ſpace betwixt them com-
poſe the *Sella equina* or *Turcica*, upon which the *Glandula pituitaria* lieth, that receiveth the pitui-
tous excrements falling from the Brain by the *In-*
fundibulum. Of this *Sella* and its ſubjacent Cavi-
ty *Schneider* thus writes. " In that *Sinus* that is
" called *Sella equina* a certain Cavity lyeth under
" the upper *Lamina* of the *Os cuneiforme*. In the
" Skull indeed of an Infant, this Cavity is always
" naturally abſent (for in theſe the Bone in that
" place is fungous:) But after the Infant is a
" year old (as *Fallopius* teaches) it begins to be
" made, and according to the encreaſe of the
" Bone is greater or leſſer. A thin skin cloaths
" this Cavity, which is not of a green colour, as
" *Bauhinus* teaches; but is very thin, ſoftiſh and

Its Proceſſes.

Sella Turcica.

Idem ib. p. 209, &c.

" whi-

" whitiſh———This *Antrum* (or Cavity) and " the like are formed by Nature to the end the " Skull ſhould not be too ponderous———No- " thing but Air is contain'd in it . . . . . In ſome " Skulls it is wanting.

Holes. Moſt of the more ancient Anatomiſts ſpeak of ſeveral *Holes* in this Bone for the tranſit of ſuch pituitous humours (into the Noſtrils or Palate) as fall upon, or are ſeparated by the *Glandula pituitaria.* But as we intimated from Dr. *Lower* in *Book* III. *Chap.* 5. there are no ſuch *Holes* in it for that office, but thoſe excrements are reſorbed by the Veins, as that Learned Doctor affirms. Yet it hath ſundry Perforations for other purpoſes, *viz.* for the paſſage of the motory and optick Nerves of the Eye, and of other Nerves for the motion of other parts, as alſo of Veins and Arteries.

Sinus. It has divers *Sinus*: Outwardly or below it has one in each wing-like Proceſs, giving room to the *Muſculus pterygoïdes* (or *pterygoſtaphilinus) internus*; (or rather to Dr. *Croone's pterygopalatinus.*) Inwardly or above, it has one large one called *Sella equina*, before deſcribed out of *Schneider*: and two or three ſmall ones.

2. Os cribriforme. The *ſecond common* Bone is *Os cribriforme*, becauſe like a Sieve it hath many holes, by which the filaments of the olfactory Nerves or *Proceſſus mammillares* paſs into the Noſtrils. It is ſeated in the middle *Baſis* of the Forehead at the top of the Noſtrils, and is covered with the *Dura Mater* which accompanies the nervous filaments aforeſaid through the holes. It is joyned by the Sutures called *Harmoniæ* to the *Os frontis*, the ſecond Bone of the upper Jaw, and to the *Cuneiforme.*

On

On its upper side in the middle it has growing upon it a kind of triangular *Process*, like to the Comb of a Cock, which is therefore called *Crista Galli*. And opposite to this in its lower side it has another that is thin and hard, dividing the Nose into two parts or Nostrils, the right and the left, and is called *Septum nasi*. *Its Processes.*

To this *Os cribriforme*, in the cavity of the Nostrils, there adhere two other Bones called *Spongiosa*, because they are full of caverns or holes like a *Sponge* or Pumice-stone. But most Anatomists consider them as parts of the *Os cribriforme*, confounding their names one with the other, calling this, *Os spongiosum*, or *cribriforme* indifferently. Ossa spongiosa.

The *third common* Bone is (from its shape) called *Os jugale*, or the Yoke bone. This indeed is not truly a distinct Bone, but is made up of one Process of a bone of the Skull, and of another of the upper Jaw: But because it has a distinct name, and is common to the Skull and upper Jaw, as partaking of both, we therefore reckon it for a distinct *common* Bone. I say it is made up of two Processes, of which the hinder is a Process of the Temple-bone that is carried from the *Meatus auditorius* forwards; and the fore one is a process of the first bone of the upper Jaw, that maketh the lower side of the outer corner of the Eye, which reaching backwards meets the other, and is joyned to it by an oblique Suture, and so makes the *Os jugale*. 3. Os jugale.

By which description of this Bone, its *situation* appears to be on each side of the Face betwixt the *Meatus auditorius* and the first bone of the upper Jaw: and its principal use seems to be for defence of the Tendon of the temporal Muscle, and to give rise to one of the Heads of the Muscle *Masseter*. *Its situation and use.*

CHAP.

CHAP. VII.

Of the upper and lower Jaws.

THus far of the Bones of the *Calvaria*, or *Scalp*: next follow those of the *Face*, which are the *Jaw-bones* with their *Teeth*; to which we shall subjoyn the *Bone of the Tongue*.

The Jaw-bones are two, the upper and lower.

The *Jaws* are two, the *upper* and *lower*.

The upper consists of 12. bones.

The substance of the *upper* Jaw, especially on its inside, is not solid but spongious; and unequal, because it is framed of sundry Bones. They are six pair, six in each side. The *first* is almost triangular, seated on the lower side of the outer corner of the Eye, and by its process maketh up the best part of the *Os jugale* as was shewed in the former Chapter. The *second* is a round, little, and thin bone in the inner corner of the Eye, having an hole in its lower part, called *Foramen lachrymale*, upon which the *Glandula* or *Caruncula lachrymalis* resteth, and through which a branch of the fifth pair of Nerves passeth to the inner Membrane of the Nose. The *third* is thin as the former, but quadrangular. It is placed between the two former in the inner-side of the Orbit of the Eye. The *fourth* is called *Os malæ*, the Cheek-bone, and is the greatest and thickest. This maketh up the greatest part of the Cheek and Palate, and containeth all the upper Teeth in its Caverns. It is joyned above, on that side next the Nose, to the bone of the Forehead, but below with the wedge-like bone; before, with the second bone of the upper Jaw, behind with the third, and last of all with its fellow. Under the Eye it has a hole for the passage of a branch

of

of the fifth pair of Nerves that is bestowed on the Face; and another near the bottom of the Nose, by which an Artery and a Vein pass from the Palate to the Nostrils. The *fifth* is long, hard, and reasonable thick; it with its fellow maketh up the bony part of the Nose. It is joyned with the Cartilages of the Nose below, (to which purpose it is very rough on that side) but to the internal process of the *Os frontis* above. The *sixth* is broad and thin, and (with its fellow) makes the Roof of the Mouth.

Note, that the under-side of the Orbit of the Eye is formed by the first, second, third, and fourth of these bones of the upper Jaw, and the upper-side by the *Os frontis*: only the *Os cuneiforme* makes up a little part in the hinder side of the outer corner. *The Orbit of the Eye, how formed.*

The *lower* Jaw in those of ripe age is but one Bone, but in Children, till they are a year or two old, it consists of two, which are joyned together at the Chin by *Synchondrosis*, and afterwards grow into one. This is moveable, but the upper immoveable. It resembleth in shape the Greek letter υ. *The lower Jaw consists but of one bone.*

At each end of it there are two *processes*, whereof the one from a broad *basis* grows sharp, and is called *Corone*, going under the *Os jugale*, and having the Tendon of the temporal Muscle firmly inserted into it. The *other* may be called *Articularis*, because it serveth for Articulation. This has a long Neck and a longish but flattish Head (or *Condylus*) that is covered with a Cartilage for its easier motion. By this Head it is inarticulated into the larger *Sinus* of the *Os temporis* that is also lined with a Cartilage, and is knit strongly thereto by a membranous Ligament. *Its processes.*

This

Cavity. This Bone has a *cavity* within, especially in the fore-part toward the Chin, which (as Dr. *Havers* affirms) does not contain a marrowy juice for its nourishment, but serves only as a chanel for the Nerve and the bloud-vessels to run along in.

Holes. It has four *Foramina*; of which *two* are at the roots of the Processes, by which a branch of the fifth pair of Nerves together with a Vein and Artery pass to the Teeth (as shall be shewn further in the next Chapter) and *two* other in its fore-part by the sides of the Chin, by which two twigs of the said fifth branch pass out again to the lower Lip and its Muscles and Skin.

Surface. Its *Superficies* is smooth for the greatest part, but in some places there are asperities for the firmer insertion of the Tendons of its Muscles, as was shewn in the description of those Muscles.

The Alveoli *of both Jaws.* Both the Jaws have *Alveoli* or Sockets for the Teeth, in number equal with the number of the Teeth. But when in old age the Teeth fall out, the Sockets close together, so that in time there remains no print of them, but the bone becomes smooth and sharp.

CHAP. VIII.

Of the Teeth.

The Teeth, their name and articulation. THE Teeth are called in Latine *Dentes*, quasi *Edentes*, from their office of *eating*. They are fixed in their *Alveoli* three manner of ways: the first and chief is by their Articulation with the Jaw-bones, by *gomphosis*; the second is by the Nerve which is inserted into their root, by

by *Synneurosis*; and the last is by the Gums which cleave to the outside of their roots by *Syssarcosis*.

Their *Substance* is the hardest of all other Bones, but more especially that part of them that stands out naked above the Gums. This part Dr. *Havers* thinks ought to be esteemed "rather stony than bony, and yet not the whole "of it neither, but only the outside or *cortex*, "which like a Shell covers the bony, which being "broken off or decayed, the bony quickly rots "and moulders away: upon which account it is, "that when the Gums are eaten away, so that "some part of a tooth, which is not defended "with this stony *cortex*, is laid bare, it is eroded; "when that part that naturally stands out of the "Gums, and is by such a solid substance secured, "suffers no such injury. The stony part is not covered with any *Periosteum*; but that part which is within the Sockets of the Jaw-bones is invested with a thin Membrane, which he says, "is not "the true *Periosteum* (though that invests the "Socket wherein they stand) but is propagated "from that Membrane that covers the Gums, "and is common to the whole Mouth, which "does not terminate with the Gums, but when it "comes to their extream edge, turns in, and "is reflected between the other side of the Gum "and the Tooth, descending into the *Alveolus* or "Socket, and adhering on one side immediately to "those parts of the Teeth which lie within, and "on the other to the hard fleshy substance of the "Gums, which with this is communicated to the "roots of some teeth (especially in the upper "jaw) to fasten them more firmly in their "Sockets; and where none of this hard flesh in-"tervenes, it coalesces as it were into one mem-"brane *Substance.*

"brane with the *Periosteum* that covers the inside "of the Socket. By this membrane, and the Nerve inserted into the root of every Tooth, these lower parts of the Teeth become exquisitely sensible.

Cavity and Vessels. The Grinders have a manifest *Cavity* within, (but the *Incisores* and *Canini* but an obscure one) whereinto by the very small holes of their roots they each receive a Capillary Artery from the *Carotides*, a Vein from the Jugulars, and a twig of a Nerve from the fifth pair (as abovesaid.) The Vein, Artery, and Nerve are united together, and clad with a common Membrane when they enter the Jaw, within which they have a proper Chanel to run along in under the roots of the Teeth, sending twigs to each as they pass under them.

Principle. The Rudiments or *Principles* of the Teeth are bred with the other parts in the Womb, but lie hid for some Months within the Jaws and Gums. These Principles are partly bony and partly mucous, and both parts are at first included in a membranous and somewhat mucous *Folliculus* or case, which in process of time they break through (some sooner, others later) their bony part ascending upwards out of the Gums, and their mucous part (hardening by degrees) descending downward into the Jaw so far as there is space for it; the *Folliculus* it self turning to a kind of Cement, whereby the Tooth is fastened to the sides of the *Alveolus*.

Eruption and growth. At what time and in what order they *break forth* out of the *Alveoli*, is known to every Nurse: omitting therefore to speak of that, I shall only note, That the Teeth alone, of all the Bones in the Body, continue to *grow* so long as a Man lives, (and they continue in his Head) for

else

elſe would they be ſoon worn to the ſtumps by their daily uſe; and we ſee that when a Tooth is loſt out of either Jaw (in the oldeſt people) that which is oppoſite to it in the other Jaw, will commonly grow longer than the reſt, having none to grind againſt; though it muſt be confeſt, that the *ſeeming* length of old people's teeth, is more owing to the falling away of their Gums, than the growth of their teeth.

When Children come to be ſeven or eight years old, they *change* ſeveral of their Teeth; but very rarely, if ever, all. The *Inciſores* or Fore-teeth, the *Canini*, or Eye-teeth, and the foremoſt Double-teeth moſt change; but the reſt of the Double-teeth very few. Now concerning this changing of the Teeth, we muſt know, that the old ones do not come out by the roots, but their uppet part only drops off, their root remaining ſtill in the Socket of the Jaw, which (being like Seed for the new ones) by degrees grows up above the Gums to ſupply the place of that which was fallen off. Commonly about the twentieth year (or upwards) there ſpring out two Double-teeth behind the reſt, which till then had lain hid in their Sockets. Theſe are called Genuine Teeth, or *Dentes ſapientiæ*, becauſe Men are then come to years of diſcretion. *Change.* *Dentes ſapientiæ.*

As for the *number* of them, commonly there are found ſixteen in each Jaw; if there fall out any difference in number as to individual perſons, it generally falleth out in the *Molares*. *Number.*

There are *three* ranks or ſorts of Teeth. Thoſe of the *firſt* rank (or the foremoſt) are called *Inciſores*, Cutters. Moſt commonly four are found in each Jaw: they have but one *Sorts.*

Root or Phang, and ſo eaſily fall, or are pulled out. Theſe firſt make way out of the Gums in Children, becauſe the tops of them are ſharpeſt. Thoſe of the *ſecond* rank are called *Canini*, or Dog-teeth, from their length, hardneſs and ſharpneſs above the reſt. In each Jaw there are two, at each ſide of the Cutters one. They are otherwiſe called *Eye-teeth*, either from an Opinion that their roots, (*viz.* of the upper) reach as far as the Eyes, or that the ſame Nerve that moves the Eye ſends a twig to theſe Teeth; neither of which conceits are true. The roots of theſe are ſingle as thoſe of the *Inciſores*, but they are both ſometimes crooked; and if ſuch people in whom they are ſo, chance to have one of them drawn, they can hardly be pulled out without breaking off a piece of the *Alveolus* in which they are fix'd. Thoſe of the *third* rank are called *Molares*, Grinders; becauſe like Mill-ſtones they grind the Meat. Moſt commonly they are twenty in number, five in each ſide of both Jaws. The two foremoſt that ſtand next to the Dog-teeth, are leſs than the reſt, having but two knobs at the top, but the three hindmoſt are larger and have four, being in a manner fourſquare. The two foremoſt alſo have but two roots at moſt, but the three hindmoſt commonly three or four. But thoſe of the upper Jaw have for the moſt part one root more than thoſe which are oppoſite to them in the lower, or however their roots are larger. The reaſon whereof may be, firſt, becauſe they are pendulous, and ſo are the apter to drop out; and ſecondly, becauſe the ſubſtance of the upper Jaw is not ſo firm as that of the lower.

The

The *use* of the Teeth is principally to chew the meat to prepare it for the Stomach, that it may be easilier concoct it into Chyle. The *Incisores* bite off the Morsel, the Dog-teeth break it, and the Grinders make it small; wherefore they are sharp in the top, that they may the better receive and keep the Meat; and rough, that they may grind it the better. The Teeth contribute also much to the formation of the Speech, especially the fore-teeth; for those that have lost them, lisp, as we say, and cannot pronounce plainly such Syllables as have C. X, *&c.* in them. *Use.*

CHAP. IX.

Of the Bone of the Tongue called Os Hyoides.

THE *Os hyoides* is seated at the root of the Tongue under the lower Jaw, and above the *Larynx*. It is shaped like the Greek Vowel υ, (whence it is also called *Os Ypsiloides*) or like the lower Jaw, being arched before, and extending into two points or horns backward. Os hyoides, *its situation and shape.*

It is commonly compounded of three Bones. That in the middle is gibbous forwards, and hollow inwards; by its gibbous side it is joyned to the *basis* of the Tongue, and into its concave it receives the *Epiglottis*. The other two are lateral, and are called *Cornua*, or Horns. Each of these has a Cartilage adhering to it; and the middle, two. They are all tied to the adjacent parts, partly by a fleshy, partly by a nervous or membranous substance. *Parts.*

Use. It ſerves for the inſertion of ſeveral of thoſ Muſcles that are deſigned to move the Tongue (deſcribed Book V. Chap. 10.) and alſo for keep ing the Throat open, that the Meat may hav paſſage out of the Mouth into the Stomach, an the Air into and out of the Wind-pipe, while w ſpeak and breath.

CHAP. X.

Of the Bones of the Neck, viz. *the* Clavicul *and* Vertebræ.

HItherto of the Bones of the *Head*; we ſhoul next proceed to thoſe of the *Trunk* (accor ing to our diviſion of the parts of a *Skeleton*: but betwixt theſe lieth the *Neck*, whoſe bones w muſt deſcribe in our way.

Theſe are of two ſorts, to wit, the *Clavicul* or Chanel-bones, and the *Vertebræ*.

Claviculæ, *their ſituation, figure, ſubſtance, number, and connexion.*

As to the *Claviculæ*, ſome reckon them to t *Thorax*, others to the Shoulder; but conſiderin their *ſituation*, they may as fitly be reckoned pertaining to the Neck. They are called *Clav culæ* from their reſembling the ſhape of old faſh oned Keys, which were of the figure of an It lick *ſ*; ſuch as *Spigelius* ſays he has ſeen belon ing to old Houſes at *Padua*. They are not crooked in Women as in Men. Their *Subſtan* is thick and ſpongie, but more about the hea than about the middle. In *number* they are tw one on each ſide. Near the Throat they a round; but towards the Shoulder flattiſh. Th are *joined* to two Bones, to wit, by one end t

th

he Shoulder-blade, and by the other to the top of he Breaſt-bone,

Their *Uſe* is to uphold the Shoulder-blades, *Uſe.* hat they ſhould not ſlide down upon the Breaſt ogether with the Shoulder-bone; which falleth ut, when there happens a fracture in theſe ones.

The other Bones of the *Neck* are the σπόνδυλοι, r *Vertebræ*; but before we come particularly to eſcribe theſe, it will be convenient to premiſe omething concerning all the *Vertebræ* of the Spine general.

There are reckoned thirty *Vertebræ* of the Vertebræ pine in all; *viz.* ſeven of the Neck, twelve of *of the whole* he *Thorax*, five of the *Loins*, and ſix of *Os ſacrum*. *Spine, their* ach conſiſts of a *Body*, that is convex forwards *Number,* nd ſomewhat hollow behind, but above and *Subſtance,* elow plain: which body is not of a ſolid and *Parts and* ard ſubſtance, but ſomewhat fungous and *Holes.* oftiſh. This body has three ſorts of *Proceſſes* rowing out of it toward its hinder ſide, two ranſverſe, four oblique, and one poſterior or a- ute, which are of an harder ſubſtance than it ſelf. There is alſo a large *proper Hole* in its middle, or rather betwixt it and its Proceſſes) for the eſcent of the Spinal Marrow: and on its upper nd under ſides two ſmall lateral *common* ones, hat is common to it ſelf and that next it: for he half of theſe holes is excavated out of the ower ſide of the upper *Vertebra*, and the other alf out of the upper part of the lower; and they erve for the entrance of the Blood-veſſels into he Spine, and for the exit of the Nerves that pring out of the ſame.

The *Vertebræ* are joined to one another *behind* *Connexion.* y *Ginglymus*, *forwards* by *Harmonia*; on the *out- ide* by an hard Membrane, on the *inſide* by a

membranous, hard and ſtrong Ligament, reac
ing from the firſt *Vertebra* of the Neck to the
ſacrum.

Thus far of what is *common* to all the *Vertebra*
As for what is *proper* to thoſe of each of the fo
Diviſions, that ſhall be ſhewn in their particul
Deſcription.

Vertebræ *of the Neck ſeven.*

And firſt for the *Vertebræ* of the *Neck*, whi
are in number *ſeven.* The *Bodies* of theſe are le
but harder than thoſe of the other, which w
convenient becauſe they are more moved. Th
are not of a ſemicircular Shape like the othe
but rather four-ſquare as it were. Their tran
verſe Proceſſes have each an hole in them, (whi
the reſt have not,) through which Veins and A
teries paſs to the Head. Their *poſteriour* Proce
ſes or Spines are forked or cleft into two, exce
in the firſt and laſt *Vertebræ.*

1. Atlas.

The *firſt* or uppermoſt *Vertebra* is called *Atla*
becauſe the Head ſtands upon it, like the Glo
of the World. It hath no Spine behind (one
a little blunt knob) left the two ſmall Muſcles
the Head (called *Obliqui inferiores*) ſpringin
from the ſecond *Vertebra* and inſerted into thi
ſhould be hurt, when the Head is bowed fo
ward. *Spigelius* ſays it has no true *Body*, but r
ther (inſtead of it) a Tubercle in its foreſid
Both its obliquely aſcending and obliquely d
ſcending Proceſſes have each a *Sinus* in them: th
upper receiving the Tubercles of the *Occiput*, an
the lower the aſcending Proceſſes of the ſecon
Vertebra. Upon theſe the Head is moved fo
wards and backwards. The ſubſtance of th
Vertebra is harder, ſolider, but thinner than tha
of the reſt, becauſe it is the leaſt, and yet its C
vity is biggeſt. Within on the foreſide of i
great *Foramen*, it has a ſemicircular *Sinus* line
wi

with a Cartilage, whereinto it receiveth the tooth-like Proceſs of the ſecond *Vertebra*; round which proceſs (ſays Dr. *Havers*) are ſome mucilaginous Glands planted, and one on each ſide.

The *ſecond* is called *Vertebra dentata*, becauſe out of its upper ſide, between its two aſcending Proceſſes, there ſprings a round, longiſh and hard Proceſs, in ſhape like a *Tooth*, which being inveſted with a Cartilage is jointed into the foreſaid *Sinus* of the firſt *Vertebra*, upon which as upon an *Axis* the Head with the ſaid firſt *Vertebra* turns round. And when a luxation happens here, the Neck is ſaid to be broken. This tooth-like Proceſs in that part which enters not into the ſaid *Sinus*, is invironed with a Ligament, by which it is knit to the *Occiput*. The hinder Proceſs of this *Vertebra* is cleft into two, as thoſe of the four following are, for the more convenient inſertion of the Muſcles and Ligaments. Its *tranſverſe* Proceſſes are leſs than theirs, and have alſo ſmaller holes. 2. Dentata.

The *four* that lie next under this are in all things like it, ſave that their tranſverſe or lateral Proceſſes are larger, and divided into two as well as the hinder. The *ſeventh* is the largeſt of all. It is liker to the *Vertebræ* of the *Thorax* than of the Neck; for neither its tranſverſe nor hinder Proceſſes are cleft like the foregoing, but both are like thoſe of the *Vertebræ* of the *Thorax*, to be deſcribed in the next Chapter. *The other five.*

CHAP. XI.

Of the Vertebræ *of the* Thorax.

IN the next place we come to the Bones of the *Trunk*, which is divided into the *Thorax* and *Abdomen*.

The Bones of the *Thorax* are the *Vertebræ* of the *Back*, the *Ribs* and *Breaſt-bone*.

Vertebræ *of the Back twelve.*

Firſt, as for the *Vertebræ*, they are *twelve* in number, unto which ſo many Ribs (of a ſide) anſwer; there are ſeldom thirteen of each, but more ſeldom eleven. Their *Spines* or *hinder* Proceſſes are not divided into two as thoſe of the Neck, but are ſolid and ſimple. The *tranſverſe* are ſhort and blunt, and have each a ſhallow *Sinus* for the inarticulation of the Ribs; but are not perforated like thoſe of the Neck. The *oblique* Proceſſes (which are four, two aſcending, and two deſcending) ſerve for the articulation of one *Vertebra* with another. The deſcending are a little hollowed, and receive the (ſomething protuberant) Heads of the aſcending Proceſſes of the next *Vertebra* below them, ſucceſſively. The fore-part of their *Body* next to the cavity of the *Thorax* is round, or convex; and the hinder part lunated, or concave. On each ſide they have a ſmooth *Sinus* for the reception of the heads of the Ribs; for into theſe *Sinus* they are received as well as into thoſe of the tranſverſe Proceſſes. As for their *Holes*, they have one large proper one in their middle, which containeth the Spinal Marrow; and the one half of two *common* leſſer ones, that is, one half on their upper ſide, and another on their lower, as they join

to

to one another, for the egreſs of the Nerves, and ingreſs of the Veins and Arteries, as was ſhewn before in the general deſcription of the *Vertebræ*.

CHAP. XII.

Of the Ribs.

THE *ſecond* ſort of Bones in the *Thorax* are the *Ribs*, which (as was ſhewn in the former Chapter) are uſually *twelve* in number. Their *Subſtance* is partly bony, partly cartilaginous; the firſt ſerving for firmneſs and ſtrength, the ſecond for articulation, and the eaſier motion of the Breaſt in reſpiration. The bony Subſtance towards the *Vertebræ* of the Back is thick and roundiſh, but towards the *Sternum* flat and thin, and ends in a Cartilage. Within, their bony part is fungous or ſpongie; whence the Ribs being broken are more readily joined together by a *Callus* than moſt other Bones. The Cartilages in bigneſs anſwer the Bigneſs of the Ribs: for the bigger Ribs have the bigger Cartilages; and on the contrary. The Ribs in the upper ſide are blunt or broadiſh, but in the under ſharper. In their lower and inner ſide they have a furrow that runs along them to receive the intercoſtal Veſſels, the Veins, Arteries and Nerves. On their inſide towards the cavity of the *Thorax*, they are cloathed with a *perioſteum* underneath the *pleura*, and (according to Dr. *Ruyſch*) the veſſels run along it, and not between the two skins or membranes which compoſe the *pleura*.

The Ribs. *Their Subſtance.*

The Ribs are of two ſorts, *viz.* *long* or *ſhort*.

The

Seven Veræ. The *long* (otherwiſe called the *true* Ribs) are *ſeven* in number (being the uppermoſt:) Theſe are articulated both with the *Vertebræ* and *Sternum*. Their cartilaginous ends or heads are received into ſhallow *Sinus's* in the Breaſt-bone; and their bony heads being covered with a Cartilage are received into the *Sinus's* in the bodies of the *Vertebræ*; and the ſame heads have each a Tubercle (except the two loweſt) that being alſo lined with a Cartilage, are articulated into the ſhallow *Sinus's* of the tranſverſe Proceſſes. "In both "theſe Articulations with the *Vertebræ* (Dr. *Ha-*"*vers* ſays) are mucilaginous glands to be found, "but the largeſt is in the lower articulation, and "on that ſide which is next the cavity of the *Tho-*"*rax*. The articulation into the Breaſt-bone, is by *Arthrodia*; but that into the *Vertebræ*, by *Synarthroſis*; for the motion of the Ribs at that end is very obſcure, as being ſtraitly tyed to the *Vertebræ* by Ligaments.

Note, That the Cartilages of theſe true Ribs are uſually obſerved to be harder in Women than in Men; which may ſeem to be for the better ſuſtaining of the weight of their Breaſts that lie upon them.

Five Nothæ. The *ſhort* (otherwiſe called *Nothæ* or *Spuriæ*, baſtard Ribs) are *five* in number; of which the four uppermoſt having their Cartilages bending upward and cleaving one to another, are joined before to the lower ſide of the Cartilage of the ſeventh true Rib: but the laſt, which is the leaſt, is looſe from the reſt, and grows ſometimes to the Diaphragm, and ſometimes to the *Muſculus rectus* of the *Abdomen*, as alſo ſometimes does the loweſt of the four next above it. Behind they are joined to the *Vertebræ* of the Back, like as the true Ribs were; onely the two loweſt, (and ſometimes

times the third) are received only into the bodies of the *Vertebræ*, and not into the tranſverſe Proceſſes which here have no *Sinus* for their reception.

The *Uſe* of all the Ribs is *firſt*, to keep the Breaſt and the upper part of the *Abdomen* diſtended, that in the former the Heart and Lungs may have free ſpace for their motion; and in the latter, the Stomach and Liver might not be preſt upon by the circumjacent parts. *Secondly*, to preſerve thoſe parts from external injuries, as from bruiſes or the like. And *laſtly*, to ſuſtain the Muſcles that ſerve for reſpiration, and to yield to or obey their motions; for if the Breaſt had been environ'd with one continued Bone, it had not been capable of dilatation in inſpiration, nor of contraction in expiration. *Uſe.*

CHAP. XIII.

Of the Breaſt-bone or Sternum.

THE *Sternum* (which is the laſt bone of the *Thorax*) is ſeated in the middle of the Breaſt before, ſerving as a Breaſt-plate, and having the cartilaginous productions of the true Ribs inarticulated into it. It is of a red fungous *ſubſtance*, and in Children almoſt wholly cartilaginous; only its uppermoſt part is in them ſomewhat more bony than the reſt, perhaps becauſe one end of the *Clavicula* is joynted into it. In Infants it conſiſts of ſeven or eight, but after ſome years they ſo coaleſce one to another, that in the adult it is compounded but of three, and in aged perſons it ſeemeth *The* Sternum, *its ſubſtance.*

ſeemeth but one Bone; yet it is diſtinguiſhed by two tranſverſe lines, ſhewing the former diviſion, which are more conſpicuous in the inſide than outſide.

It conſiſts of three Bones and a Cartilage.

The *uppermoſt* Bone is thickeſt and broadeſt; it hath in each ſide a longiſh Cavity lined with a Cartilage, to receive the heads of the Clavicles: between theſe in its middle and upper part is a lunated pit called *Jugulum.* It has alſo a ſmall *Sinus* or Dent on the inſide, to give way to the Wind-pipe deſcending. The *ſecond* Bone is neither ſo thick nor ſo broad, yet a good deal longer. It is joined to the former by an intervening Cartilage, and in each ſide has five or ſix *Sinus* for the inarticulation of ſo many of the true Ribs. The *third* is the ſhorteſt of all, yet it is broader than the ſecond, unto the lower end of which it is joined. What true Ribs were not jointed into the middle Bone, are received by this. To its lower end is annexed the Cartilage called *Mucronata* or *Enſiformis*, Sword-like. This Cartilage is triangular, about an inch long, and on the outſide of it there is formed a Cavity in the Breaſt, called *Scrobiculus Cordis* or the Heart-pit; and the gnawing Pains ſometimes felt there, *Cardialgiæ*; though thoſe Pains are not from any primary Affection of the *Heart*, but of the *upper Orifice of the Stomach*, which lies under this Cartilage, and has the name of *Cardia*, from its great conſent with the Heart, (as ſome derive the reaſon of its name.)

CHAP.

CHAP. XIV.

Of the Vertebræ *of the Loins.*

THE Bones belonging to the *Abdomen* (which is the *second* or lower part of the *Trunk*) are these five *Vertebræ* of the Loins, five or six of *Os sacrum*, *Os Coccygis* and *Ossa innominata.*

The five *Vertebræ* of the Loins are larger than those of the *Thorax*, and the lowest of them are biggest. They are jointed with the last *Vertebra* of the Back and the first of *Os sacrum*, and with one another, by an intervening clammy Cartilage, but more loosly than those of the Back, because the Body bends more upon them. Their *Bodies* are larger than those above them; and among themselves the lower the larger: but they are of a very rare and pumice-like Substance. Their middle and lateral *Holes* are like those of the Back, only the larger half of the lateral is excavated out of the lower *Vertebra*, whereas those of the Back are formed equally out of both. As for their *Processes*, their *posteriour* (or Spines) are *shorter* and more blunt, but broader and thicker than those of the *Vertebræ* of the *Thorax*, and turn something upwards; but their *lateral* are *longer.* They also differ in their inarticulation one with another; for whereas in those of the *Thorax* the upper (*oblique*) Processes were knobby, and the lower hollow, to receive them; in these the contrary is seen; for the upper Processes are hollow, and the lower knobby. Onely the last or twelfth *Vertebra* of the *Thorax* has both its ascending and descending oblique Processes hollowed, Vertebræ *of the Loins five.*

lowed, to receive the heads or knobs of the Processes of the last but one of the *Thorax*, and of the first of the Loins.

CHAP. XV.

Of the Os sacrum, *and* Os coccygis *or Rump-bone.*

Vertebræ *of* Os sacrum *five or six.*

THE *Os sacrum* is the broadest of all the Bones of the Back, and doth sustain all the other *Vertebræ*. On the inside it is smooth and hollow, on the outside convex and uneven, being of something a triangular shape. In its upper part on each side it is knit firmly to the *Ossa Ilia* by an intervening Cartilage. It consists of five or six Bones, plainly distinguishable in Infants, but more obscurely in grown persons. These Bones have the resemblance of (and are usually called) *Vertebræ*, for each of them hath a *Body* and *Processes*, and a large *hole* to receive the *Spinalis medulla*. The Bodies of these differ from those of the other *Vertebræ* in this respect; that whereas in those, the lower part is always bigger, in these it is the less; by which means the uppermost of them is the biggest, and the lowest the least. Their smaller holes which serve for the ingress and egress of Vessels differ also from those of the other, in that they are not in their sides, but before and behind; of which those before are much the larger. As for their *Processes*, the *oblique* can hardly be discerned, except in the first. The *transverse* are pretty long, but so united, that all seem but one. The *hinder* or spines are like those of the Loins, but less, and still the

the lower the lesser; insomuch that the lowest hath no Process, but only a round Protuberance.

To the *Os sacrum* the *Os Coccygis* or Rump-bone is joined by a Cartilage, somewhat loosly, that it may bend a little backwards in Women in travail for the freer passage of the *Fœtus*, *&c.* It is compounded of three or four Bones, of which the first hath a small hollowness which receiveth the last *Vertebra* of *Os sacrum*. The rest of its Bones grow each less than other, so that the lowest ends in a cartilaginous point. It is called *Os Coccygis*, because in shape it resembleth the Cuckow's bill. Its lower end bends inward, to stay the streight Gut and the Sphincter-Muscle, which are tied to it. The Bones of it are spongie and soft, and have neither Process nor any hollowness, for the spinal marrow descends no further than the bottion of *Os sacrum*. Os Coccygis.

CHAP. XVI.

Of the Ossa innominata.

AT the lower end of the *Abdomen*, by the sides of the *Os sacrum*, there stand two large Bones called by *Galen Ossa innominata* (nameless Bones) because they had then no proper name imposed on them, that he had met with. But *Spigelius* says, that *Homer* had long before called them ἰσχία, and that they have been generally, by later Anatomists, known by that name: (though, by his leave, I think that *Ischium* is more commonly taken onely for one part of these Bones called *Coxendix*.) Ossa innominata, *their name.*

But

Situation and Connexion. But be their Name what it will, there is one on each side the *Os sacrum*, to which they are joined (through the intervention of a Cartilage) by a most strong Ligament, and together with it frame the *Pelvis*, or that Cavity in which the Womb, Bladder and part of the Intestines are contained.

Parts. In Children each of them plainly appeareth to be framed of *three* Bones (called *Os Ilium*, *Coxendicis*, and *Pubis*) joined by a Cartilage, until the seventh year; but in Men of ripe Age these three, the Cartilage being dried and hardened into a Bone, seem but one entire Bone. However for the more exact Description of its parts, we must consider it as consisting of *three*.

1. Os ilium. The *first* is called *Os Ilium*, because under it lieth the small Gut called *Ileum*. This is the uppermost and broadest; in figure Semicircular; arched without, within hollow. It is joined with the *Os sacrum* by a common membranous and most firm Ligament, with a Cartilage intervening, as aboveſaid.

2. Coxendix. The *second* is called *Os coxendicis*, (or *Ischium*) and in English the Hip-bone: though sometimes both these last names are taken in a larger signification, and include all the three. This Bone is the lower and outer part of the *Os innominatum*, and has a large Cavity in it (called *Acetabulum coxendicis*) which receives the round head of the Thigh-bone, by the articulation called *Enarthrosis*. The brims of this Cavity are tipt as it were with a Cartilage, called its *Supercilium*; and in the bottom of it (according to Dr. *Havers*) "there is a *sinus* formed on purpose to receive "the large mucilaginous gland lodged there, the "greatest of this kind in the whole body. Which "*sinus*, he says, is in an humane skeleton almost

"of

of an oval figure, which he has found an Inch and five eighths in length, and in the widest place very near one inch one eighth in breadth, and about three eighths of an inch deep; occupying at one end and on both sides only the bottom of the *acetabulum*, but at the other end it runs up by the Ligament, which is inserted into the tip of the Head of the *Os femoris* to the brim of the Cavity.] Besides this *Sinus* in the bottom of the *Acetabulum*, there is another in the under and inner side of this Bone, in which the Muscle of the Thigh called *Obturator internus* winds about that part of this Bone (as a Rope in a Pulley) according to *Spigelius*. Its lower end has a large *Appendix* which we rest or bear upon when we sit.

The *third* Bone is called *Os Pubis*, and *Pectinis*, or the Share-bone. This is the lower and inner or fore part of the nameless Bone, and eaven before is joined to its fellow by a Cartilage, which is much thicker, but looser and softer in Women than in Men; for in the former, one Bone does usually recede a little from the other in Travail, to give way to the *Fœtus*. It has a very large *Foramen* between the *Sinus* of the *Coxendix*, and that part whereby it is joined to its fellow, making room for two Muscles of the Thigh. And above this *Foramen* is a *Sinus*, by which the crural Veins and Arteries pass to the Thighs. 3. Os pubis.

Note, That the *Pelvis* that is composed by these three Bones and the *Os sacrum*, is bigger in a Woman than in a Man, to make the larger room for the *Fœtus*. *The* Pelvis

CHAP. XVII.

Of the Scapula, *or Shoulder-blade.*

The Bones of the Limbs.

HAving done with the Bones of the *Head* an *Trunk*, there remain to be deſcribed th Bones of the *Limbs*, which are the *Arms* and *Leg* The Bones of the Arms are either *above* the join of the Shoulder, or *under*.

The Scapula.

Above the joint lieth the *Shoulder-blade*, i Greek called ὠμοπλάτη, in Latin, *Scapula*. Son reckon this to the *Thorax* becauſe of its ſituatio as lying upon its upper and back part: but ſeein its principal uſe ſeems to be for the ſuſtaining an motion of the Arm, we have conſider'd it as a pa thereof. Its *Subſtance* is for the greateſt part thi but hard and ſolid. Its outſide is a little arche and its inſide hollow. It is ſomewhat of a triangul *Figure*, and joined to ſundry parts by means the Muſcles; which ſort of union we call above, *Syſſarcoſis*. Thus it is joined to the Bo of the *Occiput* by the cucullar Muſcles, or the fi pair of the *Scapula*; to the *Vertebræ* of the Ne by the ſame pair, as alſo by the ſecond and four pairs, &c.

Iss ſubſtance, figure, and connexion.

Proceſſes.

It has three *Proceſſes*: of which *one* is extend along its middle, and is called its Spine; and th end of it that by a ſhallow *Sinus* receives the *Cl vicula*, *Acromium*; its point or tip: *Another* lower and leſs than this, and acute, ſomethi like a Crow's Bill, whence it has the name of *C racoïdes*; by others it is called *Ancyroides*, Anchc like: The *laſt* is the ſhorteſt, called *Cervix* Neck. In the end of this is a *Sinus* that in upper part is acute, but in its lower round: t

Cavi

Cavity being but ſhallow of it ſelf has its brims ſipt with a Cartilage, which makes it the deeper, into which the head of the Shoulder-bone is received. Dr. *Havers* ſays, "there is a conſiderable mucilaginous Gland joining to the upper brim of this *Sinus* or *Acetabulum*, juſt by the tendinous origination of the *Muſculus biceps* on the foreſide of it, which runs downwards upon the Membrane for ſome way towards the Armpit. And on the other ſide of that origination there is another at a little diſtance from it.] This articulation is ſtrengthened by very ſtrong Ligaments and Tendons, and is partly hindred from Luxation by the top of the ſecond Proceſs.

The Shoulder-blade hath a three-fold *Uſe*. Firſt, it receiveth the *Os humeri* in the *ſinus* of its *Cervix*, by the articulation called *Arthrodia*; as it does the *Clavicula* in the *ſinus* of its *Acromium* by *Synarthroſis*. Secondly, ſundry Muſcles ſpring from the Shoulder-blade, which ſerve for the motion of the *Os humeri*. Thirdly, it defendeth the Back ſo far as it reacheth, from external injuries, like a Shield. *Uſe.*

CHAP. XVIII.

Of the Os humeri, *or Shoulder-bone.*

THE Bones of the Arm *under* the joint of the Shoulder are the *ſhoulder-bone*, the *Cubit-bones*, and the *Bones of the Hand.*

The *Shoulder-bone* is but one in each Arm, reaching from the Shoulder to the Elbow. In figure it is round, only a little flattiſh behind towards the Elbow; of a hard and ſolid ſubſtance. Os humeri.

It is hollow all along like a Pipe, wherein a marrowy ſubſtance is contained.

Its upper end. Its *upper* end, that is jointed to the *Scapula*, has a great and round Head, cover'd with a Cartilage, which is received into the Cavity of the *Scapula* by that kind of articulation which is called *Arthrodia*. On the hinder ſide of this Head there ſtand two rough and uneven Prominences, (which *Spigelius* reckons for another Head) into which the Ligaments are inſerted. And betwixt theſe two Prominences there is a round and long chink through which the nervous Head of the *Muſculus biceps* doth paſs.

The lower. Its *lower* end is articulated with two Bones *viz.* the *Ulna* and *Radius*, by *Ginglymus*, for it both receives them and is received by them, having three Proceſſes and two *Sinus* betwixt them ſo that this end reſembles a Pulley, whence it is called *Trochlea*. The *Ulna* is jointed with its inmoſt Proceſs, and the *Radius* with the outmoſt. On its inſide, beſides the three foregoing, it has a large Proceſs or Tubercle from whence thoſe Muſcles ariſe that lie on the inſide of the Cubit; and another leſs on its outſide, from which thoſe Muſcles ſpring that lie on the outſide. On the hinder ſide of the *Trochlea* there is one deep large Cavity; and on the foreſide two ſmall ones, into which the Bones of the Cubit hit, when they are moved backward or forward, and are ſtopped from being carried further. In the cavity on the hinder ſide Dr. *Havers* has obſerved a mucilaginous gland; and another large and fair one in one of the *ſinus*'s which are on the foreſide. About the middle of this Bone in the inſide there is an hole through which Veſſels paſs to the marrowy ſubſtance for its nouriſhment.

CHAP.

CHAP. XIX.

Of the Bones of the Cubit.

THE Bones of the *Cubit* are *two*; to wit, the *Ulna* and *Radius*. Their ſubſtance is firm and ſolid, all but their Appendages. They are near of the ſame length (but the *Ulna* is the longer of the two) and both are hollow within, containing a marrowy ſubſtance. They are in ſome places rough in their ſuperficies, by reaſon of their lines that are appointed for the Riſe or Inſertion of the Muſcles. *Two Bones of the Cubit*, viz.

The *Ulna* (otherwiſe called *Os Cubiti*, and *Cubitus*) is larger in its upper end that joints with the *Os humeri*, and grows ſmaller and ſmaller towards the Hand, ending in a round Tubercle or ſmall Head, with a round *Sinus* in it, (on whoſe hinder ſide there grows a ſmall ſharp Proceſs, from its ſhape call'd *Styloïdes*) receiving one of the Bones of the *Carpus*, to which it is knit by Ligaments, (a Cartilage intervening.) Its upper end is articulated with the *Os humeri* by *Ginglymus*, to which end it has two Proceſſes, one before and another behind. That before, is received into one of the fore *Sinus* of the *Os humeri* (mentioned in the former Chapter) in bending the Elbow-joint: and the hinder upon ſtretching out the Arm enters into the hinder Cavity of the ſame Bone behind the *Trochlea*, (by which the Cubit is ſtayed from further extenſion than to a ſtreight poſture) and is called *Ancon* or *Olecranum*. And at the ſame end it has alſo two *Sinus*, the one of which is lateral and external, receiving 1. Ulna.

ving the Head of the *Radius*; and the other (which is betwixt its two Proceſſes) one of the Proceſſes of the *Os humeri*, which moves in it as a Rope in a Pully. As it receives the *Radius* in its upper end, ſo is it received by it in its lower: but in the midſt it bends or recedes a little from it, yet is knit to it by a long Ligament.

2. Radius. The *ſecond* Bone is called *Radius*, and lies on the outſide of the Cubit. Its upper end is ſlenderer, having a round Head, one ſide of which is received by the *Ulna*; but its tip has a round ſhallow Cavity in it, which receives the outer Proceſs of the *Os humeri*, by *Diarthroſis*. Its lower end is thicker and broader, and by a little *Sinus* in its ſide receives the *Ulna*: and at its extremity it has two other ſmall *Sinus*, for the reception of the little Bones of the Wriſt, where the often quoted Author ſays, "there are a row "of mucilaginous glands, or one of them lying "like a ridge of little hills from one ſide to the "other on the back part; and on the inſide there "are ſome alſo, but not ſo conſiderable; as there "are likewiſe at the bones of the *carpus*, which are "like a *fimbria*.

CHAP. XX.

Of the Bones of the Hand.

Four ſorts of Bones of the Hand. THE *Hand* is divided into three parts: the Wriſt, called *Carpus*; the diſtance between the Wriſt and Fingers, called *Metacarpus*; and the *Fingers* themſelves.

1. *Eight of the* Carpus. The Bones of the *Wriſt* are *eight* in number, placed in two ranks or orders. The *upper* rank hath

hath four Bones, of which three are ſo joined together that they ſeem but one; (theſe are articulated to the *Ulna* and *Radius* by *Arthrodia*:) but the fourth being the leaſt of all, is placed a little out of its rank on the outſide of the third. The *inferiour* hath alſo four Bones; they are joined to one another by *Harmonia*, but to the Bones of the *Metacarpus* by *Synarthroſis*, having ſome motion though but obſcure. They are firmly knit to one another by both a membranous and cartilaginous Ligament; and beſides, by another called *Annular*, which compaſſing the Wriſt, comprehendeth both them and the Tendons of the Muſcles which paſs to the Fingers.

The *Metacarpus* hath four Bones, they are round, and of a ſolid ſubſtance, but hollow within like a Pipe, being full of Marrow. They are bigger than thoſe of the Fingers: that which anſwereth to or ſuſtaineth the Fore-finger is thickeſt and longeſt, and the reſt grow each ſhorter and ſlenderer than the foregoing. Between each two a diſtance is left for the *Muſculi interoſſei* of the Fingers. Both in their upper and lower end they have an *Appendix*; that at the upper end hath a Cavity which receiveth the Bones of the *Carpus*; but that at the lower, a round long head, covered with a Cartilage, which is received by the *Sinus* of the firſt Bone of the Fingers, to which the Bones of the *Metacarpus* are tied by a tranſverſe Ligament, that lies in the Palm of the Hand. 2. *Four of the* Metacarpus.

The *Fingers* (taking in the Thumb) have fifteen Bones, each three. The firſt are largeſt, the ſecond leſs, and the third the leaſt. On the outſide they are round, but on the inſide plain and a little hollow, that they may lay the firmer hold upon things. Each has an *Appendix* 3. *Fifteen of the Fingers.*

(called by ſome a *Proceſs*) at each end. The *upper Appendices* are round, and thoſe of the firſt Bones have one round *Sinus* in them whereby they receive the round head of the Bones of the *Metacarpus*: but the upper *Appendices* of the ſecond and third Bones have each two *Sinus*, parted by a ſmall Protuberance. The lower *Appendices* have each two heads divided by a *Sinus*, which are received by the double *Sinus* of the upper *Appendices* of thoſe Bones that join to them: except onely the laſt or third Bone, which is received by none, but is fenced by a Nail. The ſecond Bone is joined to the firſt, and the third to the ſecond by *Ginglymus*, and by them the Fingers are onely ſtretched out and contracted. For as for their motion ſideways, that depends only upon the articulation of the firſt Bones with the Bones of the *Metacarpus*, which is done by *Enarthroſis*, or at leaſt by *Arthrodia*. The jointings of the Thumb anſwer to theſe of the Fingers, ſaving that its *upper Appendix* is not joined to any Bone of the *Metacarpus* (with which it has no communication) but immediately to the Wriſt; and its *lower* has but one head, whence the ſecond Bone has but one *Sinus* in its upper Appendix to receive it. In every joint of the Fingers (as alſo of the Toes) on the inſide or bending part, (Dr. *Havers* ſays, "there are two mucilaginous "glands (like a *fimbria.*) One belongs to the re- "moteſt, or that which is the moving bone, when "the poſture of that joint is altered, and is ſeated "juſt at the end of its extremity: the other is "planted upon the bone with which the other is "articulated at a little diſtance from the extreme "part of it, up in a *Sinus*, formed as well for "the reception of that gland, as to give the "other bone, when it moves that way, the li-

"berty

" berty of ſliding towards it, and of being in-
" flected, at which time it makes ſome little
" preſſure upon it.

Beſides theſe Bones there are in the in-ſide of the Hand, at the joynts of the Fingers, ſome ſmall bones called from their figure and bigneſs *ſeſamoidea*, like the Grains of *Seſama*, (a ſort of Indian Corn ſo called by *Pliny.*) They reſemble in figure the Knee-pan, and ſeem to ſerve for the ſame uſe; for in ſtrong Extenſions of the Fingers they ſtrengthen the Tendons of the Muſcles upon which they are placed, and hinder the luxation of the Joynt. Authors differ very much as to their number, becauſe being ſo ſmall they are ſeldom all found; but moſt agree upon the number of 12 to each Hand, placing them thus. At the joynting of the ſecond bone of the Thumb with the firſt there are two. The ſecond and third joynt of the fore-Finger have each one; but its firſt joynt, as alſo the firſt of the other three have each two. In Children they are of a cartilaginous ſubſtance, but grow bony by degrees, (being inveſted with a Cartilage) yet not ſolid but fungous or porous. 4. Oſſa ſeſamoidea.

CHAP. XXI.

Of the Thigh-bone, and Patella.

THE *Leg* (in a large ſenſe) is divided into three parts, the *Thigh*, the *Shank* (or Leg ſtrictly ſo called) and *Foot*.

The *Thigh* hath but one Bone: but of all others it is the longeſt and thickeſt. *Before*, it is round: but *behind*, ſomething depreſſed, and hollow. Os femoris.

hollow. In the *upper* part it has a round head; the ſlender part under this is called its Neck, and is pretty long and oblique. The Neck is an *Apophyſis* or Proceſs to the Bone it ſelf, and the round Head an *Epiphyſis* or Appendix to the Neck. This Head is received by the large Cavity or *Acetabulum* of the *Coxendix*, and is detained therein by two ſtrong Ligaments; one that encompaſſes the brims of the *Acetabulum*, and another that ſprings out of its bottom, and is inſerted into the tip of this round Head or *Appendix*. At the lower end of the Neck, there ſpring two Prominences from the Bone; which, becauſe the Muſcles called *Rotatores* are faſtened to them, are called *Trochanteres*. The hinder and lower is the leſſer *Trochanter*; and the lateral or uppermoſt, the bigger. The *lower* end of the Thigh-bone growing thicker by degrees hath two pretty large Heads, leaving a Cavity in the middle that receiveth the *Apophyſis* of the *Tibia*, (which is tied therein by a Ligament, as the upper head of this bone is into the *Acetabulum* of the *Coxendix*:) And again theſe are received by the Cavities of the *Tibia*, by a looſe *Ginglymus*, both the Heads and Cavities being lined with Cartilages. The forepart of this Articulation is called the *Knee*, the hindermoſt the *Ham*.

Patella. Upon the Knee appeareth a Bone, not joyned with any other Bone, called the *Pan*, or *Patella*: it is roundiſh, about two inches broad, plain without, but convex within, and covered with a Cartilage. It is ſet before the Thigh-bone and the *Tibia*, to ſtrengthen the Articulation; for otherwiſe the Thigh-bone would be in danger to ſlip out forward in going down a Hill, or the like. Its ſubſtance in Infants new born is ſoft and cartilaginous, and remains ſo for many Months; but

but in proceſs of time it becomes bony. It is full of little holes, as all thoſe bones are which paſs from Cartilages into Bones. It is involved by the thick Tendons of the ſecond, third, and fourth Muſcles that extend the *Tibia*, (and are implanted into its fore knob) whereby it is fixed in its place. The mucilaginous Glands that officiate to this part (the Knee) both before and behind, are livelily delineated in a figure of Dr. *Havers*'s often quoted *Oſteologia*, where the Reader may view them.

Behind there are two *Oſſa ſeſamoidea*, which adhere to the two beginnings of the *Gaſtrocnemius externus*, (or firſt Muſcle which extends the Foot) to ſtrengthen them.

CHAP. XXII.

Of the Bones of the Leg.

THE *Shank* (or *Leg* ſtrictly ſo called) is compoſed of two Bones. The greater is called κνήμη, *Tibia*, the leſſer περόνη, *Fibula*. Theſe are ſlightly articulated into one another near each end; but in their middle they recede one from the other, yet ſo as they are tied together by a ſtrong membranous Ligament that comes between them. *The bones of the Leg two.*

The *Tibia* (commonly called *Focile majus*) is partly three-ſquare, by its ſharp edge before making what we call the Shin. It has an appendix at each end. That above is bigger, and in its upper part hath one Proceſs, which is received by the *Sinus* of the Thigh-bone; and two long-iſh Cavities for the receiving of the two Prominences or Heads of the Thigh-bone, (ſo that the Arti- 1. Tibia.

Articulation is by *Ginglymus*) as was ſaid in the foregoing Chapter. About the brims of theſe *Sinus* there is joined by Ligaments a moveable Cartilage, ſoft, ſlippery, and bedewed with an unctuous humour, from its ſhape called *Cartilago lunata*, the Moon-like Cartilage. It has alſo a little Head behind (below the foreſaid *Appendix*) which enters into the *Sinus* of the upper *Appendix* of the *Fibula*. Its lower *Appendix* is leſs than the upper, jetting out with a notable Proceſs towards the inſide of the Foot, making the *Malleolus internus* or inner Ankle. It has two Cavities; one leſs in its ſide, by which it receives the *Fibula*; another greater and lower, divided as it were into two by a ſmall Protuberance in the middle, and lined with a Cartilage, receiving the convex head of the *Talus* that lies under it; as the ſaid Protuberance is received by the ſhallow *Sinus* in the convex head of the *Talus*: the one being articulated into the other by *Ginglymus*, ſo that the Foot is moved upwards and downwards (or bended and extended) upon this joint.

2. Fibula. The leſſer and outer Bone of the Leg is called *Fibula* (or *Focile minus*;) it is as long as the former, but much ſlenderer. This has alſo an *Appendix* at each end: the upper of which reaches not ſo high as the Knee, nor is it jointed to the Thigh-bone; but in its inner ſide has a ſhallow Cavity which receives the little hinder (or lateral) Head of the *Tibia*, that is ſeated under its upper *Appendix* which is jointed with the Thigh-bone. The lower *Appendix* of the *Fibula* is received by the *Sinus* of the *Tibia*, and extending its Proceſs to the ſide of the *Talus*, makes therewith the *Malleolus externus* or outer Ankle, which is lower than the inner.

CHAP.

CHAP. XXIII.

Of the Bones of the Tarsus.

OF the *Foot* (as of the Hand) there are three parts, *Tarsus*, *Metatarsus*, and the Toes.

The *Tarsus* is the distance between the lower end of the two Focils, and the beginning of the five long Bones which sustain and are articulated with the Toes. Some call it the *Instep*, but we have in the former Book (of *the Muscles*) named it the *Wrist*, supposing that by the Instep the *Metatarsus* is rather understood.

It hath *seven* Bones much differing from one another in bigness and shape. *The* Tarsus *hath seven Bones.*

The *first* is called *Talus* or *Astragalus* (in English the Ankle or Huckle-bone.) This is of a various figure: *Above*, it has something a convex head with a shallow *Sinus* in it, articulating with the *Tibia*, as is described in the foregoing Chapter. By the Process of the *Tibia* that makes the inner Ankle it is hedged in as it were on the inside, as it is by that of the *Fibula* on the outer. *Before*, it has a long neck, on which grows a round head that enters into the *Sinus* of *Os naviculare*; upon which jointing the Foot is moved sideways. Its *hinder* side is rough, and in its upper part has a transverse *Sinus* for the receipt of the Ligament of the *Tibia*, and in its lower a little descending *Sinus*, by which the Tendons of the Muscles of the Foot pass. *Below*, it has a *Sinus* behind and a Protuberance before, by which it is articulated with the Heel-bone by *Ginglymus*. Betwixt the *Sinus* and Protuberance there is a long and pretty deep Cavity, and over against it 1. Talus.

anc-

another ſuch in the Heel-bone. In theſe is contained a mucous ſubſtance which moiſtens the cartilaginous Ligaments that joyn the *Talus* to the Heel-bone, keeping them from drying by continued motion.

2. Os calcis. The *ſecond* Bone of the *Tarſus* is called *os Calcis*, or *Calcaneus*, the Heel-bone, and is the biggeſt of the ſeven. It lies under the *Talus*, with which in its *upper* ſide it is articulated in the manner juſt now deſcribed. *Behind*, it receiveth the great Tendon called *Nervus Hectoreus*, (or the great Cord) compoſed of the Tendons of the three Muſcles that extend the Foot. Its *fore* end is received by the *Os cubiforme*. On its *inſide* it has a large *Sinus*, by which the Tendons and larger Veſſels deſcend to the under-ſide of the Foot; and on its *out-ſide* it is uneven with ſeveral knobs, for the firmer connexion of the Ligaments and Tendons.

3. Os naviculare. The *third* is called *Os naviculare* or *Cymbiforme*, from its figure. *Behind*, it receiveth the *Talus* in a large *Sinus*; but *before*, it is convex, with three flattiſh ſmooth heads that are admitted into the very ſhallow *Sinus* of the three *Oſſa cuneiformia* to be deſcribed preſently.

The remaining *four* are leſs than the three already deſcribed, and ſtand all in one rank; the firſt of them articulates with the Heel-bone, the other three with the *Os naviculare*. There is no Cartilage betwixt them, but they are knit one to another on the out-ſide by a cartilaginous Ligament; and are cover'd both in their hinder and fore-part with a ſmooth Cartilage where they are joynted with other bones. The firſt is called *Cubiforme* or Die-like, having ſix ſides. This is bigger than the other three that follow; and is ſeated on the out-ſide of the Foot. In its *foreſide* it

4. Os cubiforme.

is

is joyned to the fourth and fifth bone of the *Metatarſus*; in the *hinder* with the Heel-bone; and in the *in-ſide*, to the third bone of the *Cuneiformia*: but its other three ſides, *viz.* the *outer*, *upper*, and *lower* are joyned to none.

The three enſuing are called *Cuneiformia*, or wedge-like Bones; for above they are thick, and below thinner, ſo that being joyned they all of them repreſent a Vault, being convex on the upper-ſide, but on the under hollow; in which hollowneſs the Tendons and Muſcles are lodged, ſo that one does not preſs upon and bruiſe them in going. The firſt of theſe Bones is the greateſt, ſeated in the in-ſide of the Foot; the ſecond is the leaſt, placed in the middle; the third is in the mean between both in bigneſs, and ſtands next to the *Cubiforme*. Theſe three, *behind*, are joyned to the *Os naviculare*, and *before* to the three firſt Bones of the *Metatarſus*.

5. *Three* Cuneiformia.

CHAP. XXIV.

Of the reſt of the Bones of the Foot.

THE *Metatarſus*, or Inſtep, hath *five* Bones; for one is appointed for the ſuſtaining of the great Toe, as well as others for each of the reſt: though in the Hand it is not ſo, where the Thumb has no bone in the *Metacarpus* anſwering to it.

The bones of the Inſtep five.

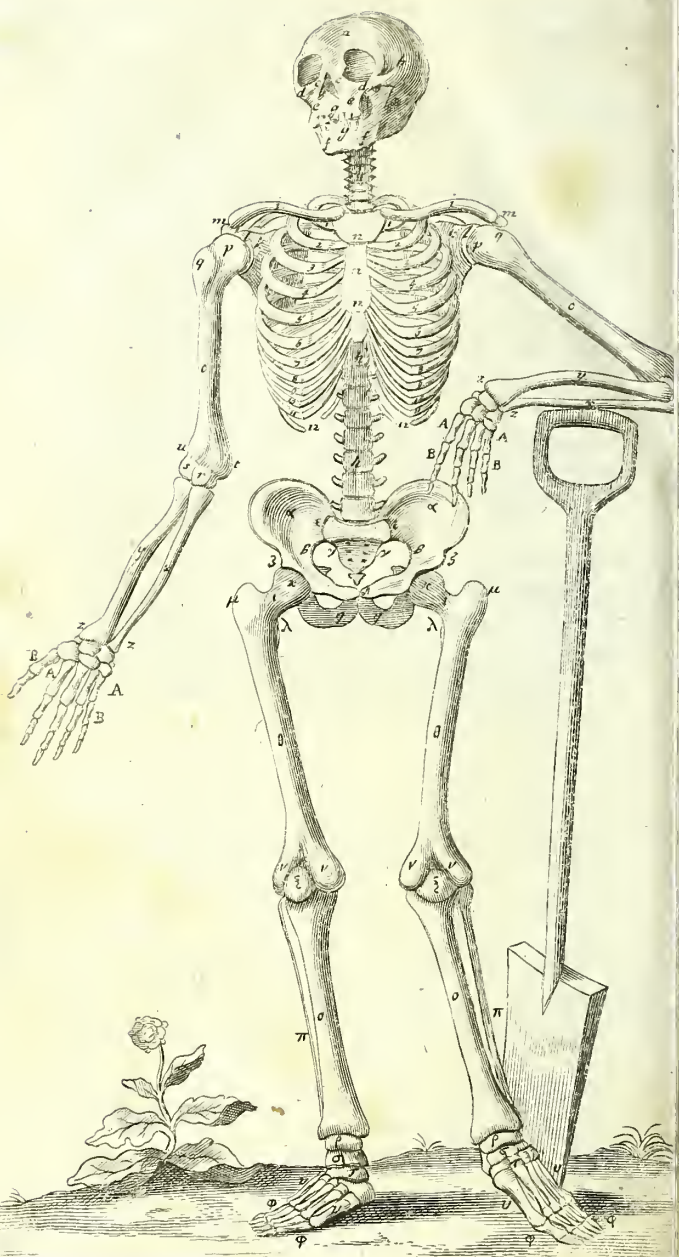
Their ſubſtance is very hard and ſolid, but they are hollow within like ſo many Pipes, and are longer than the bones of the back of the Hand. That which ſtayeth (or is articulated with)

with) the great Toe is thickeſt, but the longeſt is that which ſtayeth the next Toe: the other three grow each ſhorter than other, but are almoſt of an equal thickneſs. Their lower ends being round are inſerted into the *Sinus* of the firſt joynts of the Toes: but the upper in their own ſhallow *Sinus* receive the Bones of the *Tarſus*.

Of the Toes fourteen. The Bones of the *Toes* are in number *fourteen*; for the great Toe hath only two, but the reſt three. Theſe Bones are ſolid without, and hollow within like thoſe of the Inſtep. Their Articulation is altogether like that of the Fingers, ſo that we ſhall not need here to deſcribe it over again. And the mucilaginous Glands are likewiſe the ſame.

Each Foot has twelve *Oſſa ſeſamoidea*, as well as the Hands; which agreeing both in ſhape and ſituation with one another, the Reader may be ſatisfied concerning theſe of the Feet in the deſcription of thoſe of the Hand in Chap. XX.

Tab. XX.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Tab. XX.

Repreſenteth the *Skeleton* of an adult Body on its fore-ſide.

a *The* Os frontis.
b *The* Os temporis.
cc *The two bones of the Noſe.*
dd *The* Oſſa jugalia.
ee *The bones of the upper Jaw.*
f f *The lower Jaw.*
gg *The Teeth in both Jaws.*
hhhh *The* Vertebræ *of the Neck,* Thorax, *Loins and* Os ſacrum.
i *The* Claviculæ.
k *The* Scapulæ.
l *Their firſt Proceſs which articulates with the* Os Humeri.
nm *Their ſecond called* Acromium.
nn *The Bones of the* Sternum.
oo *The* Os Humeri.
p *Its upper and inner head that articulates with the* Scapula.
q *Its upper and outer head which ſerves for the implantation of Ligaments.*
r *The inner head of its lower* Appendix *which receives the* Ulna.
s *The outer head of the ſame* Appendix *which receives the* Radius.
u *The two Tubercles of the* Os Humeri : t *the internal,* u *the external.*
x *The* Ulna.
y *The* Radius.
z *The eight Bones of the* Carpus.
AA *The four Bones of the* Metacarpus.

BB *The four Fingers and Thumb, each of which consists of three Bones.*

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. *The twelve Ribs.*

αα *The* Os ilium.

ββ *The* Coxendix.

γγ *The* Os sacrum.

δδ *The* Os pubis.

εε *The connexion of the* Os Ilium *and* Coxendix *with the* Sacrum.

ζζ νν *The Tubercles of the* Coxendix: ζζ *The inner* νν *the outer.*

θθ *The Thigh-bones.*

ιι *The neck of the Thigh-bone.*

κκ *The upper head of the Thigh-bone that is received into the* Acetabulum *of the* Coxendix.

λλ μμ *The two Trochanters:* λλ *the inner,* μμ *the outer.*

νν *The two lower heads of the Thigh-bone.*

ξξ *The* Patella.

οο *The* Tibia.

ππ *The* Fibula.

ρρ *The* Talus.

σσ Os Naviculare.

ττ *The other Bones of the* Tarsus.

υυ *The five Bones of the* Metatarsus.

φφ *The fourteen Bones of the Toes.*

AN APPENDIX TO THE *SIXTH BOOK*:

Describing the

CARTILAGES, LIGAMENTS and NAILS.

CHAP. I.

Of a Cartilage.

AS an *Appendix* to the Doctrine of *Bones* we will add a word or two of the *Cartilages* and *Ligaments* of the Body: because the former come neareſt to the nature of Bones; and the latter, as they tye ſeveral other parts one to another, ſo eſpecially the Bones: and laſtly, of the *Nails*, which from their ſimilitude of ſubſtance are alſo conveniently ſubjoyned to the Bones.

A Cartilage (or Griſtle) *is a ſimilar part, cold, dry, and void of ſenſe, flexible, and not ſo hard as a Bone.* But when by age its glutinous particles are dried up, it many times degenerates into a Bone. *A Cartilage, what.*

Note, That though a Cartilage be of it ſelf of a dry ſubſtance, yet it is always kept moiſt on its *Why moiſt, and inſenſible.*

Superficies by a mucous or slimy humour that bedews it, whereby it is made slippery and fit for motion. *Note* also, that it is an insensible part, because it neither admits of Nerves nor Membranes, by which alone parts become sensible. Which was so ordered by Nature, because otherwise, seeing they are principally seated about the Joynts, all motion would have become painful. This has been the common opinion: But Dr. *Havers* says, that the Cartilages are covered with a Membrane (as the Bones are) which he names *Perichondrium*, (though it be only a continuation of the *Periosteum*) and that from it Fibres pass into the Cartilages themselves, whereby they are made (partly) sensible. Though he thinks the principal use of this Membrane, especially in such Cartilages as are joyned to any of the Bones, is to strengthen their conjunction.

As for the Cartilages of the Eye-brows, Ears, Nose, *Larynx*, *&c.* we shall not need here particularly to describe them, having done it where we treated of the respective parts; only we will observe in general, that all the Bones in their articulations one with another, (*viz.* such as admit of manifest motion) are covered or lined with Cartilages, for their easier and glibber motion; and sometimes themselves are the *medium* by which Bones are joyned, which articulation is called *Synchondrosis*, such as that of the *Ossa pubis*; others by tipping as it were the brims of the Cavities of the greater Joynts, make the *Sinus* deeper; and others lastly constitute parts themselves, as those of the Ears, *Larynx*, *&c.*

CHAP.

CHAP. II.

Of a Ligament.

A Ligament *is a similar part, cold and dry, of a middle Substance betwixt a Cartilage and a Membrane, appointed for the tying of sundry parts together.* *A Ligament what.*

Note, That as it is either harder or softer than is suitable to its proper nature, it acquires the Epithets of *cartilaginous* or *membranous* respectively: so, that which proceeds out of the top of the Thigh-bone and is inserted into the Cavity of the *Coxendix*, is called a cartilaginous Ligament, for its hardness; and that which environeth the joint of the Shoulder, is called membranous, from its softness. *Their differences.*

Those which tye Bones together are without sense, (for otherwise upon every Motion we should have been in pain:) but those that knit other parts together, (as those that tye the Liver, Womb, *&c.* to the neighbouring parts) are sensible. *Wky some are insensible.*

Ligaments are found in several parts of the Body. As *first*, the Head being moved upon the first and second *Vertebræ* of the Neck, there are four Ligaments to strengthen those Articulations. *Secondly*, a common membranous Ligament begirts the whole articulation of the lower Jaw with the Temple-bone. *Thirdly*, the Bone at the root of the Tongue has four, by which it is tyed to the neighbouring parts; and the Tongue it self has one strong one on its under side, (otherwise called its *Frænum*) which being too short, or running too near its tip, hindreth its motion. Children *An Enumeration of the principal Ligaments of the Body.*

dren being so troubled, are said to be Tongue-tyed, and must have it cut. *Fourthly*, both the Bodies and Processes of all the *Vertebræ* of the Back are knit together by Ligaments, as also are the Ribs with the *Vertebræ* behind, and with the Breast-bone before. *Fifthly*, sundry are to be seen in the *Abdomen*. The first tyeth the *Os ilium* to the *Os sacrum*. The second knitteth the *Os sacrum* to the *Coxendix*. The third and fourth knit the Share-bones together, one of them compassing them circularly, and the other, which is membranous, possessing their very *Foramen*, and sustaining the Muscles in that place. As for the Ligaments of the Liver, Bladder, *&c.* those were discoursed of when we described those parts in *B.* I. *Sixthly*, in the Arm these appear. 1. Five tye the *Os Humeri* to the Shoulder-blade. 2. The Bones of the Cubit, *Ulna* and *Radius*, are tyed first one to another; secondly, to the Shoulder-bone; and thirdly, to the Wrist by (mostly) membranous Ligaments. 3. There are two sorts of Ligaments at the Wrist; first an annular one, which going quite round the Wrist serves to confirm and make steady the Tendons of the Muscles which pass under it to the Fingers. Some make two of it; and then that on the outside is for the Tendons of the extending Muscles; and the other in the inner side, for the Tendons of the contracting Muscles. The other Ligament of the Wrist arising from the lower Processes of the *Ulna* and *Radius*, embraces and straitly ties together the Bones of the Wrist, and ends in the upper *Appendices* of the Bones of the *Metacarpus*. 4. The Bones of the *Metacarpus* are tyed one to another and to the Bones of the *Carpus* by common Ligaments. 5. The joints of the Fingers are also bound by common Ligaments: and in the Palm

of

of the hand there lies a tranſverſe Ligament that ties the firſt Bone of the Fingers to the Bones of the *Metacarpus*. *Seventhly*, In the Leg are theſe. 1. The Thigh-bone is tied to the *Coxendix* by two Ligaments. 2. The lower end of it is tied to the *Tibia* and *Fibula* by ſix Ligaments. 3. The *Tibia* is joined to the *Fibula* by three membranous Ligaments, *viz.* two common and one proper. 4. The *Tibia* and *Fibula* are joined to the *Talus* by three Ligaments; and there are three other for the ſtrengthening of the Tendons, that paſs under them, and confirming them in their places. 5. The *Talus* is tied with the other Bones of the *Tarſus* by five Ligaments. 6. The Bones of the Inſtep and Toes are tied with ſuch Ligaments as thoſe of the Hand are.

CHAP. III.

Of the Nails.

The Nails.

IN the laſt place we will ſay ſomething of the *Nails*, which though they are not *truly* parts of the Body, yet for their uſefulneſs ought not to be omitted.

Their Subſtance, Colour, &c.

They are of an horny tranſparent *Subſtance*, coming neareſt to that of Bones, faſten'd upon the ends of the Fingers and Toes for their defence. They are endued with no ſenſe, nor is that *colour* which they appear to be of upon the Fingers, owing to their proper ſubſtance, but to the colour of the parts that lie under them; whence they ſometimes look ruddy, ſometimes pale, blue or yellow, and thereby give ſome intimation of the ſtate of the Body. For thus in a ſwoon

ſwoon they look pale, becauſe little Blood is then driven into the fleſh that lies under them: in a Jaundice they look yellow from the Bile that is mixed with the Blood, *&c.* They grow very firmly to the ſubjacent Fleſh; and to faſten them the better, they are tied about their root with a Ligament, and on their ſides the Skin cloſes them in. The parts that lie under them are very ſenſible, for there are ſeveral twigs of Nerves and Tendons of Muſcles that run to the very Fingers ends; ſo that upon handling any hard or rugged thing we ſhould have been continually in pain, if theſe ſo ſenſible parts had not been thus defended by the Nails. Which Defence ſeems to be their principal Uſe; for their Uſe to ſcratch withall is but ſecondary and leſs conſiderable.

In what reſpect they are Parts of the Body.

They may in ſome ſenſe be reputed *Parts* of the Body, ſo as that it would not be perfect and intire without them: but that is but an *improper* Notion of a part. For if they were *properly* parts, they ſhould live by the common Life of the Body: but that they do not, ſeeing *they* as well as the *Hair* continue to grow after a Man is dead.

FINIS.