

THE GREAT  
THE THORN  
ANATOMY  
OF THE THORN  
**Humane Bodies**  
IMPROV'D,

According to the *Circulation of the Blood*,  
and all the Modern Discoveries.

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Publickly Demonstrated at the THEATER  
In the ROYAL GARDEN at PARIS,  
BY  
Monsieur *DIONIS*, Chief Surgeon  
to the late Dauphiness, and to the present  
Dutchess of BURGUNDY.

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Translated from the Third Edition,  
Corrected and Enlarged by the AUTHOR,  
With an Ample Dissertation upon  
The Nature of GENERATION;  
And several New Systems.

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With FIGURES of all the Parts of the Body,  
AND  
An Useful INDEX of the Principal Matters.

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L O N D O N,  
Printed for *H. Bonwicke* in St. Paul's Church-yard,  
*W. Freeman*, *T. Goodwin*, *M. Wotton*, *B. Tooke* in Fleet-  
street, and *S. Manship* in Cornhil. M DCC III.

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October the 26<sup>th</sup>. 1702.

**W**E the *President* and *Censors* of the *Royal*  
*College of PHYSICIANS in London,*  
whose Names are hereunto subscrib'd, having  
Perus'd and Approv'd this Anatomical and  
Physical Book, entitl'd, [*The Anatomy of Hu-*  
*mane Bodies Improv'd, according to the Circula-*  
*tion of the Blood, and all the Modern Discoveries ;*  
*Publickly Demonstrated at the Theater in the*  
*Royal Garden at Paris, by Monsieur DIONIS,*  
*Chief Surgeon to the late Dauphiness, &c.*]  
do judge it Worthy to be made Publick.

*Tho. Millington, President.*

*Walter Charleton,*

*Robert Pitt,*

*Samuel Garth,*

*Humphry Brooke,*

} *Censors.*

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THE  
TRANSLATOR'S  
PREFACE.

**T***Hough the World is overstock'd with Books on all Subjects, yet the Publication of this will be reckon'd no difference, by those, who are acquainted with its distinguishing Excellency. The Multitude of superficial performances, can be no Argument against the reception of a choice Treatise; provided the Reader is so wise as to distinguish Lumber from an useful Piece. Not that I mean to detract from our English Anatomists, in order to magnify a forreign performance: For I am very sensible that England has produc'd as great Men in that way as any Nation in the World, and that the Discoveries they have made and communicated to the World in the Language of the Learned, are at least of equal Importance with any that have appear'd elsewhere. The Circulation of the Blood, discovered by our Countryman, Dr. Harvey, is a lasting Monument of English Industry; and what he in former times Demonstrated to our Reason, is now made visible to the Eye by the help of Microscopes. But 'tis needless to vindicate the Ingenuity of our*

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English Anatomists, since the forreign World is so sensible of their Merit.

I only say that I take this Anatomical Treatise to be the most methodical and the compleatest General Systeme that has yet appear'd in any Language. 'Tis not the product of pure Theory, but real Matter of Fact; being a full Description of what was actually and visibly Demonstrated by the *Sieur Dionis*, a famous French Surgeon, before a very great Audience; for besides the Learned Faculty of Paris, and the Company of Master Surgeons, the Students of both Professions, and several other curious Gentlemen were present: And indeed it must be own'd that among many great things which the French King has done for the Advancement of Learning, that Noble Structure of the Theater, where Anatomical Exercises and Chirurgical Operations are publickly shewn at his charge, has a just Title to the first rank.

In a word, the Book will speak sufficiently for it self; for here every Part of a Humane Body is so fully and narrowly survey'd; The Substance, Magnitude, Connexion, and Uses of every Part are so clearly explain'd; that nothing can be wanting to the Satisfaction of those who are curious in this way, and the Instruction of the Students of Physick and Surgery. Here the Reader will meet with all the new Discoveries, that of late years have been so plentifully made by the help of Microscopes; for want of which the Ancients could not reach such useful parts of Knowledge. In fine, the whole Series of these Lectures or Demonstrations, is suited to the Modern Discoveries, and interlac'd with distinct Accounts of the respective Hypotheses.

When

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*When our Author spoke these Lectures, he Dissected at the same time; and shew'd the Parts to the Eye, while he discoursed their Description and Uses. For this reason he gives his Discourses the Title of Demonstrations, and the Translator thought it improper to depart from the Author's choice.*

*They have bore Three Impressions in French, and one in Latin; But the Third Edition, from which this Translation is took, contains not only very large Additions, but very material and frequent Alterations; and for that reason 'tis presum'd this Translation may justly claim a preference to the Latin, which was done from the First Edition.*

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THE  
AUTHOR'S  
PREFACE.

**T**H O' *Anatomy* was very imperfect in the time of the Ancient Philosophers, yet, in regard of the excellency of its object, they allotted it the first rank among the natural Sciences. But what respect does it now deserve at our hands? Now that 'tis become the most certain of all the parts of Medicine, by virtue of the great number of discoveries that have been made, and are still pursued every day.

Those who are *Happily* dispossess'd of a partiality to the Ancients, and follow such principles as are grounded upon Experience and Reason; Those, I say, oblige us with a clear and mechanical explanation of all the Points in *Anatomy*, that we formerly reckon'd the obscurest and most perplex'd.

I say, *Happily*; For the Ancients being unacquainted with the Course of the Blood, and fancying that the Liver sent it out by the Veins to all the parts of the Body in order to their nourishment; 'twas impossible they should avoid Errour, or draw just consequences from a false principle that is now sunk by the Circulation of the Blood.

I do not pretend to prove the Circulation of the Blood in this Preface; The disposition of the parts, which you'll see in the insuing Course of *Anatomy*, will convince you more effectually than any

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allegation I can produce. I only would give you to know, that through the whole course of these Lectures I lay down the Circulation of the Blood as a standing principle, both for confirming the sentiments of modern Authors, and confuting the Errours of the Ancients.

'Tis by the means of the Circulation that we trace the remotest Functions of the Humane Body: and discover that the faculties which the Ancients ascrib'd to different Parts, to the Breasts, for instance, a faculty of making Milk, to the Testicles that of making Seed, &c. We discover, I say, that these faculties are only the separation of the respective Liquors, which being first mingled with the Blood are filtrated and disengag'd from its other Parts, in the Breasts, Testicles, &c.

If we do but conceive that this Circulation runs from the Center to the Circumference through the Arteries, and from the Circumference to the Center through the Veins; we'll presently be sensible that not only these two Liquors (the Milk and the Seed) but all the other are separated from the Blood by the sole disposition of the Parts, the figure of which is contriv'd so as to afford a passage to one sort of Liquor rather than to another. 'Tis in this manner that the Animal juice is separated by the Glands of the Brain, the *Saliva* by the Parotides and maxillary Glands, the Bile by the Glandules of the Liver, the Urine by the Kidneys, the Pancreatick juice by the Sweat-bread, and so on.

For a further Proof that all these Liquors are separated from the Mass of Blood by the means of the Circulation; we may look upon this as a certainty, that what we call Blood is only a mixture of several different Liquors, which being convey'd by the Arteries to all the parts of the Body fall off where they meet with such Pores as are qualify'd to let 'em pass. This separation therefore is a consequence of the structure of the Parts, so that they stand in no need of the faculties call'd

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*Attractrices, Retentives, and Expultrices*; which the Ancients assign'd 'em without any ground.

For several Ages the World had such a blind deference for these first Anatomists, that 'twas a crime to depart from their sentiments; and nothing could pass for truth, but what was found in their Writings, especially those of *Galen*, for whom they had a particular Veneration. But this Age has produc'd more curious and bold Anatomists, who have shook off the yolk of so severe a Law, it being opposite to Reason and to the progress of Sciences. These Anatomists have had the courage to Publish their Discoveries, and have demonstrated them notwithstanding the bigotry and opposition of the sticklers for Antiquity, who brand-ed them for Innovatours and rash Authors.

But after all, tho' I censure some Errours of the Ancients, yet, I do not mean that we are less obliged to them than to the Moderns. On the contrary, I affirm that we owe to them the first knowledge of Anatomy. Who can deny that *Galen* knew more of Anatomy than any that went before him? Doubtless, the Reason why he did not find out all, is because one Man is not able to compass it.

The Discoveries of the Moderns stand upon the same foot; for 'tis certain that tho' they are very numerous, yet there are so many things left undiscovered, that we ought still to make fresh efforts for enlarging our knowledge. Besides, there is so great a difficulty in distinguishing all the springs of our machine, that 'twill always leave work enough for the thoughts and the hands of those who come after us, if they mean to give a mechanical explication of all the actions that retain to it.

We must not imagine that the new Discoveries have made any alteration in the Composition of Humane Bodies, or added any thing to it. The Compofure is the same that it ever was: Only the



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Moderns have found out some things in it, that were not formerly known. It falls upon the same lay with the Countries of *America* that have been discover'd within these few Ages: for 'tis very well known that these Countries are of equal standing with the other parts of the World; only they were unknown to some Men, just as some Parts of the Body were to the ancient Anatomists.

The sticklers for Antiquity, in opposition to the modern Discoveries, alledge; that 'tis of no use to know whether the Chyle is convey'd to the Liver by the Mesaraick Veins, or to the Heart by the Lacteal Veins and the Thoracick Duct; upon the consideration that the resolution of that question either way makes no alteration in the practice of Physick, and that Physicians continue still to purge and bleed just as they used to do in former times. But supposing it true, that such discoveries do not alter the Cure of some Diseases, yet 'tis certain they prevent mistakes in the cure of others, and being grounded on a more sure and solid foundation than that of the Ancients inable us to reason more justly.

If *Anatomy* is much indebted to *Harvey* who discover'd the Circulation, to *Virfungus* who found out the Pancreatick Duct, to *Afellius* who first trac'd the Lacteal Veins, to *Pecquet* who first demonstrated the Thoracick Duct, and to several other Moderns who have successfully improv'd the Science; 'tis equally oblig'd to his Majesty's goodness, who has re-established the Publick Dissections in the Royal Garden, and ordered Anatomical Lectures suitable to all the discoveries we have made of the Parts of Humane Bodies.

These Anatomical Exercises were reviv'd in the Royal Garden, in the Year 1672; after a discontinuation of several Years. Mr. *de la Chambre* the Anatomy Professor, being the Queen's First Physician, was diverted from attending these Lectures: and therefore Commission'd Dr. *Cresse* a Member of the Faculty of *Paris* to pronounce the Anatomical



## The AUTHOR'S PREFACE.

mical Discourses, and nominated me for making the Dissections and Demonstrations.

Tho' this establishment was of singular use to the Publick, yet it met with opposition from some, who pretended that the right of Dissecting and making Anatomical Lectures was lodg'd in them only. But his Majesty stilled the opposition by a particular Declaration, which was ratify'd and recorded in the Parliament of *Paris*, *March* 1673. His Majesty himself being present. In this Declaration, his Majesty ordered that Anatomical dissections and Chirurgical Operations should be perform'd *gratis* and with open doors, in the Amphitheatre that he had built for that purpose in the Royal Garden; and that his Professors should have the preference of all others in being serv'd with such Corps or Subjects as were necessary for carrying on these Exercises.

Pursuant to his Majesty's commands, I Dissected publickly for eight Years together, that is, from the Year 1673 to the Year 1680, at which time his Majesty did me the honour to nominate me for being First Surgeon to the Dauphiness of *France*; and my accession to this honourable Post oblig'd me to discontinue the publick Dissections.

The number of Spectators, which always amounted to 4 or 500, was sufficient evidence that my Dissections pleas'd and were useful to the Publick. But the thing that perplex'd me most among so great a number of Scholars, was, that most of them ask'd me what Book they should read in order to be acquainted with the Modern Discoveries, and to have a refreshing view of the Parts that I shew'd 'em: For the Parts not being methodically describ'd in any Book that I know, I protest I knew not which to pitch upon. 'Tis true, *Riolanus* and *Bartholin* seem to own the Circulation of the Blood, but at the same time all their writings are tinctur'd with the leaven of the Ancient Opinions, So that I could not possibly find them a trusty guide to

## The AUTHOR'S PREFACE.

conduct them through the road that I had chalk'd out; and upon that score they desir'd an Impression of my Anatomical Demonstrations, which I had granted sooner if I had not been call'd to attend the Court.

Since that happen'd, Monsieur *de la Chambre* dy'd; and his place being fill'd by one of the most celebrated Anatomists, whose knowledge is infinitely preferable to mine, I hop'd to be excus'd from the trouble of Printing my Demonstrations, upon his promise to outdo all that went before him, and to oblige the Publick with a Course of Anatomy, that would be so perfect and so different from all the Books of that nature yet known, that the World would own him to be the fittest Person for a work of that importance.

Questionless, his great and continual services in the Academy of Sciences, have diverted him from putting in execution his project upon such a vast Subject: for the Publick has been big with hopes of some mighty performance for several years, and hitherto their hopes are frustrated. Upon this consideration, I resolv'd to Print my Demonstrations, in order to render the knowledge of Anatomy easy to the Students of Physick and Surgery.

I am very sensible that another might have been fitter for such a performance, and I protest sincerely that *that* was the chief Reason which mov'd me to put it off so long. Besides, I take the Character of an Authour to be such a dangerous thing, that I cannot assume it without reluctance. But my regard to the publick interest, and the sense I have of the want of a Book to describe the Parts as they are publickly shewn, mov'd me to run the risque of all censures.

In this Treatise, the Osteology leads the Van; by reason that *that* Part commences our Exercises in the Royal Garden, and that the knowledge of the Bones ought to usher in that of all the other Parts.

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Parts. I divide my Osteology into eight Demonstrations, *viz.* Two of the Bones in General, Two of the Bones of the Head, Two of those of the Trunk, and Two of those of the Limbs.

In the next place, I carry on our course in Ten Anatomical Demonstrations, *viz.* Four for the *Abdomen* or *lower-belly*; Two for the Parts of the *Thorax* or *Breast*; Two for those of the *Head*; and Two for the *Limbs*.

The beginning of each Demonstration is fronted by a *Table* that represents the Parts describ'd in that Lecture: And the Alphabetical Letters engrav'd in the Cut, are plac'd in the Margent of the Discourse that relates to such and such Parts; so that the Reader may have an easy recourse from the one to the other.

I own that 'tis more instructive to see any Part in a real Corps than in a Cut: But besides, that, these Cuts are very exact, and as correct as any are; Anatomical Dissections are so unfrequent in most Counties, that the Country Surgeons can scarce have the opportunity of seeing one in a lifetime: And 'tis upon their Account that I have caus'd these Plates to be engrav'd in order to supply the want of Anatomical Dissections. Their size is of a piece with that of the leaves of the Book; and tho' they are small, yet they are not the less useful, for I have us'd all possible exactness in ranging the parts of each Demonstration in a small compass.

I did not think it fit to divide my Demonstrations into Chapters, because they contain in a continued series all the Parts that I shew'd at each Lecture, with their Names mark'd in the Margent. This method I took to be more proper for Students, to the end that they might not be put to the trouble of hunting through different Chapters for the Parts that fall within one Demonstration. Pursuant to this method 'twill cost them but ten days labour to view all the Parts of a Man, and so they

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they will easily trace the greaest curiosities of Anatomy.

My repeated reflections upon the business of my profession, and the reading of new Physical Books, which I always take care to pick up; have given mean opportunity of correcting in this third Impression many of my first thoughts, and adding such of the modern Systems as I found most reasonable.

To this last Edition I have added a Dissertation upon the nature of Generation, which proves the Systeme of the Eggs, and explains it after a new manner. If the Reader vouchsafes to peruse it with attention, he'll find that my Reasons are only grounded upon the structure of the Parts, and such matter of fact, as shews, that Man and all other Animals are ingendred by the means of Eggs.

I have likewise added an account of a particular case which was sent me from *Brest*. I mean, *that* of the extraordinary dilatation of an Auricle of the Heart, which will surprize all that look upon it. I have caus'd it to be drawn in its natural dimensions, and the Narrative is real matter of fact.

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Comprehending  
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DEMONSTRATIONS.

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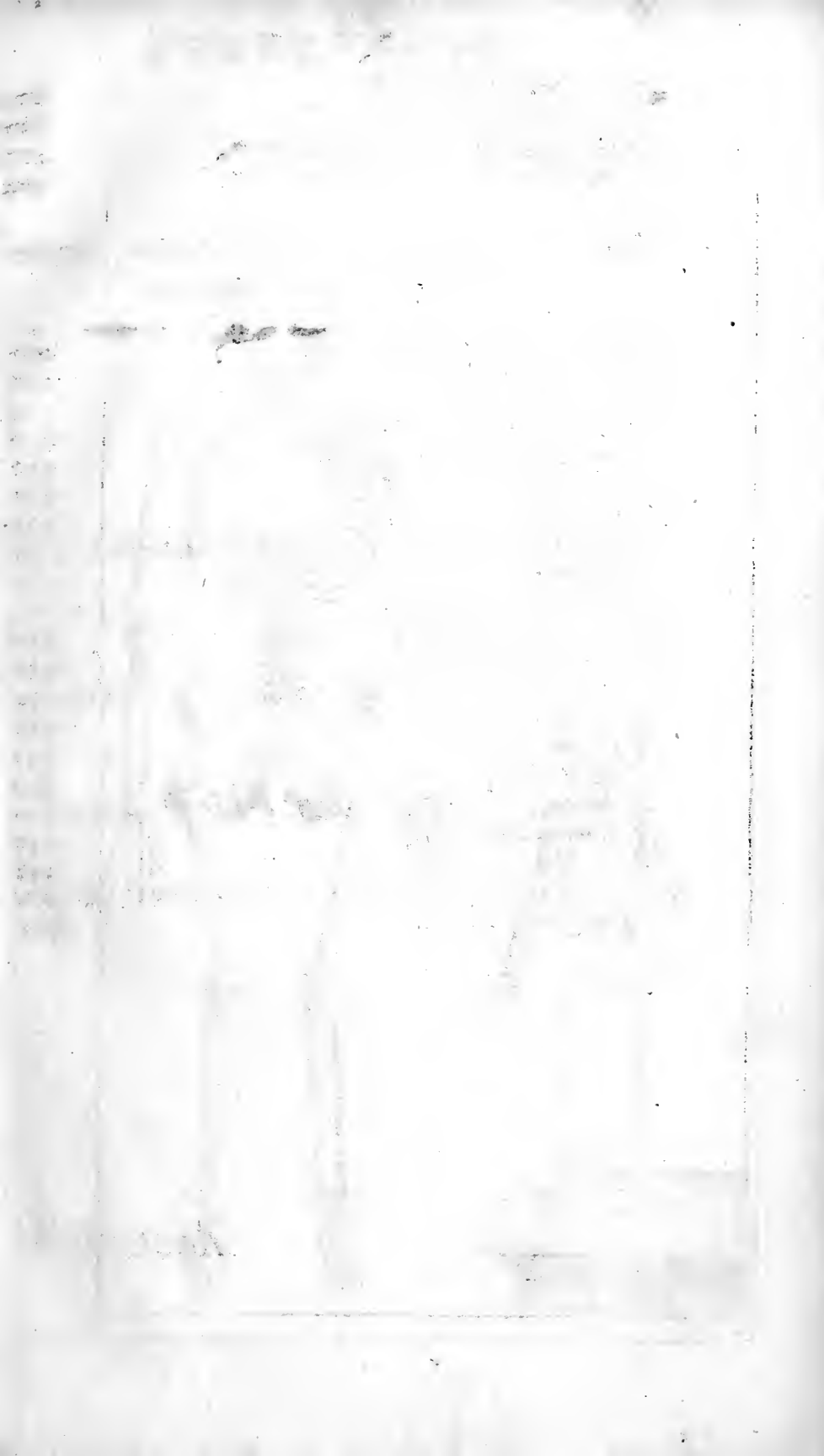
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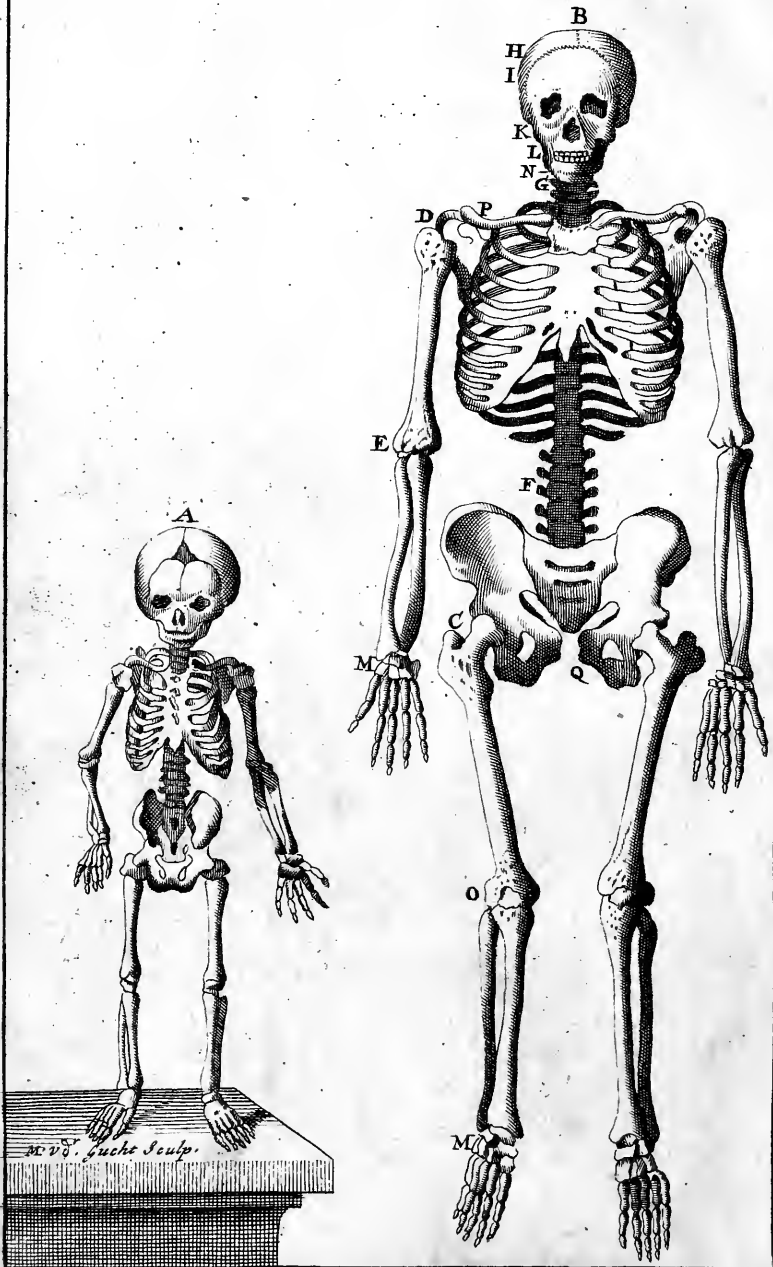
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*Anatomical Demonstrations :*

O R,

LECTURES

Made in Publick at the

King's *Physick-Garden* in *Paris*.

---

*Of the BONES in General.*

THE FIRST DEMONSTRATION.

**Y**OU know, Gentlemen, that SURGERY What Surgery is. is an Operation of the Understanding, which considers the Maladies of a Humane Body ; and that it is likewise an Operation of the Hand, which manages the Instruments and Remedies that are requisite to cure them : insomuch that for the better performing what is required, not only the knowledge of a sound state ought to precede that of an infirm, but the Surgeon ought to know Man in his perfect state, and the good conformation of all Parts of his Body, that he may be the better able to re-establish his Health, when it comes to be altered or destroyed, by some Disease, or ill Accident. The Usefulness of Anatomy. It is by Anatomy, Gentlemen, that he must acquire this Knowledge, seeing it is the *basis* and foundation of Surgery ; it is by this, that he unravels and dissects the most minute Parts, of which this admirable Structure is composed, that he searches into all the

B springs

springs and motions, and finds out whatever is curious or secret in Nature.

And here would be a fair opportunity to praise and extol Anatomy, and to let you know at the same time the indispenfable neceffity of understanding it, if a Man would ever become an expert Surgeon. But being perfuaded that all this Afsembly, though very numerous, are fufficiently convinced of this truth, I thought it more proper to enter immediately upon our bufinefs, and to examine with what Parts of the Body we are to begin.

Authors are divided in their Opinions upon this Article. *Bartholin* thinks we ought to begin with the Teguments, to proceed with examining the *Viscera* and Muscles, and finish with the Bones. His reason is, that the Bones cannot be examined, but when they come in their order to be viewed; and that their view can't be taken, till all the other Parts have been separated from them.

*Bartholin's*  
Opinion.

On the contrary, *Galen* would have us begin with the Bones, and gives feveral Reasons for his Opinion. He fays, it is the Bones which do give Man that erect figure, which he has by way of excellence above all other Creatures; and that by their being a foundation and fupport to the reft of the Body, they do likewise ferve for a connexion of the Muscles: And he maintains, that it is impoffible to understand *Myology*, until he has known the Bones, and what gives the Muscles their origin and infertion. For Example, he fhews, That if the Surgeon does not know what the *Humerus* is, the *Scapula* and the *Clavicle* when the *Musculus Deltoides* is fhewn, which is one of thofe that help to lift the Arm upwards, he would have no comprehension of the matter, when he were told that this Muscle has its origin from the middle of the *Clavicle*, the *Acromium*, and from all the Spine of the *Scapula*; and that it proceeds to make its infertion about the middle of the *Ossis Humeri*. And laftly, he adds, That the Bones being perforated in divers places for tranfmiffion of the Nerves, Arteries and Veins, the ways and *Ductus* through which they do pafs can never be explained, before the ftructure and difpofition of the Bones is firft known.

*Galen's* Opin-  
ion, which  
Parts are firft  
to be confi-  
dered.

Why a Ske-  
leton is firft  
to be known.

*Laurentius* adds to thefe Reasons, That in the Schools of *Alexandria* a Skeleton was firft of all brought to the view of all Students in Phyfick and Surgery; as the only means for their attainment of the knowledge of a Hu-



a Humane Body, and for the practice of Surgery in all its Operations. In effect, how can a Surgeon make reduction of Fractures and Dislocations, if he does not understand the structure of the Bone that is fractured and dislocated; if he does not know that the Bones of the Leg, or Arm, are forty days in forming their *Callus* when fractured; that the Clavicle requires thirty days, and the Ribs twenty; that the *Callus* is sooner made in Infants than adult Persons, because their Bones are more tender and consequently fuller of moisture. And lastly, that to cure a Wound where the Bone lies bare or is injured, he ought to know the substance of the Bones, and that some of them are softer, and exfoliate more slowly, and that the exfoliation which happens at the extremities of a Bone is sooner made than that of the middle, because this is always more solid than the extremities.

The Reasonings of *Galen*, and *Laurentius* do become the stronger, from what does happen in Publick Anatomies; we find that though they are constantly made in the Winter time, yet we have much adoe to keep the Body sweet, during the operations, and by reason that we have such a multitude of parts to examine, we are fain to lay aside the Osteology for those times, because that may be more conveniently shewn with a Skeleton at any time of the year. All these reasons therefore ought to convince, that we ought to begin with the demonstration of a Skeleton, before we come to make the Dissection.

Reasons for beginning with a Skeleton.

A Skeleton is an orderly connexion of all the Bones that belong to a Body. There are two sorts of them; the one Natural, which is prepared with all its proper ligaments, and where the Bones have never been separated asunder; such as is this little one, represented in the first of these Tables; and the other is Artificial, when the Bones are joined together with wires, such as is the great one there described, and upon which I shall pursue my demonstration of Osteology.

What a Skeleton is.

A Natural Skeleton.

B An Artificial Skeleton.

The Science which treats of Bones is called Osteology, from the Greek *ὀστέον*, signifying a Bone, and *λογία*, a discourse.

The Etymology of Osteology.

All that this Science contains, is reduced to the examination of what belongs to the Bones in common, and what to each in particular.

Two things to be examined in Bones.

We shall understand what belongs to them in common, after we shall have examined six things, which are their

What is common to them in general.

their Definition, their Differences, their Articulations, their Causes, their Parts, and their Number.

What is common to them in particular.

I will also remark to you what belongs to them in particular, when I come to treat of each Bone separately by it self.

Two demonstrations of the Bones in general.

I do purpose to give you two demonstrations of the Bones in general; in the first I shall only speak of their Definition, their Differences, and their Articulations; and in the other I shall entertain you with discoursing on their Causes, their Parts, and their Number.

What a Bone is according to the Antients.

A Bone is Defined by *Galen*, to be the hardest, the driest, and most terrestrious part of all the Body. *Laurentius* adds to this Definition, *engendred by the formative faculty, through the means of a great heat, from the thickest and most terrestrious part of the Semen, to be a support to all the body, and to give it its rectitude and figure.*

The Word Faculty no longer in use.

I cannot allow of this last Definition, because it comprehends divers things that appear to me to be useless, and that this Word, *Faculty*, does not agree either with the Idea that we have of the formation of Bones, nor with their Uses. It is true the Antients made use of it for explaining all the actions and functions of the Body. And when they were asked how the Chyle, or the Bloud was formed? how the Bones or the Cartilages were made? how Vision and Hearing were performed? they answered, that the Stomack had a Chylifying faculty, and the Liver a Sanguifying faculty, that the Bones were formed by an Ossifick faculty; and the Cartilages by a Cartilagineous; that the Eye saw by its visive, and the Ear heard by its auditory faculty, and so of the rest.

This was their general answer, by which they did evade, as well as by their occult qualities, all the difficulties that were propounded to them; insomuch that Scholars were made no wiser by their answers, than they were before. But now-a-days all these actions being explicated mechanically, I shall let you see, by demonstrating every part exactly, that the action which each of them has, does absolutely depend upon its structure, being a necessary consequence of its natural disposition, so that it cannot do otherwise than it does.

To return then to the most rational Definition; that can be given of a Bone, I shall say that it is the hardest, and most solid part of the Body of an Animal.

# The FIRST DEMONSTRATION.

§

The Differences that are observed in Bones, are taken from nine things, to wit, from their Substance, Quantity, Figure, Situation, Uses, Motion, Sense, Generation, and Cavities. Nine Differences of Bones.

The First Difference that is taken from their Substance, is because there are Bones which have a very hard Substance, as the *Tibia*; others less hard, as the *Vertebrae*; and others more soft and spongy, as the bone the *Sternum*. From their Substance.

The Second is taken from their Quantity, the number of which it is not easy to determine, because it is very great, and that all the Bones are not equal. For some are large, as those of the Arms and Legs; some more moderate, as those of the Head; and some small, as those of the Fingers. From their Quantity.

The Third is taken from their Figure, which is as different as there are Bones in the Body; some are long, as the *Femur*, or the *Tibia*; others short, as the Bones of the Wrist and the Heel; some round as the *Rotula*; others flat, as that of the Palate; others square, as the *Ossa Parietalia*, and some triangular, as the first Bone of the *Sternum*. Figure.

The Fourth is remarked from their Situation, because some are placed in the Head, others in the trunk of the Body, and others in the extremities. But we must observe, that among those of the Head, some have a deeper Situation, as the three *Ossicula* of the Hearing, and others a more superficial, as those of the *Cranium*. Situation.

The Fifth proceeds from their Uses, some serving to support the Body, as the Bones of the Thighs and the Legs; others to contain parts, as the *Costae* that inclose the Heart and the Lungs, and others both to contain and defend, as the Bones of the *Cranium*, in respect of the Brain. Uses.

The Sixth is known by their Motion, because some of them have a manifest motion, as the great Bones of the extremities; others a secret one, as those of the Wrist and the Heel; and some have no motion at all, as those of the Head. Motions.

The Seventh difference is easy to observe, because generally all the Bones have no Sensation except the Teeth. Sensation.

The Eighth is taken from the time of their generation and perfection, because some of them do grow to perfection, even from the Mothers Womb, such as the small Bones that lie in the Cavities of the Ear; and there are others which grow to perfection, with time and years, as do all the Bones of the Body. And of these Generation.

some do harden sooner, as the lower Mandible, and some later, as those of the *Vertex* or top of the Head.

From their Cavities.

The Ninth and last Difference is taken from their Cavities; some have very large Cavities, for reception of the Marrow, as those of the extremities of the Body, and some have only porosities, which contain a medullary juice, as the *Calcaneum*. Again some of them have holes for transmission of the Vessels, as the Bone of the *Basis* of the *Cranium*, and the *Vertebra*; others have only a hollowness, as the *Os Sternum*, and and some sinus's, as the *Ossa Frontis*, and *Temporum*; and lastly some consist of abundance of little holes like a Sieve, as the *Os Ethmoides*.

The Articulation of Bones exceeding wonderful.

There is such an Art and Industry in Nature in the Articulations and Conjunction of the Bones, that the observation of them has been very useful to a great many Artists by way of Model, they knowing how advantageous it was to copy by so excellent an Original. And although there are almost as many different Articulations as you see there are Bones joined together, yet they are all necessary; for if all the Bones had been Articulated after the same manner, the Body could not have moved so conveniently as now it does. And now let us examine all these Articulations.

Bones joined by Articulation, or by *Symphysis*.

*Galen* teaches us that all the Bones are conjoined, either by Articulation or by *Symphysis*. The first is a natural conjunction of two Bones, touching one another by their extremities; and the second is a natural union, or firm adhesion, as when Bones that were at first plainly distinct, do seem to be grown altogether one Bone.

Two kinds of Articulation.

There are two sorts of Articulation; one called *Diarthrosis*, and the other *Synarthrosis*. I doubt not but these Words will appear uncouth and barbarous: But because Anatomy and Surgery are fain to borrow the greatest part of their Terms of Art from the Greek, and it is difficult to find words in our Language, that are so proper for signifying the same things as they do, we become obliged to make use of them. Nevertheless I shall forbear using them as much as possible, though there is certainly much less difficulty in keeping to them, than in avoiding them. You will be of my mind if you will take the pains to understand them.

The Terms of Anatomy taken from the Greek.

What *Diarthrosis* is.

The *Diarthrosis* is a kind of Articulation, in which the motion is manifest. It is divided into three sorts, *Enarthrosis*, *Arthrodia* and *Ginglymus*. *Enar-*

*Enarthrosis* is when a large and long Head is received into a deep Cavity, as the Head of the *Femur* is received into the Cavity of the *Os Innominatum*.

C  
Enarthrosis.

*Arthrodia* is a kind of Articulation, wherein a superficial Cavity does receive a flat Head, as you see the Head of the *Humerus* is received into the *Glenoide* Cavity of the *Scapula*, or the Heads of the *Metacarpus*, or *Metatarsus* are received into the Cavities of the first *Phalanx* or rank of the Bones of the Fingers.

D  
Arthrodia.

*Ginglymus* is a third sort of Articulation, in which two Bones do mutually receive one another, so that the same Bone does receive into it another, and is likewise received into the other, as the Bone of the *Carpus*, which is received into that of the *Os Cubiti*, and that of the *Os Cubiti* into that of the *Carpus*.

E  
Ginglymus.

According to Authors, there are three sorts of *Ginglymus*; the first is, when the same Bone is received by another Bone, the which it does reciprocally receive, as we observed in the *Os Cubiti* and the *Carpus*. The Second is, when one and the same Bone does receive another at one end, and is received by another Bone at its other end, as you may observe in the *Vertebrae*, whereof one of them does receive its superior, and is received by its inferior *Vertebra*. The third sort is, when a Bone is received into another, like an Axel-tree in a wheel, as the second *Vertebra* of the Neck is received by the first.

F  
Another  
Ginglymus.

*Synarthrosis* is an Articulation so firm and strong, that it has no distinct motion. It has likewise three sorts, the Suture, *Harmonia* and *Gomphosis*.

G  
A third  
Ginglymus.

What *Synarthrosis* is.

Suture is an Articulation where two Bones are so joined as if they had been sown together. There is a true and genuine, and a false or bastard Suture. The true Suture is, when two Bones are conjoined like unto two Saws, whose teeth meet close together, as the *Ossa Parietalia*, so called, with the *Os Coronale*. The false Suture is, when two Bones are articulated in form of Scales or *Laminae* placed one over the other, as the *Parietalia* with the *Os Temporum*. I shall reserve the explication more at large of the other kinds of Sutures, to speak of in the following Demonstration, when I come to treat of the Bones of the *Cranium*.

What's a Suture.

H  
The true Suture.

The false Suture.

*Harmonia* is an Articulation where the Bones are joined in a simple straight line, or a circular, as the Bones of the Face, the Nose, and the Palate. If we examine

K  
*Harmonia*.

the Bones of the upper Jaw, we shall find their conjunction to be by small toothings; but because they are exceeding small, and do not appear to outward view, as those of the Sutures do, we are fain to distinguish *Harmonia* from a Suture, and so make this the second kind of *Synarthrosis*.

**L**  
*Gomphosis.*

*Gomphosis* is a compact Articulation, when one Bone is sunk or driven hard into another, as a nail is into a piece of Wood, or rather as the Teeth are into their *Alveoli* or Sockets.

**MM**  
The Neutral  
Articulation.

Another kind of Articulation is added to all these, and is called Neutral or Dubious, because it is neither wholly a *Diarthrosis* as having no manifest motion; nor is it altogether a *Synarthrosis*, being not entirely deprived of motion. Such is the Articulation of the *Costæ* with the *Vertebrae* of the Back, and such is that of the Bones of the *Carpus* and the *Tarsus*, among one another. This therefore partaking of both those Articulations is called *Amphiarthrosis*, and according to some *Diarthrosis Synarthrodialis*.

Of *Symphysis.*

*Symphysis*, which I have said to be a natural union of Bones, is of two sorts, either made without some intermediate Substance, or with it.

*Symphysis*  
without me-  
diura.

That which I call without some intermediate Substance is, when we find nothing at all that makes the union of the two Bones, as the *Epiphysis*, or Appendage with the principal Bone to which it is adjoined; or as we observe in the Bones of the upper Jaw. This union is something like that of a Tree, and its Graft which are so united together, that they both make but one Body: and thus Nature by hardning the Bones of the lower Jaw, and the *Epiphysis*, thereto belonging, does so conjoin them, that they make one and the same continued Body.

*Symphysis*  
with means.

*Symphysis* that is made with some intervening substance, is of three sorts, *Synneurosis*, *Sysarcosis* and *Synchondrosis*.

*Synneurosis.*

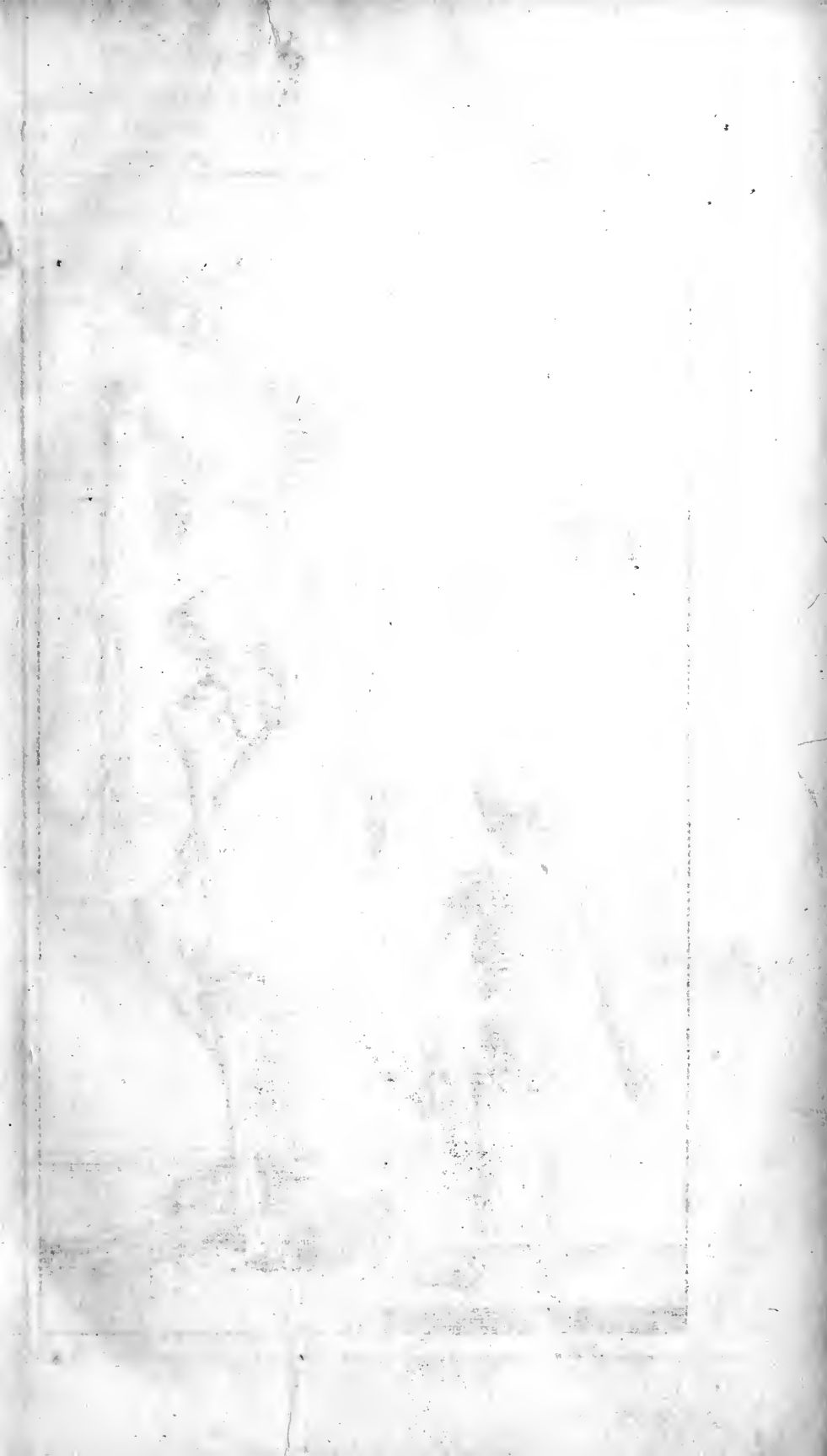
*Synneurosis* is that kind of *Symphysis* which unites Bones by the means of Ligaments intervening; such is the Articulation of the *Rotula* or *Patella*, with the *Tibia*.

*Sysarcosis.*

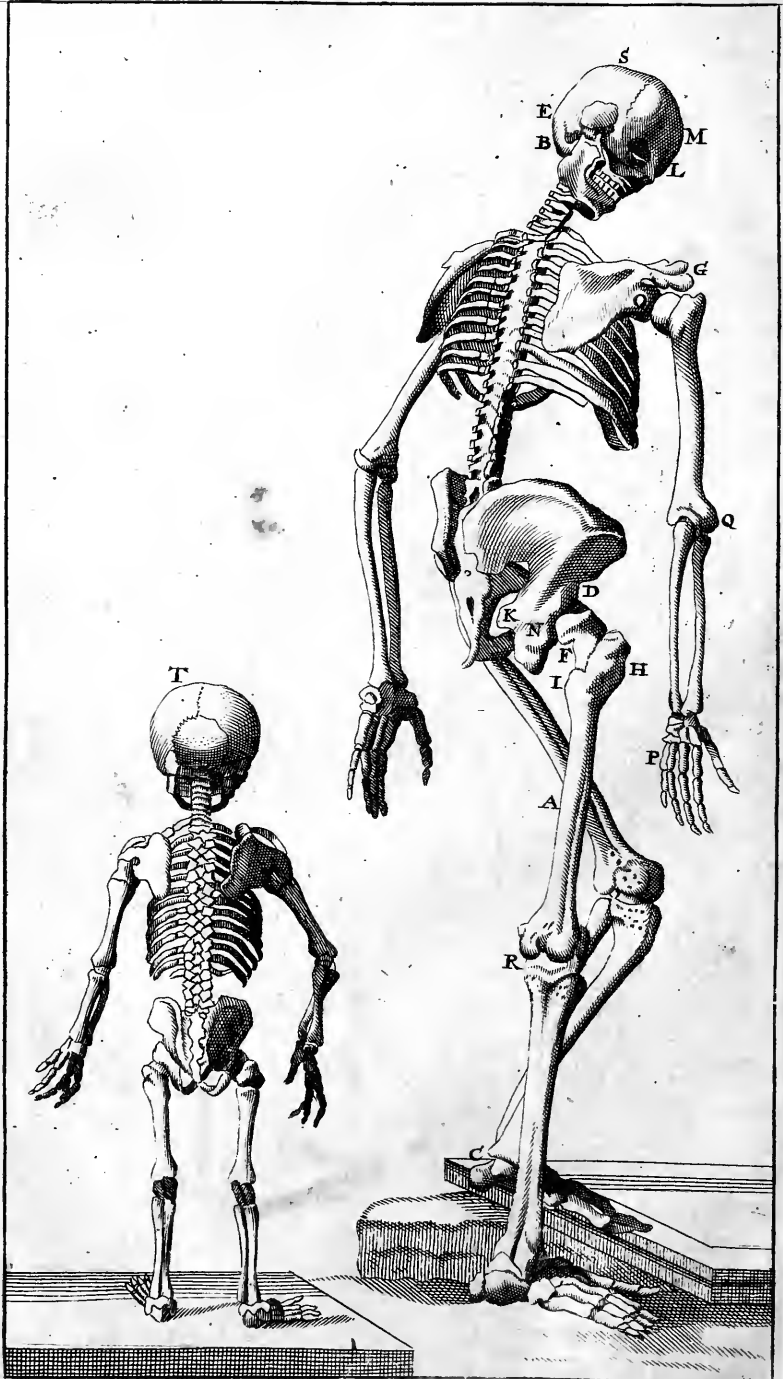
*Sysarcosis* is that which joins Bones by the means of Flesh, as the *Os Hyoidis* and the *Scapula*.

*Synchondrosis.*

*Synchondrosis* is a third kind of *Symphysis*, which unites two Bones together by means of a *Cartilage*, as the two Bones of the *Os Pubis*, or the Share-bone, where  
the









the Cartilage does unite them so strongly, that it is impossible to separate them afunder, even in Child-bed, as some have thought.

*Bartholin* allows of no *Synarthrosis*; he says that *Symphysis* is only of two kinds, either without a *medium*, whereof three sorts, *Suture*, *Harmonia*, and *Gomphosis*; or with a mediate substance, which are also three, as *Synneurosis*, *Sysarcosis*, and *Synchondrosis*, as I have said. Thus he differs little from others.

*Bartholin's*  
Opinion,

You will observe, Gentlemen, upon finishing this Demonstration, that *Symphysis* is found to be in the three kinds of *Diarthrosis*, and that it is not in any of the kinds of *Synarthrosis*.

## Of the BONES in General.

### The SECOND DEMONSTRATION.

Gentlemen, What I am going to demonstrate This Day, is not of less consequence than what I shew'd you Yesterday; since no Luxation can be reduced, unless we know how the Bones are Articulated; and since no Fracture, either Simple or Compound, can be healed, unless we know before-hand how the Bone is made, and what Parts it consists of.

The know-  
ledge of the  
Composition  
of Bones, ne-  
cessary.

When Wounds are made, either by Bullets, Granado's, or the like, partaking of Fire, or else by Falls, and cruel Blows, which do change the natural Oeconomy of the Part by the great havock and disorder that is made in it, it becomes the prudence of a Surgeon to restore these Parts, as much as he can, to their former conformation, and to correct and amend (by the knowledge he has in his Art, and of the Parts that the Bone consists of) the disorders which such misfortunes do use to cause.

The Subject  
of this day's  
Demonstra-  
tion.

I told you yesterday, that the Causes, the Parts, and the Number of the Bones were to be the Subject of this day's Demonstration; but I have thought it proper to add to them the Cartilages and Ligaments in general, because the Cartilages are not to be separated from the Bones, and they differ from them only in  
more

more or less, and do often form the greatest part of them: and the Ligaments do tie together and join them.

*Laurentius's*  
Opinion, that  
there are four  
Causes of  
Bones.

I begin with the Causes of Bones, which are reduced only to two, although *Laurentius* has comprehended four in his Definition, or rather in the Description that he has given us of them. It is true, all the Philosophers have acknowledged four Causes of every thing; to wit, the Efficient, Material, Formal, and Final: but besides that these terms are now seldom used, it may be said, that those knowing Persons understood better, than to think of comprehending all those four Causes in a Definition, which ought to be short and perspicuous, in order to explain the nature of the thing defined, and its Composition by its Essential Parts. And 'tis certain, that it could not retain these Conditions, if it consisted of more than the *genus* and the difference, which are the Matter and Form of the Definition. So that to explicate the nature of Bones, it is needless to have recourse unto four Causes, as *Laurentius* has done; since there are but two that contribute to their formation, the Seminal Liquor of the Egg, and the Heat.

A Definition  
must be short  
and clear.

The true  
Causes of  
Bones.

Now since it is certain that the Sperm of the Egg (which is understood by the name of Liquor) serves for the Matter of Bones, it will be much the easier for you to conceive, that there is nothing requisite but Heat to bring them to perfection, and rather than to amuse your selves with searching out some *Idea*, or ossifick faculty; otherwise you would be forced to multiply these faculties, and to make as many kinds of them, as there are different parts of the Body.

One and the  
same Cause  
serves to form  
all the Parts.

We must observe, That not only the Bones are made from the Seminal Liquor, but all the Parts which compound the Body; and this happens because the Heat alone operating upon this Liquor, does unravel and separate each Particle, which by taking the figure that it ought to have, by the peculiar disposition of the Matter, does come to form an Animal.

But if it be objected, That it is hard to conceive how so many different Parts can be made from one and the same Cause: I answer, That the Sun which is but one principle of Heat, does produce very different Effects, according to the different Matters that it heats; for we see that it melts Wax, and dries the Earth. And seeing

seeing these different Effects do proceed from the Matter on which it acts; so we ought to conceive, that the natural Heat acting upon the Liquor of the Egg, does disengage and separate each particle, and puts into motion those which make the Blood, at the same time that it dries and hardens those which constitute the Bones.

We know then but only two Causes of Bones, to wit, the Material, which is the Liquor of the Egg; and the Formal, which is the Heat: and we do not know what the word Faculty, or Ossifick Vertue do mean. And furthermore to destroy this Opinion of *Idea* of him that ingenders, and to make it appear that this has no part in the business of Generation, although some Authors do make it be a Cause in the Formation of Parts; we need only to reflect on what does happen, when the Eggs of different Animals are put to brood under one and the same Fowl: If you put together Duck-Eggs, and those of Hens and Partridges, you will find that one and the same Heat will produce Ducklings, Partridges and Chickens. And yet if we could penetrate into the *Idea* of the Hen that hatches them all, we should find, that she had no intention to breed any other than Chicken; but the Matter which is included in the Eggs, is the Principle on which the different Effects which follow do depend.

Experiments  
to prove it.

I shall say nothing of the Final Cause; it is to no purpose to discourse of it here for your explanation; and you will sufficiently understand what each part does, when I shall shew you how it is made. I shall only tell you, That the Final Cause has been the Subject of a great Dispute between two famous Physicians of the Faculty of *Paris*, both very eminent Anatomists; one was Monsieur *Cressé*, who making Anatomical Lectures at the *Physick-Garden*, in the place of Monsieur *de la Chambre*, first Physician to the Queen, and Professor of Anatomy there, did maintain, That when we speak of any Part, we ought to assign its End, because it is certain that every one has its End; and that God having made nothing usefess, we ought, when we shew any part, to say it was made for such or such an Action, since it has such an Action: for Example, that we may certainly say, that the Eye was made for seeing, the Hand for taking, the Foot

Different Opinions on the  
Final Cause.

for

## Of the BONES in General.

for going, and so of the rest. Monsieur *Lamy*, on the contrary, pretended, That it was not our part to determine of the End, for which a part was made; That it was true, the Author of Nature had made nothing in vain, and that he had given some End to every thing that compounds a Humane Body: but when we do undertake to assign their several Ends, we do run a risque of imposing upon our selves, because Nature may have intended some other than that which we assert; and that therefore we ought never to say this Part has been made for that purpose, but that this part does do so and so. He granted that the Eye saw, the Hand did take a thing, that we did go with our Feet; but he maintained, that it was not fit for Man to pretend to penetrate into the secret Intentions of God, that it was his Duty only to admire his Works, it not being impossible but God might have purposed other Ends in what he has made, than such as we perceive; and he added, that to know a part well, it was not necessary to maintain that it was made for such Uses, that it was our business to examine it well, and to extricate and unfold all the parts of its Composition; and that then we should find that the Action, which it has, is a consequent of its texture, and that consequently we ought not to say the Eye was made for Seeing, but that we do See with the Eye. This was the Subject of their Dispute, which grew to be so warm, that they both did make on purpose Discourses in Publick for maintaining each their own Opinion; they both had their Parties, or Followers, but the greatest number was for Monsieur *Lamy*.

The Parts of  
Bones.

Bones are composed of many Parts, of which some are prominent, and others hollow. Of the first there are three sorts, as the principal part, the *Apophysis* and the *Epiphysis*. There are also three sorts of Cavities in them, and called either Holes, Pits, or *Sinus's*.

A  
The *Femur*.

The Principal part of a Bone is the hardest and strongest part of it; it is call'd Principal, because it contains almost the whole integral Bone, and this retains the name of the whole to it self, having no other particular name; it is this, for Example, which makes the far greatest part of the *Femur*, as you see, and which possesses all the middle, even unto the extremities, where lie the *Apophyses* and *Epiphyses*, which are to be considered.

*Apophysis*

*Apophysis* is a protuberance that rises on the superficies of the Bone, with which it has the very same continuity; such is that prominence you see on the *Os Petrosum*, called *Apophysis Mastoidea*. The inequalities of Bones do serve to render their articulation more convenient, for the origination and insertion of divers Muscles, and for the defence of some parts, as are those of the *Scapula* and the *Vertebrae*.

An *Apophysis*,  
what.

B  
*Apophysis*  
*Mastoidea*.

*Epiphysis* is an appendage or additional Bone, joined to the Principal by a simple contiguity; such is that prominence you see on the *Os Tarsi*.

C  
*Epiphysis* of  
the *Os Tarsi*.

Authors have assigned two Uses to the *Epiphyses*; the first is, to strengthen the Articulations, because the *Epiphyses*, which are situated at the ends of the Bones, do serve for props, or a *basis* to them, being of larger extent than the Bone it self, and are thereby articulated the better. Their second Use is, to serve, as well as the *Apophyses*, for the insertion of divers Muscles and Ligaments; because being of a less solid substance than the Principal Bone, and being harder than the Ligaments, they are of a middle nature between both, and consequently do render more easie the adhesion of the Ligaments; for you know that there is no Articulation made, where there are no Ligaments; and that these Ligaments do adhere more easily to the *Epiphyses*, which are of a soft substance, than they do to the Bones, which are harder.

The Uses of  
*Epiphyses*.

All *Epiphyses* are like one to another; and it is observed that they differ four several ways, in Figure, Quantity, Number, and Situation.

Differences  
of *Epiphyses*.

They differ so in Figure, that the view does easily distinguish them. And they are reduced into three kinds, the Head, the Neck, and the *Corona*.

When a Bone terminates or rises in a great round bunch, it is truly call'd the Head, as is that of the *Femur*; but if it be a small prominence, it is call'd *Condylus*, such as is that of the lower-Jaw, which enters into the cavities of the *Os Petrosum*, in order to join them together.

D  
Head.

E  
*Condylus*.

The Neck is the narrowest part of the Bone, but from a narrow beginning does dilate it self by little and little. It is always placed under a Head, as you may see one under the Head of the *Os Femoris*. It is observable, that the Head and the Neck do differ from one another, in that the Head is almost always *Epiphysis*, and the Neck *Apophysis*.

F  
Neck.

The

**G** The *Corona* is when a Bone has a sharp prominence.

*Corona.*

These sharp prominences have divers figures, and are called by the names of such things as they do most resemble. There is one in the *Os Petrosum*, called *Styloides*, because it is made like a Styletto; another *Mastoides*, because it resembles a Nipple; another *Corocoides*, placed in the *Scapula*, and so called from resembling the Beake of a Raven; and lastly, those of the *Os Cuneiforme*, called *Pterygoides*, because they are like the Wings of a Batt.

*Corocoides.*

The magnitude of *Epiphyses* is not alike in all the Bones; the *Tibia*, for Example, which is a large Bone, has large ones; and the small Bones, as those of the Fingers, have very small appendages. Also you may see one and the same Bone to have *Epiphyses* of a different bigness, as the *Femur*, has a large one call'd the Great *Trochanter*, and another small one called the Lesser *Trochanter*.

**H**

The Great *Trochanter*.

The Little *Trochanter*.

The Number of *Epiphyses* is not alike to every Bone; some have none at all, as that of the lower Mandible; and others have many. The *Costa* have each one, the Bones of the Leg and the Arm have each two, those of the *Os Ilium* three, those of the *Femur* four, and each *Vertebra* has five of them. In the Bones we do find the most of them.

Number of *Epiphyses*.

Situation of the *Epiphyses*.

The Situation of the *Epiphyses* is different, in that they are not all placed at the extremities of Bones, but some are found in the middle of them.

Besides these four Essential Differences we have taken notice of in *Epiphyses*, there still remains one, which comes by age, which does make their Substance more or less hard; in Infants it is Cartilaginous, but it hardens according as they advance in years, and it does not come to be perfectly turned into Bone until after the twentieth year of their age: a thing that I have observed in the making of a Skeleton of a Youth eighteen years old, all whose *Epiphyses* did separate from the Bones, by Ebullition, or boiling.

Substance of *Epiphyses*.

We may observe once more, that the *Epiphyses*, at their extremities, are covered with a Cartilage, that facilitates the motion of the Joints; and besides this Cartilage that was necessary for hindring the Bones from rubbing, or grating against one another, Nature has likewise provided a slimy Humour in all the Joints, which having the same effect as Grease has in Coach-

Cartilages of *Epiphyses*.

Wheels,



Wheels, does hinder, in conjunction with the Cartilage, that the extremities of Bones do not waste and heat one another in their continual motions.

The hollow parts of Bones are, as I have said, of three sorts; they have a Hole, a Pit, and a *Sinus*. The Cavities of Bones.

A Hole is a cavity that has both ingress and egress; as may be seen in the cavities that are at the *basis* of the *Cranium*, whereof some give an entrance to the Arteries, and others do let the Nerves and Veins go out. Likewise that great Cavity we see in the *Os Ischii* is called a Hole. K  
A Hole.

A Pit is a Cavity that has an Entrance, but no passage out, and whose brims are raised by small prominencies like little hills: these Cavities do serve to give a part some figure, or else to contain somewhat in them; such is the Cavity of the *Orbite* that contains the Eye. L  
A Pit.

A *Sinus* is a kind of Cavity in a Bone, whose Orifice or Entrance is very narrow and the Bottom large; these *Sinus's* are found in the *Basis* of the *Os Coronale*, and the Ancients thought their use was to make these Bones more light, which I do not believe. I shall forbear to tell you my thoughts thereupon, untill I come to shew them. M  
*Sinus*.

Besides these three kinds of Cavities that I have explained, there are still some others that are divided into Internal and External.

The Internal are two, either great and apparent, such as are those along the great Bones, which contain the Marrow; or little and porous Cavities, such as are those in the *Vertebrae* and *Epiphyses*, which do contain a Medullary juice. Internal Cavities.

The External are of three sorts, either great Cavities incircled with thick brims, and are called *Cotyla* or *Cotyloides*, from the name of an old measure among the Antients, such is that of the *Os Ischium* that receives the Head of the *Femur*; or moderate and less deep Cavities, and called *Glenoides*, such as that of the *Scapula*, which receives the head of the *Humerus*; or else little and flat, such are those at the ends of the Bones of the first rank of the Fingers, which receive the heads of the Bones of the *Metacarpus*. External Cavities.

These Cavities are simple or double; the first sort do receive only one head, as that of the end of the *Radius*; and the double ones do receive two, as does that which receives N  
The *Cotyloides*.  
O  
The *Glenoides*.  
P  
Small Cavities.  
Q  
Simple Cavities.

R  
Double Ca-  
vities.

receives the end of the *Tibia* from above, and those of the Bones of the two last ranks of the Toes. They are likewise of a different figure; some of them are like unto a Pully, as those of the lower extremity of the *Humerus*, which do receive the *Os Cubiti*; others like to a Half-moon, as those of the upper part of the *Cubitus*, and so of the rest.

Uses of the  
Circular Li-  
gament.

All these External Cavities, that serve for Articulation, have every one of them an Eminence on their circumference, that may be called a Lip, or Brow, to which is tied a circular ligament, which inclosing the head of the Bone that they receive, does serve to strengthen the Articulation, and to hinder Luxations; which would often happen if such Ligament were not there.

Four things  
remarkable  
in Bones.

It remains for me to shew you the Number of the Bones, for finishing this general head; but before I do it, it will not be improper to observe to you four things, the Magnitude, the Colour, the Nourishment, and the Sensation of Bones.

Magnitude.

All Bones are not of the same bigness in Bodies, I do not mean only in those of men of different stature, but even in persons of the same height; for it happens often that among these last, some have their Bones smaller than others: And if Beauty does depend on the slenderness of the Bones, they may be said to have the best shape who have the smaller. And indeed it is one of the reasons why Women are commonly handsomer than Men; because the Bones of their Face are more curious and small than those of the Men: and this makes us able to distinguish easily the Skeleton of a Woman from that of a Man. But besides there is a very great difference between the one and t'other, in that the *Os Ilium* is in men lesser and straiter, whereas in Women it is more expanded in order to form that capacity where the *Fœtus* is to lie; and hence it is that Women having their *Os Ilium* more outward, and their *Os Sacrum* more backward, have their Hips and Buttocks larger than Men.

We may also observe the magnitude of Bones, according to mens different Ages: for they do grow and magnify from the Birth to the twentieth year, or thereabouts; and from twenty to threescore they continue of the same bigness; but after threescore they still decline or decrease; which does happen because the



the bony fibres grow dry, and wast, and come closer together.

The Colour of Bones is not alike in all; some are very white, others less white, and some are of a greyish colour; and it is so true that the diversity of these colours does depend upon the first matter of which the Bones are formed, that though we take the same pains to whiten two or three Skeletons, yet we can never make all of them alike white.

Colour.

It has been thought a long time, that the Marrow, and the *Succus Nutritius* did serve the Bones for Nourishment, but the Discoveries which have been made of their other Uses, have proved that the Bones were nourished by Blood, as well as the rest of the Body. It is true the Marrow may serve to humect them, as Fat does soften the Parts, but it is not their true alimentary juice, since there is nothing to be found but in the Blood, which, by circulating in the Substance of Bones, is able to bring them such Particles as are proper for their Nourishment, as it does to all the other Parts; the which may also convince us that Bones are not nourished by apposition of matter upon matter, as Stones are formed, but by a Liquor which by insinuating into their Pores, does increase their bulk: for there is a vast number of *Ductus* in the body of Bones (like unto those in the Trunks of Trees, that convey their juice) through which the Nourishment is conveyed by means of the Arteries and the remaining superfluity returning through the extremities of these *Ductus*, is received by the little Veins, which carry it back into the mass of Blood. Moreover it is easy to perceive in using the Trepan, that there is Blood between the two Tables of the *Cranium*, and that if you break the Bone of an Animal newly killed, there will come forth of it some little drops of Blood: which leaves no room to doubt but that some Blood does enter into the Bones.

Nourishment.

Marrow is always found, not only in the Bones of Men, but of all other Animals. It is true there are Times when they are full of it, and other Seasons when they are without it; but it is an error to think the Moon does cause either the increase or decrease; the diminution of it is rather an effect of some disease, some fatigue, or of some great abstinence. And since we see the Fat of Men to consume after a Disease, great Labour, or Abstinence, we may conclude, that

All the Bones contain a Marrow.

the Marrow does likewise waſt and conſume by one of thoſe three cauſes, ſince Marrow is to the Bones, what Fat is to other parts of the Body.

**Senſation.** Indeed Bones have no Senſation, but they are covered with the *Perioſteum*, which is a very ſmall and very ſenſible Membrane. Thoſe that are ſubject to the Gout, or who have had any Operation made on their Bones, can give us a certain Aſſurance of it, ſince the pains they feel during theſe Operations are very great, when this Membrane comes to be cut.

**The Number of Bones in all the Body.** The Number of Bones, which is the fixth and laſt thing to be conſidered of the Bones in General, is very great. In the firſt Denomination, I have ſhewn you

**S** A great Skeleton ſhewn on the Side of it. the fore-part of a Skeleton, and in this I ſhall give you the Side of this great Skeleton, and the hinder-part of this little one, that you may have a full View of it on all ſides. You muſt not wonder, when you find it

**T** A little Skeleton viewed behind. to conſiſt of ſo many Bones, even to the Number of two hundred forty and nine, in the whole. For Example, there are reckoned be in the Head threeſcore, in the Trunk of the Body threeſcore and ſeven, in the Arms and Hands threeſcore and two, and juſt ſixty in the Thighs and Legs. If the Author of Nature had formed fewer in the Hands, do you think the Hands could have taken things as they now do? If the Spine had not conſiſted of ſo many *Vertebrae* as it does, could it have bent as it now does? and laſtly if the Leg, and the Thigh, had been but one Bone, could a man have Walked ſo conveniently as now he does? It was therefore neceſſary, that the Number of Bones ſhould be ſo great as it is, for the perfection of his Body and the performance of his Functions.

**Threeſcore Bones in the Head.** Of threeſcore Bones in the Head, there are fourteen of them in the *Cranium*, and forty ſix in the Face, reckoning among them the *Os Hyoides*; the fourteen belonging to the *Cranium*, are the *Os Coronale*, the *Os Occipitis*, the two *Bregma's* or *Parietalia*, the two Temporal, the *Os Ethmoides*, the *Sphaenoides*, and the ſix auditory Bones, or the *Incus*, *Stapus*, and *Malleus*, on each ſide. Of forty ſix that are in the Face, there are ſeven and twenty of them in the upper Mandible, the Cheek-bone, the Nail-bone, the Maxillary or Jawbone, the Bone of the Noſe, and that of the Palate, and the ſame Number on the other ſide; the eleventh, which is ſingle, having no fellow is in French called *le*

*vomer*, being like the Coulter or Share of a Plough; and there are sixteen upper Teeth, eighteen in the lower Mandible, to wit two Bones and sixteen Teeth, adding to all which the *Os Hyoides*, there will appear to be threescore in the Head.

Of sixty-seven in the Trunk of the Body, there are two and thirty of them in the Spine, and nine and twenty in the Breast. Those of the Spine are seven in the Neck, twelve in the Back, five in the Loins, five in the *Os Sacrum*, and three in the *Coccyx* or Rump-bone. Those of the Breast are the four and twenty Ribs, the two *Clavicles*, and three in the *Sternum*. There are likewise six *Ossa Innominata*, which are the two *Ilia*, the two *Ischia*, and the two *Ossa Pubis*. Their whole Number makes sixty-seven in the Trunk of the Body.

Sixty-seven in the Trunk of the Body.

Of sixty-two that are in the upper Limbs, each Arm and Hand has one and thirty, which are the Shoulder-blade, the *Humerus*, the *Cubitus*, the *Radius*, eight in the Wrist, four in the *Metacarpus*, and fifteen in the Fingers; and the same Number in the other Arm, which makes sixty-two.

Sixty-two in the Arms and Hands.

Of threescore in the lower Limbs, there are thirty in each, as the *Femur*, the *Rotula*, the *Tibia*, the *Fibula*, seven in the *Tarsus*, five in the *Metatarsus*, and fourteen in the Toes; and the same on t'other side, in all, sixty.

Threescore in the Legs and Feet.

This Number of Bones might be increased, if we would make several of the *Os Hyoides*, or would add to them the *Sesamoides*. Likewise the Number would be less, if we should reckon the two Bones of the lower Mandible to be but one, and if we should make but one Bone of the *Os Sacrum* instead of five. But since we ought to keep to some determinate Number, I should advise you to stick to that of two hundred and forty-nine, which is the most universally received among all Authors.

Two hundred forty-nine in the whole Body.

Although the Cartilages and the Ligaments become separated from the Skeleton by boiling, nevertheless our Osteology would be imperfect, if we should pass them by in silence, and if I should not instruct you in what ought to be known of them in general, reserving to treat of each of them in particular, in their proper place of my Anatomical Demonstrations.

The Cartilages ought to be known.

The Cartilages, what.

The Cartilages are the hardest of all parts, next to the Bones, they are almost of the same nature, and do differ only in the more or less. There are three sorts of them, some are hard and become quite bony with time, as those do which make the *Sternum*, and those that tie the Appendages to the Principal Bone; others again are softer and contribute to the composition of the parts, as do the Cartilages of the Nose, the Ears, the *Xiphoides*, and that of the *Coccyx*; and lastly some are very soft, and are of the Nature of Ligaments which has made them be called Ligamentary Cartilages:

Figure of the Cartilages.

There are Cartilages of divers figures, and they have obtained the name of those things that they resemble; one is called Annular, because it is like unto a Ring; another *Xiphoides* or *Ensisformis*, because its figure is like the point of a Sword; another *Scutiformis*, shaped like to a Helmet, and so of divers others. They commonly associate with the Bones, yet there are some that do not touch together, as those of the *Larynx*, and the Eye-lids.

The Cartilages are insensible,

Cartilages have no Sensation, consisting neither of Membrane, nor Nerve; which is so much the better for Men, seeing they have parts enough that are subject to Pain, without the addition of these, which would occasion continual Pains in the motions they are fain to make. They have no Cavities and consequently no Marrow in them: but in defect of that they have a mucosity of a viscous and flexible Substance that preserves and keeps them.

The Uses of them.

The Uses of the Cartilages are to hinder the Bones from hurting one another by a mutual collision; to join them together in divers places by *Syncondrosis*, and to contribute much to the better shape of many parts, as do those of the Nose, the Ears, the *Trachaa*, the Eye-lids, and some others.

No Ligaments left in this Skeleton.

All the Bones which you see in this Skeleton, could not be kept fastned together if they were not conjoined by Ligaments; but I have already told you, that since they have been separated from the Bones by boiling, a Wire serves instead of them, and Cork supplies the Cartilages of the *Sternum*. Nevertheless it were not impossible to preserve a Skeleton with the Cartilages and Ligaments upon it, by taking away the Flesh only; but take what care we will, the Worms would breed in it, and we could never be able to keep

keep such a one, either so well, or so long as I have done this.

A Ligament is of a solid and white Substance, it is softer than the Gristle; and harder than a Nerve or Membrane; it has neither Cavity, nor Sense, nor Motion, which makes it to suffer Pain no more than the Cartilage.

A Ligament, what.

Ligaments are made as the rest of the parts, of the Sperme or feminal liquor of the Egg; some of them are strong being placed within between the Bones, some thick and round, called Cartilaginous Ligaments, and some thin and of a membranous nature, which do outwardly cover the Bones.

The Matter of Ligaments.

They are of divers Figures; some large, called Membranous, and others round or Nervous: These Names are given them, for the resemblance they have to Membranes or Nerves, and not because they are in reality either Membranous or Nervous.

Their Figure.

The only and true Use of Ligaments, is to tie, like a Cord, the Parts of the Body, and chiefly the Bones, which they do keep joined and united together, and hinder them from falling out of their places.

Their Use.

I shall finish this Demonstration, by saying two words concerning the forming of *Callus*. You know, we call *Callus* that knot which joins together a fractur'd Bone. It is made after this manner: The Juice which nourishes the Bones sliding along the bony Fibres, does give, or sweat, towards the place where these Fibres were broke asunder; and stopping or gathering together about the two ends of the fractur'd Bone, it there becomes dry, and unites them like a strong Glew, insomuch that afterwards there remains only a small inequality in the place where the *Callus* is formed.

How *Callus* is made.

Thus, Gentlemen, you have what I intended to Demonstrate to you This Day: To Morrow I shall entertain you with discoursing on all the Bones in particular, beginning with those of the Head.

## Of the HEAD in General.

### Of the Bones of the *Cranium*.

#### The THIRD DEMONSTRATION.

**T**O give an Account of the Bones with some Order, as I promis'd you, Gentlemen, we must divide the Skeleton into the Head, the Trunk of the Body, and the Limbs.

We ought to begin with the Head.

Although Authors do not agree among themselves, with what Part of the Skeleton we ought to begin, provided they be all known; nevertheless, I cannot but think we ought to begin with the Head, because it appears first to our view, and because it is the noblest and most considerable part of the Body.

The admirable Structure of the Head.

I shall not here make any *Elogium* on the Brain, reserving that to its proper time, in the progress of my Anatomical Demonstrations: I will only observe to you, That the Bones which compose the Head are not of so small consequence to the Brain it self, but that it receives considerable advantages from them, since they do make a mansion for the Brain, and are a rampart or fortification to it against external injuries.

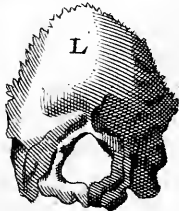
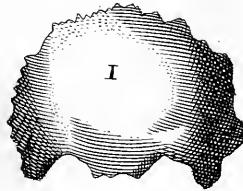
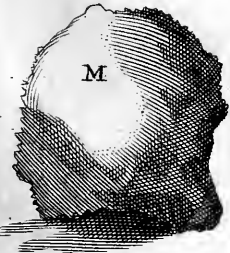
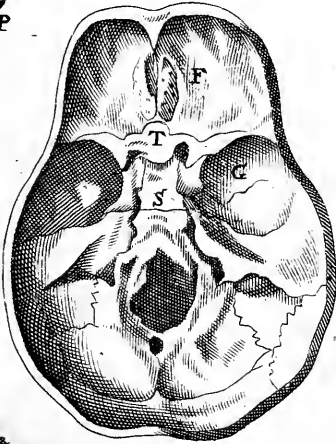
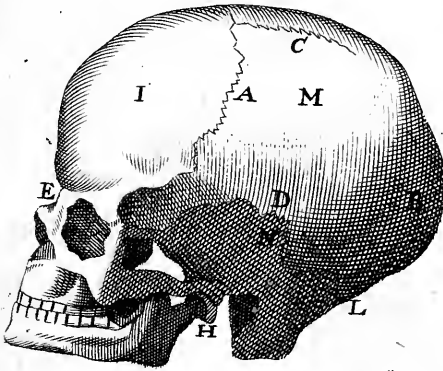
Definition of the Head.

We do understand by the Head, all that lies between the *Vertex* and the first *Vertebra* of the Neck, comprehending in it both the Skull and the Face. *Hippocrates* considers it as the *Domicilium*, or Dwelling-house of the Brain, and defines it to be a Bony part, consisting of two Tables woven together with the *Diploe* between them, and covered outwardly with the *Pericranium*, and inwardly provided with the *Dura Mater*.

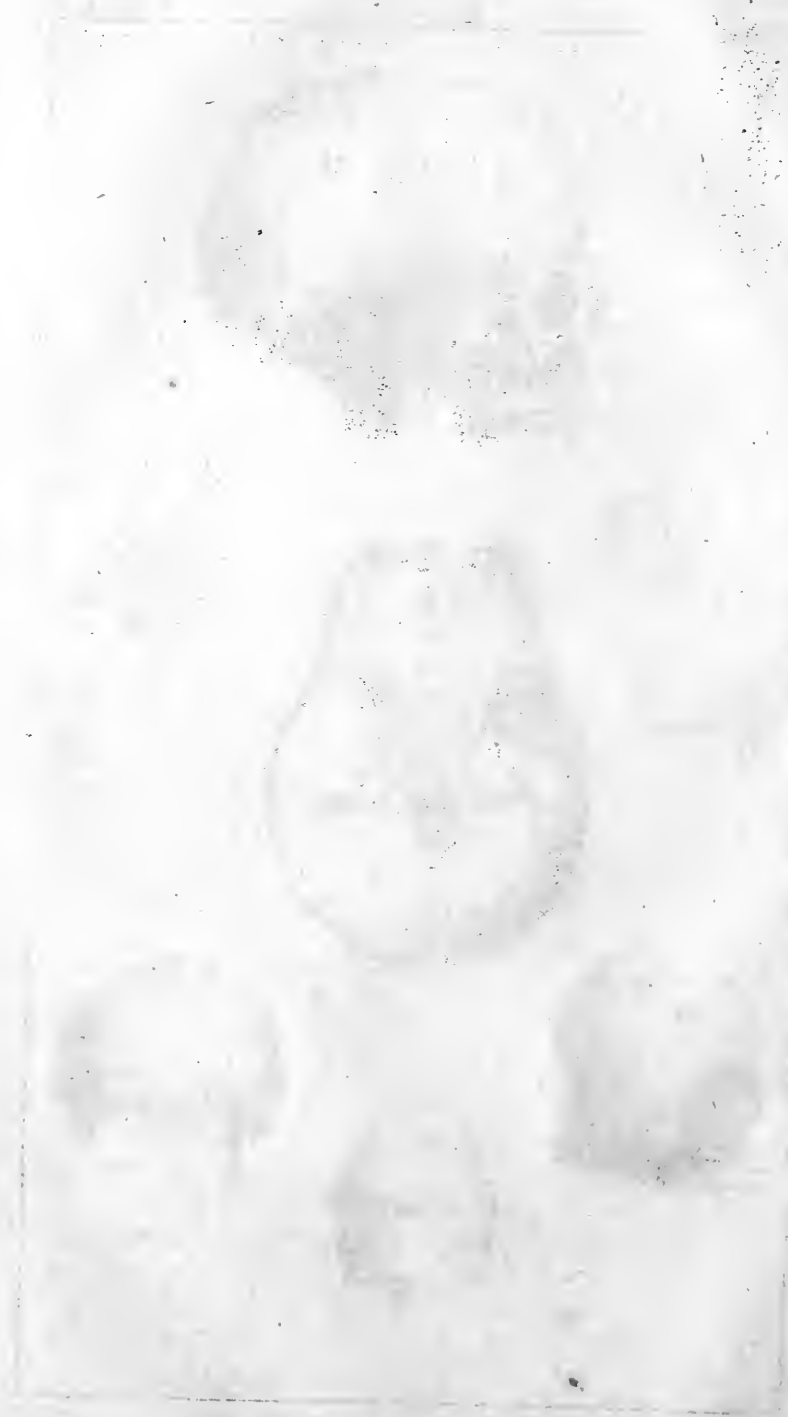
Its Substance.

You'll observe, that the Substance of the Head is altogether Bony, in which it differs both from the *Thorax* and the *Abdomen*, one of them being wholly fleshy, and the other partly bony and partly fleshy. This so solid a Substance is of great help to it, not only for containing the Brain, that has need of so strong an inclosure, but also to defend it against all injuries.

The









The Head is the most eminent Part of the Body ; <sup>Its Situation,</sup> but the Reasons that many Authors give for its high Situation, does not seem probable to me. They say, it is for the sake of the Eyes that are therein placed ; and that their action being to see and discover all things, they ought to be placed in the highest part of the Body. But it is a better Reason, to think that the Brain being to transmit the animal Juice through the Nerves to all the parts of the Body, for their motion and their sensation, it could not so do more conveniently than from on high downwards, the impulse of it being more easie after this manner than from below upwards, since the Brain is of so soft a substance as it is. And here the Brain may be compared to a River or Pond that supplies Water to several Fountains ; this is always placed in the highest part of a Garden, for the more convenient communication of the Water, which it would not be able to do, if it were situated lower than the Fountains.

The Magnitude of the Head ought to be propor- <sup>Magnitude.</sup> tionable to that of the Brain, since it is made for the sake of it. There are some of them very great, and others very small, and both do denote a fault in their conformation. The great Heads are subject to abundance of defluxions and inconveniencies, and the small ones have a tendency to folly, the Brain being in these streightned in its functions: nevertheless, it seems more desirable to have the Head encline rather to largeness than smalness ; for it is observed, that those who have large Heads have a great deal more Sense than the small ones.

The natural Figure of the Head is Round, and a <sup>Figure.</sup> little flatned on the sides, for the better containing the Brain, and for its easier motion. It is Oblong both before and behind, for yielding the more room both for the Brain and the *Cerebellum*. If it were not flatned on the sides, but were absolutely round, the Temples would have been too much exposed, and it would not have had such an *equilibrium* as it has.

There are Heads of a depraved and preternatural figure ; in some the protuberance before fails, and in others that behind, and in others again there is no prominence on either side. Those that have the misfortune to be like a Sugar-loaf, have not a Brain well regulated in its functions.

Uses of the Head.

The Uses of the Head are considerable ; for besides its particular or proper ones to contain and to defend the Brain, it has likewise the common use of all the Bones to serve for the adhæſion of many Muscles.

Division of the Head.

The Head is divided into two parts, of which one is covered with Hair, call'd the *Cranium*; Skull, or Scalp ; and the other without Hair, call'd the Face.

The Bones which do constitute these two parts are sufficiently numerous and considerable, to employ us for two Demonstrations. Wherefore I shall begin with those of the *Cranium*, and end with those of the Face.

The *Cranium*, what.

The *Cranium* comprehends the Bones which do contain the Brain and the *Cerebellum*. It is divided into two Tables, which are like two *Lamine* laid one upon the other, between which there is the *Diploe*, or a medullary Substance, which is full of little Cells of a different bigness that receive their little Arteries from the Brain, and transmit the little Veins into the *Sinus* of the *Dura mater*. It is between these two Tables that the Blood is lodged which nourishes the *Cranium*; and it is this same Blood that is seen to drop forth in the Operation of the Trepan, when the first Table of the Bone is bored through.

The Outward part of the *Cranium*.

The External and Superiour Superficies of the *Cranium* is smooth and polish'd ; but the Inferior is very rough and unequal, by reason of the many processes and appendages that are found in it.

The Inward part.

Its Internal and Superior Superficies is in like manner smooth and equal, excepting some little channels that are made in it by the Vessels that creep upon the *Dura mater*, when the *Cranium* is still moist and cartilaginous ; but it has its Internal and Inferior Superficies unequal, by reason of the productions and cavities that are found in it.

The Holes of the *Cranium*.

The *Cranium* has many Holes that are of a different bigness, they do give passage to the *Medulla Spinalis*, to the Nerves, Arteries and Veins, which fill up these Holes ; and which fill them so exactly, that neither Vapours nor Fumes can come into them, nor go through them, but by means of the Vessels themselves. I shall shew you all these Holes, when I demonstrate each Bone in particular.

As to the Doubt that some have to judge whether the *Cranium* does cause the Largeness of the Brain, or the Brain causes the Largeness of the *Cranium*, it is easie to conclude, that the Bigness of the *Cranium* does depend on that of the Brain, for two reasons: The first is, That the Matter which encompasses the Brain, and is to form the *Cranium*, does extend more or less, according as the Brain is greater or lesser: And the second is, That the *Cranium* is not formed till after the Brain. Which is so true, that we see in an Infant newly-born the Brain is in its perfection, when the *Cranium* remains only cartilaginous and but half-bone about the Sutures, and in the middle and superiour region of the Head, that is called the Fountain, and which grows not into perfect Bone, but after some years. Hence it is, that in the Labours of Women, these Bones not being yet hard, they give back and yield a little to compression, to help the Delivery of the Infant.

That the Brain gives the Head its Magnitude.

Nevertheless, the Moderns are divided hereupon: For some do pretend, that Nature forming at the same time all the Parts of a Body, it can never be decided, whether it be the Brain or the *Cranium* that communicates its figure the one to the other, since it often depends on the motions which happen in the formation of the *Fœtus*, either naturally, or by accident.

The *Cranium* is compounded of many Bones, distinguished by the Junctures, called Sutures.

The Bones of the *Cranium*.

After having given the Definition of Sutures, and of some of its kinds, when I treated of *Synarthrosis* before, it will suffice to divide them here into Proper and Common Sutures. The Proper are those that serve to divide only the Bones of the *Cranium*. They are True or False.

The Sutures.

The True Sutures are those that are indented together like the Teeth of a Saw. We must also observe, that there are small pieces of Bone which enter into one another, but are not edged like the Teeth of a Saw, but made like unto the Tail of a Swallow, which encloses them together, and hinders them from dividing and separating. They are three, the Coronal, the Lambdoide, and the Sagittal.

The True Sutures.

The Coronal is that on the fore-part of the Head; it is so called, either because it is situated in the place where formerly Crowns were worn, or else because it has

The Coronal Suture.

has a circular figure ; it extends from one Temple to the other, and joins the *Os Frontis* with the two Bones of the *Sinciput*.

The Lambdoide.

The Lambdoide is so called, because it is made like a Greek  $\Lambda$  : it is opposite to the former ; it unites the *Os Occipitis* with the two Bones of the *Sinciput* behind.

The Sagittal Suture.

The Sagittal Suture is so call'd, because it is strait like an Arrow, that is in Latin, *Sagitta*. It is placed in the superior part of the Head ; it goes from the Coronal to the Lambdoide, and joins the two Bones of the *Sinciput* in their uppermost part. This Suture does sometimes descend to the root of the Nose, and then it divides the *Os Frontis* in two parts, the which it also does in the *Os Occipitis* in some Bodies. These three Sutures are sometimes so strongly united in Old People, that they do seem to be but one entire piece.

The False Sutures.

D  
*Squamosa*.

The False Sutures are those that are joined together like the Scales of Fish, and they are called *Squamosa*, or Skaly ; they are two, one on each side ; they do join the superior and smaller parts of the *Os Petrosum* with the *Parietalia*, or Bones of the *Sinciput*.

Those are called Common Sutures which do separate the Bones of the *Cranium* from those of the Face : They are four, the Transversal, Ethmoidal, Sphænoidal, and Zygomatick.

E  
Transversal Suture.

The Transversal is so called, because it traverses the Face from one side to t'other : it begins at one of the small angles of the Eye, and passing by the bottom of its orbit, by the root of the Nose, it finishes its course at the other little angle : It is this which separates the *Os Coronale* from those of the Face.

F  
Ethmoidal Suture.

The Ethmoidal turns round about the *Os Ethmoides*, and does separate it from the Bones that touch it.

G  
Sphænoidal Suture.

The Sphænoidal is so called, because it encompasses the *Os Sphænoides* ; it separates it from the *Os Coronale*, the *Os Petrosum*, and the *Os Occipitis*.

H  
Zygomatick Suture.

The Zygomatick is so named, because it is placed wholly in the *Zygoma* ; it is very small, and separates the *Os Petrosum* by its process from the Cheek-bone. These Sutures are not so apparent as the former ; and we must observe them very near, to see the little pieces of Bones that fall into their intermediate spaces.

The Uses of Sutures.

The Uses of Sutures are reduced to three principal ones ; the first is for the adhesion of many small threads

threads of Ligaments, which tie the *Dura-mater* ; the second is to give passage to the Vessels, which go in and come out of the *Diploe* ; and the third is to help perspiration : For it is not likely that these Sutures were made only to hinder the fracture of one Bone of the *Cranium* from affecting another : It is true, they do so ; but that this should have been the chief design of Nature can never be maintained, no more than to say the appendages were made to hinder the fracture of Bones being communicated to the Joints.

It has been observed, That those who have their Sutures of the *Cranium* too much closed, are subject to intolerable Pains of the Head, because the Perspiration is thereby hindred. And this I observed in Monsieur *Rainsant* a Physician, and Keeper of the King's Medals ; he had the Bones of his *Cranium* so strongly united, that the Sutures were quite defaced, insomuch that a serous acrimony, having no transpiration, had corroded the *Cranium* in seven or eight places of the *Os Coronale* and the Bones of the *Sinciput*, in order to eat a passage outwards ; which thing did occasion to him most dreadful Pains from time to time, and made him often take *Opium*, which he carried always about him ; and this was the cause of his Death : for walking in the Garden of *Versailles*, and going to take a little Water to dilute his *Opium*, he fell down into the Basin, and was drowned.

An Observation in Sutures that are too compact, or close.

I have assisted at the Opening three Bodies of the Blood-Royal of *France*, that is, of two Dukes of *Anjou*, and of *Madam* of *France* ; the first dying at Three Years old, the second at Seven Months, and *Madam* in the Fourth Year of her age. The Sutures of all their Skulls were so exceedingly closed, that there could be no Perspiration. All the Physicians and Surgeons that were present at the Opening these Bodies, were convinced that this natural Disposition of the Sutures was the chief cause of their Deaths.

Other Observations.

The Bones of the *Cranium* are Proper or Common : The Proper are so called, because they properly belong only to the Skull ; they are Six, the *Os Coronale*, *Occipitis*, the two Bones of the *Sinciput*, and the two Temporal Bones. The Common are those that are assistant both to the *Cranium* and the Face : They are Two, the *Os Sphaenoides* and *Ethmoides*. All these Bones will be the Subject of This Day's Demonstration, after

Eight Bones of the *Cranium*.

I shall

I shall have observed to you, That all Skulls are not alike thick, in all Parts, and in all Bodies: And this the Surgeon ought to take great notice of, lest he commit mistakes in Trepanning, and in his other Operations that he makes on the Head; for there are Persons whose *Cranium* is not so thick as a Crown, and others have it as thick as two or three Crowns; and likewise you will find the six Bones of the *Cranium* to be all of a different bigness.

r. *Os Frontis*,  
or *Os Cor-*  
*onale*.

The First of these Bones is the *Os Coronale*, or *Os Frontis*; it is the hardest of all the Bones of the Head, next to that of the *Occiput*; its figure is semi-circular, particularly in its superior and lateral part; it is smooth outwardly, and rugged inwardly; it is situated in the uppermost part of the Face, and the foremost of the *Cranium*, whence it makes the Front or Forehead, and is therefore called the *Os Frontis*.

Circumscrip-  
tion of the  
*Os Coronale*.

This Bone is bounded above by the Coronal Suture, and below by the Transversal; the first of them joins it with the Bones of the *Sinciput* and the *Os Petrosum*, and the second joins it to those of the Nose and the Cheek. There is also the Sphœnoidal Suture, that joins it with the *Os Sphœnoides*.

The Parts of  
the *Os Coro-*  
*onale*.

The Parts of this Bone are either Solid or Hollow; the Solid are the four Processes, whereof there are two at the great angles of the Eye, and two at the small angles, which do serve to form the Cavities of the Orbits. The Hollow part are of three sorts, Holes, Pits, and *Sinus*. The Holes of the *Os Coronale* are in number three; two External, placed at the Eye-brows, a branch of the fifth pair of Nerves passes through them, and is distributed into the two Frontal Muscles, and to the Proper *Elevator* of the upper Eyelids. The third Hole is Internal, and situated above the *Crista galli*; it is in this Hole that the root of the right *Sinus* of the *Dura mater* does adhere, which makes a small fold, that sinks into it in shutting it.

The Pits.

The Pits of the *Os Coronale* are four; two External, which make the Superior part of each Orbit; and two Internal, which do form the Anterior Cavities of the *Cranium*, and serve to lodge a great portion of the Brain, with the two Mamillary Processes.

The *Sinus*.

The *Sinus* of the *Os Coronale* are two, called the *Sinus* of the Eye-brows, because they are situated at the lower part of this Bone, near the Eye-brows. Many



Uses have been assigned to these *Sinus*; some say they are assistant to the Voice, others that they do contain Air, which serves for a Vehicle to Smells, and others that they serve for a Reservatory both for the watry Humours which cause Tears, and for a medullary Humour that renders the Eye slippery; some say that they are Magazines of a mucilaginous Humour, that is properly the Snivel which drops through the Nose; and lastly others, that they are made only to render this Bone the lighter.

But whatever Uses have been given to these *Sinus*,<sup>What forms the two Sinus.</sup> I cannot think but that the mechanical Structure of the *Os Coronale* has the greatest share in their Formation rather than these Uses: For if we observe well, we shall find that they are made by the Elongation of the two Tables of the *Os Coronale*, whereof the external Table does advance outwardly to form the superior Eye-brow of the Orbit, and the internal Table does retire inwardly to make the roundness of the anterior Cavities of the *Cranium*, otherwise there would be an Angle that would incommode the Brain. And this persuades me that these *Sinus* may have that Use which I do attribute to them. But yet it ought not to hinder you from looking upon them as two Sources that furnish abundance of moist Humours to the Nose; for it is experimentally true, that these sinuous Cavities are every where clothed with a Membrane that invests the Nose; and seeing it is a glandulous Membrane, we may conclude that these little glands may filtrate a *Lympha*, which quickly thickens by means of the Air which enters by respiration through the Apertures of the *Sinus*. As for the five or six other Uses which the Ancients have given to them, they are meerly imaginary.

The Second Bone of the *Cranium* is the *Os Occipitis*,<sup>*Os Occipitis.*</sup> which is opposite to the *Os Coronale*. It is the hardest of all the Bones in the Skull. The Reason that Authors give for it is, because there being no Eyes behind the Head, Nature has made it so much the stronger, that it might the better resist Blows when it receives them.

This Bone is not so great as the former; it is of an oblong Figure, having five Sides or two circular lines, that terminate in a point; it is placed in the hinder-part of the Head, and make the whole hinder-part; it is bounded by the Lambdoide Suture, and the Sphænoidal:  
the

the one joins it with the Bones of the *Sinciput*, and the other to the *Os Sphænoïdes*.

Its Parts.

The Parts of this Bone are either solid or hollow; the solid are two Processes, which are received into the Glenoid Cavities of the first *Vertebra*; they do join the Head with the Spine by *Synarthrosis*. The hollow Parts are of two sorts, either Holes or Pits.

Its Holes.

The Holes are either common or proper; the common are two, one on each side of the *Os Petrosum*; they give passage to the *Nervi Vagi*, and to the internal jugular Veins. The proper are five; the first is single and very great, this it is through which the *Medula Spinalis* does pass, and the vertebral Arteries which slip into a little notch that is behind the *Condyl* of the *Os Occipitis*, as they pierce the *Dura Mater*. Two others do give passage to the ninth pair of Nerves, which distribute themselves wholly in the Tongue. The two last do let the vertebral Veins come forth, which are otherwise called the cervical Veins from the propinquity of the *Nucha*.

Its Pits.

The *Os Occipitis* hath four Pits, two lower ones which are the greatest, and do serve to lodge the *Cerebellum*; and two superior that are smaller, and contain the posterior Lobes of the Brain, which are separated from the *Cerebellum*, by a transversal inclosure that is formed by the *Dura Mater*, and that has a strong Tension, in order to hinder the *Cerebellum* from suffering compression; which might occasion an interruption of the Course of the Animal Spirits.

MM

The Bones of the *Sinciput*.

The Third and Fourth Bones of the *Cranium*, are those of the *Sinciput*, and called *Ossa Parietalia*, from their being a kind of Walls to the Head. They are of a more delicate, thinner, and softer Substance than those I have already mentioned.

Their Figure.

They are of a square figure, their Magnitude surpasses that of all the other Bones of the Head; their Situation is on the two sides which they possess intirely; the Sagittal Suture joins them together in their superior part; the Coronal Suture unites them with the *Os Frontis* in their anterior part; the Lambdoide joins them to the *Os Occipitis* in their posterior part; and lastly the Squammous Suture unites them to the *Os Petrosum* in their inferior part. These Bones have their external surface very smooth, but the internal is unequal, by reason of the impressions that represent the upper



upper side of a Fig-leaf, and which have been made by a Branch of the external Carotide, which makes a kind of wrought-work on the *Dura Mater*, that covers all which lies under these Bones.

Each of these Bones have a little Hole pierced near Their Holes, the Sagittal Suture, through which the Branches of the External Jugular do pass, to receive the superfluous Blood that could not be used in nourishing the Teguments, and to dispose it into the longitudinal *Sinus* of the *Dura Mater*. Upon which it may be observed, that all the Vessels which open into the great right *Sinus* of the *Dura Mater*, which is the superior, have a direction contrary to the course of the Liquor, for they do open from behind to before in Man; which is not so in other Animals. This Insertion is of great importance, because it serves to slacken the too rapid course of the Blood, which is apt to run too quick in the *Sinus*, by reason of the fall from before backwards, men being in an erect Situation.

The Fifth and last of the Bones of the *Cranium*, NN are those of the Temples, so called *a temporibus*, The Temple-bones. because they use to shew Mens Ages, and because the Hairs which grow upon the Temples do grow white sooner than others; their superiour part is called laminous or scaly, being very thin; and their lower part is called petrous or stony, being very hard.

These are the least of all the proper Bones of the Their Bigness and Figure. Skull, and in order to observe their figure the better, we must divide them into a superiour part, which is semicircular, and an inferior which resembles a Rock: they are placed on the sides and lower part of the Head, and are circumscribed upwards by a Suture that is called a false Suture although it be not so, and this unites them to the Bones of the Sinciput. Behind the Lambdoide Suture unites them to the *Os Occipitis*; and before or forwards, and below, the Sphœnoidal Suture joins them with the *Os Sphœnoides*. Artists among themselves do call such a Suture, a Suture with recovered jointings, by reason of a border it has that hides the Indentings or Toothings that are within. Sometimes also there are Skulls, in which all the circular brim of the scaly part of the Temples is indented outwardly; and the inferior brim of the Bone of the *Sinciput* that joins to it, is likewise indented after the same manner: the which does make an evident Suture outwardly,

wardly, altogether like unto other Sutures that are called true ones, which join the principal Bones of the *Cranium* together. I have a *Cranium* that I keep by way of curiosity, wherein the Suture of the Bone of the Temples is after this fashion, so indented; which is a rarity, because among a great number of Skulls there is hardly one such to be found, in which the Suture of the Temples is so formed:

Their Prominences.

There are divers parts that are to be shewn you in these Bones, and they are either prominent, or hollow. The protuberant parts of the *Os Petrosum* are their internal or external Processes; the internal are two, one on each side, like a great Rock, in which are the auditory Cavities, and the four little Bones that belong to it. The external Processes are three, the *Mastoides*, so called from resembling a Nipple; the *Apophysis Styloides*, like a Dagger; and *Zigomatick* Process, which by advancing outwardly, and by joining to an eminence that is in the *Os Malum*, does form the *Zigoma*.

The hollow parts of the *Os Petrosum* are of three kinds, Holes, Pits, and *Sinus*.

Their Holes.

The Holes of the Bone of the Temples are five, four external and one internal: This last is within, and called the internal auditory Hole, for through this the auditory Nerve, which comes from the seventh Pair, has its passage; which Nerve is divided into two branches or parts, the one soft, and the other hard. The first branch is called soft, because it feels to the touch softer than the other, which to the touch seems more fibrous and more compact.

The First of the external Holes is the external Auditory, otherwise called the Conduit of Hearing, because it conveys the Air from without to the membrane of the *Tympanum*, which receives its impressions from it.

The Second is called the oblique Hole, it is large and of an oval figure, it opens obliquely into the Canal or bony *Sinus*. This gives an Entrance to the internal Carotide. The third is a little Hole that is found at the bottom of two Processes, between the *Apophysis Mastoides*, and the *Styloides*; through which comes forth the hard part of the Auditory Nerve. Lastly the fourth of the external Holes is the Canal of Communication, which opens to the Barrel of the *Tympanum*. Some part of the Air we do breath does enter

enter

enter by this Canal into the Barrel without getting out again when once it is entred, by reason of the obliquity of the Conduit, which serves instead of a Valve.

The Pits are likewise Internal and External; the internal are two, and they do make the middle Cavities of the *Basis* of the Brain; the external which are also two, do serve for the Articulation of the lower Mandible.

The *Sinus* are two; there is one in each of the *Apo-physis Mastoïdes*. It is thought that these *Sinus* being divided into many little Cells, are appointed to receive the Air from the Barrel of the *Tympanum*, which Air does retire thither to give place unto other Air that comes from the Aqueduct

I have told you before that in this Rock which forms the *Os Petrosum*, there were four little Bones, to wit, the *Malleus*, *Incus*, *Stapes* and the *Os Orbitale*. These Names have been given them from their Resemblance to those Instruments. These Bones are thought as big, and as hard, at their first formation, as ever they will be during the whole Life; nevertheless they do grow stronger more and more with Age, which makes them somewhat harder at the end, than they were at the beginning, being almost all of a cartilaginous Nature.

The little Bones of the Ear.

In this Rock there are three Cavities, the Drum, the Labyrinth, and the Shell. And in the first of these Cavities are placed those four little Bones, which are joined and articulated together, so that the Process of the *Malleus* is tyed to the *Tympanum*, and articulated by its Head in the Cavity of the *Incus*. You will observe in the *Incus* or Anvil, two Legs, whereof the shortest is placed on the *Tympanum*, and the longest on the *Stapes* or Stirrop. Lastly the *Stapes*, whose two Branches are placed on a large *Basis*, does receive the little Tubercle of the *Incus* by its sharp and superior part.

Three Cavities in these Bones.

O

*Malleus.*

P

*Incus.*

Q

*Stapes.*

R

The circular Bone, or *Os Orbitale*.

In Infants there is found a Bone called *Os Orbitale*, it is made circular, like a Ring, on which the Membrane that we call the *Tympanum* or Drum, is stretched, as the Skin of a Drum is stretched on a Barrel, and this has given it its Name. The *Os Orbitale*, which is the fourth of those little Bones of the Ear, shut up in the Barrel, was first discovered by *Silvius De-le-Boe*. It is tied by a small Ligament to the lateral and superior part of the *Stapes*.

D

These

Articulations  
of the Bones  
that serve for  
Hearing.

These little Bones being thus articulated, are tied to the *Tympanum* by a very thin Cord, which serves to fasten them, and afterwards to loosen them with the second of the little Muscles that are there situated. These Parts being thus disposed, and being struck by the Impulse of the Air that enters into them, do represent to the Brain by their little Motions the sounds in such manner as they are conveyed thither.

*Os Sphænoïdes.*

The First of the two Bones that are common to the Scalp and the Face, is the *Os Sphænoïdes*. It has divers Names, both by reason of its different Figures, and its Situation. It is called by some *polyformous* and *multiformous*; others call it *Os Cuneiforme*, because it sinks into others like a Wedge into Wood; others call it the *Os Basilare*, because it is at the *Basis* of the Brain; some do call it *Os Colatorium* or *Cribriforme*, because the *Glandula Pituitaria* is placed upon it, and that it serves to derive or strain the *Pituita* from the Brain: but this last Use is false, and does not agree with the new Experiments of Anatomy. The *Os Sphænoïdes* is thick in its *Basis*, and very thin in the Cavity of the Temples: it is sufficiently large and hard; it is accounted but one Bone, although in Infants it may be divided into four. It is of such an extent, that it touches all the Bones of the Head, and many of the upper Mandible, with which it is united by a Part of its Suture.

The Processes  
of the *Os*  
*Sphænoïdes*.

This Bone has both external and internal Processes. The internal are three, called *Glinoides*, because they resemble a Saddle, or else are thought like to the Feet of a Bed. Two of them are anterior, and one posterior, and together they do make a Cavity wherein the *Glandula Pituitaria* is seated. The external Processes are two, called *Pterygoides*, because they are like the Wings of a Batt.

Cavities.

The Cavities of the *Os Sphænoïdes* are of three sorts; for it has Holes, Pits, and *Sinus*.

Holes.

The *Foramina* or Holes are six on each side. The first is the Optick, through which the Optick Nerve passes. The second is the great Cleft in the Orbit, through which the nervous Branches of the 3d, 4th, 5th, and 6th Pair do pass, together with the blood Branches of the Carotide and Jugular. The third is under the fore-said Cleft; it is a round Hole that gives Passage to some of the Branches of the Fifth Pair of Nerves, but they

are

are its inferior Branches. The Fourth is a bony Channel, dug into the *Os Petrosum*, which goes obliquely to the Saddle of the *Os Sphænoïdes*; it is in this Channel, or boney *Sinus* that the internal Carotide does lie, which rises thence towards the Saddle. The fifth Hole is the oval Cleft that lets the great Branch of the Fifth Pair of Nerves, which is the posterious Branch, come forth. Lastly the sixth Hole of the *Os Sphænoïdes* is a little round hole, through which there passes a Branch of the external Carotide, that makes the Resemblance of a Fig-leaf on the *Dura Mater*, under the Bone of the *Sinciput*. It is likewise this Branch that forms the Shape of a Leaf so well on the internal Table of the said Bone.

The Pits are three; one internal on the Saddle of the *Os Sphænoïdes*, and which serves for a *Basis* to the *Glandula Pituitaria*, and two external, which are in the *Apophyses Pterygoides*.

Pits.

In the middle of the *Os Sphænoïdes*, under the Saddle, are found two *Sinus* that are separated by a boney *Lamina*, which open in the Nose. These two *Sinus* are invested with a Membrane that is altogether glandulous, and is always covered with a *Mucus*, because the little glands of this Membrane do separate from the Blood a *Serum* which acquires consistence by its continuance in the *Sinus*, and when they are full of it, this *Mucus* is thrown out at the Apertures into the Nose, by mixing with the Snivel it there meets.

The Second and Last of the Bones that are common to the Scalp and Face, is the *Os Ethmoides*, called by some *Os Cribriforme*, because in its upper part it is full of little Holes, like a Sieve; and by others 'tis called *Os Spongiosum*, because all its lower part is spongy; it is situated in the middle of the *Basis* of the Forehead, and fills the Cavities of the Nostrils.

T

*Os Ethmoides.*

This Bone is the smallest of all the Bones that compose the *Cranium*; it is joined to the *Os Coronale*, in its upper part by a common Suture that is called the Ethmoidal Suture; and to the *Os Sphænoïdes* by the Sphænoïdal Suture.

Its Bigness.

The *Os Ethmoides* is divided into three parts, the upper, or Sieve-like part, which has abundance of little holes; the lower, which is spongy and does separate the Cavity of the Nostrils in twain; and into lateral parts, which are full and flat, and do make part of the Orbit.

Its Division.

You may see a Prominence in this Bone, that advances into the Cavity of the Cranium, and by reason that it resembles the Comb of a Cock, is called *Crista Galli*; it is very hard, and part of the *Dura Mater* is tied to this place, and called *Falx*, because it is like a Scythe, which *Falx* divides the Brain into two parts.

The Uses of the Holes of the Os Ethmoides. There are two Uses assigned to the Sieve-like holes; one is to give passage unto many small Fibres, which coming from the *Processus Mamillares*, disperse themselves in the Coats that invest the Cavities of the Nostrils; and the other is to filtrate the many serous Humours of the Brain, which gliding along these Fibres, do fall into the Nostrils.

Observation. But upon this Occasion I cannot but observe it to be a false Opinion, that the Serosities do run, or trickle through those Holes into the Nose; it is an Error of *Willis*. For these little Holes of the Sieve-bone are too closely stoppt by the Nerves, and by the *Dura Mater*, to let the least Drop of *Lympha* pass through them.

Thus, GENTLEMEN, I have shewn you all the Bones, that I was to demonstrate this Day, to morrow we will examine those of the Face.

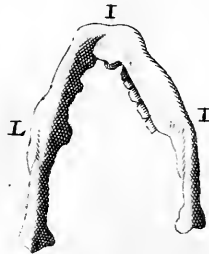
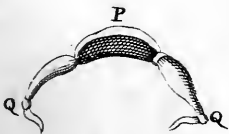
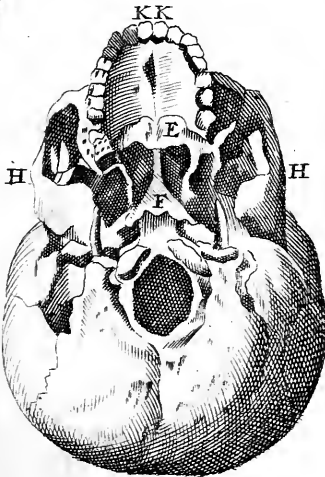
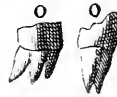
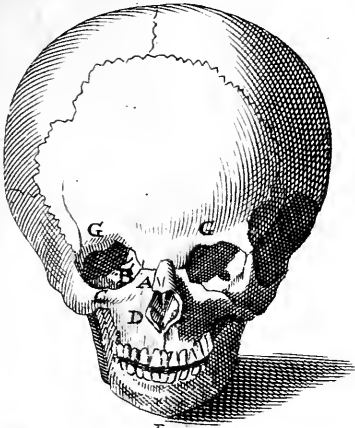
## Of the BONES of the FACE.

### The FOURTH DEMONSTRATION.

An Elegium  
on the Face.

**I**F you have found, GENTLEMEN, in the Composition of the *Cranium*, a Structure worthy your Admiration, you will not be less surprized with that of the Bones of the Face; and if the *Cranium* deserves its Commendations, because it contains the Brain, which is the noblest Part of all the Body, I am persuaded that the Face will not deserve much less Consideration, since it contains all the Senses, which makes it justly to be called the very Image or Representation of the Soul.

It is this Part likewise that represents before us all the Passions of the Mind so to the Life by such undeniable Characters, that it causes us to appear either courageous







ragious or fearful, joyful or sad, and generally such outwardly as we are really within. And since the Face is the Seat of Beauty, and does attract by its Charms the Eyes of all Men, as well as captivates the Hearts, we ought to know that nothing does contribute more to its Beauty than the Bones of which it consists, seeing it is from their just proportion that the Excellence of all the Parts of the Face does depend; for if, for Example, the ill Shape of the *Os Frontis* spoils the Forehead, if the Bones of the Nose make that Part deformed, and if the Bones of the Lower Jaw do make the Chin too sharp, it is certain the Face can never be Beautiful, although the Lips should be never so ruddy, the Mouth never so little, although the Complexion be all Lilies and Roses, and the Skin white and fine.

The Face is the Seat of Beauty.

What I have said in respect of the Bones of the Face, may be also understood of those of the rest of the Body; for if one of the Clavicles jets too much outwardly, it spoils the Shape of the Neck, and if one of the Bones of the Leg be too big, or should be crook'd, it is a disfigurement to the whole; insomuch that the Bones do not only recommend the Stature to be suitable or disagreeable, but they contribute to the Beauty of the Body.

The Bones give the Stature.

The Face consists of two Mandibles or Jaws, to wit, the Upper Jaw which comprehends all from the Eye to the bottom of the Upper Lip; and the Lower Jaw which extends from the top of the Under Lip to the end of the Chin.

Division of the Face.

The Upper Jaw is immoveable, the Lower on the contrary is altogether moveable, seeing Mastication, which is an Action so necessary sustaining for Life, depends wholly upon it, and it serves for Comminution of the Nourishment; In like manner as in a Mill it is sufficient for the well grinding the Corn that one of the two Mill-stones only should move; with this Difference nevertheless, that it is the Upper Mill-stone which being plac'd over the other, does easily grind the Grain, and turn it into Meal; and on the contrary it is the Lower Jaw that by means of divers Muscles and by its Pressure against the Upper Jaw does chew and grind the Aliments. And in this we ought to admire the great Wisdom of the Almighty, who has not thought it proper to let the Upper Jaw move, because being knit so fast to the *Cranium*, it would with its

The Lower Jaw does only move.

own Motion have forced the whole Skull to move at the same time; which would have been the more in-commodious to the Brain because it requires Ease and Quietness for performance of its Functions. Moreover, if God had appointed Mens Upper Jaw to move, as it does in Parrots, He must then have taken away its fastening to the Bones of the *Cranium*, and must have made it prominent forwards, as it is in Parrots. But since this would have been a great Deformity to the Face, the Author of Nature has avoided those In-conveniences, by ordering only the Lower Jaw to have any Motion.

Eleven Bones  
in the Upper  
Jaw.

There are eleven Bones in the Upper Jaw, five on each side, and one in the middle; the first is that of the Nose, the second the *Os Unguis*, the third is called by the French *de la Pommette*, the fourth the Jaw-bone, the fifth the Bone of the Palate or Roof of the Mouth; the sixth, which is single, is the Share bone. These Bones are separated from the *Cranium* by common Sutures, and joined together by *Harmonia*, one of the kinds of *Synarthrosis*; which causes them to have no Motion. Let us examine them one after another.

A  
The Bones of  
the Nose.

The Bones of the Nose, which offer themselves first to our View, are of a solid Substance, though they be very thin; they are very small, and of a Pyramidal Figure; they are placed as you see, on the upper part of the Nose, and compose what is called the Bridge of the Nose, for the wings which make the lower part of it, being Cartilaginous, are separated in the boiling.

How bound-  
ed.

These Bones are terminated above by the transversal Suture, which joins them in their upper part with the *Os Frontis*, and on the sides by two *Harmonia* Sutures, that is, one of the Sutures joins them together, and is in the middle of the Nose, and the other unites them with the two Jaw-bones. We must observe that these Bones are more smooth in their outward Surface, than they are in the inward, and that their lower part is unequal, and in Slits, to the end the Cartilages may the better stick to them.

B  
*Os Unguis*.

The two Bones which follow are called by the French *Os Unguis*, because they have the Bigness and Figure of a Nail; they are of a thin Substance like a Scale. These are the smallest Bones of the Upper Jaw; their Situation is at the great corner of the Eye; they have been called by some the Lachrymal Bones, but impro-

improperly, because in Man there is no *Glandula Lachrymalis* in the great corner of the Eye. Some have also called them the Orbit-bones.

These Bones do not hold very fast to the others, Bones that are easily lost. for which reason they are easily lost, and they are not to be found in a great many Skeletons: They touch four Bones, the *Os Frontis*, the Bone of the Nose, the Jaw-bone, and to that part of the *Os Ethmoides* which forms the Orbit of the Eye.

The Fifth and Sixth Bones are the Bones of the Cheek; they are very large, and of a hard and solid substance; they are of a triangular figure, their middle part is a little prominent outwards, and round like an Apple. I do believe that this Figure of theirs, and the Ruddiness which comely Persons do use to have in those places, have caused them to be call'd by the name *de la Pommette*, in French. C  
The Cheek-bones.

These Bones do make the Cheek, and the lower-part of the Orbit; they are also fastned to four other Bones, the *Os Frontis*, the *Sphænoïdes*, the Jaw-bone, and the *Os Petrosum*: There are observed in each of them three Processes; one forms an Eminence, which rising upwards, does make the little corner of the Eye; another advancing towards the Nose, does make the greatest part of the lower Eye-brow of the Orbit; and the third joining with a Prominence of the *Os Petrosum*, makes a great part of the *Zygoma*. Three Processes in the Os Mala.

The Seventh and Eighth are the proper Bones of the Jaw, and call'd the Jaw-bones; these Bones are D  
The Jaw-bones. the most spungy, and the greatest of all the Face; these do make some part of the Cheek, and do contribute to the formation of the *Orbita* in its inferior part; they compose the greatest part of the Palate, and articulate all the Upper Teeth.

It is hard to describe their Figure, because they have Their Figure. a very extraordinary one; they are placed on the side, and under the Bones of the *Os Mala*, possessing the inferior part of the Upper Jaw. They are observed to touch four different Bones, those of the Nose, the Palate, the *Os Mala*, and the Bones of the *Orbita*.

There are found in these Bones three sorts of Cavities, Cavities. Holes, Pits, and *Sinus*.

The *Foramina*, or Holes, are Internal and External: Foramina. The Internal are four; two are called Incisives, because they are directly under the Teeth called *Incisores*; and

two others on the lateral and posterior parts; these last are common to the Bones of the Palate. The External are two, and called Holes of the Orbit, because they are placed on the superior and middle part of these Bones, near to the Orbit. The Nerves of the Fifth Pair do pass through them, and are distributed into the parts of the Face.

The Pits are sixteen in each Jaw, and they are the *Alveoli* in which sixteen Teeth are fastned.

The *Sinus* are two, one in each Bone that lies along the extremities of the Roots of the Teeth. Their Use is to furnish a *Mucus*, by reason of the Membrane that covers them within.

**E** The Bones of the Palate of the Mouth. The Ninth and Tenth Bones of the Upper Jaw, are those of the Palate, which are very hard, but so small, that they do make but the least part of the Palate; the greatest part of the Roof of the Mouth being formed by the Jaw-bones, which reach unto the Line that separates the one from the other.

Their Figure. These Bones being a little bigger than they are long, are of a Figure almost square; their situation is at the bottom of the Palate, and they do make the deepest part of the Roof of the Mouth; they are joined together by the Suture of the Palate, which advancing forwards near to the *Dentes Incisores*, do also unite the two Jaw-bones. They are likewise fastned to the *Apo-physes Pterygoïdes*, by the Sphœnoidal Suture. They are supported on the following Bone, and have each a *Foramen*, called *Foramen Gustativum*, through which there passes a branch of the Fifth Pair of Nerves.

**F** The Eleventh Bone. The Eleventh Bone of the Superior Jaw is called the Plough-Bone, and so called because it resembles the Coulter or Share of the Plough: This Bone is a single one, having no fellow to it; it is placed in the middle, above the Palate; it is hard and small, joined with the *Os Ethmoides* and *Sphœnoides*, which have both some small eminences that are received into the cavities of this Bone; and which by this means do strengthen it in its position: It is this Bone that divides the interior part of the Nostrils into two.

**G G** The Orbits of the Eyes. The Orbits of the Eyes are two great Cavities, situated at the lower part of the Forehead, and serve for a Mansion or habitation to the Eyes, and they defend them against all that may offer to hurt them; their Figure is Pyramidal, having outwardly a great Aperture,

ture, which by lessening according as the Orbit sinks inwardly, does form a kind of Perspective; their bottom is pierced through, for a passage to the Optick Nerves.

These Cavities are compos'd of Six different Bones, which do all together form the extent and depth of the Orbit. Of these six Bones, there is one proper to it, and five common to it and others: The proper one is the Bone of the Orbit, or the Orbital-Bone, which serves only for the use of the Orbit; it is situated in the great corner of the Eye. Of the common Bones, there are three that belong to the *Cranium*, and two to the Face. The first of those of the *Cranium*, is the *Os Frontis*, which forms the superior part of it, and serves for an Arch to the Orbit; the second is the *Os Ethmoides*, which makes the lateral part of it, towards the Nose; and the third is the *Os Sphænoïdes*, which forms the deepest or most inward part of it: The two Bones of the Face do form its inferior part, of which the Bone *de la Pommette* makes that part which is near the little corner of the Eye, and the Jaw-bone that which is next to the great corner.

They consist  
of Six Bones.

Before I shall proceed unto the Bones of the Lower-Jaw, I will let you see the *Zygoma*, called by some *Os Jugale*; it is not one single Bone, but an union or coalition of two prominences of Bones, whereof the one comes from the Temporal-bone, and the other from the Cheek-bone. These Prominences, or Processes, are joined by a small oblique Suture, which I call'd the Zygomatick Suture, when I shew'd it.

HH

The *Zygoma*.

It is remarkable, That these two Bones do together make an Arcade, that has two considerable Uses; one is to give passage to the Muscle *Crotaphytes*, and to serve for a defence to it; and the other is to give rise to the Muscle *Masseter*, whose business is with the *Crotaphytes*, to help the chewing of the Meat.

Uses of the  
*Zygoma*.

The Lower Jaw consists of two Bones until the seventh year of age, and then they turn into one, joining together in their anterior and middle part by *Symphysis* without a *medium*, as the *Epiphyses* do, which from Cartilages do become Bones by length of time.

II

The Lower  
Jaw.

These two Bones are large enough, or as large as was requisite, to serve for a *basis* to sixteen Teeth that are articulated into them; their Substance is solid and very hard, to the end they may be strong enough to bite,

KK

The two  
Bones of the  
Lower Jaw.

bite, and to chew. They together make a better figure in Man, than in any other Animal; for it is semicircular, and resembles an Arch; they are smooth and even outwardly, and a little rough and uneven inwardly, and in their inferior part, in order to facilitate the rise and the insertion of the Muscles. That which is rounded before is named the *Basis*, and their brims are called Lips, of which they have one internal, and another external; in their upper part they are fastened to the *Os Petrosum*, with which they are articulated by *Arthrodia*, and bounded below by the Chin, which makes their inferior and interior part.

To examine these Bones the better, we must consider the Parts, which are Solid, or Hollow.

The Processes.

The Solid Parts are Superior and Inferior; the Superior are four, that is, two Processes, or Heads, placed on a little Neck, called *Condiloides*, which do make them to articulate with the *Os Petrosum*, and two other Processes or Points, call'd *Coronoides*, which serve for the insertion of the Muscles *Crotaphytes*. The Inferior Parts are three; one anterior, call'd the Chin; and two posterior, call'd Cones, of which one is on the right, and the other on the left, where the Muscle *Masseter* is outwardly inserted, and inwardly the *Pterygoides*, which do serve for mastication.

The Cavities.

The Hollow Parts are Holes, Pits, and *Sinus*: The Holes are Internal or External; the Internal are two, placed at the Angles which do receive a Nerve of the Fifth Pair, and also an Artery which goes to all the roots of the Lower Teeth. They do likewise give passage to a Vein for carrying away the Blood. The External, which are also two, are placed towards the anterior and middle part of the Lower Jaw; it is through these Holes that a part of the Nerve goes out which came in by the Internal, the branches of which Nerve proceed to be distributed into the External parts of the Chin.

The Pits are sixteen, as they were in the Upper Mandible; and they are Cavities, or *Alveoli*, in which the sixteen Teeth are set and fastened. Some of the *Alveoli* have but one Pit, others two, some three, and others four, according as the Teeth have more or fewer Roots.

The *Sinus* are two, one on each side; these are Internal Cavities that lie along the Jaw, and they do contain



contain the Matter of which the Teeth are to be formed.

The Lower Jaw has divers Uses ; the first, which is for Ornament and Beauty, is common to it, and to other parts of the Face ; the second is for Mastication ; and the third for forming the Voice.

Uses of the Lower Jaw.

We do not commonly Demonstrate in a Skeleton all the Teeth both of the Upper and Lower Jaw, because there are very few of them wherein some of the Teeth are not wanting. Moreover, we ought to observe, That they do not fall out of the Jaws in a living Body, as they do out of a Skeleton ; because in the one there are Gums that keep them fast in their *Alveoli*, whereas in all Skeletons they are lost, or fall out in the boiling.

L. The Teeth.

The Teeth are small hard Bones, white and smooth, articulated in the Jaws by *Gomphosis*, which serve to chew and grind the Meat.

Definition of the Teeth.

They differ from other Bones, in that they have no *Periosteum*, which is the cause they have no sense of Pain, but only at their Root, where the Nerve enters ; for we must agree, that the part of the Teeth which appears outwardly, is depriv'd of all Sensation.

Although the Teeth are very hard Bones, and do exceed all the Bones of the Body in point of hardness ; nevertheless they do wear and consume by their continual action, and by their friction one against another. The proof of which is so evident, that when one Tooth fails, that which is opposite to its place not meeting it in the chewing, does grow ; and exceeding the length of those which are on each side of it, does rise into the cavity of that which is lost : And this is the reason why Nature not being able to hinder their wearing away, as cautious as it is, has given them Vessels which convey to them a Matter that nourishes and repairs them.

That the Teeth wear away, and grow.

The Teeth are made of the Seminal Liquor of the Egg, as all other Parts are, from their first conformation ; they are found in the cavities of the *Alveoli*, even in some *Fœtus* that have not yet accomplished their Nine Months. It is true, they have not then attained their Perfection, since only a great part of their Table is but then formed : But there is observed in those same *Alveoli* a *Mucus*, which growing dry with time, does push out the remainder of the Tooth, in proportion

The first Principle of the Teeth.

tion



tion to its formation. The Time is not certainly fix'd by Nature for the expulsion of the Teeth ; there are some Infants who have had some Teeth even from the birth, others in the first month, and others in seven or eight months, which is the usual time ; and there are some of them who do not begin their Toothing till they are a year or two old.

Why the  
Teeth do  
come one af-  
ter another.

The Teeth do not come forth all at a time, the *Incisors* or Cutters of the Upper Jaw do first break forth ; because being the smallest of all, they the sooner acquire perfection ; and being sharp, they do the sooner cut the Gums. Next appear the *Incisors* of the Lower Jaw, then the Dog-teeth, and lastly the Grinders.

Breeding of  
Teeth causes  
Pain.

Seeing the Extrusion of the Teeth does use to be very painful to Infants, and to cause dreadful Accidents, Nature does therefore wisely expel them one after another, or at most but two at a time ; because if they were to come all at a time, the Infants would not be able to overcome the Convulsions which would happen, without the greatest danger, and perhaps loss of their Lives ; as it has been often experienc'd in those that have had three or four coming together.

The Infant  
to be Wean'd  
after he has  
Twenty  
Teeth.

When Twenty of the Teeth have appeared, the rest do not come forth for some years : Nevertheless, we use to say, the Infant has all his Teeth ; which is to be understood of all that he ought to have at that age, the number being commonly twenty in twenty months. It is thought the most proper time then to Wean an Infant, and not before ; because the Nourishment of Milk is not only proper for the better breeding the Teeth, but also for the keeping the Gums moist, and especially when the latter Teeth are bred ; I say, the latter, because that having their ends thicker, they break forth of the Gums harder than the first.

The Use of  
their Coral.

When the Toothing comes on, they do hang a Rattle or Coral about the Infant's Neck, both for their diversion by the noise of the Bells that rattle, and for the frequent putting it into their Mouths ; which has two advantages, whereof one is to cool their Gums that are inflamed by the pains which are caused by the extrusion of Teeth, and this happens from the coldness of the Crystal or Coral that is at the end of the Rattle ; the other is to facilitate the extrusion of the Tooth that is ready to Cut, the which the Infant readily does, who feeling pain, and squeezing the Coral be-  
tween

tween his Gums, does by this means help the Tooth to Cut the more easily.

The Twenty first Teeth being shot out, or all cut, the Child remains in this condition unto the Seventh year of his age, and then four more of them do appear behind the former. At Fourteen years old there come four more; and lastly, about Twenty there do rise four more, which are call'd the Wise Teeth, because they come at an age when People should begin to be Wife. All these Teeth together do make the number of them Thirty-two.

The Wise Teeth.

Those Twenty first Teeth are called the Milk-Teeth; they fall out commonly towards the Sixth or Seventh Year, because they are Double from their first conformation, and because those which are under the *Alveoli* do push forwards the former towards that time. And this is easie to observe, since it is certain, that when one Tooth falls out, another is found to lie underneath, that push'd it, and caused it to fall out. It is good to help out those Milk-Teeth, so soon as they begin to loosen, that those which come underneath, and that are to continue for life, may rise strait, and in a good position. It is further observed, That those first Teeth, when they fall, do not prove to be perfect Teeth, having lost a part of their Root; because those that succeed underneath do possess their place, and as they grow up, do force the former to fall out; and if it chance to happen that some new Tooth shall come in elderly Persons, such as are Fifty or Sixty years old, or if one should chance to shoot out in the place of another that has been drawn at such times of life, I assert, that these new Teeth had their principle from the first conformation of Parts; for since we cannot Draw a sound and perfect Tooth, without breaking the Vessels at the Root, I am persuaded, that there can be no return of new ones, unless there be some *Semen* of them underneath; some first principle being necessary for the production of Teeth, as it is to all other things; and this Principle depends on the disposition of Matter, which once failing, can never regenerate.

New Teeth have their Principle in the *Alveoli*.

All the Teeth are ranged in the two Jaws, one by another, in a certain order, although sometimes there will happen a Double Row of them; but that is to be regarded as a vicious conformation, because it is both

A Double Row of Teeth inconvenient.

a defor-

a deformity, and inconvenient, especially when the second Row happens outwardly ; for when it comes within the first, it is the less inconvenient.

Some Infants  
born with  
Teeth.

Some do imagine that a greater number of Teeth than ordinary, and their coming over-early, as when Children are born with them, are Signs of Good-Fortune, and of their being Predestinated : But it is an Error ; since the having more or fewer Teeth, depends upon the abundance or want of Matter in the *Alveoli* at their first conformation. I believe only, those are happy that have Two and thirty Teeth, and have them good in their kind, because it is a means of Health ; Mastication being better perform'd by those who have them all, rather than those who want some : For if the Meat can't be sufficiently chew'd, but is fain to be swallow'd in bits or morsels, for want of Teeth, the Stomach not being able to make a good Digestion, the distribution of the Nourishment can't be so well perform'd, as when it has been well prepar'd in the Mouth by Mastication, through the means of the Teeth.

No Worms  
in the Teeth.

When I said, all the Bones have their Cavities, I did not think that I ought to except the Teeth, since they have one in their middle, where the Nerve is inserted. It is in this place that a ferous Acrimony is sometimes found, which corrodes and spoils the Tooth so sensibly, that we are oblig'd to Draw it out ; because this sharp *Serum* having begun to eat into the Tooth, it continues to do so, until it has destroyed it by piece-meal. Some have thought that little Worms will grow in the Teeth, but they are mistaken ; it being only a way of expressing our selves, founded upon the resemblance which the Holes of these Teeth have, like unto those which little Worms do use to make when they corrode a-part.

The Teeth  
fall out with  
Old Age.

It is a rarity for a Man to preserve his Teeth sound during his whole Life ; for besides that they often grow rotten, which forces us to Draw them, they also fall out of themselves, as we grow old ; because they become very dry, and the Gums loosen from their Roots. There are some Old People whose Gums do harden to such a degree, that it supplies their want of Teeth, and they can chew their Meat upon them, but never so well as they did with the Teeth themselves.

The Uses of  
the Teeth.

The Teeth have three Uses ; the first and chiefest is for Mastication : The second is to distinguish the  
Voice ;

Voice; I do not pretend that they are absolutely necessary for Speech, but only for the speaking well, whence it comes that toothless Persons find a difficulty to pronounce distinctly certain letters, and certain words. Lastly, The third Use is for Ornament; for it is a great Deformity when they grow black and rotten, or when some of them are gone, especially those before. On the contrary, it is a grace to a comely Person to have them well shap'd, in good order, and very white.

Although I have before observed to you, that the Their Number. Number of the Teeth is commonly Thirty two, to wit, Sixteen in each Jaw; nevertheless, some Persons have happened to have more, and sometimes fewer. There have been seen some Persons who have had but two in all, that is, one continued Bone in each Jaw, which served instead of Teeth. These Two and thirty Teeth are divided into *Incisores* or Cutters, and into Dog-teeth, and Grinders.

The *Incisores*, or Cutters, are so call'd, because they MM do cut and divide Meat like a Knife. Others will call Two of the Incisores. them the Laughing-teeth, because they appear so plain when a Man laughs. They are eight, four in each Jaw, placed before the rest outwardly, and in the middle of the others; their outward surface is like an Arch, and the interior is hollow; they are sharper, more cutting, and shorter than the rest; they are planted in their *Alveoli* by single Roots, which terminate in a point; wherefore they fall out easily, especially the upper rank of them.

The Dog-Teeth are so called, because they serve to N break and crack hard bodies; which makes us One Dog-tooth. commonly to put the Bones we would gnaw under these Teeth. They are four, two in each Jaw; they are placed next to the Cutters, one on each side; they are thick, strong, and solid; and are fastened in their *Alveoli*, or Sockets, by single Roots, like the Cutters, but more deeply and strongly, for they exceed all the rest in length. The Upper Dog-Teeth are called Eye-Teeth, by reason that a part of the Nerve which moves the Eyes is branched towards these Teeth; wherefore many do think it is dangerous to Draw them.

The Grinders are so called, because they do serve, OO like Mill-stones in a Mill, to break and grind all sorts Two of the Grinders. of

of Meat. There are twenty of them, ten in each Jaw, and five on each side; they are hard, great and large; that of them which is next to the Dog-tooth, is lesser than the others, and all of them encrease in bulk, according to their deeper situation in the Mouth. These Teeth have divers Roots, which serve the better to fasten them in their Sockets. It is observed, that the Lower Grinders have but two or three Roots, whereas the Upper have three or four; which is not without good reason in Nature; for the Upper being in a hanging position above, have occasion for a greater quantity to keep them fix'd and firm.

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Os Hyoides.

And now I shall Demonstrate the *Os Hyoides*, to finish the Number of Threescore Bones of the Head, among which it is comprehended. It is so called, from being like the Greek letter  $\Upsilon$ , which has also given it the name of *Os Ypsiloides*: This is the Bone that is seen at the end of a Neat's-Tongue. It is situated at the *basis* of the Tongue, upon the *Larynx*. It has ten Muscles which keep it in its proper place, as ten Cords do keep up a Mast of a Ship; it touches no other Bone, but is tied above by Bones that are called its superior *Cornua*, to the two *Apophyses Styloides* of the Bone of the Temples by small Ligaments, and below at its inferior *Cornua* it is joined unto the two wings of the *Cartilago Theroides* of the *Larynx*, by Ligaments of the same nature with those that tied its upper part: inso-much that its true Articulation is not *Sysarcosis*, as the Ancients pretended, but a true *Syneurosis*, seeing it is fastened by Ligaments, and the ten Muscles which beset it, do only serve to move it with the Tongue, by drawing it up and down, and sideways. It is composed of five Bones, of which the greatest makes the *Basis*, which is the anterior and middle part of this Bone. This *Basis* is arched outwardly, and hollow within; two other lesser Bones are united to this, one on each side, and two very small ones are joined to the ends of these last: These four small Bones do all together make the sides of the *Os Hyoides*, and they are call'd the *Cornua*.

QQ

The *Cornua*  
Offis Hyoidis.The Uses of  
the *Os Hy-*  
*oides*.

The principal Use of this Bone is not to serve for a Prop and Support to the Tongue, (as many have written,) for it would be too weakly supported thereby; but it is for to facilitate the admittance of Air into the *Aspera Arteria*, and the passage of Meat and Drink into

into the *Oesophagus*, by keeping the *Pharynx* in that just Bigness it ought to have, for the free Passage of the Nourishment.

Seeing the Cavities of the Head are very numerous; I believe it will not be useleſs here to make a repetition of them before I make an end of this Subject, and ſhall ſay once more, that they are of three ſorts, *Foramina*, Pits, and *Sinus*. A Recapitulation of all the Cavities of the Head.

In Order to examine well the *Foramina*, or Holes of the Head, we muſt divide them into Internal, which are ten in Number on each ſide without reckoning the little Holes of the *Os Cribriforme*, and the great Hole of the *Os Occipitis*. The firſt is the Optick; the ſecond is the great Cleft of the Orbit; the third is the great round Hole; the fourth is the great Canal or bony *Sinus*: the fifth is the Oval Cleft; the ſixth is the little round Hole; the ſeventh is the Internal Auditory; the eighth is the Hole called the great Jugular; the ninth is the Hole of the ninth pair of Nerves, called the lateral Hole; Laſtly the tenth is the Cervical. Ten Internal Foramina on each ſide of the Head.

There are alſo eleven External *Foramina* on each ſide; the firſt is that of the Eye-brows; the ſecond is the Naſal Canal, otherwiſe called the Lachrymal Canal, which is almoſt all of it cavernous in the Superior Part of the Jaw-bone, in the Place where it is joined with the *Os Unguis*; the third is the Internal Orbitaly, or a Hole in the Orbit that is found placed againſt the *Os Planum*; the fourth is the External Orbitaly, it is the Egreſs of a Canal that is made in that part of the Jaw, which forms the lower part of the *Orbita*, this Hole is placed outwardly at the Edge of the Orbit in the Jaw-bone; the fifth is the Inciſive, which opens by two different Apertures into the Noſe, it is common to both the Jaw-bones, and is ſituated under the two firſt Teeth called *Inciſores*. It is through this Hole that the Tears which fall into the Noſe do afterwards come into the Mouth, and hence it is that in crying a Man ſpits much, by reaſon of the abundance of Tears that run into the Mouth, and by their Acrimony do irritate the Salivating Veſſels; The ſixth is the Hole of the Roof of the Mouth, that is called *Foramen Guſtativum*, through which there paſſes a Branch of the Fifth Pair of Nerves; the ſeventh is the External Auditive, or the Conduit of Hearing; the eighth is the Oblique, which opens into the bony Canal; the ninth is a little Eleven External Foramina.



## Of the BONES of the FACE.

Hole between the *Apophysis Mastoides* and the *Styloides*; the tenth is the Canal of Communication, or the Aqueduct so called, because it has sometimes served for a Sink to the purulent Serofities that come from Abscesses in the deepest parts of the Throat, and which are discharged at the Ear. Lastly the eleventh is a small Hole in the Bone of the *Sinciput* near the Sagittal Suture.

Six Internal Pits.

The Pits are more easy to see than the Holes; they are Internal and External. The Internal are six, and are all perceived so soon as the *Cranium* is opened; they are situated at its *Basis*; two of them are less than the rest, and are in the anterior part of the *Cranium*, that is in the *Os Frontis*; two a little bigger than those are in the *Os Petrosum*, and the two largest are placed in the *Os Occipitis*, unto which I shall add the two Superior.

Fourteen External Pits.

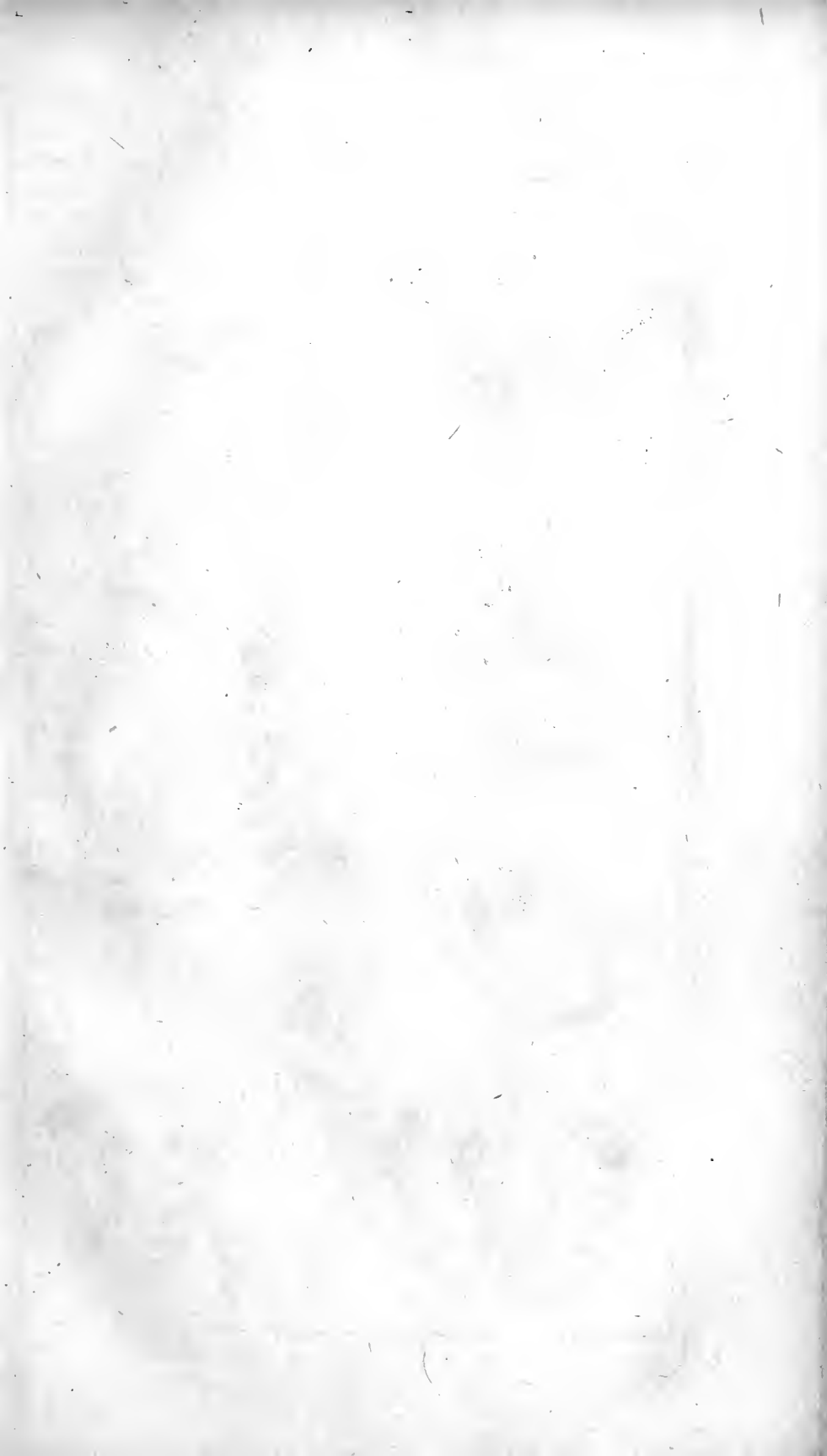
The External Pits are fourteen, seven on each side, of which the first does receive the *Condylus* of the Lower Jaw, for its Articulation with the *Os Petrosum*; the second is in the *Apophyses Pterygoides*; the third is toward the Hole that is rent in two, through which the *Par Vagum* does pass; the fourth is on the Palate; the fifth makes the Arch of the Palate; the sixth is under the *Zygoma*; and the seventh is the Cavity that forms the Orbit.

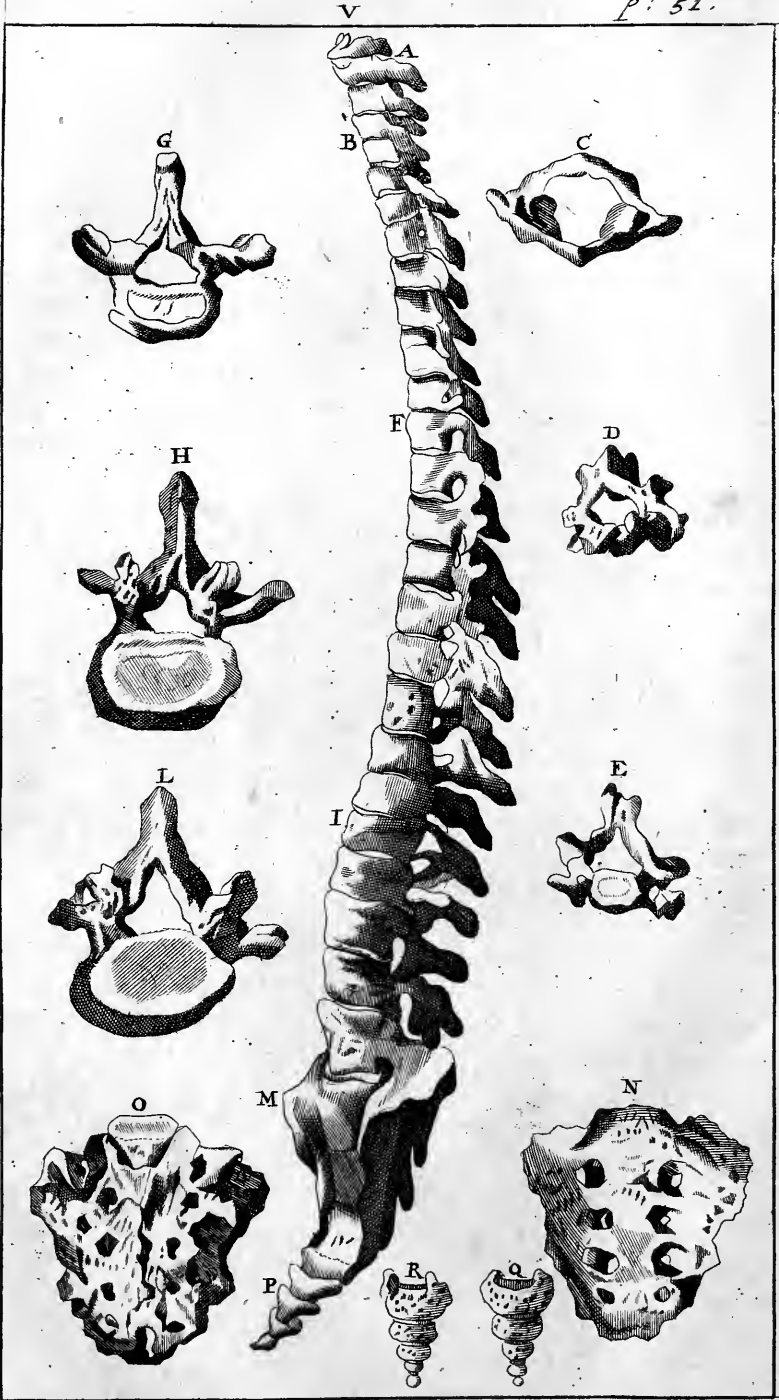
Eight Sinus.

The *Sinus* are Eight; two in the Upper Jaw; two in the inferior part of the *Os Frontis*. two in the *Os Petrosum*, in the *Apophyses Mastoides*, and one in the Saddle of the *Os Sphæroides*.

Thus, GENTLEMEN, You have had all the Cavities of the *Cranium* and the Face shewn you, in the Number of which I have not comprehended those of the Lower Jaw, because they are separated from the rest of the Head. In the two following Demonstrations I shall speak of the Bones of the Trunk of the Body, which will make the second part of the Skeleton.







## Of the BONES of the SPINE.

### The FIFTH DEMONSTRATION.

**Y**OU have seen, GENTLEMEN, all the Bones of the *Cranium*; and now Order requires that I should shew you those which do form the Trunk of the Body. These are divided into three sorts, the Bones of the Spine, the Bones of the *Thorax*, and the *Ossa Innominata*. I shall begin this Day with those of the Spine, reserving those of the *Thorax*, and the *Ossa Innominata*, for your future View in the next Demonstration.

The Bones of the Trunk divided into three sorts.

The admirable Structure of the Spine does no less display the Wisdom of God, than did the Composition of the *Cranium*; for as He made this Part altogether bony for the containing and defending the Brain, so it was necessary in like manner that the Spine should be bony, to the end that the Marrow, which is a continuity with the Brain, should thereby be preserved and defended in the long Passage it has to take. It is perforated on the right and left, as the *Cranium*, with many *Foramina* for Transmission of the Nerves which are appointed to convey the Animal Juice into all the Parts; in effect, it would be in vain for the Brain to separate this Juice, and to be, as I may say, the Fountain of it, if there were not an Aqueduct, such as the Spine to convey it to all the Parts by means of the Nerves.

In order to understand exactly the Composition of the Spine, we must consider it both in general and in particular. There are seven things to be examined in the general, its Name, its Definition, its Division, its Figure, its Connexion, its Uses, and its Parts.

All the Bones which are from the first *Vertebra* of the Neck unto the Extremity of the *Coccyx*, are called the Spine; it is so named, either because of the Sharpness of its back-part, or else because if you separate entirely the *Vertebra* from the other Bones which touch them, they will all together make the Figure of a Thorn.

It is defined, a Complex of many Bones articulated together to serve for a Habitation and Rampire to the Marrow,

Marrow, as the *Cranium* is to the Brain. If it had consisted but of one Bone, it would have remained strait like a Stake, without possibility of bending, and if it had consisted but of two, three, or four Bones, it would have been forced to make right Angles in all its Flexions, at the Articulations, and that would have made a Compression on the Marrow, which would have hindred the Transition of the Animal Juice into the Extremities of the Nerves. But being composed of many Bones conjoined and articulated together by strong Ligaments, it easily moves in all its Parts without incommoding the Marrow which it contains, or either the Parts of the *Thorax* and *Abdomen*, which it touches.

Division.

The Spine is divided into five parts, the Neck, the Back, the Loins, the *Os Sacrum*, and the *Coccyx*.

Figure of the Spine in general.

The Figure of the Spine is one of the principal Circumstances we ought to observe in it; for if we behold it either before or behind, it appears direct or strait; but if we consider it on either side, we shall see that it falls one while inwards, and one while outwards, both for its better Support, and to remove from, or to approach to the parts of the *Thorax* and the *Abdomen*.

The particular Figure of the Neck.

The sharp End of the Spine, at the Neck, bends inwards; and some pretend it is in order to support the *Astera Arteria*, and the *Oesophagus*, which I do not believe, seeing the Proximity of many Bones so hard as are the *Vertebra*, would rather hurt the *Oesophagus*, and hinder Deglutition, than be any Advantage to it. It is much more likely that this Position is given, for the better sustaining the Head, which is there placed as on a Pivot; for if the Spine had risen strait up, it would have been joined with the hinder-part of the Head, which being thereby not well supported, would have fallen forwards by its own Weight.

The Figure of the Back and the Loins.

The *Vertebra* of the Back, on the contrary, do incline or bend outwards, for the Augmentation of the Capacity of the *Thorax*, because the Heart and the Lungs which are therein contained, being in a continual Motion, ought not to suffer Compression. Those of the Loins do incline a little inwards, not for the Support of the great Artery, and the *Vena Cava*, as some have pretended, but for the better balancing the Weight of the Body, by serving for Buttresses to the

the Parts which they sustain; for if they had bent outwardly, as do the *Vertebrae* of the Back, the Body which is supported by them, instead of forming an erect upright Figure, would have continually fallen forwards. The *Os Sacrum* bends outwards, in order to form the Cavity of the *Pelvis* more large, that the *Rectum*, the Bladder, and the Parts that serve for Generation may have the easier Position, and especially those Parts in Women which have need of room in the time of their Breeding. The *Coccyx* bends inward, that it may not be hurt, or uneasy, when we do sit, or mount on Horse-back.

That we may the better examine the Connexions of the Spine, we must observe those which are common, and those that are particular to it; the common Connexions are those it has with the Parts that are joined to it; the first is with the Head, to which it is joined by *Arthrodia*, the *Os Occipitis* having two Prominences which do enter into the Glenoide Cavities of the first *Vertebra* of the Neck; the second is with the Ribs, which are articulated with the twelve *Vertebrae* of the Back by a double *Arthrodia*, the one being made in the body of the *Vertebra*, and the other at its transverse Process; the third is with the *Scapula* by *Sysarcosis*, there being some Muscles which spring from the spiney *Vertebrae* of the Neck, and from those of the Back, which have their Insertion into the *Basis* of the *Scapula*; the fourth is with the *Ossa Innominata*, which are strongly united with the *Os Sacrum*.

The General  
Connexions  
of the Spine.

The Particular Connexions of the Spine, are those which the *Vertebrae* do make one with another; they are of two or three kinds; one of them is made by their Bodies, which is a *Symphysis* called *Syncondrosis*, because the Connexion is made by means of a Cartilage; the other is made by their oblique Process, which is an *Arthrodia*; a third sort is added to them, which is a *Species* of *Ginglymus*, because at the same time as a *Vertebra* is received by that which is inferior to it, it also receives that which is superior to it.

Particular  
Connexions  
of the Spine.

The Ligaments, which are in the Articulations of the *Vertebrae*, are very strong, in order to hinder their Luxation, in the violent Motions they make. They are of two sorts; the one are thick and fibrous, made in the form of a Crescent, which tie them both above and below; and the others, which are membranous,

The Liga-  
ments of the  
*Vertebrae*.

do serve to fasten them more strongly. They do rise from the transverse and acute Processes.

Uses of the Spine.

The Spine has Uses that are common and particular to it. The first are to serve for a Prop and Support to the Body, as all the rest of the Bones do, and also to serve for the Insertion of many Muscles: The second are for the Conveyance of the Marrow, to defend it from all Injuries both Internal and External, and to be a Support to the Head, the Breast, the Ribs, the Legs and Arms; insomuch that it may be said to be like the Keel of a Ship, to which the Ribs, the Stern, the Fore-deck, and generally the whole Ship is fastned.

Its Parts.

The Parts which compose the Spine are called  $\Sigma\pi\acute{o}\nu\delta\sigma\tau\alpha\iota$ , and commonly *Vertebrae*, from *Verto*, to turn, because the Body turns several ways by their means.

What the *Vertebrae* have in common.

Before we shall examine the *Vertebrae* particularly, we ought to observe five things which are common to them all, and are to be found in the Structure of them all; the first is that each of them has its body in its Internal part, their Body is the largest Part of them, on which they do support one another; the second is, that they have all of them a great *Foramen*, through which the *Medulla Spinalis* passes; the third is, that they have all three sorts of Processes, to wit, four oblique, two transverse, and one acute; the fourth is, that they have all of them five *Epiphyses*, or Appendages, to wit, two at their Body, two at the Extremities of their transverse Processes, and one at the End of their acute Process; the fifth and last thing is, that they are all pierced through on their sides, for the Passage of the Nerves that come through them. We must observe, that they are not so pierced in their middle part, which would weaken them too much, but that two *Vertebrae* do contribute to make the Hole between them, so that in each of them there does not appear but one half of the Hole, the greatest part of it being hid in the Cartilage, which ties two *Vertebrae* together.

In order to examine well each *Vertebra* in particular, we must resume the Division that I made of the Spine into five parts, the Neck, the Back, the Loins, the *Os Sacrum*, and the *Coccyx*.

**B**  
The Neck.

The Neck is composed of seven *Vertebrae*, which are more solid and harder than those of the Back, because their business is to support the Head, which is a very weighty Part; but they are likewise smaller than the others, because if they had been as big as those of the

Back

Back and Loins, the Neck would have been too big, and it would not have been able to move so easily as it does.

Two or three of these *Vertebrae* have something particular to them, which I shall demonstrate after I have observed to you what they have in common to one another. I shall confine my self herein to five things that are remarkable. The first is, that besides the seven *Apophyses*, which I have said do meet in all the *Vertebrae*, these of the Neck have two more than the others, which makes their Number nine, the which are placed in the Superior Part of their Body, one on the right and the other on the left; they do encompass the body of the Superior *Vertebra*, which is small enough, and by hindring that does not slip either one way or t' other, they preserve it firm and certain in the Motions of the Neck. The second is, that the body of these *Vertebrae* is flatter before than that of the others, to the end they may not incommode the *Aspera Arteria*, nor the *Oesophagus*. Many Authors have thought that these *Vertebrae* have their Tendency forwards, to support those Parts; but it is not true, since they have no such need of the neighbourhood of these Bones, which if they were too near would not fail to injure them in their Functions, by compressing them too much. The third is, that their transverse Processes are pierced through, for giving Passage to the Cervical Arteries, which are conveyed this way into the Brain. The fourth is, that their Processes both transverse and acute are cleft or forked, to facilitate the Adhæ- sion of the Muscles. And lastly, the fifth is, that their acute Processes are a little couched in their lower part, for the easiness of Motion.

The first of all these *Vertebrae* is called the *Atlas*, because it immediately supports the Head, which being of a round Figure, has Resemblance to the World, which has been feigned to be born by *Atlas*. This *Vertebra* has no acute Process, because the Motions of the Head are not made upon it, but upon the second; and it being obliged to turn as often as the Head has a circular Motion, if it had had an acute Process, this would have incommoded the posterior Muscles of the Head in its circular Motions, and especially the two little right Muscles, which have their Rise from the second *Vertebra*, and their Insertion in the *Occiput*. This is of a more delicate and thinner,

The *Vertebrae* of the Neck have five things in common.

C  
*Atlas*.



and also harder substance than the other *Vertebrae*. It likewise differs from the rest, in that the others do receive on one side, and are received on the other: On the contrary, this does receive at both its extremities; for two Prominences of the *Occiput* do enter into its two superior Cavities, which make its Articulation with the Head; and at the same time two other Prominences of the second *Vertebra* do enter into its two inferior Cavities, which do join them both together.

Observation  
on the Arti-  
culation of  
the Head.

We must observe, That the Articulation of the Head is made on the anterior part of this *Vertebra*, and not on its posterior part, to the end it may be the better supported by the body of the *Vertebrae*, and that it may be so kept the better in its *Aequilibrium*. We must also observe, that the Aperture which is in the middle of this *Vertebra*, is greater than that of the rest; for besides that it gives passage to the *Medulla Spinalis*, as all the others do, it receives the Tooth of the second, which passing through its aperture, does unite it self to the *Os Occipitis*.

D  
The Wheel-  
ing *Vertebra*.

The second of the *Vertebrae* is call'd the Wheeling *Vertebra*, because it is upon this that the Head and the first *Vertebra* do turn about as upon a Pivot, and because from the middle of its body there does rise a Process, which represents in some measure a Tooth, which has also given it the name of *Dentata* at this Process, whose Surface is somewhat unequal, that the Ligament which rises from it, and which ties it with the *Occiput*, may fasten the better to it. It is likewise invironed with a solid and round Ligament, which has a curious fabrick, in order to hinder the *Medulla Spinalis* from compression by this Process. This *Vertebra* and the first are joined to the *Occiput*; and they are conjoined to one another by particular Ligaments, which tie them strongly to the Head.

E  
The Axle-  
tree.

The third is call'd the *Axis*, or the Axle-tree, because it is this that begins to form a Body on which the two former *Vertebrae*, and the Head, are supported, as on an Axle-tree; the four following *Vertebrae* have no particular names; it is observable only, that the last has no acute Process forked like the others; and that this last begins to assume the figure of those of the Back.

F  
The Back.

There are twelve *Vertebrae* that compose the Back; these are larger than those of the Neck, and smaller than

than those of the Loins. We must observe, that they are not all equal, and that they do become larger and stronger, in proportion as they descend lower, for the same reason as that which bears ought to be stronger than that which is born; and besides, they all having a pyramidal figure, have the more strength from it. They have their Processes spiney, simple, and acute, which rest one upon another below: Their transverse Processes are very large, for the articulation of the *Costæ*, or Ribs, which are fastened to them; for each *Vertebra* of the Back does articulate two Ribs, both by its Body, and by its transverse Processes.

The first of these *Vertebra* is called the Eminent, because it is higher than the rest; the second is call'd <sup>G</sup> the Axillary, because it is nearest to the Arm-pit; the eight which follow are call'd the Costal, or the Pleuritical, because they do articulate those Ribs, which are inwardly invest'd with the *Pleura*. The Eleventh <sup>H</sup> *Vertebra* of the Back is call'd the Direct, because its acute Process does not bend downwards to rest upon the next below, as do the others. The twelfth is call'd the Girdler, because it is situated in the place where the Girdle uses to be worn. <sup>One of the last.</sup>

The Loins are composed of five *Vertebra*, which are thicker and larger than those of the Back, because they do serve for a *basis* to them; their Articulations are not so close and compact as those of the Back, to the intent that the motions which the Loins are obliged to make, may be the freer, and that we may be able to stoop the more easily. They have their transverse Processes longer and finer than those of the Back, which serves there instead of Ribs, excepting only the first and the fifth of them, which have them shorter; and this is the cause that the *Vertebra* of the Loins do never hurt any part in the motions and flexions which they make towards the Ribs. They have nine Processes; for those that are ascending, which do serve to articulate them together, are double: Lastly, They have their Spines thicker and larger, which serves to fasten to them the better the Muscles and Ligaments of the Back. <sup>I</sup> The Loins.

The first of these *Vertebra* is call'd the Nephritick, <sup>L</sup> or Renale, because the Reins or Kidneys lie on the side <sup>One of the Vertebra of the Loins.</sup> of it, and because it is in this place that the Nephritick Pain begins to be felt: The three which follow have

no particular name given them: The fifth is consider'd as the prop and support of the whole Spine, wherefore it is call'd *Ασφαλις*.

**M** The *Os Sacrum* is a great, large and immovable Bone, that serves for a *basis* and pedestal to the Spine. I cannot tell the reason why it is so called; some say, it is because the Antients did offer it in Sacrifice to their Gods; others, because it is so very large; and others again, because it encloses the *Pudenda*. Its Figure is triangular; it is hollow within, which serves to form the cavity that is in the lower part of the *Hypogastrium*, call'd the *Pelvis*; it is smooth and equal on its anterior part, which hinders the parts contained in it from receiving any hurt; is it convex and unequal on its posterior part, which is a help to the better insertion of the Muscles.

**Its Articulations.** This Bone has three different Articulations; its first, which is with the last *Vertebra* of the Loins, is like unto that of all the other *Vertebra*; the second is with the *Coccyx*, and is made by *Synchondrosis*; and its third is with the *Ossa Innominata*, by an indenting. Wherefore we must observe on the superior part of this Bone two ascending Processes, each of which has a Glenoide Cavity that receives the descending Processes of the last *Vertebra* of the Loins, and which makes the first Articulation; also on its inferior part two small descending Processes, which are joined to the *Coccyx*, and which make the second; and again, on its lateral parts many intricate *Sinus* interlaced with Prominences, which receive and are received of the *Ossa Innominata*, and do make the third Articulation.

**N** The Parts which do compose the *Os Sacrum* are reckon'd among the *Vertebra*, not for their having the same Use, but the same Resemblance. The *Os Sacrum* is divided into five *Vertebra* of a different bigness, of which the superior is the biggest; they lose in bigness, in proportion to their descent, for the last is the least of them all. These *Vertebra* are easily separated from one another in Infants, because the Cartilages which conjoin them, not being become boney, break atunder in the boiling; but in adult Persons they are so strongly united, that they do make but one Bone, which indeed ought to be very solid, for the support of the whole Spine, and to articulate so strongly as it does the *Ossa Innominata*.

It is at the *Os Sacrum* that the Cavity ends, which conveys the *Medulla Spinalis*. We must observe, that the Holes which are in it for transmission of the Nerves, are not situated laterally, as they are in the other *Vertebra* but before and behind; because being articulated on its sides with the *Ossa Innominata*, it could not suffer there, by reason of its Holes. The Holes before are greater than those behind; and it is through the former that the last pair of Nerves does come forth of the *Medulla Spinalis*, and distribute themselves into the anterior parts of the Thighs and Legs. There's nothing that comes through the Holes behind, because they are stopt or filled with a membranous Tendon. Its transverse Processes are very small, which is the cause that they give no inconvenience to its Articulation with the *Ossa Innominata*.

O  
The hinder-  
part of the  
*Os Sacrum*.

This Bone has five Uses; the first is to serve for a prop and support to the Spine; the second to contain the parts of the *Hypogastrium*, by forming a Capacity proportionable to their Magnitude; the third is to defend them; the fourth, to articulate the *Ossa Innominata*; and the fifth is, to give origin and insertion to many Muscles.

The Uses of  
the *Os Sa-  
crum*.

The *Coccyx*, or Rump-bone, is the last extremity of the Spine; it is so called, because it resembles the Beak of a Cuckow; it is situated at the end of the *Os Sacrum*; it is composed of three Bones, of which the greatest does touch the *Os Sacrum*; the second is less than the former; and the third, which is very small, is that to the end of which is fastened a small Cartilage. They are all three joined together by a very loose connexion, which makes them pliant, and to draw back easily behind.

P  
The *Coccyx*.

In Women these Bones do jet outwards, more than they do in Men; because they have need for a greater Cavity, to inclose the *Matrix*, and to contain the Infant during their being big with Child. The end of these Bones does always bend inwards, that it may be no inconvenience in Sitting; but they draw backwards a little, for the better extrusion of the Excrements; and they do so in Women, in time of Delivery, to open the greater passage to the Infant.

Q  
The *Coccyx*  
represented  
before.

R  
The *Coccyx*  
behind.

I have now endeavoured, GENTLEMEN, to omit nothing which regards the SPINE, and all its Parts; that

that the Surgeon being throughly instructed in its true Conformation, may be able to preserve it in its natural state ; which is not always easie for him to do. For it being compos'd of many Bones united together, it often happens that it falls sometimes too much inwardly, and sometimes outwardly, and sometimes towards the Ribs : And then it causes not only a great Deformity to the Body, but also sometimes occasions Death it self ; because it makes a compression on the Heart and the Lungs, and hinders the *Medulla Spinalis* from distributing the Animal Juice to all the Parts.

I shall entertain you, in my next Demonstration, with the Bones of the *Thorax*, and with the *Ossa Innominata*.

*Of the BONES of the THORAX,*  
and those of the Hips, called the  
*Ossa Innominata.*

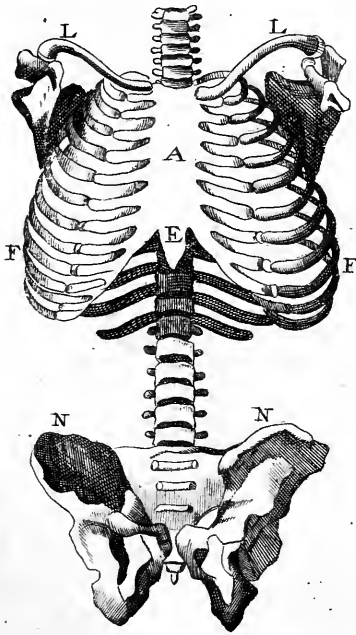
*The SIXTH DEMONSTRATION.*

**A**FTER having shewn you, GENTLEMEN, the first Bones of the Trunk of the Body, which are those of the *Spine* ; it remains that I should Demonstrate to you those of the *Thorax*, and the *Ossa Innominata*.

The Brain and the Heart have functions so noble, and so necessary to our Life, that Anatomists have not yet been able to decide which of these two Parts ought to have the prehemineny of the other. But without perplexing our selves in this intricate Question, I shall follow the Order I have propos'd ; and we shall find, in the examination of the *Thorax*, that its Composition is no less worthy of our Admiration, than was that of the *Cranium* : It is partly Boney, and partly Fleshy ; because it not only serves to contain and defend the Heart and the Lungs, but has need of expanding and contracting it self according to the motion of these Parts.

Structure of  
the *Thorax*.

The







The Breast (which is also call'd the *Thorax*, ἤθος ἔσθ The figure of the Breast. Ἰσπῶ, h. e. salio; because the Heart, which it enclotes, does never cease to beat) is of an oval Figure, especially when the *Diaphragma* moves downwards. It is terminated above by the Clavicles, before by the *Sternum*, behind by the *Vertebra* of the Back, on the sides by four and twenty Ribs, and below by the Cartilages of the *Costa Notha*, and by the *Cartilago Xiphoides*, to which is joined the great Muscle call'd the *Diaphragma*.

It was necessary that this Cavity of the Breast should be great, large and deep, to the end the Parts contained in it should be able to move with more facility: And it is observed, that those who have it greatly extended, do live much longer than those who have it small and narrow. Magnitude of the Breast.

The Bones which compose the *Thorax* are the *Sternum*, the Ribs, and the Clavicles. I am now going to Demonstrate them unto you, as well as the *Ossa Innominata*. Division of the Breast.

The *Sternum* is all that anterior part of the *Thorax* which above touches the Clavicles, and ends below at the *Cartilago Xiphoides*, and laterally both on the right and left is joined to the ends of the Ribs before. Its body does proceed forward, but bends towards the Ribs, in order to form the round and oval figure of the Breast, on which it is, as it were, couched, which has caused it to be called *Sternum*. A The Sternum.

To know well the Substance of the *Sternum*, we must examine it according to the different Ages. In Infants it is wholly Cartilaginous, excepting only the first Bone, into which the Clavicles are annexed: In Old People it is wholly Boney, and even the Cartilages which join it with the Ribs can hardly be separated with a Knife; but in those of a Midling Age it is found to be partly Boney, and partly Cartilaginous. The Substance of the Sternum.

I have told you, that in Infants the *Sternum* was wholly Cartilaginous, and that it did not grow hard but only with Time, the superior part of it turning boney sooner than the middle, and the middle sooner than its inferior part. The exact number of the Bones of the *Sternum* cannot be determined, until they become perfect Bones; for in some Infants there have been found eight, which by growing together after seven years old, do come to be but four, and commonly but three. That the Sternum grows boney after the Birth.

Some

Some Authors have fixed their number to be Seven, because between every space of the Ribs a little line is to be seen, which seems to separate the *Sternum* into so many Bones as there are Ribs which articulate with it. But I shall continue in the number of Three, which is that number which is commonly found in it.

The First of the Three Bones of the *Sternum* is the superior of them, it is larger and thicker than the rest, its upper part is somewhat like a little Crescent; and I believe it is on this account that some have called it the Upper Fork. On each side of its superior part a *Sinus* is seen, that receives the head of the Clavicle, with which it is joined by means of a Cartilage: It has likewise another Sinuous Cavity in the middle of its internal and superior part, which makes room for the *Trachea*.

The Second of these Bones is placed under the former; it is straiter and thinner, but it is longer. There are divers *Sinus* to be seen on both its sides, which receive the Cartilages of the Ribs that articulate in them.

The Third is still less in length than the Second, but it is thicker; it is found under the two former; it ends at the *Cartilago Xiphoides*, so called because it is sharp like the point of a Sword.

This Cartilage is commonly triangular, and oblong; sometimes it is round, and at other times divided in two, which has caused some to call it the Fork. Whenever it sinks inwardly by some stroak, or by some fall, it occasions Vomiting, which ceases not until it is restored to its proper place. This Cartilage serves to defend the Stomach, to tie and fasten the *Diaphragma*, and to support the Liver before, by means of a large Ligament that is tied unto it.

These three Bones are joined together by Cartilages, which do fill up the middle spaces, and serve instead of Ligaments to them: They do likewise form a Cavity which appears outwardly, and which some do call the Pit of the Heart.

The Uses of the *Sternum* are four: The first is for the forming the anterior and middle part of the Breast; the second is to join and articulate the *Costae* and the Clavicles; the third is to contain and defend the Heart, and the Parts for Respiration; and the fourth is to fasten all along its middle and internal part to the *Mediastinum*,

**B**  
The First  
Bone of the  
*Sternum*.

**C**  
The Second  
Bone of the  
*Sternum*.

**D**  
The Third  
Bone of the  
*Sternum*.

**E**  
The *Cartilago*  
*Xiphoides*.

Its Use.

Its Articula-  
tion.

All its Uses.

*Mediastinum*, which is a Membrane that separates or divides the Breast into two parts.

The *Costæ*, or Ribs, have been so called, because they are placed on the sides of the Breast, whose two Sides they do form, both on the right and left. FF  
The Ribs:

We shall be perfectly instructed in all that regards the *Costæ*, after we shall have examined their Substance, their Figure, Connexions, Number, Parts, and Uses. Six things to be examined in the Ribs.

The Substance of the Ribs is partly Boney, and partly Cartilaginous: That end of the Rib which is articulated with the *Vertebra*, being slenderer than that which is joined to the Breast, is of a harder substance, that it may be the less subject to be fractured; the other extremity, on the contrary, is of a more spongy substance, and the middle part of it has a middling nature between the two ends, both in respect of Substance and Bigness. Their Substance.

All the Ribs in their anterior part do end with Cartilages, which are to them instead of *Epiphyses*, and which sometimes do become so hard, with age, that they cannot be separated from the *Sternum* with a Knife. And it is observed, that the Cartilages of the superior Ribs are harder than those of the inferior, because they are immediately joined to the *Sternum*; whereas the others are not conjoined to it but by other Cartilages, and consequently are more obliged to comply with the motions of the Breast.

The Figure of the Ribs is a Semi-circle, or a Crescent, if you consider but one of them at a time; but if you examine two of them together, as they lie in a Skeleton, they do make a compleat Circle: They are of a concave figure within, to form the capacity of the Breast; and convex without, for the better resisting Accidents: The farther they are distanced from the *Sternum*, they become the more narrow and round; but they flatten and become larger, according as they do approach unto it. They are not all alike great; for the superior are shorter, the middle Ribs are the greatest of all, and the inferior are very small. These different Magnitudes were necessary in Nature, for the formation of the Arch of the Breast; and although the superior and the inferior Ribs are the smallest, yet these do also differ from one another, in that the superior are larger than the inferior Ribs. F  
The Ribs.

Connexion  
of the Ribs.

The Ribs are articulated with other Bones at both their Extremities, at their anterior Part with the *Sternum* by *Synchondrosis*, and at their posterior part with the *Vertebra* by *Arthrodia*; this last Articulation is double, in the seven first Ribs, one of them is made with the body of the *Vertebra*, and the other with the transverse Process; for the five lower Ribs are only joined by a Simple Tuberosity or Prominence.

Number of  
the Ribs.

The Number of the Ribs seldom varies: it is always that of twenty four, twelve on each side; they are divided into True, and False Ribs. The True are the seven Superior, and are so called, because they do finish the Circle more perfectly than the rest, and because they do touch the *Sternum*, with which they have a strong Articulation: the two first on each side, reckoning from above, are named the crooked, the two next the solid, and the three others the Pectoral Ribs. The five last Ribs are called False, because they are smaller, softer, and shorter than the others, and because they do not reach the *Sternum*, which occasions them to have but a very loose or slack Articulation. They are fastned to the *Vertebra* behind, but before they terminate in long and soft Cartilages, which bend upwards, and are united so fast to the Superior *Costæ*, as if they were glewed to them, except the last, which being the smallest of all, has no Adhesion before to any other.

G

One of the  
first Ribs.

H

A great Rib.

I

A smaller  
Rib.

K

A False Rib.

The Parts of  
the Ribs.

In the Ribs two kind of Parts are considered, their Body, and their Extremities; that which makes the middle and Principal Part of them, is called the Body. Their Superior Part is also remarkable, having two Lips, the one Internal, and the other External, unto which the Intercostal Muscles are fastned; and so is their Inferior Part, which has likewise two Lips, that are separated by a *Sinus* along the Rib, which *Sinus* disappears, according to the Length it removes from the *Vertebra*. This *Sinus* does serve to lodge the Artery, and the Intercostal Veins, the Extremities being double, the one joins the *Sternum*, and the other the *Vertebra*, as I have shewn them to you. At the Anterior Extremity there is a small Cavity in the End of the Rib which serves to receive the Point of the Cartilage, which is there by this means more strongly united, than if it had only lain upon it: and at the other Extremity, besides its double Articulation by *Arthro-*  
*dia*,


*dia*, there is likewise a Ligament which ties and fastens it with the *Vertebra*.

The Ribs do serve for three purposes: first to form the Capacity of the Breast; secondly to defend the Parts which they inclose; and lastly to give Origin and Insertion to many Muscles. Their Uses.

The *Clavicles*, or Channel-bones, are so called, because they are like Keys which shut the Superior Part of the *Thorax*, or else because they do fasten the Shoulder with the *Sternum*. Besides, the Arms have no other Bones but these to fasten them unto the Breast. L L  
The Clavicles

They are two of them, one on each side, they have a transverse Situation at the lower part of the Neck, and the upper part of the Breast, a little above the first Ribs; they are articulated at both Ends, of which one is joined to the Superior Process of the Shoulder, by a large and oblong head, and this by means of a Cartilage which nevertheless does not adhere to it, to the Intent that it may yield a little in the Motions of the Arm and Shoulder, but which is fastned only by Ligaments that involve the Joint; and the other End is joined with the *Sternum*, as I have already said. Besides these two Articulations, there is often found a third, which is made of it with the two first Ribs, by two small Prominences, of which one rises from the Superior Part of the Rib, and the other from the lower part of the *Clavicle*, and which are conjoined by means of a small Cartilage. Articulations  
of the Clavicles.

The Substance of the *Clavicles* is thick, but porous and fungous, whence it is that they are often fractured, and when a Fracture does happen, their Re-union and *Callus* are sooner made, than in other Bones. Their Substance.

Their Figure is like unto that of a  made of two Semicircles conjoined and opposite one to the other; it is convex outwardly towards the Neck, and a little concave inwardly, that the Vessels which are under them, may not suffer Compression. It is observed that Men have them more bent, for which reason it is that they have their Arms more free for Extension. On the contrary, Women having them straiter, have not the same Agility with their Arms, nor can they throw a Stone with the same Strength as Men; but this little Defect of theirs is supplied by the Beauty of their Neck, which is longer, smoother, and more free from Wrinkles and Cavities than those of Men. N  
One Clavicle  
alone.

The Uses of  
the Clavicles.

The *Clavicles* are assistant to the different Motions of the Arms, which do move more easily forwards and backwards, by reason they are supported on these Bones as upon a *Basis*. They are likewise of great use to hinder the Arms from too great an Extension forwards; and for this reason those Animals which have occasion for their Superior Extremities to move forwards, have no *Clavicles* at all.

NN

The Hip-  
bones, or *Ossa*  
*Innominata*.

The last of the Bones which I am now to demonstrate to you, are those of the Hips, or *Ossa Innominata*, which do form the last part of the Trunk of the Body. They are called *Ossa Innominata*, or Bones without a Name, because taking them all together they have no particular Name, but when they are divided into Particulars, they have every one a Name which distinguishes them from one another, as you will presently see.

Articulations  
of the Hip-  
bones.

The Hip-bones are two, one on each side, situated at the lower part of the Trunk; they are articulated, at their posterior part, with the *Os Sacrum*, and on their lateral parts with the *Femur*; the first of these Articulations is made by *Ginglymus*, for many small Prominences in both these Bones do enter into Cavities proportionable to their Bigness, insomuch that these Bones do receive, and are reciprocally received. The second is made by *Enarthrosis*, for the head of the *Femur*, which is very big, is received by a great Cavity that is on the lateral and external part of these Bones. There is observed at the bottom of this Cavity a small Inequality, at the very place where the Ligament is inserted, which by tying strongly in its place the head of the *Femur* does hinder it from Luxation, unless upon very great Efforts, such as do use to cause Luxation of this Part.

Women have  
these Bones  
more extend-  
ed.

When these Bones do come to be examined nicely in a Skeleton, we do easily find that there is a Difference between those in Men, and those in Women; they are stronger and smaller in Men, and greater and slenderer in Women; insomuch that the Cavity which is called the *Pelvis*, and the which is formed by these Bones, and the *Os Sacrum* together, is much greater in the Skeleton of a Woman, because it not only contains the *Rectum*, and the Bladder, as it does in Man, but also the *Matrix*, which has need of a great deal of room, especially in Child-bearing.

Their Uses.

These Bones do serve for the Insertion of Muscles, and for a Support unto all the Body, as all the other  
Bones



Bones do. But besides these common Uses, they are also useful for tying the Inferior Extremities with the Trunk, for bearing up and supporting the Spine, for helping to form the Capacity of the *Abdomen*, and to serve for a *Basis* and Couch to the Parts contained in the *Hypogastrium*.

The Hip-bones consist of three different Bones, which are joined together by Cartilages, that grow drier with Time, until they become so bony, that they seem to make but one Bone with the others in Adult Persons. These Cartilages do still remain such until about the Tenth or Twelfth Year of Age; and then their Nature is not so defaced, but that there remain some footsteps of them, or some Signs by the means of which these Bones may be divided into three, which are the *Os Ilium*, *Os Ischium*, and *Os Pubis*.

The Hip-bones divided into three.

The *Os Ilium* is so called, because it contains the Gut *Ileum*; this Bone offers it self first, because it is the greatest; it is also situated above the others; its Articulation is made with the *Os Sacrum* by *Ginglymus*, which is strengthened by a Cartilage, and by a Membranous Ligament that is very strong.

O  
*Os Ilium*

The Figure of this Bone is semi-circular; we must here consider its two Appearances or Surfaces, the one Internal, which is filled with one of the *Musculi Flexores Femoris*, called the *Flexor Iliacus*, by reason of the place it possesses; and the other External, where the *Musculi extensores Femoris* are inserted, which are called the three *Glutei*.

Its Figure.

That which is between these two Surfaces is the *Costa*, which is bordered with two Lips, of which one is likewise Internal, and the other External; the two Extremities of this Rib do end with two Prominences, called Spines, of which the Superior is much greater than the Inferior. Near to this last, which is placed before, is seen an Indenting or Notching that facilitates the Passage to the Tendons of the *Musculi Iliaci*, and *Psoas*, and to the Crural Veins and Arteries, and to the Spermatick Vessels.

And that we may forget nothing which ought to be examined in this Bone, you may observe that with its Inferior Part, it forms a part of that Cavity which receives the head of the *Os Femoris*.

I have already said that this Bone was made larger in Women than Men, because there was need of the

Magnitude of the *Os Ilium*.



Infant's being well supported in the *Matrix*; and this is the cause also that Women with Child do often feel in this part a Pain that is occasion'd by the Weight of the Infant.

**P** The *Os Ischium* is the second of those Bones which compose the Hips. In it three Parts are to be considered; the Superior does make the greatest part of the *Cotyla*, the Anterior makes a part of the *Foramen Ovale*; and the Inferior is that in which two Processes are observed, the one Posterior, called the Spine-process, and the other Anterior and Inferior. There is likewise seen a *Sinus*, or Cleft, which gives a Passage to the Tendon of the *Obturator Internus*.

**Articulation of the *Os Ischium*.** This Bone is annexed to the *Os Sacrum* by a double Ligament that rises from it; one is inserted in the acute Process of the Hip, and the other behind at its Appendage, which serves to support the *Rectum Intestinum*. Its Extremity is called the tuberos part of the *Ischium*, which gives Rise to the Muscles of the *Penis*, the *Levatores Ani*, and many of the *Flexores Femoris*.

**Q** The *Os Pubis* is the third and last of the Hip-bones, it is also called *Os Pectinis*; it is situated at the middle, and anterior part of the Trunk. It has four different Parts to be examined; the Anterior, which is joined by *Synchondrosis* with its fellow, by means of a Cartilage; the Posterior, which being the Extremity behind the Spine, does form one part of the *Cotyla*: It is between this Part, and the Extremity of the *Os Ilium*, that the *Sinus* is placed, through which the Tendons of the *Musculi Lumbares*, and *Iliaci* do pass; the Superior Part, otherwise called the Spine, is that in which the Muscles of the *Abdomen* are inserted; and lastly the Inferior is that which is joined with a Prominence made by the tuberos part of the *Ischium*, both which Prominences do make the *Foramen Ovale*, otherwise called *Tyroides*, into which Prominences many Muscles are inserted. This Hole is intirely shut by a very strong tedinous Membrane, to which are annexed the *Musculi Obturatores*, which serve to move the Thigh semicircularly inward or outward. A Famous Anatomist has told us, that this great *Foramen* of the *Os Pubis* has no other use, but to lessen the bulk of the *Os Innominatum*. But without desiring to contradict him, another Use for it may be assigned. It is this which serves

erves to facilitate the Motions of the *Obturatores*; For if we Examine well after what manner they are fastned against this hole, we shall find that they would not have been able to act, if they had been posited on a *Superficies* that was altogether flat and bony, which would have given them too much resistance; whereas they having nothing to resist them, they can both of them abbreviate themselves by sinking in the middle, for the thrusting inwardly or outwardly, the which they would otherwise never have been able to do, if there had not been a Vacuity behind.

The *Ossa Pubis* are slenderer and larger in Women than in Men; and those Women who have them advanced more outwardly, do undergo their Labour the more easily.

The Bones of the *Ossa Pubis* slenderer in Women.

I shall finish, GENTLEMEN, this Demonstration, in relating to you two different Opinions, concerning the Articulation which the *Ossa Pubis* have with one another. *Bartholin* pretends, that they do separate asunder in the Time of Delivery, nay that they can be divided with the back of a Knife, in Women newly Delivered, which cannot so easily be done another time. Those who are of the contrary Opinion, which is the true, do maintain that these Bones being once joined, as they are, cannot separate asunder during the Delivery; and that if there has been found some Women, in whom they have been easily separated, it was the pure Effect of their natural disposition, some persons possibly having had the Articulations of them more loose than others, and not upon the account of the Delivery. For I have opened and dissected many Women that were newly brought to Bed, in whom nevertheless I was not able to separate them without a great deal of pains. The Authority of so famous an Anatomist, as was *Bartholin*, has caused this opinion to spread; but I am obliged to assure you, that both He, and those who follow Him, are mistaken in this matter.

Whether the Bones of the *Ossa Pubis* do separate in the Delivery.

An Observation that they do not separate.

We must also observe, that the Cartilage which joins the two *Ossa Pubis* together, is of a Substance capable of plying. Wherefore in hard and painful Labours, it may well happen that this Cartilage may be distended a little; but to believe it is that alone which facilitates the Delivery of the *Fœtus*, is to forget that which is most considerable. Know we not

Another Remark.

that the Head of a *Fœtus*, in time of Labour, is so soft that it can easily change the magnitude of its figure : and the same thing may be said of his Breast, and of his Hips : so we see from thence, that it is rather the great change of Figure, which happens to these three parts, that gives a free egress to the *Fœtus* through or out of the *Pelvis*, which can be but little aggrandized by the extension of the Cartilage of the *Os Pubis*, which Cartilage cannot yield above three or four lines at most.

## Of the BONES of the HANDS.

### The SEVENTH DEMONSTRATION.

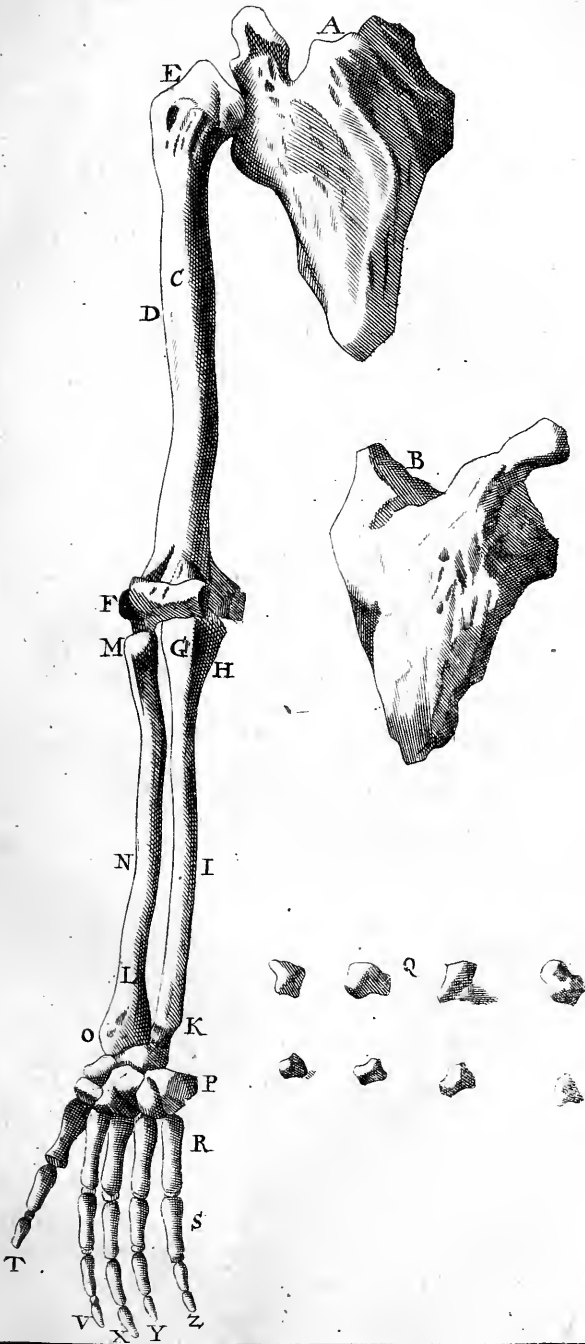
I Have shewn you, GENTLEMEN, all the Bones of the two First Parts of a Skeleton : It now remains, that I should let you see those of the Extremities, with which I shall finish my *Osteology*.

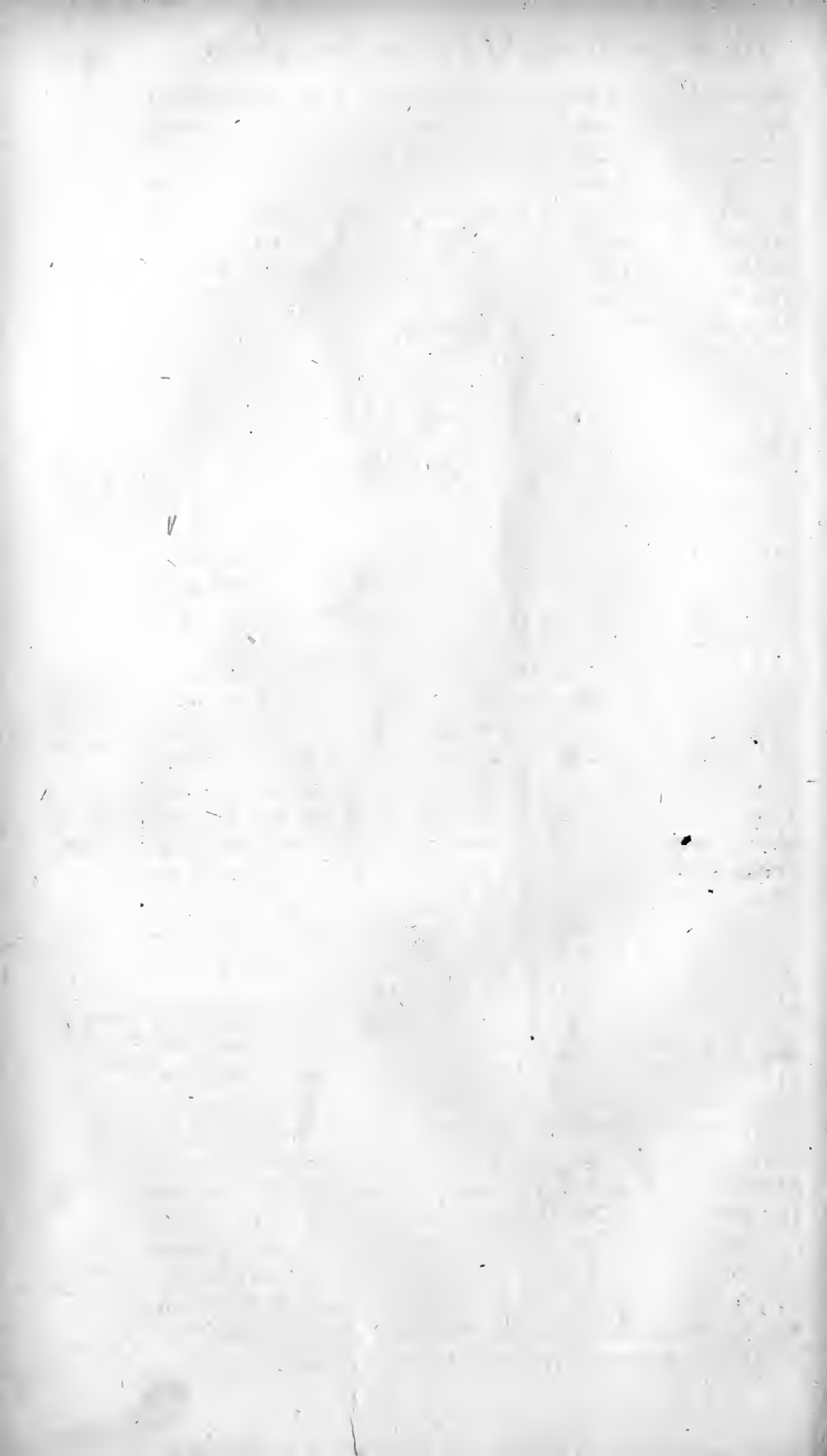
Two sorts of  
Extremities.

These Extremities are Superior and Inferior ; both the one and the other are like so many Branches springing from the Trunk, and growing to it : The first are the Hands, and the second the Feet. In this Demonstration I shall shew you the Bones of the Hands, and in my next those of the Feet.

An Elogium  
upon the  
Hand,

Although there is not a Part in the Body but deserves Admiration ; yet we must agree, that the Hand deserves it above all other Parts. And Authors have done it but justice, and especially *Aristotle*, when they have call'd it the Organ of Organs, and the Instrument of Instruments. And if there be something very particular, that Nature has given to every Animal, either to defend it self against others, or to preserve it from outward Accidents or Injuries, we may affirm, that Man has received two things preferably to all Animals, that is, Reason, and the Hand ; the one for Council and Conduct, and the other for Execution. The first of them distinguishes him, and exalts him far above all other Animals ; it is this which gives him dominion over them all, which conducts all his Actions,  
and





and which, by the Invention of all Arts, does enable him to make good Use of them. Nevertheless, all these Advantages would have been of little Use to Man, if he had not had Hands to execute what Reason dictates to him, and to make benefit of all that the Author of Nature has provided in his favour. These are the Parts which make all sorts of Arms for his defence, and to maintain his Mastery over all the Animals; these do form those Vestments which are to supply the defect of Hair, and Feathers, which Nature hath cloathed the others with. Lastly, It is with them that we practise the Art of Surgery, an Art so noble in it self, and so necessary for Life.

The Action of the Hand is Apprehension; and Man has two Hands, to perform it the better. We must observe, that all the Joints of the Arms and Hands do bend inwardly, to the end they may embrace any thing the better, and that they may mutually assist one another in their Actions, which could not but have been imperfect with one Hand alone.

The two Hands, why necessary.

All Men, and even Infants, are naturally disposed to make use of both Hands alike; and if there be some of them who use the Right Hand rather than the Left, we ought to think it proceeds only from a Custom which they have contracted, and because they are taught to take things with that Hand, and not because there is more Heat on that side, which has enclined them rather to use that Hand than the Left; since many of those Persons who have not been so taught, do of themselves use sometimes the Right, and sometimes the Left indifferently; and when they are grown up, they cannot get rid of this Custom.

That Man does naturally use both Hands alike.

These Superior Extremities, which are the Subject of this Demonstration, are divided into three parts, the Arm, the Cubit, and the Hand; the Arm consists of one Bone only, the Cubit of two, and the Hand of seven and twenty. We will examine them all in their turn, after that we have first consider'd the *Scapula*, or Shoulder-blades, which were comprehended in the number of sixty two Bones that compose the Arms.

Division of the whole Arm.

The *Scapula*, or Shoulder-blade, is the Bone that forms the Shoulder; it is defined a large and slender Bone, especially in the middle, and thick in the Processes; it is situated at the posterior part of the superior Ribs, where it serves instead of a Buckler to them.

A  
The *Scapula* shewn on the inside.

We must observe four things in it, its Figure, Connexions, Parts, and Uses.

**B**  
The *Scapula*  
shewn on the  
Outside.

The Figure of the *Scapula* is Triangular; of which two Angles are posterior, and the third anterior. It is convex without, and concave within, both for its better apposition on the Ribs, and for containing a Muscle, of which I shall speak by and by.

Its Connexions.

It has three sorts of Connexions, one by *Arthrodia* with the *Humerus*, having at its anterior angle a glenoid cavity, which receives the head of the *Humerus*; this Cavity is covered over with a Cartilage that facilitates the motion; and it has a ligamentous brim, which by making the cavity deeper, and embracing the head of the *Humerus*, does strengthen its Articulation: The other is made by *Synchondrosis* with the Clavicle, by means of a Cartilage that unites this Bone with the Clavicle: And the third is made by *Sysarcosis* with the *Vertebra* and the Ribs; there being nothing but Muscles in all the posterior part that unite it with the adjoining Bones.

The Parts of  
the *Scapula*.

The Parts to be considered in this Bone are many: We will begin with its *Basis*, which is its posterior part, and next to the *Vertebra* of the Back. This *Basis* doth end with two Angles, of which one is called the Superior Angle, and the other the Inferior: The Parts which come from these Angles towards its Neck are called the *Costa* of the *Scapula*, of which there are also two; the one is call'd the Upper *Costa*, which is the slenderest and shortest; and the other the Lower *Costa*, which is the thicker and the longer.

The two  
Surfaces de-  
scrib'd.

The two Surfaces of this Bone do differ one from the other; the Internal is hollow, to lodge the Scapular Muscle; the External is elevated, to form a considerable Eminence, which from the bottom of the *Basis* does rise straight upwards; it is call'd the Spine of the Shoulder-blade, whose end is called *Acromium*, because it resembles an Anchor. Some have pretended that it was a different Bone from the others, because during the Infancy it is only a Cartilage, which grows Boney by little and little; and after twenty years of age becomes so hard, and so united to the rest of the Spine, that it appears one and the same Bone.

On each side of this same Spine there are two Pits, one above, called *Fossa Supra-Spinata*; and the other underneath, called *Fossa Infra-Spinata*, which is greater than



than the former ; becaufe, besides the *Musculi Infra-Spinati*, it contains some more Muscles, which do serve for the motion of the Arm ; and in the middle of the Spine there is a crook'd Eminence call'd the Crest, or the Wing of a Batt, by reason of its resemblance.

The Process which is placed at the superior part of the Neck, and which advances above the head of the Shoulder-bone, is called *Coracoides*, because it is like the Bill of a Raven : This strengthens the Articulation of the Shoulder, and gives rise to one of the Muscles of the Arm, that is therefore named *Coracoides*.

We must still observe two Cavities more, one of which is between the Neck and the *Acromium*, and the other between its Superior *Costa* and the *Apophysis Coracoides*, they do both serve for the passage of Vessels ; and lastly, the Concavity which is at the end of the Exterior Angle, is call'd the Glenoide Cavity of the *Scapula*, of which I have already spoken.

The Shoulder-blade has many Uses ; it gives origine and insertion to the Muscles, as all other Bones ; it fastens the Arm to the Body ; it serves for a support to the Arm, that it may more conveniently make its motions ; it makes the Shoulder, and defends the internal parts with its bulk or largeness, which covers the Ribs.

The Arm is composed only of the *Humerus*, or Shoulder-bone, which is the greatest and strongest Bone of all the whole Arm. In order to know it well, we must examine its Connexions, and its Parts.

It is Articulated at both its ends ; the upper end is with the *Scapula* by *Arthrodia*, as I have shewn you already ; and the lower part is doubly joined by *Ginglymus* with the *Cubitus*, and by *Arthrodia* with the *Radius*. We must observe, that the *Ginglymus* is here perfectly made, these two Bones of the *Cubitus* and *Humerus* reciprocally receiving at the same end, and having both of them Prominences and Cavities which form this Articulation. The *Humerus* is also joined with the *Radius* by *Arthrodia*, having a Prominence at its end, which is received into the Cavity that lies at the end of the *Radius* ; it is this Articulation that causes the motions of the *Cubitus* inwards and outwards, called by some Pronation and Supination.

That we may examine the Parts of the *Humerus*, we must divide it into its Body, and its Extremities ;

mities ; and these are two, the one Superior, the other Inferior.

**D** The Body of the *Humerus* is long and round ; it has an Internal Cavity all its length, and which contains the Marrow ; its Figure is not absolutely straight, but a little hollow on the inside, and raised on the outside, for the strengthening of it in its Actions. In it there is observed a Line which descends and terminates in two *Condylis* ; this serves to fasten more strongly the Muscles which are inserted in this Bone.

**E** The Upper-end of the *Humerus* is much larger, and more spongy than the Lower ; it contains a Medullary Juice. This part is call'd the Head : It is not only invironed on all sides with Ligaments and Membranes, which come from the Glenoide Cavity of the *Scapula* ; but it is likewise involved with four *Aponeuroses* of the Muscles that compass it. A little from under this Head there is a part that is round, and a little strait, call'd the Neck ; and at the fore-part of this Head there appears a pretty long cleft, which goes to the middle-part of the Bone ; it is made like unto a Gutter, to make room for one of the Tendons of the *Musculus Biceps*.

**F** The Lower-part of this Bone is smaller, flatter and harder than the other ; it is also bigger, because it is joined with the two Bones of the *Cubitus*, which are placed on the side of one another, and which have two different motions. In this place we see three Processes, and two Cavities : The first of the Processes is the Superior, which is the larger, it is a round head which articulates with the *Radius* : The second is the Inferior or Internal, it is smaller than the former, and called *Apophysis Condylodes* ; it does not articulate with any Bone, because it only serves for the origin of the *Musculi Flexores* of the Hand. In the middle of these two *Condylis* is a third Process that is smooth, oblong, and made in form of a Pully, round which the *Cubitus* has its motions : The two Cavities are near this Process, one is internal and smaller, and the other external and greater ; they receive the *Apophyses Coronoides* of the *Cubitus*, and the Pully is received into the *Cavitas Sigmatoides* of the same *Cubitus*.

The Elbow. The Elbow consists of two Bones, by reason of the different contrary motions that it has, and which could not have been performed by one Bone only, joined

joined by *Ginglymus*, which indeed would have allowed the Arm to bend, and to extend, but not to have turned both inwards and outwards, the which motions are made by the *Radius*, which to this end is joined by *Arthrodia*.

These two Bones are not so long nor so big as that of the *Humerus*, but they are both of them much of the same magnitude; nevertheless, the *Cubitus* is a very little larger than the other; and this difference has caused them to be called by some the Great, and the Little *Focile*: They are removed from one another in their middle, for the more convenient situation of their Muscles for the passage of the Vessels, and especially for their easier motion; and besides, it was fit that having different Actions, their bodies should have different Situation. They do touch one another at their Extremities, being likewise articulated together, as I shall shew you presently. One is call'd the *Cubitus*, and the other the *Radius*.

Its two Bones pretty equal to one another.

The *Cubitus*, or the Bone of the Elbow, is so called, because it is this that makes the Elbow. Others have named it the *Ulna*, because in old times it served for an Ell, or a Measure; and though this Measure is not exact, some having it longer and some shorter; nevertheless, we do see some, even now-a-days, use the length of their Arm to measure things. In this Bone we must consider two things, its Articulations, and its Parts.

The *Cubitus*

The *Cubitus* is articulated at both ends, at its upper end two ways, with the lower end of the *Humerus* by *Ginglymus*, and with the upper part of the *Radius* by *Arthrodia*; and its lower end is joined two ways, with the *Os Carpi* by its end, and with the lower part of the *Radius* by its lateral or side-part. These two Articulations are made by *Arthrodia*.

Articulations of the *Cubitus*.

We cannot well examine the Parts of the *Cubitus*, unless we do divide it into three, its Superior, Middle, and Inferior part.

Its Division.

At the Superior part of the *Cubitus* we observe two Processes, and two Cavities; the smallest of these Processes is situated before, and has no particular name, but only that of *Coronæ*, which is the general name to all such Prominences: The other is situated behind; it is larger than the former, and called *Olecranon*; it is on this Process that the *Carpus* is supported; it makes an acute

The Upper end of the *Cubitus*.

acute Angle when the Arm is bent, and it hinders it from bending backwards. These two Processes do enter into the two Cavities that are at the lower end of the *Humerus*. Of the two Cavities that are at the superior part of the *Cubitus*, one which is very great is placed between the two Processes, and it is called *Sinus Sigmatoides*, because it resembles a Greek *Sigma*; this does receive the end of the *Humerus*. In the middle of this Cavity there is a Line, or an Eminence, that goes from one Process to t'other, and which enters into the *Sinus* of that part which is at the lower end of the *Humerus*: The other Cavity is very small, it is on the lateral and internal part of the *Cubitus*; it is this which, by receiving the *Radius*, does join them together.

**I**  
The Middle  
part of the  
*Cubitus*.

At the Middle part of the *Cubitus* are observed three Angles, of which the Internal, call'd the *Spine*, is very sharp; the other two are not so keen; the one is anterior, and the other posterior.

**K**  
The Lower  
end of the  
*Cubitus*.

At the Interior part there are two Prominences and a Cavity: The first of these Prominencies is situated at the lateral and inferior part, it is received into the Glenoide Cavity of the *Radius*: The second is at the end of this Bone, and called *Styloides*; it serves to fortifie the Joint, and is therefore placed externally: The Cavity which is at the end of the Bone helps to make an *Arthrodia* with the *Carpus*.

**L**  
The *Radius*.

The second Bone of the Elbow is called the *Radius*, because some will have it to resemble the *Radius*, or Spoke of a Wheel. We are to consider two things in it, as in other Bones, its Connexions, and its Parts.

Articulations  
of the *Radius*.

This Bone is Articulated like the *Cubitus*, in its Superior and its Inferior part; by its superior part two ways, and both by *Arthrodia*, the one with the external *Condylus* of the *Humerus*, and the other with the *Cubitus*; by its inferior part it is also articulated two ways, either with the *Os Carpi*, or with the *Cubitus*, and both these are *Arthrodia*: for the *Cubitus* and the *Radius* are joined together both above and below, only with this difference, that the upper part of the *Cubitus* receives the *Radius*, and the lower part of the *Radius* receives the *Cubitus*.

Its Div' Gou.

But if we would be instructed in all that concerns the *Radius*, we must likewise divide it into three parts, the Superior, the Middle, and the Inferior.

Three things are observed in its Superior part, a Head, a Neck, and a Tuberosity; the Head is round and smooth, for its better motion; there is over this Head a Glenoide Cavity that receives the Superior *Condylus* of the *Humerus*; the Neck is very long, for oblique motions; the Tuberosity or Eminence is situated under the Neck; it is in this place that the *Musculus Profundus* is inserted, and one of the *Flexores* of the Thumb.

M  
The Superior  
part of the  
*Radius*.

At the Middle part we must observe, that it has an acute Angle, called the *Spine*, and that it grows still bigger as it comes nearer to the Wrist; contrary to the *Cubitus*, which lessens according as it is elongated from the Elbow. And in this we ought to admire the Wisdom of Nature, which in making these two Bones unequal in their Extremities, found means to render the Arm equally strong in its whole length, by placing the strongest part of one Bone with the weakest part of the other.

N  
The Middle  
part of the  
*Radius*.

At the Inferior part are observed many Sinuosities and Inequalities, which are like so many little Channels, made to avoid hurting the Tendons that go particularly to the outward part of the Hand. There are likewise two Cavities, of which one, that is at its extremity, does receive the Bones of the *Carpus*; and the other being smaller, is at its lateral and internal part, in the which is placed a Prominence of the *Cubitus*. We must not forget this Prominence, which is at the external part of its Extremity, which with the *Apophysis Styloides* does jointly form a great Cavity, which receives the Bones of the *Carpus*, and hinders their Luxation.

O  
The Inferior  
part of the  
*Radius*.

The Hand, properly speaking, is made up of the *Carpus* or Wrist, the *Metacarpus*, and the Fingers; it begins where the Bones of the Elbow do end, and it terminates with the ends of the Fingers.

The Hand.

The *Carpus*, or Wrist, is the first part of the Hand; it is a heap of Bones situated between the Inferior Articulation of the Elbow and the *Metacarpus*. These Bones are eight, placed in two rows, four in each row. We must first examine the Situation of those of the First Rank, and then those of the Second.

P  
The *Carpus*.  
Q  
The Bones  
of the *Carpus*  
separated  
from one  
another.

The First Rank is composed of four Bones, of which the two greatest are received into the Cavity of the *Radius*, by their upper part, for the motion of the Hand,

The First  
Row.

Hand,

Hand, and by their lower part they do touch the three first Bones of the second Rank; the third, next to these in Bigness, is situated in the Cavity at the end of the *Cubitus*, joining to his *Apophysis Styloides*, and in its lower part is united with the fourth Bone of the Second Rank; the fourth Bone of the first Rank, which is the smallest of them all, is situated upon the third on the inside of the Hand, making a Prominence that is like unto the crooked Process of the fourth Bone of the second Rank.

The second Row.

The first Bone of the second Row is placed more within the Hand than without; which makes it the better to support the Thumb, and to answer to the crooked Process of the fourth Bone of the same Rank; the second and the third do support the first and second Bones of the *Metacarpus*, and the fourth and last Bone of the *Carpus* does support the third and fourth Bones of the *Metacarpus* by its two small Glenoide Cavities.

We must observe, that there is at the Internal part of all these Bones a crooked Process which makes a Prominence on one side, and that on the other the first Bone of the second Row does advance on the inside of the Hand, and thus the Space that is between both, being made like a Gutter or Channel, serves for a Passage to the Tendons of the *Musculi Flexores* of the Hand, which do pass by this Vacuity in all manner of safety, with the help of the Annular Ligament that covers them, and joins together all these Bones I have now spoken of.

The Figure of the *Carpus*.

The Figure of the Bones of the *Carpus* joined together is round, and railed on the outside, but it is unequal and hollow on the inside for the facility of motion.

Articulations of the *Carpus*.

There are three sorts of Articulations in the Bones of the *Carpus*, the first with the Bones of the Elbow by *Arthrodia*, as I have already said; the second with the Bones of the *Metacarpus* by *Amphiarthrosis*; and the third by *Synneurosis* between themselves, that is to say, by very strong Ligaments, which unite them together. Of these three Articulations, it is only the first that has a manifest motion; for the two others have none at all, or at least it is very obscure.

R  
The *Metacarpus*.

The *Metacarpus* is the second part of the Hand, it makes its Palm by its internal part, and its back by its external; it is composed of four long, slender, and unequal Bones; they have each of them a Cavity that contains a Marrow. There are some who reckon them



them five, and to this effect they add to these the first Bone of the Thumb; but this ought not to be placed in the Number of the Bones of the *Metacarpus*, because it has a manifest Motion, when the others have it but very obscure.

These four Bones are joined with the *Carpus*, by a strong Connexion, by means of many Cartilaginous Ligaments, which allows them to have but an obscure Motion; and with the Fingers by *Arthrodia*, each of them having a round head at their End, which enters into the Glenoide Cavity that is at the End of the first Bone of the Fingers. And besides these two Articulations, which are made of their Extremities, they do mutually touch, and are united together by their lateral part, very near the place where they are joined to the *Carpus*, and this for their greater strength. They afterwards separate towards the middle, in order to leave a convenient space to the *Musculi Interossei*.

Articulations of the *Metacarpus*.

They are of a round Figure in their middle part, which is a little Convex outwardly for Strength's sake; and a little hollow inwardly for the better Apprehension, or taking things up. Their Superior Extremity is their largest part, being that which unites them with the *Carpus*; and their lower Extremity is smaller, which ends with a head that joins them with the Fingers.

These four Bones are not equally large, that which supports the *Index* Finger is larger than the others; the second is less than that, the third still less, and lastly the fourth is the smallest of all. I have told you that these Bones have no Motion, or at least that they had but very little, since only the last, which is the Supporter of the Little Finger, has a little more than the rest, which is easily perceived, when two Fingers are made to spread at a distance.

Its Bones differ in Bigness.

It now remains to shew you the Fingers, which are many, to the end that the Action of the Hand, which is Apprehension, might be the better performed, and that the smallest things might be taken up with them; they are five, and differ from one another both in Bigness and Length; the first is called the Thumb, being bigger and stronger than the others, and being the only one that is opposite to the rest in the matter of Apprehension; the second is called the *Index*, because we do make use of it when we would shew, or point at some-

S  
The Fingers.

T  
The Thumb

V  
The Index

some-



X  
The Middle-  
Finger.

Y  
The Ring-  
Finger.

Z  
The Little-  
Finger.

Fifteen Bones  
in the Fingers.

something; the third is called the Middle-Finger, by reason of its Situation, this is the longest of them all; the fourth is called the Annular, or Ring-Finger, because the Ring is worn upon this; the fifth is the least of all, and called the Auricular, or Ear-Finger, because being little and pointed some do commonly use it to cleanse their Ears of *Sordes*.

The Bones of the Fingers are fifteen, three on each Finger; they are placed in three Ranks, called *Phalanxes*, because they resemble Ranks in Battel-array: the first Rank is of larger Bones than the second, and the second than the third, which is the smallest of them, and whose extremity does end in a Semicircle, or Crescent.

The Figure of these Bones is hollow on the inside, for the convenience of Flexion; convex on the outside for Strength sake; and a little flatned on the inside, that they might not hurt the Tendons of the *Flexores*, and for the better bending the Fist.

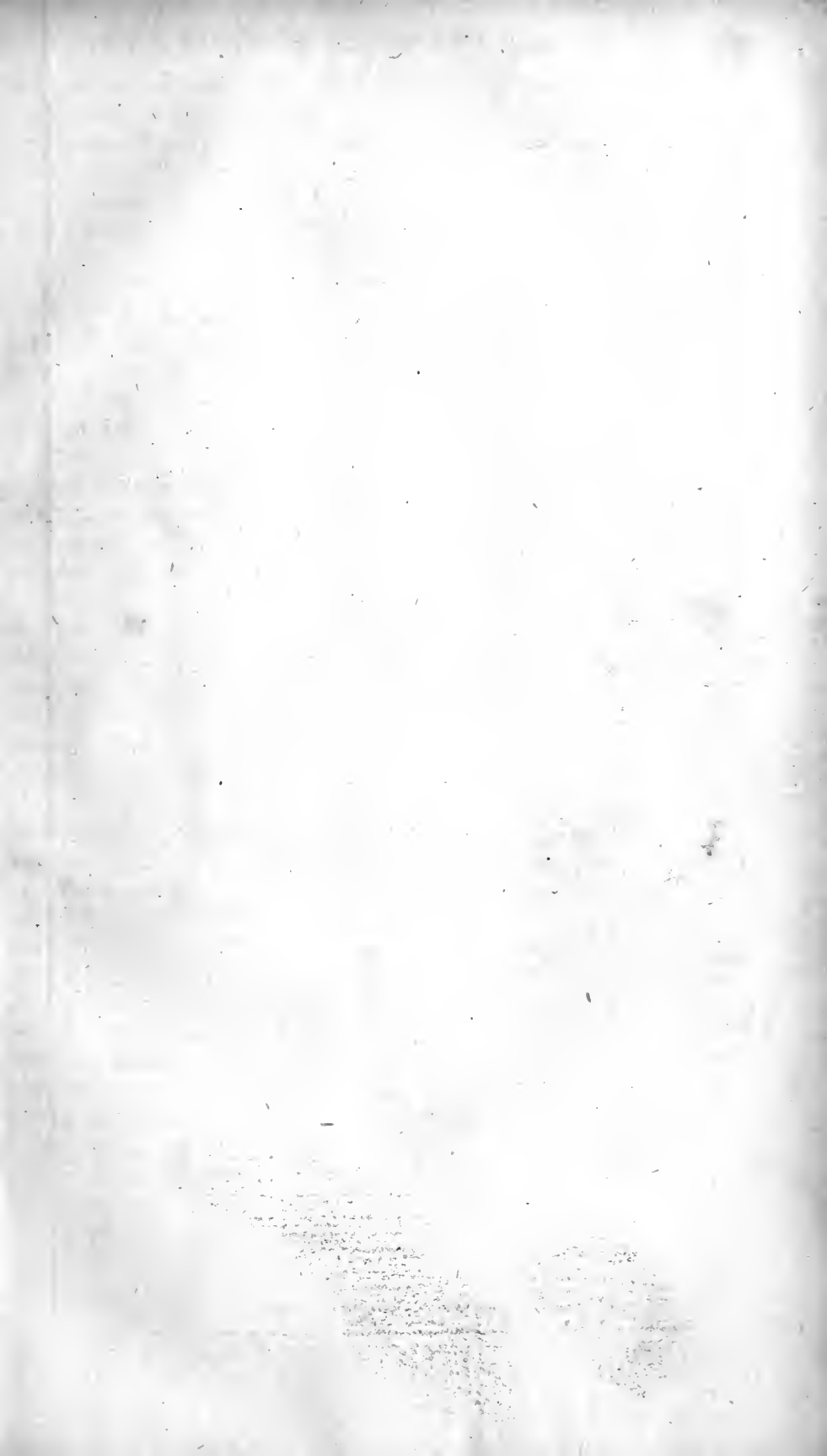
Articulations  
of the Bones  
of the Fingers.

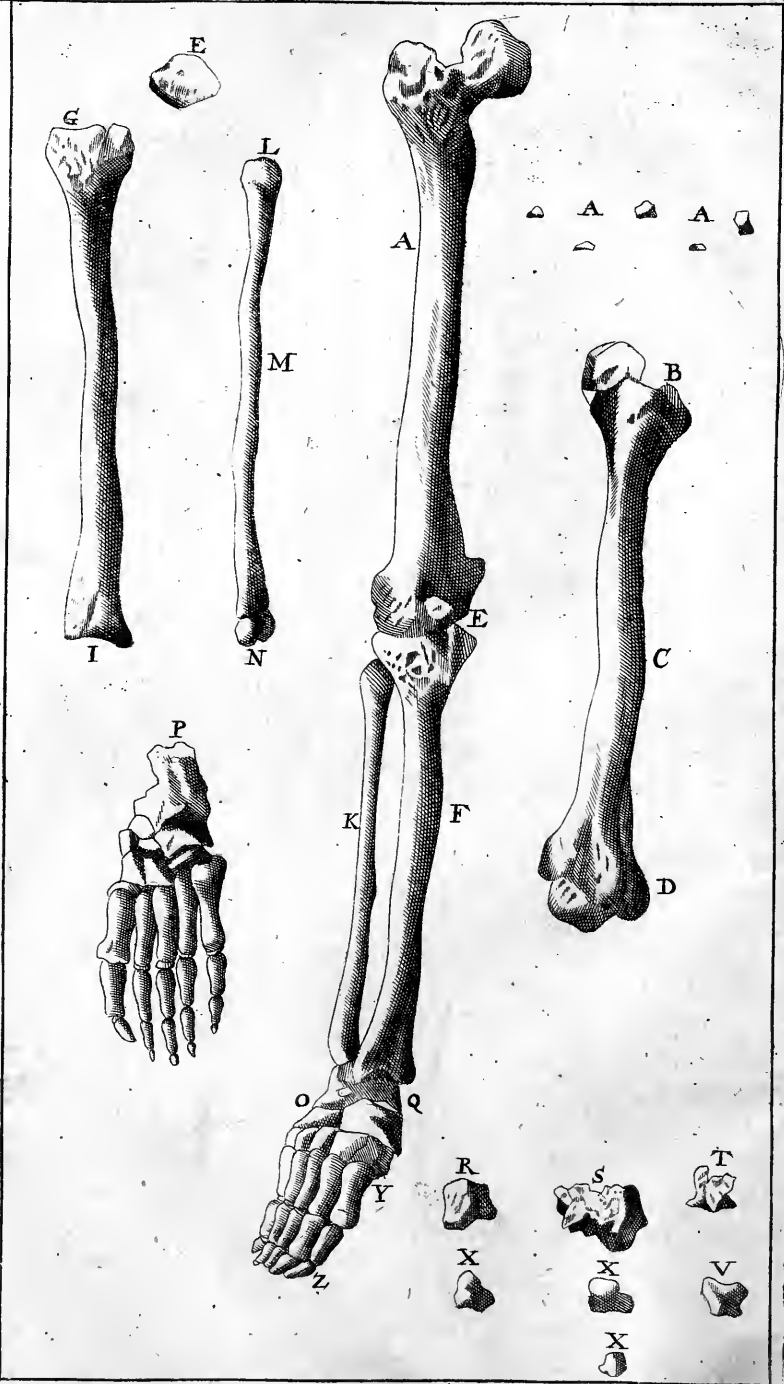
They are joined together by *Ginglymus*, having all of them both little heads and little Cavities, which do reciprocally receive one another; their Articulation with the *Metacarpus* is made by *Arthrodia*; each Finger hath likewise Ligaments, the whole Length, on the inside. These Ligaments tie these Bones mutually together.

I shall not speak to you of the *Ossa Sesamoidea*, which are found in the Junctures of the Bones of the Fingers, until I come to explain those of the Feet.

Observation  
on the Moti-  
ons of the  
Fingers.

I conclude GENTLEMEN, with remarking to you, that after the manner that the Bones of the Fingers are articulated together, they are only capable of Flexion and Extension; and that if they do also ply on this side, and that side, which are called Adduction and Abduction, this does depend on the Articulation of their first *Phalanxes* with the *Metacarpus*, unto which they are joined in that place by *Arthrodia*, as I have often said.





## Of the BONES of the FEET.

### The Eighth and Last DEMONSTRATION.

**A**FTER having explained to you at large the Bones of the Hand, it is fit GENTLEMEN, that I should finish my Osteological Demonstrations, with the Bones which compose the lower Of the Lower Limbs. Limbs; and I am persuaded that you will not be less surprized at the Excellency of their Structure, than you have already been at that of other Parts. These being the Organs of Gradation, do enable a Man to go easily from one place to another; and these do principally contribute to a Man's having that erect Figure, which gives him a Majestick Aspect, which no other Animals have besides.

By the Leg is understood all that which is comprehended from the *Os Ilium* unto the ends of the Toes, and we will divide it as we did the Arm, into three parts, the Thigh, the Leg, and the Foot, properly speaking. Division of the Leg.

The *Femur*, or Thigh is made like the *Humerus* of one Bone only, which is the greatest and strongest of A The Femur. all the Bones of a Humane Body, because it does alone bear the Burthen or Weight of the whole.

This Bone has Articulations suitable to its Magnitude and Bigness, having two strong ones at both ends of it; the first is the Superior, called *Enarthrosis*, it is made by the means of a very large Head, which is received into a great Cavity; the Head is at the end of the *Femur*, and the Cavity is at the lateral part of the *Os Ilium*; this Cavity has a Cartilaginous Brim, for the better inclosing this Head, and to hinder it from luxating out of its place. There is besides a strong Ligament that ties this Head to the bottom of the Cavity, but notwithstanding all the Precautions that Nature has taken to fortify this Articulation, it cannot but luxate sometimes. The second Connexion is made at Articulations of the Femur. its

its lower end by *Ginglymus*, having two Heads which are received into two Cavities, that are at the Superior and Extreme part of the *Tibia*. Between these two Heads there is a Cavity which receives a Prominence of the same *Tibia*; and which makes the *Ginglymus*.

Its three Parts. The Parts of the *Femur* are three, to wit, a Superior, a Middle, and an Inferior part.

**B**  
The Upper  
part of the  
*Femur*.

In the Superior, we must examine, a Head, a Neck, and two Processes; the Head is large and round, it is formed of that Process which is inserted into the *Cotyla* of the Hips, the little Pit that is in its middle is the place where the Ligament rises that ties it unto the *Ossium*, This Part deserves better the Name of a Head, than any other in all the Body, nay it has more of that Figure than other parts have, being larger than the Neck which supports it, although this be very large too, and very long; it inclines outwardly, not only for the convenient Situation of the parts of the Thigh, but for the stronger going. This Neck is oblique, because the Cavity of the *Ischium* not being situated in a straight Line, the Head of the *Femur* would not otherwise have been able to enter well into it; Moreover, the Neck stretching thus outwardly, it separates these two Bones from one another, and causes the rest of the Bones to descend in a straight Line, and the Body to be more conveniently and surely supported.

The two Processes which are behind the Neck of the *Femur*, are called *Trochanters*, from a Greek Word signifying to turn, because the Muscles which do make the motions of the Thigh, and particularly those which cause it to turn are inserted in these Processes, of which the Superior and the greatest is called, the great *Trochanter*; it gives Insertion to the *Musculi Extensores* of the Thigh; and for this reason its External part is rough and unequal, that they may insert the better; and at its internal part, which regards the Neck, there is a Cavity, over which there is found a kind of *Sinus*. The second Process is smaller, and placed underneath, and is called the lesser *Trochanter*.

**C**  
The Middle  
of the *Femur*.

We must observe, that there is on the inside of the *Femur* a straight Line which serves for the Insertion of Muscles. We must also observe, that the middle part of

of the *Femur* is round, that it is smooth and equal in its anterior part, and unequal in its posterior part, where a Line is found to be drawn all the Length of the Bone, as I have already said before. This Bone has a great Cavity its whole Length, which contains Marrow, as the rest do, and this makes it be the lighter. It is convex outwardly, and a little crook'd or concave on the inside, insomuch that it serves for a Buttress to our Body, to hinder it from falling, and from inclining too much forwards. And this Surgeons ought to mind in the Fractures that happen to it, they must take care not to compell it to receive a straight position, since it has not such a one in its natural State.

At the Inferior part of the *Femur*, there are two Processes, called *Condyli*, and these do make the *Ginglymus* that I spoke of. They are covered with a large Cartilage, as are all the other Extremities of Bones. There is between these two *Condyli* a Cavity which receives the Prominence of the *Tibia*. Likewise at the upper part of the *Femur*, there is a Vacuity which gives a Passage to the Vessels that go down to the Leg. This Vacuity is invested, like all other Cavities, as well as the Processes which do serve for the Connexion of Bones; they are plaistered over with a Cartilage which is smooth and slippery, in the mass of which there are small Glands which have each of them a secretory *Ductus*, through which runs that slimy Liquor, which serves to facilitate the motion of the Joint. When this same Slime comes to thicken by reason of its abundance, it glues the Heads of the Bones together with their Cavities, and this Union is called *Anchylosis*, which is a distemper of the Bones very hard to cure in old Luxations.

That Part which is at the lower end of the Thigh, and the upper end of the Leg, is called the Knee, where there is found a particular Bone called the *Rotula*, because it is like a little Wheel; others call it the Knee-pan. It is a round and large Bone that lies at the Articulation of the *Femur* with the *Tibia*. Its Substance in Infants is cartilaginous for some Months, afterwards it comes to be Bony: its Figure is like the circular Boss of a Buckler, its Middle part being thicker and more prominent than its Brims.

Articulations  
of the *Rotula*.

The *Rotula* is moveable, and is articulated by a kind of *Ginglymus*; it is covered with the *Aponeurosses* of four Muscles that are *Extensores* of the Leg, which are inserted at its External part, and its Brims. It is invested at its Internal part with a slippery Cartilage, to facilitate the motion it is obliged to make on the Extremities of the *Femur* and the *Tibia*. It does serve not to fortify the Articulation of the Thigh-Bone with that of the Leg; nor to hinder the too great Flexion forwards, but to give more Strength to the *Extensor* Muscles of the Leg, to which it is a Support, and serves for a Pully for the Tendons of those same Muscles to slide along upon its Cartilage. The Fracture of this Bone is very hard to cure, and often leaves Men remaining lame.

Uses of the  
*Rotula*

Two Bones  
in the Leg.

The Leg is the second part of the Lower Limb; it comprehends from the Knee down to the Foot; it consists of two Bones, of which one is very big, called the *Tibia*, and the other smaller called the *Fibula*.

What they  
have common  
to both of  
them.

These two Bones do only differ in Bigness, being of the same Length; for if the *Tibia* rises higher, the *Fibula* descends the lower; they have both of them a triangular Figure, but that of the *Fibula* is more irregular; they are jointed together at their ends, but separate asunder in their middle to give room to the Muscles, and to give a passage to the Vessels. They have both of them the Name of *Focile*, with this difference that the *Tibia* is called the greater *Focile*, and the *Fibula* the lesser *Focile*. They do also each of them make a *Malleolus*, or Ankle-bone. And these two Prominences are on the sides of the Foot, the *Tibia* making the inward Ankle, and the *Fibula* the outward.

F  
The *Tibia*.

The *Tibia* is the largest Bone of the Leg, hollow within its whole Length for containing the Marrow; it is situated on the inside of the Leg: we shall consider two things in it, its Articulations, and its Parts.

Articulations  
of the *Tibia*.

It is articulated at both its ends by *Ginglymus*, that above is made with the *Femur*, that below is made with one of the Bones of the *Tarsus*, called *Astragalus*. It is likewise joined with the *Fibula* by *Arthrodia*, at both its ends, but laterally. The *Fibula* has a small Cavity in its superior part, that receives the *Tibia*, and below it has a small Prominence that is received into the *Tibia*.

This



This last Bone has three parts, a Superior, a Middle, and an Inferior part.

The Superior Part is the biggest of all the Bones, it has in its Middle a Process, that is received into the Cavity which is at the end of the *Femur*. There are on both sides of this Process two small Cavities which do receive the heads of the *Femur*. Their depth is increased by a *Cartilago Lunata*, which is not deprived of motion, although it be fastened by Ligaments; it is soft, slippery, and besmeared with an unctuous Humour; it is thick in the brim, and slender towards the centre, which has occasion'd its name of *Lunata*.

G  
The upper part of the *Tibia*.

The Middle part of the *Tibia* is almost Triangular, having three Angles, of which the most remarkable is the Shin, being long and sharp before, like the edge of a Knife; whence it comes to pass that blows received upon this part are very much felt, by reason that the Skin and the *Periosteum*, which cover it, are often cut with the blow: According as this Bone approaches to the Foot, it lessens in bigness; but in recompense of that, it grows the harder as it descends.

H  
The Middle of the *Tibia*.

The Inferior part of the *Tibia* does terminate in two little Cavities, which receive the Prominences of the *Astragalus*; and from the middle of these Cavities there rises a small Protuberance, which is received into the Cavity that is found at the upper part of the *Astragalus*; and from the side of this Cavity there is a pretty large Prominence which forms the Internal Ankle, which hinders the Luxation of the Foot, by keeping it firm and strong.

I  
The Lower part of the *Tibia*.

The *Fibula* is the least of the Bones of the Leg; nevertheless, it often happens in Fractures of the Leg, that the *Tibia* shall be broke, and this will remain whole; because being slender, it will ply the more; and by reason of this plying a little, it will not break so easily as the other. It is situated at the external part of the Leg.

K  
The *Fibula*.

This Bone is articulated at both its ends with the *Tibia* by a kind of more compact *Arthrodia*, the which is fortified by a Ligament both above and below it.

Articulation of the *Fibula*.

This Bone has three parts, a Superior, and Middle, and an Inferior part.

**L** The Superior is a round head which does not touch the Knee, ending a little under it, at the place where it is articulated with the *Tibia*.

The Upper part of the *Fibula*.

**M** The Middle part is slender and long, and of a triangular figure, like the *Tibia*, but a little more irregular.

The Middle.

**N** The Lower part hath a *Condylus* which makes a Process, call'd the Outward Ankle; it is a little hollow within, that it may leave a liberty to the *Astragalus* to move freely. It is remarkable, That the lower end of this Bone descends a little lower than that of the *Tibia*.

The Lower part of the *Fibula*.

**O** All that is comprehended from the Inferior Articulation of the Leg, unto the end of the Toes, is called the Foot, in propriety of speech. It is composed of the *Tarsus*, the *Metatarsus*, and the Toes.

The Foot.

**P** The Foot is of an Oblong figure, for the better performance of its function, and to keep it the stronger. It is longer than big, to the end a Man may not fall upon his Nose in walking, and that he might not be obliged to throw his Legs too far asunder.

The Bottom of the Foot.

Its Superior and External part is Convex, in order to help to form the Cavity which is found in its Inferior and Internal part, call'd the Sole of the Foot: This Cavity has its Ules; for besides that it contributes to the convenience of Walking, and to the Standing firm, it also leaves a free passage to the Tendons that go to the Toes, and it lodges one of their *Flexores*.

**Q** The *Tarsus*, which is the first and largest part of the Foot, is a collection of seven Bones, of which four have distinct Names, and the three others only that of *Cuneiformia*.

The *Tarsus*.

**R** The First is the *Astragalus*, which serves for a *basis* to the Bones of the Leg, under which it is articulated. We consider in it six several Surfaces: The first, which is the superior, is smooth, and made like a Pully, upon which the great Bone of the Leg is placed. This part has the figure of the Nut of a Bow, used in old times, which has caused it to be called the Bone of the Cross-bow: The second Surface, which is Anterior, is a large Head that enters into the Cavity of the *Os Naviculare*, with the which the *Astragalus* is strongly articulated: The third, which is the Posterior, is strongly

The *Astragalus*.

strongly united with the *Calcaneum*, whose Head it receives: The fourth, which is the Inferior, is rugged and unequal; it rises in some places, and sinks in others: The fifth and sixth Surfaces of the *Astragalus* are the two lateral, which are inclosed by the two *Malleoli*, or Ankles.

There is found in these parts an unctuous Humour, which moistens not only this Joint, which is in a continual motion, but also the Tendons of the Muscles that go to the Foot, and which do pass under the *Malleoli*.

The Second Bone of the *Tarsus* is the *Calcaneum*, or the Heel-bone; it is the greatest, the thickest, and the most porous of all the Bones of the *Tarsus*; it is this Bone only which hinders the Body from falling backwards, being situated at the posterior part of the Foot, and the other at the anterior: Wherefore it is called by some the *Spur-bone*; and in this the Tendon of *Achilles*, which is the biggest and strongest of all the Tendons, is inserted, consisting of the *Musculus Plantaris*, and the two *Gemelli*, or *Gasterocnemij*, which are the three chief Muscles that form the Calf of the Leg; this Bone is doubly joined with the *Astragalus*, although it be also with a flat head joined with the *Os Cuboides*. It is observed, that there is in its hinder part an Appendix, which in time does come to unite with it. And lastly, This posterior Prominence does hinder the Body from bending too much backwards.

The Third is the *Os Scaphoides*, or *Naviculare*, so called, because it resembles a little Boat; it has a pretty large Cavity, that goes from one of its ends unto the other, in which the large head of the *Astragalus* is received, which joins them both strongly together; and on the other side of this Cavity it has three Protuberances, to which the three last Bones of the *Tarsus* are articulated.

The Fourth is the *Os Cuboides*, so named by some, because being of a Square figure, it is like unto a Cube; and by others it is called Multififormous; it is greater than the three which remain to be shewn; it is situated before the *Calcaneum*, unto which it is joined by an unequal Surface; it is likewise articulated with the seventh Bone of the *Tarsus*, and if we examine this alone, we shall find it have six sides like a Dye.

XXX  
Ossa Cunei-  
formia.

The Fifth, Sixth and Seventh Bones of the *Tarsus* are called *Cuneiformia*, because they have the figure of a Wedge that cleaves Wood. Although they are like to one another in figure, nevertheless they do differ in magnitude; one of them is greater than the rest, another of a middle size, and the other is the least of all; they are all three articulated with the *Os Scaphoides* by one of their ends, and by the other end they do one of them support one of the Bones of the *Metatarsus*, the two others being supported by the *Os Cuboides*.

Y  
The Meta-  
tarsus.

Its Figure.

The *Metatarsus*, or Instep, consists of five Bones situated sideways to one another, for the sustaining each of them a Toe; these Bones are very compactly join'd together at that end where they are united with the *Tarsus*, for the stronger Articulation; but they separate from one another in their middle, for the insertion of the *Musculi Interossei*; they are Convex outwardly, and hollow within, for the more easie reception of the Tendons of the Muscles; they are long and slender, and end with a little head, which entering into the Cavity that is at the end of the Bones of the first *Phalanx* of the Toes, does unite them together by *Arthrodia*. That which supports the Great Toe is the largest, the strongest, and the shortest of the five; the second is not quite so big; the third is still less; insomuch that they still lessen, so that that of the Little Toe is the least of them all; they have at their slenderest end a Head cover'd over with a little Cartilage, for the freer motion of the Toes.

Z  
The Bones of  
the Toes.

In the Bones of the Toes we consider the same things as we did in those of the Hand, excepting their number, which is but fourteen in the Foot, whereas they were fifteen in the Hand, by reason that the Great Toe has but two Bones, and the Thumb has three.

The reason of it is this: The first Bone of the Great Toe is numbred with those of the *Metatarsus*, as having no more motion than the four others; which Account causes the *Metatarsus* to consist of five Bones, whereas the *Metacarpus* has but four; because the motion of the first Bone of the Thumb is made upon one of the Bones of the *Carpus*, as I shewed you before.

Fourteen  
Bones in the  
Toes. and  
their Artic-  
ulations.

Of the fourteen Bones of the Toes, there are two to the Great Toe, and three for each of the four other  
Toes;

Toes: They are distributed into three *Phalanxes*, or Ranks, as those of the Fingers; those of the first Order, or Rank, are greater than those of the second; and those of the third are less than the others, and so of the rest. They are of the same figure as those of the Hand; for they are Convex outwardly, and Concave within; they have likewise the same Connexions, to wit, by *Arthrodia* with the Bones of the *Metatarsus*, and by *Ginglymus* with one another.

There are found in the Joints of the Bones of the Hands and Feet some very small Bones, called *Ossa Sefamoidea*, A A  
Ossa Sefamoidea. by reason of the resemblance they have with the Seed of *Sesamum*; they do adhere to the Tendons, under which they lie hid, and are covered with Ligaments, insomuch that they never fail to be gone, when the Bones are cleaned in order to make a Skeleton, unless very great care be taken to preserve them.

Their figure is round, like a small Pea, being yet a little flatned, and even hollow on the side where they touch the other Bones, and remaining round on their external side. Those of the Hand are greater than those of the Foot, excepting only those that belong to the Great Toe, which are the greatest of them all: Nevertheless, those of the Hand are not all of the same bigness, for those of the Great Fingers are greater than those of the Little Finger; also those that are at the Joints of the Bones of the first *Phalanx* are bigger than those of the second, and the third. Their Figure.

Their Number is uncertain, although we do commonly count twelve of them in each Hand, and the same in each Foot; yet there are sometimes more of them, and sometimes fewer. In Old People there are more of them found than in Younger Persons, because they do begin by small Cartilages, which come to grow Boney with time. Their Number.

These Bones, as small as they are, yet are not useless; for they not only serve to strengthen the Joints, and to hinder Luxation, but their principal Use is to serve for Pulleys to the Tendons of the Muscles, which go to the Fingers, in order to retain them in their due places, and to hinder them from falling upon the Joint, there being to that end some *Ossa Sefamoidea* on the right, and on the left of the Tendons. Their Use.

Thus,

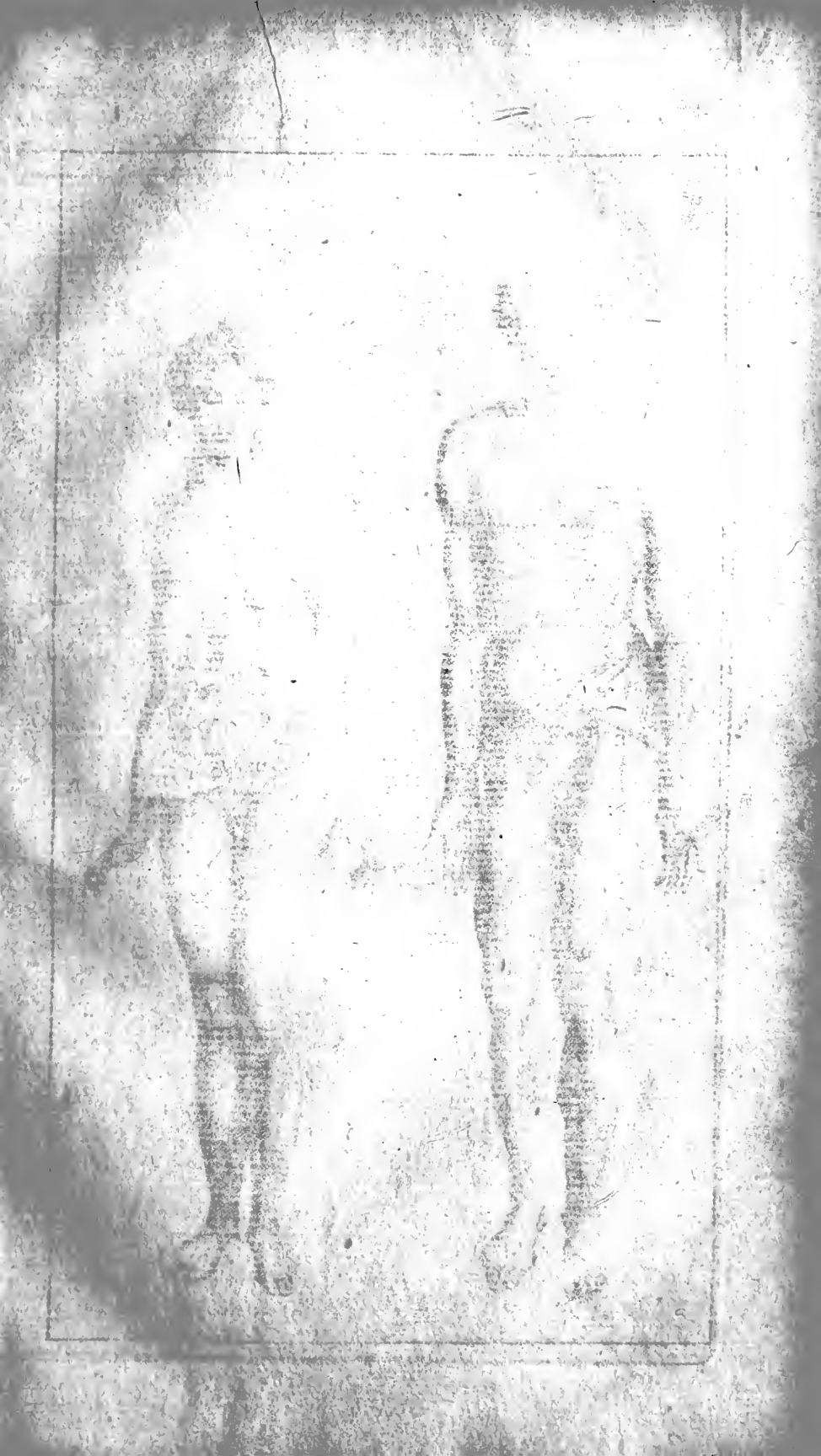
The certain  
Number of  
all the Bones  
235, without  
reckoning  
the *Ossa Se-  
samoidea* and  
the *Os Hyoi-  
des*.

Thus, GENTLEMEN, you have seen all the Bones that use to be shewn in a Humane Body. There have been some who have farther added some little Bones which are found now in the Hand, then in the Foot, and sometimes in the Ham. But because those are seldom found at all, unless rarely, they do not deserve to be inserted in the number of Two hundred thirty five, which do compose a Skeleton.

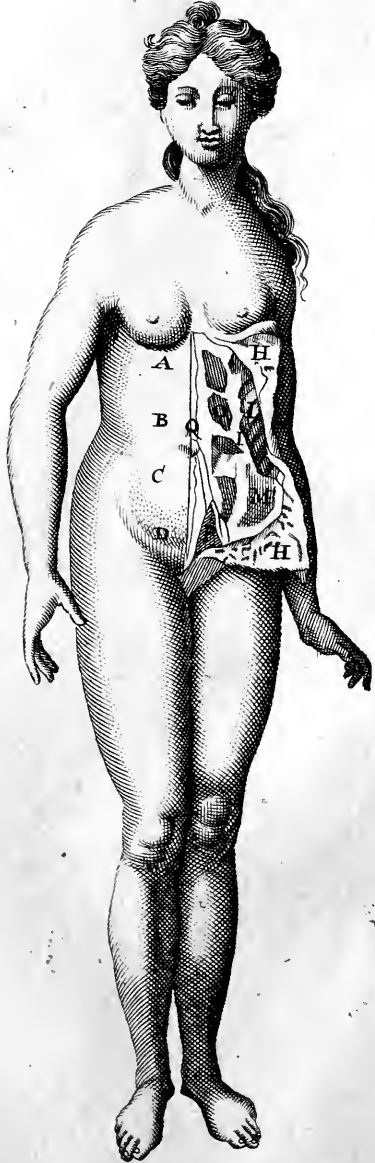
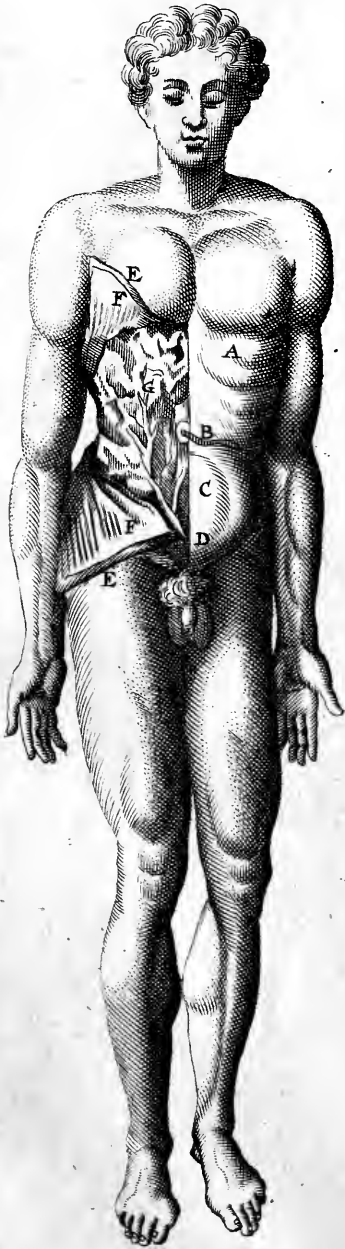
I shall continue hereafter the same Order in the rest of my *Anatomical Demonstrations*, as I have done in those of the Bones; and suiting my Discourses to the New Discoveries, I shall endeavour to shew you a Humane Body according to our knowledge of it at present.

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T H E







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THE  
**A N A T O M Y**  
 OF A  
**H U M A N E B O D Y,**

According to the Doctrine of the  
**C I R C U L A T I O N,** and the late  
**D i s c o v e r i e s.**

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*The* **F I R S T D E M O N S T R A T I O N.**

*Of the Parts Containing.*

**I** Do not intend, **G E N T L E M E N,** in these *Demonstrations*, to make an *Elogium* upon **M A N,** nor to expatiate upon the Advantages which He hath over the rest of Animals; because such things would make too great a Digression. Therefore, without stopping to observe what it is that raises him above all the Beings that we see in the Universe; I will presently begin with telling you, that the Science which leads us to the knowledge of Man's Structure is called *Anthropology*.

*Anthropology*

This Science contains two Parts: The first treats of the Soul, and is called *Psychology*, of which I shall say nothing: And the second makes us to know the Body, and all that depends upon it, and this is call'd *Anatomy*.

Definition of  
*Anatomy.*

It is Defined an Artificial Dissection of a Body, in order to know the Parts which compose it. It is chiefly divided into two parts, *Osteology*, and *Sarcology*: The first treats of the Bones and Cartilages; and this of the Flesh, and other soft and tender Parts.

Having already explained all that relates unto Bones, in the Eight preceding *Demonstrations*; it remains for me to shew before you the soft Parts: But that I may do it in Order, let us divide *Sarcology* into three parts, into *Splanchnology*, into *Myology*, and into *Angeiology*. The first gives an Account of all the Internal Parts, and especially the *Viscera*; the second instructs us in the Muscles; and the third, in the *Vasa*, or Vessels, such as the Nerves, the Arteries, Veins, and Lymphatick Vessels. On these three parts I hope to entertain you distinctly, and shall endeavour to make you understand them thoroughly, in the Course of my following *Demonstrations*.

*Anatomy* absolutely necessary to Physicians and Surgeons.

The Science of *Anatomy* is so useful and so advantageous to all Men, and especially to those who practise Physick and Surgery, that these cannot neglect the knowledge of it, without abandoning wholly their Profession, it being the *basis* and foundation of it; and it being impossible for them to cure Distempers, or to perform any Operation, unless they do know before-hand the Part affected: For to how great Dangers would wounded Men be exposed, if the Surgeon, who is to make an Incision, or to use the Trepan, or to extract Bullets, or a Splinter of a Granado, did not know how these Parts are formed? Could he, without this Knowledge, cure so many wounded Men, and perform so many fine Cures in the Army, where strange and amazing Wounds do happen every day?

Anatomical Lectures restored at the King's Garden.

And it is for this Reason, GENTLEMEN, that the King, who well knows how useful able Surgeons are, has pleas'd to Order these Exercises in the *Royal Garden* to be again renewed, they having suffered an Interruption for divers Years; to the end that Publick Anatomies should here be made *gratis*, and all the Operations of Surgery should here be shewn, for the giving a free Opportunity to Students to make themselves perfect in an Art, unto which His Majesty does owe the Preservation of his greatest Captains.

The King could not commit the care of his Orders, at the *Physick Garden*, better than unto him to whom

he had committed the care of his Health, and therefore then chose Monsieur *Daquin*, his First Physician, to have the Inspection of these Matters. And these Exercises are now continued with much better success, under the Orders of the famous Monsieur *Fagon*, whom His Majesty hath expressly chosen for his First Physician, inasmuch that this School may now be said to be one of the most flourishing in the World. Nay, and the choice which this Great Man has made of able Professors, both in Anatomy, and in Chirurgical Operations, as well as in Chymistry, and in the Teaching of Plants in the Garden, does sufficiently evince what a Love he hath for the Sciences, and how great a Consideration he hath for those that apply themselves to them.

It is in Obedience to his Orders, that I shall observe to you, in this Dissection, all the curious Discoveries of the Moderns, and shall confute the Errour of the Ancients, who thought the Blood did move from the middle of the Body to the extremities, without ever returning back again; and that it advanced forwards but only in proportion as some part of it got out of the Orifices of the Vessels, for nourishing the Animal; and that the Chyle was carried to the Liver, as to the Principle of Sanguification, through the Mesenterick Veins. These Opinions have been received by the Ancients without any Proof, in times when Men did make a scruple to doubt whether the former Anatomists were capable of mistaking. But now-a-days, when we do not submit blindly to Authority in such Matters, and when we enquire into the Reasons that former Authors had for establishing certain Opinions of theirs; this Doctrine does appear to be a meer Imagination, without any good foundation.

To return then to the Subject for which we are met together, and to give you those Lights you expect from me in this Anatomy; I do believe, GENTLEMEN, you will agree with all Anatomists, that a Humane Body is the most proper of all others that can be proposed for these kinds of Demonstration, not only because it is the Master-piece of Nature, and consequently the most perfect of all Bodies, but because it is of much more advantage to Physicians and Surgeons to know it rather than any other.

A Humane  
Body the  
Subject of  
Anatomy.

In a Dissection there are two ways of knowing a Humane Body, either by the Senses, or by the way of Reason: But this may be said in some measure to depend on the other; wherefore we begin with the Sensible Parts, because they do lead the Reasoning Part to frame a Judgment on what is Insensible.

The Parts which compose a Humane Body.

These Parts are External or Internal; and although both of them do fall under the Senses yet there is this difference, that the first sort do occur to our Eyes, as the Head, the Arms and the Legs, whereas the others are not discovered till after some Preparation.

The due Proportion of the External Parts.

In the External Parts we do observe only the Proportion they ought to have in respect to one another. For Example: The Head ought to be of a bigness suitable to the rest of the Body, but yet rather large than little, of an oval figure, flatned on the sides, and prominent both before and behind, because it ought to be neither round nor sharp-pointed: The Forehead ought to be large, the Features strong or manly, especially in Men, who ought not to value themselves on account of Beauty. The Neck ought to be long, and not too large: The Breast large, capacious, and rising like an Arch; because if it were sharp, flat, or sunk, the Heart and the Lungs would not have liberty enough to move as they ought. The Breasts of a Man ought to be less prominent than those of the Female Sex: The Belly ought to be round, and to rise a little: The Spine ought to be straight; the Buttocks a little large; the Hips advanced; the thighs round and firm; the Joints large; the Legs well made, and a little large; the Foot large; the Arms fleshy, not too long, proportionable to the Body, but especially the Muscles and the Veins ought to appear in them: And lastly, the Hands ought to be strong, for the better enduring of Labour.

Division into Similar and Dissimilar Parts.

The Parts of Man are divided into Similar and Dissimilar Parts. The Similar are those which do not consist of Particles of a different nature: Of these we do reckon Ten in all, the Bones, the Cartilages, the Ligaments, the Membranes, the Fibres, the Nerves, the Arteries, the Veins, the Flesh, and the Skin.

Division of the Similar Parts, according to the Ancients.

It was pretended heretofore, that the Parts were called Spermatick, Sanguine, or Mix'd: Those Parts were called Spermatick, in which there was thought to be more of *Semen* than Blood, as in the eight first; and those

those were called Sanguineous in which Blood was thought to be predominant, as in the fleshy Parts; and those were called Mix'd, which were believed to be equally compounded of *Semen* and of Blood, such as the Skin. But the Disquisitions of the Moderns have taught us, that all these Parts are Spermatick, seeing they are all found to have existence in the Egg, as I shall shew you in the Sequel.

The Dissimilar Parts are those that are compounded of Parts of a different Nature, as the Finger, which can be divided into Bone, Nerves, Arteries, &c. Dissimilar Parts.

Besides all these Parts, there are some that are called Organical, because they do serve for Organs and Instruments for certain Actions, which cannot be perform'd without them; as the Foot, which serves for Walking, and the Hand for Writing. Organical Parts.

Some have pretended, that there were no Organical Parts besides the Dissimilar; and they have often confounded them together, but improperly; seeing the Arteries, the Veins, the Nerves, and the Bones, which are Similar Parts, are nevertheless Organical, by reason of their functions, as well as the Foot and the Hand.

In order to Demonstrate well all these Parts one after another, we must, GENTLEMEN, divide the Body into the Trunk, and the Limbs. Although this Division be a common one, yet it is the best and the clearest of all. The others are more extensive, but very intricate and obscure. Division of a Humane Body.

By the Trunk of the Body, we do understand Three Parts, or Three principal Regions, which are the Head, the Breast, and the *Venter* or *Abdomen*: The Head is in the highest position of all the Body, the Breast in the middle, and the *Abdomen* is the inferior part of the Trunk. What the Trunk is.

The Limbs are Four; two superior, called the Arms; and two inferior, the Legs. I shall speak of the Limits that Nature has given unto all these Parts, as I shall Demonstrate every one of them in particular. The Limbs.

The Opinions of Anatomists are divided on the choice of the Part with which we ought to begin; some say we ought to begin with the Brain, because it is the noblest Part of the Body, and it is that which commands all the rest: Those who are of a contrary opinion, do pretend that all the Parts of Men are equal. With what Part to begin the Dissection.

equal, in that they were formed at the same time, and could not be one of them without the other: And thus we ought to begin with the Part that rises first to our view. The one Party follows the Order of Dignity, and the other that of Situation. We shall leave them both, to follow the Order of Necessity, according to which we shall begin with the *Abdomen*, because it incloses the Excrements, and the Parts that are most subject to Corruption; and we cannot make a perfect Dissection of the Whole, unless we begin with removing these.

Definition of  
the *Abdomen*.

The *Abdomen* is all that Cavity which is extended from the *Diaphragma* unto the *Os Pubis*. Although the word *Venter* does include all Cavities; nevertheless, this Part does retain that Name by way of Excellence, being the greatest Cavity in all the Body. It is called the Lower *Venter*, to distinguish it from the two others superiour to it.

Its Substance.

Its Substance is soft and fleshy before, and it can therefore extend and contract it self freely, both for easier Concoction, and for expulsion of Excrements, as well as to make room for the expansion of the *Matrix* during Child-bearing. It is terminated above by the *Cartilago Xiphoides* and the *Diaphragma*, by the true and the false Ribs, below and before by the *Os Pubis*, on the Sides by the Hip-bones, and behind by the *Vertebrae* of the Loins and the *Os Sacrum*.

Its Division.

The *Venter* is commonly divided into an Anterior and a Posterior part: The Anterior, which is that we call the *Abdomen*, is divided into three regions, of which the superior is called the Epigastrick, that in the middle the Umbilical, and the inferior the Hypogastrick; the first begins at the *Cartilago Xiphoides*, and ends two fingers breadth above the Navil; the second begins where the former ended, and determines about two fingers breadth below the Navil; and the third descends unto the *Os Pubis*.

A A

The *Epigastricum*.

Each of these three Regions is divided into three Parts, a middle, and two lateral parts. The middle part of the Epigastrick region is call'd the *Epigastricum*; and the two Sides *Hypochondria*, of which one is the right, and t'other the left *Hypochondrium*.

That a Surgeon ought to know the Parts contained in the Three Regions.

And seeing it is necessary that the Surgeon should know how to distinguish the different Parts which are contained in these three Regions, it may not be amiss



amiss to describe them all one after another, both in the middle and in the lateral parts of the Regions. The *Epigastrium* incloses the small Lobe of the Liver, and a part of the Stomach with its Inferior Orifice, and also the middle part of the *Colon*; the Right *Hypochondrium* contains the great Lobe of the Liver, and the Bladder of Gall; and the Left contains the greatest part of the Stomach, and the Spleen.

The middle part of the Umbilical Region is called the Navil; its two Sides are the two Loins, one on each side, the Navil includes the greatest part of the *Intestinum Jejunum*, and the Mesentery; the Right Loin contains the Right Kidney, the *Intestinum Cœcum*, and part of the *Jejunum* and *Colon*; and the Left Loin the Left Kidney, and some part of the *Colon*, and *Jejunum*.

**B B**  
The Navil.

The middle of the Hypogastrick Region is called *Hypogastrium*; its Sides are the *Iliæ*, or the Flanks, and under it we find the *Rectum*, the Bladder, and the *Matrix* in Women; the *Iliæ* are so called because they do contain the Gut *Ilium*.

**C C**  
The Hypogastrium.

The lower part of the Hypogastrick Region is likewise divided into three, the middle, or that of the *Pubis* or *Pecten*, and two lateral, called the Groins. The *Pubis* begins to be covered with Hair at fourteen years old; the Groins give passage to the Spermatick Vessels, it is in these Parts that Tumours do too often rise, called Buboës.

**D D**  
The Pecten.

The posterioür part of the *Venter* extends from the last Ribs unto the end of the *Os Sacrum*; it is divided into a superior part, called the Loins, and an inferior called *Nates* the Buttocks, between which there is a Fissure, and a *Foramen* called *Anus*, which is the Sink, or Drain of the grosser Excrements of the Body.

The back-part of the *Abdomen*.

The *Venter* or Belly, is that Cavity which contains and incloses the Parts which serve for Nourishment, and for Generation. It is composed of two kinds of Parts, whereof the one are External, and containing, and the others internal and contained.

Its Division into Parts Containing and Contained.

The first of these are common or proper; the common Parts containing are the Teguments as the *Epidermis* or *Cuticula*, the *Cutis* or Skin, and the Fat. The proper containing Parts are the Muscles of the *Abdomen*, and the *Peritoneum*.

What are the Containing Parts.

Before we lay open the Muscles of the *Abdomen*, it is convenient to tell you that all the Ancients, and the

**H**

greatest

What it is that  
was called  
*Panniculus*  
*Carnosus*.

greatest part of the Moderns, do reckon up and shew five Teguments: they look'd upon the *Panniculus Carnosus*, as the fourth Tegument of the Body; and it is according to them, a thick Membrane, which covers all the Body, and which also does become musculous in some places. But this *Panniculus Carnosus* ought not to be accounted a containing part of the *Abdomen*, because there is no such thing in the Body, and what is shewed usually, is nothing but the Membrane of Fat.

The Opinion  
of the Anci-  
ents on this  
matter;

The Ancients gave unto it the Use of wrinkling the Skin; but where-ever we see the Skin run into wrinkles, there are particular Muscles for it, called cutaneous, as in the Forehead the *Frontal*, in the *Occiput* the *Occipital*, in the *Scrotum* the *Dartos*. They have said, that these Muscles had particular motions, but not so all over the Body; and that they were not observed but only in places where there was no Fat between the *Panniculus Carnosus* and the Skin, which is false; for we observe no Fat between it and the Skin, as in the Forehead and the *Occiput*; in Animals too which move their Skin, there is no Fat found between the *Panniculus Carnosus*, and the Skin. Besides, in Animals this *Panniculus Carnosus* is a cutaneous Muscle, as well as the *Dartos* of which I spoke.

and their Er-  
ror concern-  
ing the com-  
mon Mem-  
brane of the  
Muscles.

The Fifth and last Tegument of the Body was also, according to the Ancients, the common Membrane of the Muscles; they called it so, because they said it contained or covered all the Muscles. But it is an Error; for every Muscle has its proper Membrane, and it is known that this pretended common Membrane is not to be found in a Humane Body, nor in Animals, unless we take for it some *Aponeurosis*, or the proper Membrane of a Muscle, as it is customary to do in the *Abdomen*.

EE  
The *Epider-  
mis*.

The *Epidermis* is a very thin Membrane and strongly fastned to the Skin, which it immediately covers, wherefore it is a Tegument as well as the others; some do call it the first Skin, others the *Cuticula*, it being as thin as the peel of an Onion, and lastly others the *Epidermis*, because it is situated immediately upon the Skin.

Its Origin ac-  
cording to  
the Ancients.

Most Authors say, that the *Epidermis* is made of an oily, unctuous, and moist Vapour, which exhales from the Skin, and the parts that are under it; and that this  
Vapour

Vapour hardens by the Air, which strikes its Impression upon our Skin continually. They likewise give us the comparison of that small Skin which is formed upon Ebullition, when the Liquor is left to settle. But this Opinion will hardly answer Experience, which tells us that Infants, whilst they remain in the Womb, and who consequently have had no Impression from the Air, have nevertheless an *Epidermis*. This is so true, that whenever a Woman miscarries (let the *Fœtus* have more, or fewer Months) this is found in them thick enough to be distinguished from the Skin. And it is to be separated from the Skin, even in Abortions, where the *Fœtus* remained some time dead in the Womb. So that we have no reason to doubt but the *Epidermis*, as well as all the other parts, is always to be found inclosed in the Egg.

That which ought to confirm us in this Opinion is, that these same Authors do assign to this part the Use of shutting the Orifices of the Vessels which determine in the Skin, and that it hinders the wast of Humours which would otherwise be at these Orifices; which could not be in a *Fœtus*, whilst it is still in the Womb, because it would have no *Epidermis*, for want of having had the Impression of the cold Air.

The *Epidermis* has the same Figure, and the same Magnitude as the Skin, because it follows the same dimensions, according to the Encrease or Diminution of the Body. In Burns it separates from the Skin, but it regenerates very easily again, without leaving a Mark afterwards.

Its Figure and Magnitude.

Let an Anatomist be never so expert, he can never dissect this *Cuticula*, nor separate it from the Skin, in order to shew it alone, unless he does it by burning a part with the Flame of a Candle. It is this which rises up in large Pustules, when Vescicatories are applied to some part of the Body; and when it separates from the Skin of its own accord, and without any outward cause, it is a sign that the part has a disposition to Mortification and Gangrene. I say when it happens without any outward cause, because an *Erysipelas*, or the great Heat of the Sun sometimes will make it separate from the Skin, but then Nature repairs it again quickly.

That the *Epidermis* cannot be dissected.

Its Colour is different in divers Countries; for the French have it white, the Spaniards tawny, the Moors black,

Its Colour.

black, and so of others. This Colour of the *Epidermis* is always derived from the nature of the Skin underneath. Those who are of a Sanguine Complexion, have a ruddy Skin, mixed with white; the Choleric have it dry, and drawing to a pale Yellow; the Phlegmatick have it soft and white; and lastly the Melancholick have it rough, brown, and dark. All these Colours are imprinted on the *Epidermis*, which being only a very thin Pellicle and commonly white, does easily receive the Colour of the Skin which it immediately covers.

It contributes  
to Beauty.

This Part contributes very much to Beauty, for the thinner, smoother, and more diaphanous this is, the more beautiful is the Complexion; it sometimes becomes thick and callous, and then it is the less sensible of touching. It is perforated in many places of the Body, like the Skin: for besides its great Apertures, it has likewise abundance of small Pores throughout its Extent, both for Sweat and insensible Transpiration, as well as for the shooting of Hair.

Its Uses.

The Uses of the *Epidermis* are, to cover the Skin, to render it more smooth and equal, to hinder the Exclusion of Humours out of the Extremities of the Vessels which terminate upon it, and lastly to blunt the Sense of Touching, which could not be made upon the Skin without Pain, if the Impression of Objects were to be made immediately upon the Fibres, and upon the Nerves which do end and are inserted into the Skin it self.

FF  
The Skin.

The Second Tegument of all the Body is the Skin. It is the greatest Membrane of the Body; it is very thick, especially in the Back, at the Kidneys, and in the Limbs, it is very thin in the Face, and exceedingly so in the Lips; Animals have it stronger than Men, and it is for this Reason that they are less sensible of Injuries or Impressions from the Air.

The Origin of  
the Skin.

The Ancients do pretend, that the Skin is made partly of *Semen*, and partly of Blood, and that this is the only Membrane that is composed of the mixture of these two matters; but they are certainly mistaken, and if Blood be observed to be transmitted to it through many Vessels, it is only for its Nourishment and Augmentation; its true Principle being to be sought, as that of all the other parts in the Egg.

The Enquiries of some curious Anatomists have lead us to understand that the Skin is formed of Fibres intertwisted together like unto Nets, which do make its thickness; that there are thousands of small Glands placed under these Nets; that into every one of these Glands there comes a small Branch of an Artery, that a small Vein also comes out of them, and that a Lymphatick Vessel going from the Gland, does pass through these Nets, and does terminate at the Superficies of the Skin.

The Structure of the Skin.

The Knowledge of this Structure has taught us after what manner Sweating is performed; that we ought to look upon the Skin as the universal Drain of the Body; and that the Evacuation which is made by insensible perspiration is a very wholesome one.

How insensible Transpiration is performed.

We do find then that a sufficient quantity of Blood, being brought hither by so many Arteries as there are Glandules in it, is carried back again by so many little Veins; and that whilst it is passing through the Pores of the Glandules, a *Serum* is filtrated from it, which coming through the excretory Vessel, does furnish matter for Sweat.

The matter of Sweat.

We must observe that when this Serosity is but little in quantity it dries upon the Skin, and makes what we call Scurf. The first of these Evacuations, which is Sweat, does use to make the *Crisis* which cures abundance of dangerous Diseases. The second which is insensible Transpiration, is no less advantageous, because being made without Intermision, it purifies and cools the Blood, and makes such a Dissipation of it as is necessary for Life.

Scurf, how made.

This Moisture which is continually vented through the Pores of the Skin, the excretory or lymphatick Vessels does also serve to preserve the Skin moist, as well as the *Epidermis*, which without that would become too dry, which then would be hurtful to the Sense of Touching.

The Use of moist Perspiration.

The Skin has an infinite Number of small insensible Holes, called Pores, and others that are very evident, as those of the Mouth, Nose, Ears, Eyes, and those of the *Pudenda*.

The Pores of the Skin.

The Skin is a Membrane that can extend and contract it self easily; we see how it extends in Women with Child, and in Hydripical Persons, and in such as grow exceeding big and fat. So that those

The Skin can extend and contract.

who have thought it limited the Parts of the Body, have been mistaken. In Summer it is thinner and softer than in Winter, and its Pores are more open, whence it comes to pass that Transpiration is better performed in Summer than in Winter. Throughout all its Extent it adheres to the Parts which it touches; but more in the Palm of the Hand and the Sole of the Foot, than in the Forehead or Belly. It adheres more in Man than in some other Animals, which makes them able to move it more easily.

Its Adhesion.

The Skin reunites by means of a Scar.

If the Skin happens to suffer a Solution of Continuity in any part, it never reunites without making a Scar, a Mark of which remains afterwards all the Life. A Scar causes a less deformity in Infants, because their Flesh is moister than in Persons in Years, whose Skin is drier.

That all the Skin is covered with Hair.

The Skin of a Man is covered over with Hair, that of Women is less so; and some Men have more Hair than others, We do easily discover those on the Head, Face, Arm-pits, and the *Pudenda*; but we perceive with much difficulty those that are over the Surface of all the Skin; that which appears smoothest hath in every Pore a small Hair that shoots forth, and which hath its Root in one of the small Glands that lies dispersed in the Skin. This little Hair is seen more or less, according as it is more of a fair or a dark Colour.

It is needless to tell you that there have been Persons covered over with Hair like Bears, since such things are Wonders in Nature, and are no rule to us. Neither shall I relate the Reasonings of some Authors to prove that Man had no need of Hair, nor of Feathers, he having Reason and Hands for making Vestments, which were to supply their Defect.

The Colour of the Skin.

All Men have not their Skin equally white, although that is their Natural Colour; the Colour often changes according to the Temper of the Body, and the predominant Humour, as I have already shewn when I spoke of the *Epidermis*. Fat People have it whiter, because the Fat which lies under their Skin, does give them a white Lustre. Lean Persons on the contrary have it ruddier, because the Flesh which immediately touches it, does give them that Colour.

Abundance of Vessels found in the Skin.

All that we Cut, in order to separate the Skin from the other Membranes, are so many small Vessels, which either go to the Skin, or else come from it; for besides those



those of the Glands, of which I spoke, there are also those that are called Cutaneous Vessels, which are the Capillary Arteries and Veins. There are also an infinite number of small Nerves, which terminate in the Skin, and give it its Sensation.

I shall observe three considerable Uses of the Skin; The Uses of the Skin. the first is to cover and inclose all the Parts of the Body; the second is to be the Organ of Touching; and the third is to serve for an Emunctory to the Humours which pass forth by Sweat, and by Transpiration. I give no faith to that which the Physiognomists do assign to it, which is to be a Register of our Destiny, they fancying that they know our good or bad Fortunes, by the Features of the Face, and the Lines on the Hands and Feet.

The Third of the common Teguments is the Fat, which covers and incloses all the Body; it is in the Interstices of the Fibres of the *Membrana Adiposa*, and in the little Cells that are made by it, that the Fat congeals and fixes.

⊙  
Fat.

Fat is a white body, of a middle Consistence, it is Its Definition: made of the unctuous and oily part of the Blood, and condensed by a moderate Cold, or rather by a certain degree of Heat, which not being strong enough to dissolve it, cannot be a hindrance to its Production.

It cannot be denied but this fatty matter does acquire Four sorts of Fat. Consistence by the Hardness and Coldness of the Membranes that fix it, and that a great heat will melt it; but since there is a difference in it, some of it being more or less solid, I shall take notice to you of four several sorts of it: of which one is called Suet, which fixes so, and becomes so hard, that it is easy to break it in pieces, when it comes to be cold, and this sort is found in great store in Beefs and Muttons, in their Paunches, and about their Kidneys. The second, or that of which I now speak, is less solid, and fixes with more difficulty than the others. The third is called *Axungia*, or Grease, and is more liquid and soft, being an Oyl thickned, and this is found in the Joints. And lastly, the fourth is a medullary Juice, which dissolves with the least degree of Heat, and then it runs like Oyl.

These four sorts of Fat have their different Uses, The Uses of Fat. according to the different Parts wherein they are found. That which invests the whole Body, does



keep it warm, and serves to preserve its Natural Heat; Wherefore they who are very fat are very little sensible of Cold. That which is about the Heart does serve to keep it moist and pliant in its Motions. That which is at the Kidneys preserves their *Pelvis* from being hurt by the Salts of the Urine; and that which is found near the Joints does facilitate their Motion by its Lubricity. Some Authors will have the Fat contribute not only to the Nourishment of all the Parts, when there is occasion for it by reason of some great Abstinence, but also unto Beauty, for Persons who have little or no Fat have their Skin dry and subject to wrinkles.

No Fat found  
in the Brain.

We must observe, that there is no Fat found in the Brain, the Lips, in the upper part of the Ear, on the *Penis*, or with the Testicles; I shall give you the reasons for it in due time and place, but there is some of it in all the other Parts, and especially about the Heart, the Kidneys, the *Nates*, and in the Joints.

We have understood that Fat does serve to moisten the Parts, in order to facilitate their Motions, for which reason there is abundance of it found in places where the Motions are great and violent as at the Heart, and the Eye. It likewise serves to mollify, and to defend them against the hardness of bodies near it, as it is with the Eye. It also serves principally to sweeten the Acrimony of the Blood, by mixing with it, and to hinder the Exaltation of Salts, whence it is that fat people are more jocund and less fretful than the lean; they sleep without the disturbance of Dreams, whereas lean persons are sad, and full of Inquietudes Day and Night, by reason of the pungency of the Salts of their Blood, which prick them, and inflame them. This Oyl is received into the Veins and Lymphatick Vessels. Phthical People are observed to have but little Fat in them, and their *Epiploon* is wont to be consumed; which contributes much to their dry habit, the Salts having an Exaltation for want of this Balsamick Oyl.

The Fat changes sometimes into Nourishment to the Body; and this is the reason that Bears, Monkeys, &c. do make of their Bodies Magazins of Fat, before they shut themselves up in Caves in the Winter, and that we find abundance of Fat stored up in their *Epiploon* and Mesentery, which are as their Storehouses, whereas

whereas after Winter they are found exceeding lean, and their *Epiloon* and *Mefentery* are dried up, confumed, and without Fat. Not that we ought to imagine that their Fat was fufficient for their Subfiftence, during their retirement, if thefe Creatures were not in a continual flumber, unlefs the motion of their Blood was then very flow, as has been obferved upon diffefting them at that time, becaufe they being out of action, there is little Diffipation of Humours and confequently they have little occafion of Nourifhment.

Moreover the Oily Fat contained in the Veficles of Fat does mix with the Blood by entring directly into the Veins through their little Orifices. And M. *Malpighius* pretends to have found Veffels for this purpofe, which open and difcharge the Fat into the Veins; whence it is, fays he, that there is fo great a Connexion between the Veins and the Fat, for this follows them in all their Ramifications, as may be plainly obferved in the Heart, and the *Epiloon*. But this new Experiment of fo famous an Anatomift, does ftill want a Confirmation; for fome Dutch, whofe merit is well known, and their foie Application to Anatomy do af-fure me that after many nice Examinations they could find out no fuch thing.

Thofe who ftill admit of a *Panniculus Carnofus*, do take the Membranous Fibres which compofe the *Pinguedo*, or Fat, and which form the little Cells that contain it, to be this Membrane: they will have it, that in Fevers it is the feat of the Chilnefs that is caufed by fome fharp Serofity which makes the pungency, and that it is this which by means of its Flefhy Fibres caufes the Motions which we perceive in the Skin. The moft difcerning of the Moderns do pretend on the contrary, that the Carnous Fibres which are found in the Forehead, the *Occiput*, the Neck, and in the *Scrotum*, are the Mufcles: that if the Forehead, and the *Occiput* are moved, it is by means of the Frontal, and the Occipital Mufcles: that if the Skin of the Neck moves, it is the Cutaneous Mufcle which moves it; and laftly, that when the *Scrotum*, and the Testicles are feen to move, it is an Effect of the *Cremafter* Mufcle.

Thofe who hold the common Membrane of the Mufcles to be one of the common Teguments of the Body, do fhew for it a part of the proper Membrane of the oblique

HH

Membrana  
Carnofa.

I

The common  
Membrane of  
the Mufcles.

Oblique Descending Muscle, which, they say, is white, thin, transparent, and made of an interlacing of Fibres and Nerves, which render it of so exquisite a sense, that it causes troublesome Shiverings, and intolerable rheumatick Pains, when it is prick'd with some acid: They also find a Use for it, which is to hinder the Muscles from being displaced in violent Motions, as if it were possible for a Muscle that is fastened at both ends unto two solid parts, to remove out of its place. But laying aside these different Opinions, I have sufficiently shewn, that there is no Carnous Membrane (otherwise called *Panniculus Carnosus*) nor Common Membrane of the Muscles. Let us now then come to the Proper Containing Parts.

Ten Muscles  
of the *Ab-*  
*domen.*

The Teguments being raised, many Muscles do appear, which possess all the Anterior parts of the *Abdomen*. These Muscles are Ten, five on each side. Sometimes there are counted fewer, when the two Pyramidal Muscles of *Fallopins* are not reckoned; and sometimes more, when the *Recti* are divided into many: but I shall keep strictly to the number Ten, which are the four Oblique, two Transversal, two *Recti*, and two Pyramidal. They do all receive their Names from their Situation, and from the Order and Disposition of their Fibres.

What a  
Muscle is.

I shall not speak of the Muscles in general, until I shall treat of a greater number of them. I will only say here, that the Muscles are Organical Parts, and the Instruments of Voluntary Motion, and that it is only by their means that the *Abdomen* can expand and contract it self.

L  
The Oblique-  
ly Descend-  
ing Muscles.

Of the four Oblique Muscles, there are two of them descending and external, and two ascending or internal: Those which appear first are the Obliquely Descending; they are so called, because their Fibres descend obliquely from above downwards. They are also called External, to distinguish them from the others which are situated under them: And lastly, called the Great *Obliqui*, because their magnitude exceeds that of the other *Obliqui*. Their figure is almost triangular.

The Origin  
and Insertion  
of these  
Muscles.

They take their Origin by Digitation from the *Serratus Major*, that is to say, from the sixth and seventh of the true Ribs, from all the bastard-Ribs, and

and from the edge of the transverse Processes of the *Vertebra* of the Loins; they proceed to insert in the external part of the *Os Ilium* and the *Os Pubis*, and end with a large and strong *Aponeurosis* in the *Linea Alba*. The *Serrati Majores*, which are Muscles of the *Thorax*, have as many Indentings as these Muscles, and they do interlace one another, after the manner as the Fingers of one Hand use to be placed between the Fingers of the other Hand. At every one of these Indentings, which are seven in number, there is a little Nerve that enters into it, which causes these Muscles to be very hard to Dissect, when one would shew them all. These Nerves do likewise shew us the origin of these Muscles, because the Nerves which go to the Muscles do enter into them rather towards their origin than at their insertion.

The Obliquely Ascending Muscles are so called, because their Fibres do rise from below upwards; they are situated just under the former, for which reason they are call'd the Oblique Internal. They are a great deal less than the former, and are like them of a triangular figure. They have their origin from the superior part of the *Os Pubis*, continuing along the middle of the Crest of the Hip-bones, they insert at the ends of all the Ribs as far as the *Cartilago Xiphoides*, and at last insert in the *Linea Alba* by a large and double *Aponeurosis*: They do receive the Nerves at the place where they were inserted at the *Vertebra* of the Loins.

M  
The Oblique-ly Ascending Muscles.

Of these Two *Aponeuroses*, the one passes over, and the other under the *Rectus*, that it may be equally strengthened both above and below. The Fibres of these Muscles, as well as the former, do cross one another like a *St. Andrew's Cross*; which has the same effect as a strong compression of some Part. For Example: If one Hand be feeble, we add the other to its assistance, which crossing the former, adds unto the strengthening the other.

Why these Muscles have their *Aponeuroses* double.

The Transversal are so called, because their Fibres traverse the others; they are situated under the Oblique, and placed upon the *Peritonaeum*, unto which they adhere so strongly, that it is hard to separate them asunder without tearing them: These are of a quadrangular figure.

These Muscles take their Origin from the transverse Processes of the *Vertebra* of the Loins; they insert in the

the

the internal part of the *Os Ilium*, and the internal part of the Cartilages of the lower Ribs; then passing under the *Rectus*, they terminate in the *Linea Alba* by a large *Aponeurosis*.

Observations  
on these  
three sorts  
of Muscles.

These three sorts of Muscles have *Aponeuroses*, which serve them instead of Tendons, and each of which goes and inserts with that of the Muscle which is on the other side, and this unites them so as that they seem to be but one. They are perforated in their middle part, for giving a passage to the Umbilical Vessels; and at their lower part, to let pass in Men the Spermatick Vessels, which go to the Testicles; and so in Women the round Ligaments of the *Matrix*, which proceed to make their Insertion in the Thighs.

The Mechanism  
of these  
Holes.

The three Holes which are at the *Aponeuroses* of these Muscles are so oppositely made, that they deserve to be taken notice of; that of the Transversal Muscle is the uppermost of all, that of the Oblique Ascending is a finger's breadth lower, and that of the External Oblique is still lower: so that these three Holes are not placed over-against one another; and the *Aponeurosis* of one of them covers the Aperture of the other, in order to hinder the eruption of the internal parts outwardly; nevertheless, there do happen too often ruptures in those places, by the eruption of the *Epiploon* and the Guts.

O  
The *Recti*.

The Fourth Pair of the Muscles of the *Abdomen* are the *Recti*, so called, because their Fibres proceed in a straight line from on high downwards, or from below upwards; for some will have them to rise from the *Sternum*, and others from the *Os Pubis*: but it is a thing indifferent whether their origin or insertion be in the one or the other of those Parts, provided we know that they are fastened at one end to the *Sternum*, and to the sides of the *Cartilago Ensiformis*, and by the other end to the superior part of the *Os Pectinis*.

Observations  
on the Mus-

The Fibres of these Muscles do not go without interruption from one extremity to the other; but they are cut off by some Nervous places, called of old *Eneruations*, although they be really true Tendons. Their number is not always the same, some Bodies having three of these interruptions, others four, and sometimes more.

The Origin  
and Insertion  
of these  
Muscles.

Some would fain make so many distinct Muscles as they saw of these Membranous Intervals, because they

they had observed that many Nerves did enter into this Muscle: But that ought to be the less surprising, seeing this Muscle is long, and has a very strong motion, to the performance of which one small Nerve alone would not have been sufficient.

Some Authors have related, that a Man had more of these *Eneruations* above the Navil than below it; because being more addicted to Gluttony and Intemperance, his Stomach had more need of extension: And that a Woman, on the contrary, had more of them below the Navil, by reason that this Muscle being obliged to extend in that place, for the giving more space or room to the *Matrix*, in the time of Child-bearing. But this Observation is not found to be true, since both Men and Women have of them equally throughout.

In order to understand rightly what are the Uses of these *Eneruations*, we must know, that every Muscle, in its action, does abbreviate; and during its abbreviation, it swells in its middle more or less, according as its Fibres are more or less long. Now it is certain, that if the Fibres of the *Rectus* had extended without interruption from one end of it to the other, without being cut off sometimes by these membranous intervals, the swelling of this Muscle had been so great in its middle part, that it would have hurt and crush'd the Contained Parts, instead of assisting them to make expulsion of Excrements by an equal and gentle compression; the which could not happen but by the interposition of these *Nodi*, which by cutting this Muscle into four parts, do make that instead of one Tumour there are four, which do equally compress the *Abdomen*, and facilitate the expulsion of Superfluities out of the Intestines and the Bladder.

It is not only on the Use of these *Eneruations* that I do differ in opinion from others, but also on that of the Mammillary and Epigastrick Veins; many having thought that one of the Branches of the Mamillary Vein which is found under this Muscle, when it is turned up, did make an *Anastomosis* with the Epigastrick Vein; that this communication did make the great Sympathy that there is between the Breasts and the Womb; and that this was the way through which some Milk was voided from the Womb, in Women newly brought to bed. But the Circulation of the Blood

The Opinions  
of some Au-  
thors.

The true Use  
of their Ener-  
uations.

No *Anasto-*  
*mosis* in the  
Vessels of  
these Mus-  
cles.



Blood teaches us, that these Veins have no other Use than all the rest of them have, which is to convey back again the Blood to the Heart. For I have tried, by syringing Liquors into each of these Veins, to make them pass from one of them into the other, without ever being able to do it: which plainly shews, that this famous *Anastomosis*, which hath made so much noise, is nothing but a meer *Chimera*.

**P** The Pyramidal figure which the two last Muscles of the *Abdomen* have, does cause them to be called the *Pyramidal Muscles*; they lie upon the lower Tendons of the *Recti*, which hath made some think them a part of them; but they are two distinct Muscles, and separate from the others.

Their Origin and Insertion. They take their Rise by a fleshy and very compact Principle from the upper and external part of the *Os Pubis*, and rising upwards, they contract themselves by little and little, and terminate in a point in the *Linea Alba*, three or four fingers breadth above the *Os Pubis*, and sometimes reach to the Navil.

These Muscles have a Use that is contrary to that of the others.

*Fallepius*, *Riolanus*. and *Gelée* have assigned many Uses to them: They pretend that they fortifie the Tendons of the *Recti*, that they help the excretion of Urine, and that they contribute to the erection of the *Penis*. I do believe, on the contrary, that they serve to raise the *Peritonæum*, and to hinder the Region of the Bladder, where they are inserted, from too much compression, and that a Man be not forced to make water as often as the other Muscles do make compression on the internal Parts; these two Muscles are very small, and are never equal to one another: That which is longer than the other has its insertion a finger's breadth higher; which helps to confirm me in the opinion, that they do lift or raise the *Peritonæum* in this place, which by not compressing the Bladder, does render it capable of containing a greater quantity of Urine than otherwise it would do.

The true Use of the Muscles of the *Abdomen*.

We may consider the Oblique and the Transversal Muscles, as Hands laid one upon the other, in different fences; and the *Recti* as great Barrs situated in the middle of the *Abdomen*, which do hinder the others in their motions from too much binding and compressing the Intestines against the Spine, and the *Vertebra* of the Loins. The *Recti* do also retain the others, and do make them to act on both sides, for the



the better compression of the Parts of the *Abdomen*, for Reasons I shall tell you hereafter.

Hence we see that the Parts of the *Abdomen* are equally compressed throughout, and that the Guts and the *Viscera* cannot avoid this compression, in whatsoever place they are deposited; for the *Recti*, in their action, do squeeze directly before from above downwards, and thereby do constrain the *Viscera* to encline towards the Sides, by reason of the resistance they find towards the Spine. But then the Oblique Muscles are like Diagonal Barrs, which do strongly repel them: And since the *Costæ* from above, and the *Ossa Innominata* from below, do make a good resistance, the Parts of the *Abdomen* would thrust outwardly towards the Flanks; and therefore Nature, to prevent it, has made the Oblique Muscles very thick and very fleshy in this place; and the more to counter-balance this resistance, she has here placed the Transverse Muscles, which draw the Navil towards the Loins.

It is well understood that the Navil is a re-union of the Tendons of almost all the Muscles of the *Abdomen*, and consequently that it is the place where all the Powers do act more strongly; and this makes it to flatten it self, in order to make the Belly equal in its parts; and that suits very well to the Uses of the Parts of the *Abdomen*, which are situated in this place; for we find in it the Guts *Ilium* and *Jejunum*, and the Mesentery, which are the parts of the *Abdomen* that have most need of a strong compression: For in the former of them the Chyle does come to a state of perfection, separates from the gross Excrements, and, lastly, adapts its self to the orifices of the *Vena Lactea*, all which requires a very strong and very vigorous compression; and the Mesentery has no less need of it than the others, for the distribution of the Chyle.

The *Colon*, which is in like manner situated in this Region, had need also of a great compression; for the *Fæces*, in the place where this Gut traverses the *Abdomen*, do find it difficult to pass forwards, both by reason of the ascent they must there make; whereas every where else they have a descent, and because here they are of a drier nature. The Colon.

It is not agreed in what time these Muscles do thus act; it is nevertheless very likely that they contract themselves in the time of Expiration. There is, notwithstanding-

withstanding, a time in which they contract in Inspiration, as when we are at the Stool. And thus it is; having once received Air into our Lungs, our *Thorax* being dilated, and our *Diaphragma* relaxed, we then come to hold our breath; and we make the Muscles of the *Abdomen* to squeeze our *Viscera* with the more force, which being, as it were, between two presses, are constrained to discharge the *Faces* they contain.

Observe, That in holding the Breath, the *Diaphragma* is forced to relax, the *Thorax* not being then able to contract it self; because there can be no expiration of Air at that time, and the *Diaphragma* can have no Tension: whence it is, that this being a violent and constrained motion, it cannot last long.

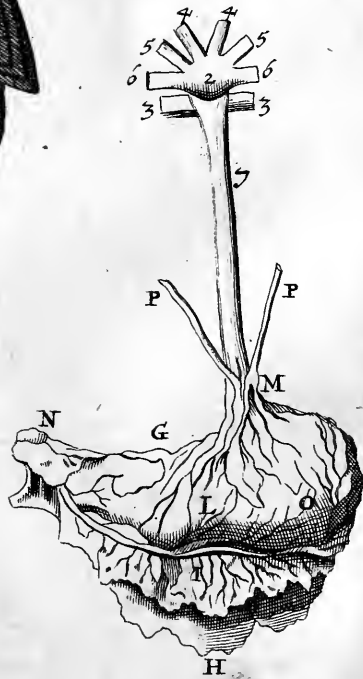
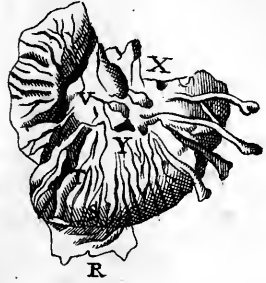
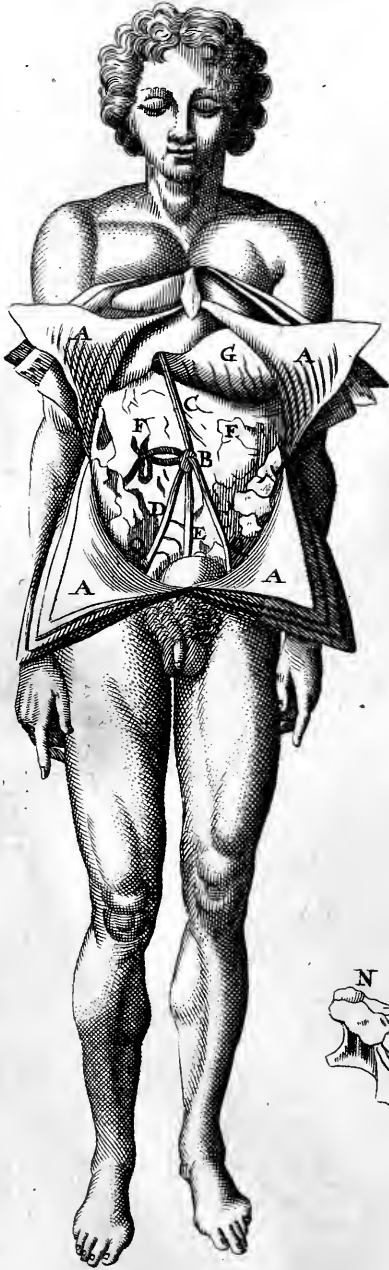
Q  
The *Linea*  
*Alba*.

The *Linea Alba* is a concourse of all the *Aponeuroses* of the Muscles that I have shewn you; it is called *Linea*, a Line, because it is straight like a Line, and white, because it has no flesh in it. It extends from the *Cartilago Xiphoides* unto the *Os Pubis*. We must observe, That it is straighter below the Navil than above it, and that it divides the Muscles of the right side from those on the left side.

This should be the place, GENTLEMEN, to shew you the *Peritoneum*, it being the Second and Last of the Proper Containing Parts: But before we open it, since we must prepare and dissect the Umbilical Vessels to shew you them at the same time, I remit your seeing them until the next *Demonstration*.

The





## The SECOND DEMONSTRATION.

### *Of the Parts contained in the ABDOMEN, that serve for Chylification.*

**I**T is in this *Demonstration*, GENTLEMEN, that I shall begin to examine the Parts which are enclosed in the *Abdomen*. Although this Place is the Kitchin wherein all the Nourishment is prepared for all the rest of the Body, and it is the Sink through which all Impurities are drained; nevertheless, its Structure is no less admirable than that of the other Parts. An Architect who undertakes a great Edifice, is sometimes as much concerned to dispose the Kitchin, and the Offices, in convenient places, as to order the more noble Apartments; and he lets us see the strength of his *Genius* in their construction, as well as in his forming a Chamber or a Closet. God has no less made appear his great Wisdom and Power in forming the meanest Parts of a Humane Body, than he does in the most noble, having given to the one and to the other a certain degree of Perfection which much surpasses all that Humane Understanding could have contriv'd or imagin'd.

That all the Parts of the Body are equally perfect.

It being impossible to shew all the Parts of the *Abdomen* in One single *Demonstration*, I shall divide them into Three, by reason of Three kinds of Parts that are contained in it; some do serve for Chylification, others for the Purification of the Blood, and lastly, others for Generation.

Division of the Parts contained in the *Abdomen*.

But before I shew you any of these Parts, I must, GENTLEMEN, finish the shewing you the last of the Contained Parts, which is the *Peritonæum*, with the which we do commonly begin the Second Lecture or *Demonstration*.

AAAA  
The *Peritonæum*.

The *Peritonæum* is a thin, soft Membrane, that encloses, as in a Bag, all the *Viscera* contained in the *Abdomen*. Its Internal Surface is smooth, and besmeared with a humour, which hinders it from hurting the *Intestines*, and the other Parts which it touches. The

Its Definition.

External Surface, on the contrary, is fibrous and unequal, in order to fasten unto the Muscles the better.

Its Figure.

It has the same Figure and the same Magnitude as the *Abdomen*, which it invests all over. It extends as much as this capacity is able to do, in the time of Child-bearing, and in a Dropsy, or in a Tympany; and easily contracts again, when the Infant, the Water, or the Wind which caused the Tumour, are discharged. *Sylvius* thought this Part was stronger in Men above the Navil, and that in Women it is thicker below the Navil: But this opinion is not true, no more than that of the *Eneruations* of the *Rectus*, seeing it is certain that it is equally thick throughout.

The Opinions of the Ancients about the *Peritoneum*.

What it truly is now found to be.

According to the Ancients, the *Peritoneum* is made of a double Membrane, in the duplicature of which the Umbilical Vessels do pass, which are the Vein, the two Arteries, and the *Urachus*. But now-a-days we know that the *Peritoneum* has no Duplicature, and that instead of having its Origin from the *Vertebrae* of the Loins, it is not so much as fastned to them; which may be seen by following its track from place to place: It fastens before unto the Muscles, above to the *Diaphragma*, below to the *Pubis*, and passing over the Bladder and the *Rectum* in Men, and over the *Matrix* in Women; it covers the Spermatick Vessels, and the *Vasa Differentia*, without enveloping them quite notwithstanding. Lastly, It passes over the Muscles *Iliaci* and *Psoas*, and over the *Aorta* and *Vena Cava*, covering the Kidneys on all sides, where it forms that Membrane which is called *Membrana Adiposa*, because it contains a great deal of Fat.

The Holes of the *Peritoneum*.

The *Peritoneum*, which was thought to be perforated in seven or eight different places, has not above two *Foramina*, or Holes, at most, the one above, for the entrance of the *Oesophagus*; and the other below, for the passage of the *Rectum*. The six other Holes, that were given to it, are not to be found, to wit, two at the upper part, for the passage of the Great Artery, and the *Vena Cava*; one before, for the passage of the Umbilical Vessels; another for the *Matrix*; and two for passing the Vessels which go to the Thighs. Those who supposed a Duplicature in the *Peritoneum*, imagin'd these Holes; but seeing the Great Artery, the *Vena Cava*, the Umbilical Vessels, and the *Matrix*, are placed

placed out of the *Peritoneum*, it is needless to search for their Entrances and their Egresses.

The *Peritoneum* in a Humane Body has two Productions or Elongations, one on each side which conduct the Spermatick Vessels unto the Testicles. In a Woman it covers the round Ligaments but half way. when these Productions are come to the Testicles they grow larger for the better covering them, and so form their second proper Membrane, called *Elythroides*, or *Vaginalis*, because it resembles the Sheath of a Sword.

Its Productions.

It receives small branches of Nerves from those that are distributed to the Muscles of the *Abdomen*; its Arteries come from the *Phrenica*, the Mamillary, and the Epigastrick Arteries; and its Veins do carry back the superfluous parts of its Nourishment, to the Phrenick and Epigastrick Veins.

Its Vessels.

The Uses of the *Peritoneum*, are to contain and to inclose some parts of the *Abdomen*. It was thought that this did furnish them all with a coat, for besides the proper coats they had, they received one common coat, according to the Ancients, from the *Peritoneum*; and this has caused it to be called the Mother of all the Membranes in the *Abdomen*.

Its Uses

The Navil is a *Nodus* formed by the Re-union of the Umbilical Vessels, and cut so soon as the Infant is born; it is called also *Umbilicus* from *Umbo*, that signifies the Middle, because it is not only placed in the middle of the *Venter*, but also in the middle of the Body; and this is so true, that if a Man stretches out his two Arms, and sets his Legs at the like distance, it will be found that these four Extremities do make a Circle.

B

The Navil

We must consider the Navil, either of an Infant whilst he is in the Womb, or else in a perfect Man. In the *Fœtus*, it is a String of a French Ell long, or thereabouts, that goes from the After-birth to the belly of the *Fœtus*, and which then incloses four Vessels, which are a Vein, two Arteries, and the *Urachus*.

What the Navil-String is.

This String serves to conduct these Vessels, which would have been too weak of themselves for so long a passage, and would not have been able to resist the Motions of the Infant. Its Length is of Use to the Infant, that he may remove conveniently to and fro in the Womb, and that both the Infant and the After-birth may come away one after another, in the Deli-

The Uses of this String.



very. So soon as the Infant is born this String is to be tied within two Fingers breadth of his Belly, and then cut above the Ligature; afterwards Nature rids it self of what remains of it, so that there remains only a *Nodus*, or Knot, as you commonly see, and as we ought to consider it in a perfect Man.

Four Umbilical Vessels.

The four Vessels that we call Umbilical, are annexed to it; one, which is the Vein ascends upward, and the three others, or the Arteries and the *Urachus*, do descend. These Vessels are brought from the Navil unto their Insertion between the Muscles, and the *Peritoneum*.

C

The Umbilical Vein.

The Umbilical Vein goes to insert in the Veiny *Sinus* of the *Cava*, to carry thither Bloud and Chyle together; for it is certain that this Bloud must be full of Chyle; it is that of the Mother which is abundantly filtrated in the Glandules of the *Matrix*, and in those of the *Placenta*, which from being of an imperceptible Bigness at first do afterwards become so prodigiously big, that it cannot but amaze us to see a thing so surprizing.

DD

The Umbilical Arteries.

The two Arteries do go, or rather do come from the Iliacks; the *Urachus* which is in the middle, goes to annex at the bottom of the Bladder.

E

The *Urachus*.

The Uses of the Umbilical Vessels in a Man.

I cannot Agree to the Uses that are given to these Vessels; it is pretended, for Example, that the Vein serves for a Ligament to the Liver, which cannot be for three Reasons: the first is, it would hurt the Liver rather than help it, by drawing it downwards; the second is, that it could not support it before, being fastned to the Navil, which submits to all the motions of the Belly; and the third is, because the Liver hath already a sufficient store of Ligaments in its superior part, without wanting this; unto all which may be added, that it were an ill disposition of a Ligament, for to fasten it unto a Vein, such as the *Porta*, whose coat is as thin as Paper.

An Error concerning the Iliack Arteries.

Some Authors will have the Iliack Arteries serve to sustain the Bladder; but it was unadvisedly thought, because they are removed two Fingers breadth in distance from it, and besides these Vessels being so small as they are, would be but a feeble support to the Bladder, and which little wants one at all, being to expand and swell as there is occasion.

As for the *Urachus*, they pretended that it served as a *Ductus* for emptying the Urine of the *Fœtus* into the Membranes; but since I have never found it to be hollow, I do not believe it hath this Use. Besides this Experiment, Reason will tell us, that the *Fœtus* does not make Water in the Belly of the Mother, seeing the Chyle which is carried to him with the Blood for his Nourishment, is purified before it comes thither: and besides, there are to be found other causes of the Serofities in which the *Fœtus* swims, without searching for them in the Urine. But the true Use of the *Urachus* is, to suspend the bottom of the Bladder, and to hinder it from falling towards its Neck, in order to contain a great quantity of Urine.

Another Error concerning the *Urachus*.

The Opinion of the Moderns is not only different from that of the Ancients on the Use of these Vessels in a perfect Man, but also with respect to those of a *Fœtus*: the Ancient Opinion was, that the Arteries did bring Arterial Blood to the *Fœtus*, and the Veins Venal Blood; and seeing this Opinion is repugnant to our Principles, and to Experience, I'll tell you in few words how things are in reality: The Arteries of the Mother do carry a certain quantity of Blood into the *Placenta*, which being therein dispersed, is received by the branches of the Umbilical Vein, which carries it into the *Vena Porta*, to be filtrated through the Substance of the Liver in the *Fœtus*, before it is to enter into the *Vena Cava* that carries it into the Right Ventricle of his Heart, from whence it passes into the Left through the *Foramen Botalli*, in order to be afterwards distributed into all the Parts of the Body by means of the Arteries; the superfluous part of this Blood is brought by the two Umbilical Arteries to the After-birth, where being dispersed, it is received by the Veins of the Mother, which are spread therein, and which carry it into the great Veins to circulate with the whole mass of Blood, and thus there is made continually a Circulation of the Blood of the Mother to the Infant, and of that of the Infant to the Mother. And there is a certain Testimony that it is done after this manner, because if you touch the String of an Infant newly born, you will find the same pulse within it, as in its Arteries, which makes it evident, that the Blood which runs into the Umbilical Arteries, is the same which comes from the Heart of the Infant, and that it

The Uses of the Umbilical Vessels in *Fœtus*.

is not that of the Mother, as has been believed a long time.

The Circulation plain from the Mother to the Infant.

This reciprocal motion of the Blood of the Mother to the Infant, and of the Infant to the Mother, is manifest by the Structure of the Parts which serve for this purpose. If you do but make the Dissection of a *Fœtus*, you will be of this mind.

So soon as the *Peritoneum* is cut, and its four Corners raised, as those of the Teguments were before, there is seen a fat Membrane, which floats upon the Guts; and is called the *Epiploon*, others call it the *Omentum*, because it serves to cover the Intestines.

FF

The *Epiploon*.

The Situation of the *Epiploon*.

This Membrane is under the *Peritoneum*, and upon the Guts; it goes even into their sinuous windings; it extends from the bottom of the Stomach unto the Navil, where it commonly ends; but it happens sometimes to descend unto the Lower Region of the *Hypogastrium*, and even to lapse into the *Scrotum*; and then it causes the *Hernia Epiploceles*, which does use to happen oftner on the Left Side than the Right, because the *Epiploon* descends lower on that Side. And when in Women this Membrane happens to slip between the *Matrix* and the Bladder, it makes a Compression on the Orifice of the *Uterus*, and thereby hinders Generation, according as *Hippocrates* did observe. Its Weight is commonly half a pound, although *Vesalius* relates that he saw one of five pound Weight.

The Figure and Origin of the *Epiploon*.

The Figure of the *Epiploon* is like a Pouch, or Bag, others liken it unto a Fishers Net, which hath caused it to be called *Rete*, or Net-work. It hath in its middle part a great Cavity, that is formed by two Membranes which are removed from one another, of which the External or Anterior is annexed to the Bottom of the Stomach, and to the Spleen, the Internal and Posterior is annexed to the *Colon*, and to the Back, under the Diaphragm.

The Fat of the *Epiploon*.

In examining this part nicely, we find in it, as well as in the *Membrana Adiposa*, small Vessels of Fat, which serve for *Ductus* to the Fat, and which terminate in globules; this Fat does often melt in those that have a Hectick Fever. There is here likewise an infinite number of Lymphatick Veins, which being broke do cause a Dropsie, that is not to be cured but by Punction.

The *Epiploon* does easily corrupt, when it comes to take Air, wherefore in Wounds of the *Abdomen*, we are obliged to cut off any such part of it, as has had an Eruption outwards. There are likewise some Distempers which spoil and corrupt it, as it is easy to observe in Scorbutick, Phthifical, and Hypochondriacal persons, and in some others.

The *Epiploon* easily corrupts in the open Air.

It has divers Vessels, which are spread over all its Substance; nay it has more of them than any other Membrane, in proportion to its Magnitude; it receives small Nerves from the intercostal branch of the Eighth Pair; it has many Arteries which come from the *Cœliack* Artery, and many Veins which discharge themselves into the *Vena Porta*. There are also found in it a great quantity of small Glandules, which are not placed there but for some particular Use.

Its Vessels

The Uses that are given to the *Epiploon* are, to warm the Bottom of the Stomach, thereby to help Digestion by its Heat, and to excite the Fermentation of Meat in the Stomach; to cover the Guts, and lastly to conduct the Splenick branch, and the other Vessels, which go to the Stomach, the *Duodenum*, or the *Colon*. *Galen* relates that a Gladiator, who had his *Epiploon* cut out, was very sensible of Cold, and that he was fain to have his *Abdomen* covered with Wool, in order to help his Digestion, *Riolanus*, and some others do assure us on the contrary, that Persons who had it cut out, were very well in health after it. This contrariety of Opinions does make me doubt of its true Uses, and so much the more, seeing we are certain of the hurt it does by the ruptures which it causes, and we are in a manner ignorant of the good which it does.

Its Uses

From the Mouth unto the *Anus*, there is a continued and very long Body, whose beginning gives an Entrance unto the Nourishment, the middle receives and preserves it, and whose end gives a discharge unto its Excrements; this great road, through which all that we swallow does pass, has divers Names. The Part which is from the Mouth unto the Diaphragm, is called *Oesophagus*, or Gullet; that which is more large, and more capable of containing what is taken is called the Stomach; those which make the Circumvolutions, are the Intestines, or the Guts; and the Membrane which retains them all is the Mesentery. I shall not demonstrate the *Oesophagus* until I come to the Breast,

The long Continuity of the Guts.

The different Names of Parts in this Length.

in which it is enclosed. I will begin with the Stomach, which is one of the principal parts of the *Abdomen*, and that which appears first after the *Epiploon* is removed.

**G G** The *Ventriculus*, or little *Venter*, is that which is called the Stomach; it is an Organical Part, that receives the Meat and Drink, and it is the principal Instrument of Chylification.

The Situation and Magnitude of the Stomach.

Its Natural Situation is the *Epigastrium*, immediately under the Diaphragm, between the Liver and the Spleen; it should of right be placed in the middle of the Body, being a singular Part; but because the Liver is greater than the Spleen, it thrusts it towards the Left *Hypochondrium*, which it possesses almost entirely with its larger part; it takes up more or less place, according as it is greater or lesser; for it is not of an equal Bigness in all Men. It is said, that they who live temperately have it moderate, and that Gluttons and Drunkards have it larger: but that is not always true, since the Bodies of great Feeders, and great Drinkers have been dissected, and their Stomach has been found to be very little, but to make amends, it has been twice as thick as those of other Men. Women have commonly this part less than Men, because they eat less; so that we cannot assign it any determinate Bigness: besides, it being Membranous, it can extend and contract it self very easily, seeing it can contain at a time three quarts of Wine or Water, and three or four pounds of Meat.

Its Figure and Connexion.

Its Figure is round and oblong, and it resembles a Bag-pipe, particularly when the *Oesophagus* is left with it, and a part of the *Duodenum*. It is equally Convex and round before, but behind it makes as it were two Bosses or Bunches, which are separated by the Spine, because it must necessarily accommodate its Figure unto the place which it possesses. Its External Surface is smooth and whitish, and the Internal is wrinkled and reddish: it is annexed above to the Diaphragm, below to the *Epiploon*, on the right side to the *Duodenum*, and on the left to the Spleen.

Three Membranes in the Stomach.

The Stomach consists of three Membranes, one common, and two proper.

**H**  
The common Membrane.

The common or External Membrane of the Stomach, is much less thick than the two proper which it incloses; the Fibres of this do go from one of its Orifices

Orifices unto the other ; they are very strong and tendinous, for hindring the two other Membranes from dilating themselves too much. It is this that sustains all the Ramifications of Vessels that are dispersed on the Stomach.

The Second, or Middle Membrane, is the first of the Proper Coats ; it is fleshy, for its better extension and contraction ; it hath abundance of Fibres, both straight, oblique, and transversal, disposed after different manners ; the first do go in a direct or straight line from the Superior Orifice of the Stomach unto the Inferior, call'd the *Pylorus* ; the others do descend obliquely from the sides of the Stomach towards the bottom, in its Convex Surface ; and the Transversal do cross the others all over its body, from top to bottom. All these Fibres do serve to contract the Stomach on all sides, in order to make expresseion, by this means, of the Juice contained in the little Glandules of the Third Coat ; and thereby to make the liquified Aliments, and all that is contained in the Stomach, descend by the *Pylorus* into the Intestines.

I  
The First of  
the Proper  
Coats.

The Third Membrane, which is the Internal, is altogether Nervous, and consequently exceeding sensible ; it has abundance of Folds and Wrinkles, which render it the more capacious, and hinder the Nourishment from making too much haste out of it into the Guts before it is perfectly digested.

L  
The Second  
of the Proper  
Coats.

Some pretend, that a remainder of the Nourishment which was left in these *Plicæ* from one Meal to another, does grow soure and pungent ; and by affecting this Membrane with its acrimony, does cause Hunger ; and that it serves for a ferment to help the Digestion of new Nourishment ; and that the Driness of the Fibres of this Membrane is that which causes Thirst.

An Opinion  
on the sense  
of Hunger  
and Thirst.

Experience teaches us, that this Membrane is be- deck'd with many little Glandules, which are like so many Sources that pour continually into the Stomach an Acid Juice, which serves as a Leaven to ferment the Aliments, and as a *Menstruum* to dissolve them.

The Usefulness  
of an  
Acid Juice.

The Stomach is divided into a Convex part, and a Concave ; the first regards the Intestines, and the other the *Diaphragma*. Besides these two parts, we are to consider its two Orifices, and its Bottom.

The Division  
of the Sto-  
mach.

The Superior Orifice is on the left side ; it is called, by some, the Mouth of the Stomach ; it begins where

M  
The Superior  
Orifice.

the



the *Oesophagus* ends ; it is of an exquisite sensation, by reason of the multitude of Nerves which environ it : it is larger than that on the right side, because it does receive all the Aliments, and gives them entrance, though they be often but half chewed. It is situated over against the Eleventh *Vertebra* of the Back ; it is closely shut by abundance of fleshy and circular Fibres at the times when it receives no Nourishment, which was a thing very necessary, not only for the better Concoction, but to hinder the Aliments from being cast up again into the Mouth, and to hinder the Fumes, that are caused by Digestion, from being offensive.

N  
The Inferior  
Orifice.

The Inferior Orifice is on the right side ; it is called the *Pylorus*, that is to say, the Porter, because it gives leave to the Aliments to descend out of the Stomach. Although this be called the Inferior Orifice, it is only with respect to the other that is placed a little higher than it, and not with respect to the fund or bottom of the Stomach, since both Orifices are almost equally removed from this ; it is a little bent, and sometimes it is Cartilaginous ; it is very narrow, because it is full of transverse Fibres ; and it is begirt with a thick Circle, as if it were a Circular Muscle, or a Sphincter, that shuts it. Nevertheless, its Action differs from that of the Sphincters of the *Anus* and the Bladder, in that those are Voluntary Actions, whereas this is a Natural one, seeing it does not depend on our Will to stop, or to let pass the Chyle. I found this Orifice in one of the King's Musicians so hard and narrow, that the Aliments, after their digestion, not being able to pass through the *Pylorus*, were forced to be cast up by Vomit, which was the cause of his Death. In the *Pylorus* there is observed an internal Protuberance, which serves it instead of a Valve.

O  
The Bottom  
of the Sto-  
mach.

The bottom of the Stomach is all that round and fleshy capacity that is between the two Orifices ; it is the place that contains the Magazine of Meat and Drink, and wherein the Fermentation and Digestion of the Aliments is performed. This Bottom extends and contracts it self in proportion to the Aliments which it receives ; for it takes into it as well a small quantity as a great : it is a singular Part ; and if it has been found sometimes divided into two Parts, it is a Rarity, and Preternatural.



The Stomach does receive the Nerves of the Eighth Pair ; there are two of them which form a *Plexus* at the Superior Orifice, which do make it exceeding sensible ; it also receives Nerves from the *Plexus Hepaticus* and *Intercostalis* ; wherefore we ought not to wonder, if when the Brain is disordered, Vomitings do happen ; nor when the Stomach is indisposed, if all the rest of the Body does sympathize. It receives Arteries from the *Cœliaca*, which brings it Blood for its Nourishment ; the which Blood is afterwards carried into the *Vena Porta* by the Gastrick and Gastrapiploick Veins. These Vessels do prove the Stomach to be nourished with Blood, and not with Chyle, as some have thought.

PP  
The Nerves  
of the Sto-  
mach.

At the bottom of the Stomach there is found a Vessel called *Vas Breve*, because it is very short ; it has many small Branches, which go from the bottom of the Stomach to the Spleen, or else, according to the Use which the Ancients gave to it; from the Spleen to the Stomach ; for they thought that the Spleen did send to the Stomach, by these Vessels, an Acid Juice, which operating on the Internal Membrane of the Stomach, did cause in it the sense of Hunger ; that this Acid did detain the Aliments in the Stomach as long as it was necessary ; and that this same Acid Juice, by its Acidity, did help their Dissolution. But this Reasoning is destroyed, when, upon examination of the Branches of this Vessel, we shall see that it has no perforation into the Stomach, and that its Branches are only of Veins which do carry back the Blood into the *Ramus Splenicus*, from whence it passes into the *Vena Porta*.

The *Vas*  
*Breve*.

The Use of the Stomach being to receive the Aliments, to boil them, and to convert them into Chyle ; I ought to explicate to you how this conversion is made, which is that which is commonly called *Chylification*.

The Uses of  
the Stomach.

It has been the common opinion, that the Natural Heat was the principal Instrument of it ; and that not only the proper Heat of the Stomach did contribute to it, but also that of the adjacent Parts ; that all the Aliments were in it, as in a Pot, under which a great deal of Wood was put, to make it boil ; and that the Liver, the Spleen, the *Pancreas*, and the *Epiploon*, were as so many Billets lighted round about the Stomach, to make Concoction and Digestion of the Aliments.

The Opinion  
of the An-  
cients con-  
cerning this.

Others

Others pretended, that there was in the Stomach of every Animal a Chylifick Faculty ; and that it was this same Faculty which made the Digestion of the Aliments, and converted them into Chyle.

The manner  
how Dige-  
stion is per-  
formed.

But it would be ignorance of the Structure of the Stomach, to have a Deference to the Opinion of the Ancients, concerning the Digestion of Aliments ; since it is only requisite to know (to explain it after a Mechanical and Natural manner) that the Internal Coats of the *Oesophagus* and the Stomach are all bedeck'd with Glandules, which do continually transmit into it an Acid Juice, which is a Dissolvent as powerful in respect to the Aliments, as *Aqua fortis* is in respect of Metals. Nevertheless, we must not imagine that these Glandules are the only Fountain of this Dissolvent, there being another of them in the *Parotide* and Maxillary Glandules, from whence there do spring little Rivulets of *Saliva*, which running through the Salivary *Ductus*, do discharge themselves in the Mouth, to soak and moisten the Aliments in it, and there to begin their Fermentation, by means of the Acid Juice, and the Volatile Salts, with which the *Saliva* is replete, when it is neither too thick, nor too watry ; for in such case it can neither temper the Aliments, nor procure their Dissolution, its Spirits and its Salts being either intangled and confounded in too gross a Liquor, or else drowned in too great a quantity of Phlegm. The more solid Aliments, after having been pounded in the Mouth, and penetrated with the *Saliva*, are conducted through the *Oesophagus* into the Stomach, and either by the help of the Acid Juice, both of that which they find in it, and of that which distills into it without intermission, they do become more liquid. Then this Liquor not being able to rise upwards through the *Oesophagus*, by reason of its situation, and of the *Diaphragma's* making compression upon the Stomach, does gently run through the *Pylorus* into the Intestines, where it comes to greater perfection, by the mixture of the *Bilis* and the Pancreatick Juice, as I shall shew you hereafter, speaking of the *Vena Lactea*.

That Dogs  
and Wolfs  
have a quick-  
er Digestion.

Thus the Dissolution of Aliments in a Humane Body is performed. It is made more speedily in Animals, who have a stronger Dissolvent, as in Dogs and Wolfs, who digest Bones themselves. We agree, that this Disso-

Disso-

Dissolution is assisted by the Natural Heat both of the Stomach and the adjacent Parts, and that this does facilitate even the penetration of the Dissolvent: But we cannot agree, that it is the principal Instrument of it, as it has been believed, nor that there is any need at all of a Chylifick Faculty.

Hunger and Thirst are the two sensible things which do alternately agitate the Stomach: Hunger is caused by an Acid Liquor which trickles down, without intermission, into the cavity of the Stomach, from its own Glandules, and from those of the *Oesophagus*: When this Acid finds no Aliments to prey upon, it exagitates and pricks the Membranes of the Stomach, and causes that which we call Hunger. And when there rises up some Vapour which heats the superiour orifice of the Stomach, which then enclines us to cool it with Drink, that then happens, which is called Thirst.

What causes Hunger and Thirst.

The Intestines, or Guts, are long, round, hollow, and continued Bodies, from the *Pylorus* unto the *Anus*. They are so called from the word *Intus*, signifying Within, because they are placed within the Body; and they receive into their Cavities the Chyle and the Excrements of the first Concoction.

QQ  
The Guts.

They are situated under the *Epiploon*, in the *Abdomen*, whose whole capacity they do almost fill, which reaches from the Stomach to the *Os Pubis*. They are knit or annexed to the Back by means of the Mesentery, which ties them together; so that the *Tenuia Intestina* are in the middle of the *Abdomen*, in the Umbilical Region, and the *Crassa* in the Circumference.

Their Situation.

The Intestines have not all the same bigness, nor the same Diameter; but they have commonly seven times the length of the Body from whence they are taken: This great Extent, and the different Circumvolutions which Nature was obliged to give them, by reason of the small space they take up, were necessary both for retaining the Aliments a longer time, and for their Fermentation, by the mixture of the *Bilis* and the Pancreatick Juice, as well as to separate the Chyle the better from its Excrements, and by means of these two Liquors to render it more fluid, more subtil, and consequently to be in a better condition to pass into the *Vena Lactea*.

Their Magnitude.

Moreover, if the Body had had but one Gut, a Man would have been forced to eat continually, as the ravenous

A Remark.

ravenous White Wolf and Cormorants are said to do, because they have very short Guts; and it was for this reason that a Man who died of a Dropsie, whose Body I open'd, and in whom I found only such a small length of Guts as was necessary to reach directly from the Stomach to the *Anus*, did eat continually every hour all his life; he was said every night to provide store of Bread to be near him, that he might readily eat in the night-time whenever he waked.

The Intestines are covered with Fat outwardly; and they are within besmeared with a *Mucus* that defends them against the acrimony of the Cholera and Humours which continually glide within them.

The Substance of the Guts.

The Substance of the Guts is Membranous, that they might be able to extend, when they are full of Chyle, or Excrements, or *Flatus*; and that they might contract, in order to drive the Chyle into the *Vena Lactea*, and to make protrusion of the Excrements towards the *Anus*.

Three Membranes.

It is composed, as that of the Stomach, of three Coats, one Common, and two Proper.

R  
Their Common Membrane.

The First is the Membrane that is called Common, because it is continued with the External Membrane of the Stomach, and with the Mesentery and *Peritoneum*; it is harder and drier than the two others which it incloses; and this Membrane does hinder the Guts from dilating too much, when they are full of *Flatus*.

S  
The First of their Proper Coats.

The Second Coat of the Intestines is Carnous, and interlaced with divers small Fibres, but particularly with two sorts of them, whereof the one are Circular, and the others direct: The Circular Fibres are placed under the Direct, or Straight Fibres, and terminate at that part of the Mesentery which touches the Intestines; and the Straight Fibres do traverse the Circular at right Angles, and go to the External Membrane of the Intestines.

The Peristaltick and Antiperistaltick Motion of the Guts.

The Peristaltick Motion of the Guts is made by the contraction of their Fibres from above downwards, as the Antiperistaltick Motion happens by their contraction from below upwards. I have often observed in Living Animals that I have Dissected, in order to see in them the distribution of the Chyle, that the contraction which happens in the Peristaltick Motion (which some call a Vermicular Motion, because it is like

to the creeping of Worms) does not happen in all parts of the Intestine at the same time, but one part is successively contracted after another. This Motion is always made from above downwards, both for the distribution of the Chyle, and for the expulsion of the grosser Matters. On the contrary, in the Motion that is made from below upwards, all things ascend and come out of the Mouth, instead of following their ordinary course; and this happens in the *Miserere*, and in Prolapses of the Guts into the Groins.

The Third Coat of the Intestines is Nervous, like that of the Stomach; it is about thrice as long as the two others which cover it: it hath abundance of Wrinkles and *Plicæ*, which still form more small Membranous Circles, that serve to retard the motion of the Chyle, and the descent of the Excrements; the Arteries, the Veins, and the Lacteal Vessels, which over-spread all the Mesentery, do terminate at the Internal Surface of this Coat: Its External Surface is likewise full of abundance of small Branches of Arteries and Veins, and little Glandules, which are ranged in small parcels, at convenient distances, in the small Guts. Every one of these Glandules is perforated with a small *Ductus*, that yields a whitish Liquor when they are squeez'd; but in the great Guts they are sown one and one, all over their Surface: They have the figure of a Lentil, and are alike perforated, in order to furnish a Liquor which serves to make the gross Matters more fluid. The great number of Nerves which do form this Third Coat, do make it a very sensible Part; and for this reason its inside is always full of an unctuous vitcous Humour, which has occasioned it to be called the Velvet Coat; this *Mucus* doth moisten and defend its Fibres against the acrimony of the Choler, and the hardness of the Excrements.

**T**  
The Second  
of the Proper  
Coats of the  
Guts.

The Guts have abundance of Nerves, Arteries and Veins, which are spread between their Membranes; the Nerves come from the Eighth Pair. They bring an Animal Juice, which is necessary for the motions of the Carnous Fibres of the Second Coat. The Arteries do come from the Superior and Inferior Mesenterick Arteries; they bring them store of Blood, both for their Nourishment, and to be filtrated through the Glandules. The Veins go to the *Porta*, they carry back to the Trunk of that Vein the superfluous Blood that remains from the Nourishment of the Guts. Al-

The Vessels  
of the Guts.

Their Division.

Although the Intestines be but one continued body from the Stomach unto the *Anus*, nevertheless, they are divided into small Guts, and great: the small are three, the *Duodenum*, the *Jejunum*, and the *Ileon*: The great are likewise three, the *Cæcum*, the *Colon*, and the *Rectum*.

The Small Guts.

The *Tenuia Intestina*, or Small Guts, are so called, because of the tenuity or thinness of their Membrane: They are situated, as I have already shewn you, in the Middle Region of the Belly, about the Navil; because their principal Use being to perfect and to distribute the Chyle, they can do this the more conveniently, by being near unto the Mesentery, which ties them fast, as unto their Centre, rather than they could if they were more remote from it. Besides, the Lacteal Veins having no long course to take, the distribution of Chyle is the better performed by them, and much the more speedily.

The Great Guts.

The *Crassa Intestina* are so called, because their Coats are much thicker than those of the others: They are situated all round the Small Guts, to which they serve for a defence. Their Use is to retain, for some time, the grosser part of the Aliments, and to contain the Excrements.

The *Duodenum*.

The First of the *Tenuia* is the *Duodenum*; it is so called, because its length is twelve fingers breadth; which is hard to prove nevertheless, unless we comprehend the *Pylorus* in this length. It begins at the *Pylorus*, which is the right Orifice of the Stomach; and descending towards the Spine, it ends where the Circumvolutions of the other Guts begin; it is thicker and narrower than the others. It is of a straight figure; because if it had been crook'd or bent, that which comes forth of the Stomach would have found it difficult to get an entrance into this Gut. Upon the end or latter part of this Gut, or else towards the beginning of the *Jejunum*, two Holes are found, which are the ends of two *Ductus*, whereof one is called *Ductus Cholodochus*, and the other *Pancreaticus*. The first of these discharges Choler, which comes from the Bladder of Gall and the Liver into the cavity of one of those two Guts; and this discharges the Pancreatick Juice which comes from the *Pancreas*.

The *Jejunum*.

The Second of the Small Guts is the *Jejunum*, so called because it is always found to be less full than the



the others, having a great quantity of *Vena Lactea*, which receive the Chyle without intermission. We may add, That the *Bilis* and the Pancreatick Juice mixing together at the beginning of this Gut, or at the end of the *Duodenum*, would too quickly precipitate not only the grosser part of the Excrements, but also the Chyle, if there were not folds and turnings within, for retaining it some time, and hindring it from running with too great violence. It possesses the upper part of the Umbilical Region. It begins at the end of the *Duodenum*, and terminates at the *Ilion*, after having made many Windings below, and towards the sides. Its length is an Ell and an half, *Paris* measure.

The Third of the Small Guts is the *Ilion*, or the Gut The *Ilion*. of the Hips, so called, because it is placed in those parts. Its Colour is a little blacker than that of the *Jejunum*, and thereby it is known and distinguished from the other. It begins immediately where the *Jejunum* ends, and terminates at the *Cacum*; it is longer alone than all the rest together, having at least twenty foot in length: it hath fewer *Vena Lactea* than the *Jejunum*, for which reason it is always fuller. It possesses almost all below the Navil, and extends, by its Circumvolutions, towards the *Ili*a on both sides. This Gut not being so fast tied to the neighbouring parts, as the *Colon* and the *Cacum*, does often fall into the *Scrotum*, and makes the *Hernia Enterocelis*. It is also in this Gut that the *Volvulus* and *Miserere* do happen, which are called *Iliaca Passio*, in which the very Excrements are vomited upwards; because then the Membranes of this Gut do enter into one another, and cause those *Nodi* which hinder the passage downwards.

The First of the *Crassa Intestina* is the *Cacum*, so called The *Cacum*. because being made like a Pouch, it hath but one Aperture both for ingress and egress; or else, according to *Bartholin*, because its Use is but blindly known. It is situated in the right *Hypochondrium*, lower than the right Kidney, where it is strictly annexed to the *Peritoneum*; it hath an *Appendix* that is like an oblong Worm, made up of the conjunction of three Ligaments of the *Colon*: it is bigger in Infants newly born, than when they are grown in years; which is a thing that much perplexes Anatomists, to resolve on its true Use. As for the *Cacum*, it is pretended that it serves



for a second Stomach, in which some parts of the Aliments, that escaped the first Concoction, are here boiled over a second time.

The Colon.

The *Colon* is the Second of the Great Guts, and the largest of them all; it is so called, because it is in this Gut that the Colick Pains are felt. Its length is eight or nine foot; it begins at the end of the *Cacum*, towards the right Kidney, unto which it is annexed, and ascending up to the Concave part of the Liver, where it is also fastened sometimes, it touches the Bladder of Gall, which tinges it with its Yellow colour in this place: from thence it passes along the inferior part of the Stomach, and fastens to the Spleen, and the left Kidney; from whence it descends like an *S*, unto a little above the *Os Sacrum*, and terminates at the *Rectum*, insomuch that it encompasses all the *Abdomen*: for want of the assistance of the Mesentery, it is moistened with many small Processes full of Fat: it has three Ligaments, whereof two do tie it above and below; and the third forms many small Cells, which serve to retain the *Feces* some time before they are discharged. At its beginning it hath a membranous and circular Valve, in order to hinder the Excrements, the *Flatus*, and even Clysters, from returning out of the great Guts into the small. This Valve may be seen, after having washed and turned the Gut inside outwards.

An Observation on the Structure of the Valve of the Colon.

We must observe, that besides the foresaid Valve, and the Cells that are in the *Colon*, which serve, as I have said, to retard the descent of the Excrements, there are likewise other Valves from place to place, that are found not only in the *Colon*, but also in the *Jejunum*. These last Valves, of which no body ever made mention before *Kircher*, do not shut entirely the whole cavity of the Gut; and because they are always a little half-open, they do hinder the Excrements from too quick a discharge; for each of them filling but about one half of the Cavity, and being larger on one side than the other, their Whole is received, insomuch that the largest part of the Valve below does answer to the narrowest part of that above; which hinders the Excrements from falling with too much precipitation into the lower Guts.

These Valvules are greater in the *Colon* than the *Jejunum*; they lessen in proportion to their descent down-

downwards. It requires Skill to discover them; but in order to succeed in it, you must not blow into the Guts, because then you would see nothing at all; you must only open them, to see their inside: but you will see them still better, if you let the Guts dry beforehand.

The Third and the last of the Great Guts is the *Rectum*, so called because it descends in a straight line from the *Os Sacrum* to the *Anus*, where it terminates: it is a foot long, and three fingers big; its Coats are thick and solid; they are enclosed with a particular Covering which serves to expel the Excrements with the more force. It is fastened to the neck of the Bladder in Men, and to the neck of the Womb in Women. Its External part is moistened with a great deal of Fat, and therefore it is call'd the Fat Gut. The *Anus*, which is formed by its inferior extremity, hath three Muscles, to wit, a *Sphincter*, and two *Levatores*: The first is call'd the *Sphincter* of the *Anus*, its figure is like to that of a Ring, its bigness is two fingers breadth; it is annexed before to the *Penis* in Men, and to the neck of the *Matrix* in Women; and behind it is fastened to the *Coccyx*, and laterally to the Ligaments of the *Os Sacrum* and the Hips; it serves to open and shut the *Anus*, according to our will. The two others, which are called *Levatores Ani*, have origin from the inferior and lateral part of the *Os Ischion*, and insert in the *Sphincter* of the *Anus*, to lift it up again, after the expulsion of Excrements is over.

Upon syringing a Liquor into the Hemorrhoidal Arteries, I found that there were more Branches of Arteries than were needful for bringing Nourishment to this Gut; I observed, that abundance of these little Arteries did end in Glandules, with which it is overspread throughout; and that this Gut was not only the Drain of the grosser Excrements, but also, that it served to separate and carry off the greatest part of the impurities of the Blood. This great number of Vessels was necessary for purifying the Blood: but we pay dear for this service they do us, by the Hemorrhoids which they do cause.

The Mesentery is a double Membrane situated in the middle of the Belly, of a figure near unto circular; if the elongation of the *Colon* and the *Rectum* be excepted in it, it hath about four Fingers breadth diameter,

V  
The Mesentery.

and three *Paris* Ells in its circumference, round about which Mesentery the Guts are folded. When the Guts are separated from it, it resembles those Ruffs that were anciently worn about the Neck, and which the *Swisses* wear still; and this is the part we eat, under the name of a Calf's Chadern.

There are in this part abundance of small Glands and Vessels, which have been discovered in this Age: These Vessels are the Lactéal Veins, which carry the Chyle from the Intestines to the Glands, which are abundantly more in number in the centre of the Mesentery, than in its circumference. From these Glandules the Chyle does go by other Lactéal Veins into the common Receptacle, and from thence into the *Ductus Thoracicus*, in order to fall into the left Axillary Vein. The other Vessels of the Mesentery are the Lymphaticks, which distill their *Lympha* into the Receptacle, in order to make the Chyle more fluid. The *Vene Lactea* are true Lymphaticks, through which the *Lympha* runs when there is no Chyle in them. This *Lympha* keeps them always open, to the end that when a Body has been for some considerable time without eating, the Chyle may always find these *Ductus* open for its more easie passage through them.

The Fat of  
the Mesen-  
tery.

Fat is collected in the Mesentery, as in the *Epiploon*, from an oily and sulphurous Blood, which evaporates from the Vessels, and is retained there by the thickness of the Membranes. This Fat was necessary in this place, both for the preservation of the Natural Heat of these Parts, and to moisten the *Vene Lactea*, which having only a very thin Membrane, and being filled only in the time of the distribution of the Chyle, would otherwise grow dry.

X  
The Gland-  
ules of the  
Mesentery.

The Glandules of the Mesentery have each of them a little Artery, which brings Blood to them, a little Vein which carries back the Blood, and an excretory *Ductus*, which discharges into the Guts what has been filtrated through these Glandules; and if at any time these Glands do become big and schirrous, it is because the grosser Humours, which come to the Mesentery, as to a natural Drain, do find the Pores of these Glands too closely shut to get through them; insomuch that they stop here, and cause hardnesses, which encrease with time. And since it is so hard to dissolve or disperse these Tumours, when they are of a long  
standing,

standing, some have thought fit to call the Mesentery the Mother that feeds and nourishes the Physicians Business.

The Use of the Mesentery is to tye the Guts together unto the *Vertebra* of the Loins; and to hinder any disorder from happening in their Circumvolutions; the Use of its double Membrane is in order that the Vessels passing between them, may go to the Guts and return from them without being hurt in their passage.

The Uses of the Mesentery.

The Nerves of the Mesentery do come from the *Vertebra* of the Loins; it likewise receives Nerves from the intercostal Branch; they are all so interlaced together in the middle of the Mesentery, that they form there a *Plexus*, out of which there comes abundance of Nervous Ligaments, as fine as Hair, which overspread all the Membranes of the Guts.

The Nerves of the Mesentery.

The Arteries which are inclosed in the duplicature of the Membranes of the Mesentery do come from the Superior and Inferior Mesenterick Arteries, which are two great branches that come from the Trunk of the *Aorta*, and terminate in all the Guts. One of its greatest branches is that which runs along the *Rectum*, and ends at the *Anus*. This Branch is the Hemorrhoidal Artery, which brings a thick saculent Blood to be purified in these Parts, and when this Blood cannot return back as it ought through the Hemorrhoidal Veins, as it sometimes happens by reason of its Heaviness, it then causes that troublesome Malady, called the Hemorrhoids.

Arteries of the Mesentery.

If the Number of Veins does appear greater than that of the other Vessels in the Mesentery, it is because those Veins being full of Blood are easily seen, and the other Vessels being empty, cannot be perceived. According as all the Veins do approach the *Basis* of the Mesentery, they do unite together and form larger Veins, the Union of which greater branches does form a Trunk of a Vein, called the Mesenterick Vein, which joining with another called the Splenick, do together make a very great Vein, or the *Vena Porta* so named by the Ancients, because they thought it carried the Chyle to the Liver, there to be turned into Blood.

Its Veins.

These two Trunks of which the Splenick that comes from the Spleen, is the Superior, and the Mesenterick, which comes from the Mesentery is the Inferior, do convey the Blood to the Trunk of the *Porta*, that

The Uses of the *Vena Porta*.

was before brought to those Parts. There are four Veins which are inserted into the first of these Trunks, the posterior *Epiploides*, the *Coronaria Stomachica*, the *Epiploick*, and the greater *Gastrick*; whereas in the second there are but two inserted, which are the *Hemorrhoidal* and the *Cæcal*.

I have observed to you, that the *Vena Porta* was made of the Conjunction of these two Trunks, and that it entred into the concave part of the *Liver*; but it is good to know, that before it comes to the *Liver*, there are four Veins which come and join the *Porta*, which are the *Intestinal*, the *Gastropiploique*, the little *Gastrick*, and the *Cystick*.

Four Branches that go to the *Vena Porta*.

The Opinion of the Ancients.

Two very opposite and even impossible Uses have been assigned to all these Veins; the one was to carry the *Chyle* from the *Intestines* to the *Liver*, and the other was to bring back the *Bloud* from the *Liver* to the *Intestines*. This Opinion hath been followed, until this Age, wherein the *Vena Lactea* have been discovered, which do carry the *Chyle* from the *Intestines* unto the *Glandules* of the *Mesentery*; and thus the *Vena Porta* has no other Use, but that which is common to it, and all the Veins of the *Body*, which is, to carry back the *Bloud* to the *Heart*. I shall give you the reason when I shall shew the *Liver*, why the *Porta* does not rather insert it self into the *Vena Cava*, than into the Substance of the *Liver*. But at present it is time to speak of the *Vena Lactea*, and the *Lymphatick Vessels*.

Y  
The *Vena Lactea*.

It is impossible to see the *Vena Lactea* in a dead *Body*, because they do all disappear as soon as once they are empty. When you would see them, you must give a great deal of *Meat* to a *Dog*, and four hours after, you must tye the *Dog* upon a *Table*, and open his *Belly* quickly, and then you will see the *Vena Lactea* dispersed through all the *Mesentery*, full of *Chyle*, which they are carrying to the *Receptacle* of *Pequest*.

Why so call'd.

These Veins are so called, because they contain in them a white and liquid Substance, like unto *Milk*. They have been intirely unknown to all the *Ancients*, and they were never discovered till the Year 1622. by *Asellius*, who relates that these Vessels have the Substance and the Structure of a *Vein*: that they have one simple *Membrane*, wherein three sorts of *Fibres* have been

been observed, the straight, the transverse, and the oblique; and that this Membrane, though simple, is nevertheless strong enough, because it is securely placed between the two coats of the Mesentery, which fortify it.

Their Number is exceeding great, there being of them as many again as of the Meseraick Veins; they are almost all in the Small Guts, because they do make the distribution of Chyle, and do separate it from the Excrements. I have told you already that the *Jejunum* has more of them than any other of the Small Guts, and that the Great Guts have but very few of them, their Use being to expel the Excrements, and all other Impurities of the *Abdomen*.

In what parts the *Vena Lactea* abound.

The better to comprehend the Road which the Chyle takes to goe to the Heart, and not to the Liver, as the Antients pretended: We ought to know, that there are two sorts of *Vena Lactea*; the one are called the first Lacteals, and the others secondary; the first are those which bring the Chyle from the Intestines unto the Glandules, which are spread in very great quantity through all the Mesentery, but especially towards its Center.

Two sorts of *Vena Lactea*.

The Secondary *Vena Lactea*, are those which carry the Chyle from these same Glandules (after it has been made more liquid by the *Lympha* contained in them) into the Receptacle of *Pequett*. It has received that Name, because Monsieur *Pequett*, a famous Physician, first of all in the Year 1651. made the Discovery of it. This Receptacle is placed between the two Origins of the Diaphragm, in the place where the Lumbar Glandules are found, and which are so called, because they are situated upon the *Vertebra* of the Loins. The two branches which come from these Glandules, joining together, do make the *Ductus Thoracicus*, which is often found to be double. This *Ductus* ascends along with the *Aorta*, between the Ribs and the *Pleura*, and goes and terminates by one, two, or three branches, in the Left Subclavian Vein, near unto the Axillary Vein, from whence the Chyle is carried into the Right Ventricle of the Heart, by the descending *Vena Cava*.

This Canal or *Ductus*, and all the *Vena Lactea*, have Valvules in them from place to place; and they are disposed in such a manner, that they do easily give admittance to the Chyle, and hinder its ever returning.



The Ancients  
fancy'd that  
the Milky  
Veins went to  
the Liver.

The Discovery of the *Vena Lactea* (or Milky Veins) has been of great Use to Anatomy, though at first View it did not prove so serviceable as it ought to have done, for the Anatomists of that Age, and even *Afellinus* who first discover'd 'em, were so prepossess'd with the Opinion that the Blood was form'd and prepar'd in the Liver, that they took that to be the only Receptacle of the Chyle. And notwithstanding all the Discoveries that have been made since, we have had such obstinate Sticklers for Antiquity, who upon Ocular Demonstration, would own that in the dissected Animals things stood so and so, but still maintain'd that 'twas otherwise in Man. As for my part, I am fully convinc'd, that the Case is the same in Man as 'tis in other Animals, for about Eighteen Years ago a false Coyner being condemn'd to die, I sent him some Victuals and Drink a few hours before he dy'd, and the Place of Execution being near my House, I had a Coach ready to receive his Body as soon as he was strangl'd: Accordingly I carry'd him off, and open'd him immediately, and when I came to the Mesentery found a great many of the Milky Veins full of Chyle; which to me was sufficient Evidence that 'tis distributed in Man after the same manner with other Animals.

The Obstina-  
cy of some of  
the Ancients.

The Lymphatick  
Vessels  
of the Me-  
sentery.

The Lymphatick Vessels of the Mesentery are small fine Pipes which convey the *Lympha* to *Pequett's Cistern*, in order to render the Chyle more active and fluid. Tho' these Vessels are very numerous in the Mesentery, yet they are not perceptible but when they are full of this *Lympha*, which is a pellucid Liquor like Water. They spring from the Glandules of the Liver, Spleen, and other Parts. Now the Ancients taking these Vessels for the *Vena Lactea*, have been long in imagining that they convey'd the Chyle from the Mesentery to the Liver and Spleen. But in the Year 1652 *Bartholin* made it appear that those Vessels which they took for the *Vena Lactea* carry'd the *Lympha* to the *Receptaculum*.

The manner  
of Chylifica-  
tion.

These Parts are employ'd in Chylification, tho' in demonstrating the Ventricle, I began to give you an *Idæa* of the manner in which the Chyle is made; yet 'twill be proper to touch upon it in this place, to the end that you may have a perfect Knowledge of the matter, upon the conclusion of this *Demonstration*. I repre-



represented to you but now the Impression of Hunger: When a Man is affected with it, he calls for Victuals, conveys 'em to his Mouth and chews 'em: The Teeth assisted by the *Saliva* bruise and mince 'em, upon which they are swallow'd and convey'd through the Gullet into the Ventricle where they mix with the same Acid Juice that occasion'd the Sense of Hunger; This Acid Juice penetrates the Substance of the Victuals, and splits it into such small Particles, that it appears as an uniform Liquor, which being squeez'd by the Stomach equally on all sides, is forc'd to make its way through the *Pylorus* and so enter the Intestines; There it meets with two other Dissolvers, namely the Bile and the Pancreatick Juice, which are possess'd of a Vertue equal to that of the *Saliva* and the Acid Juice of the Stomach. These two finish the Liquefaction of the Aliment, and split what is yet unbroken; This done, it pursues its course through the Intestines; and in the mean time the subtillest part of it which we call the Chyle, enters the Orifices of the first or radical Milky Veins. These Veins are spread all over the Mesentery some by themselves, others in company with the Meseraick Veins; some in a straight Line and others crossing one another, and at last terminate in the Glands at the *Basis* of the Mesentery, then the Chyle is taken up by the secondary Milky Veins, and convey'd to the Glandules that lie between the two Tendons of the Diaphragm, which were formerly known by the Name of *Glandula Lumbares*, and at this day are called *Pequett's Receptacle*. Here we take leave of the Chyle for some time, designing to visit it again in the space of three Days, and conduct it to the Heart, in demonstrating the *Ductus Thoracicus*.

Of

*Of the Parts contained in the ABDOMEN,  
which serve to Purifie the Blood.*

The THIRD DEMONSTRATION.

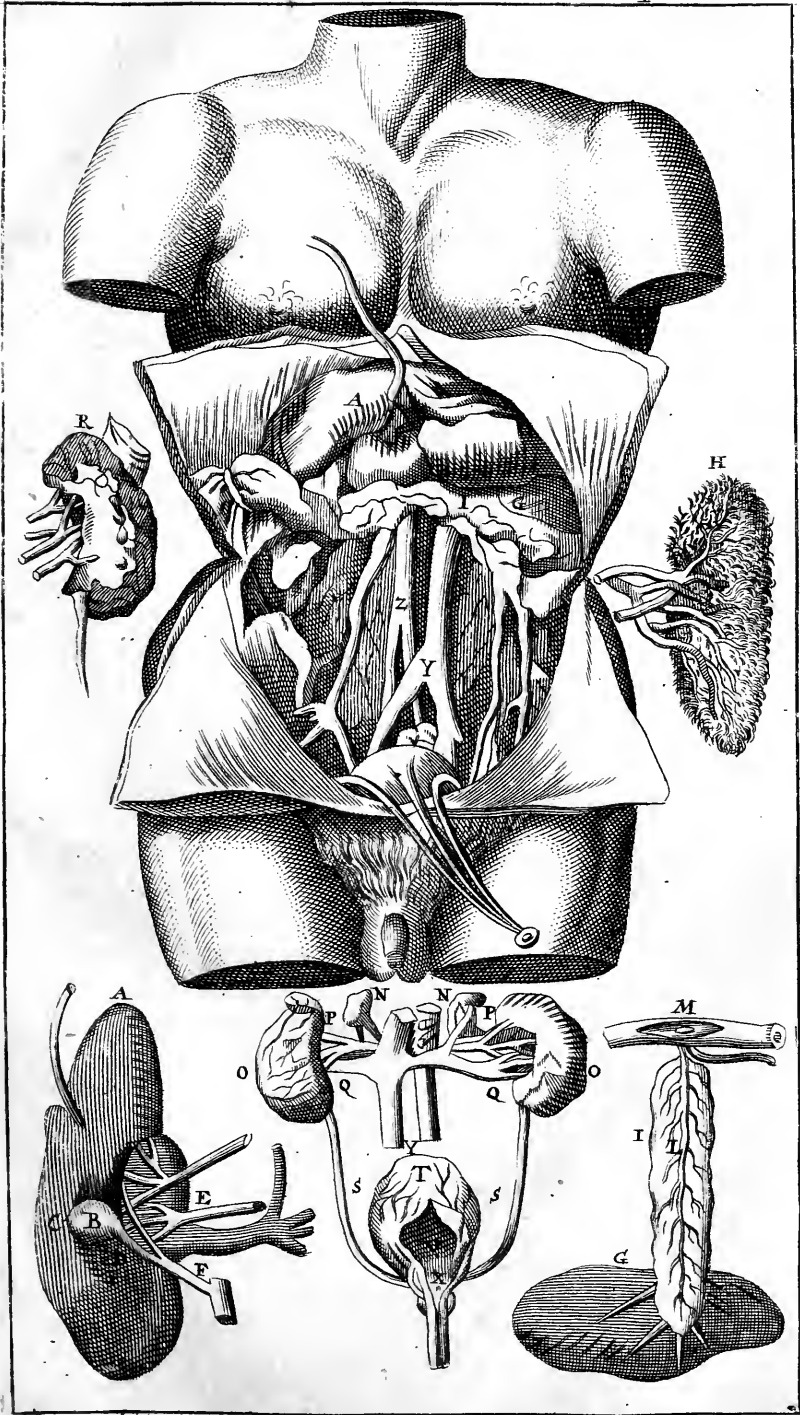
Blood is made  
of Chyle.

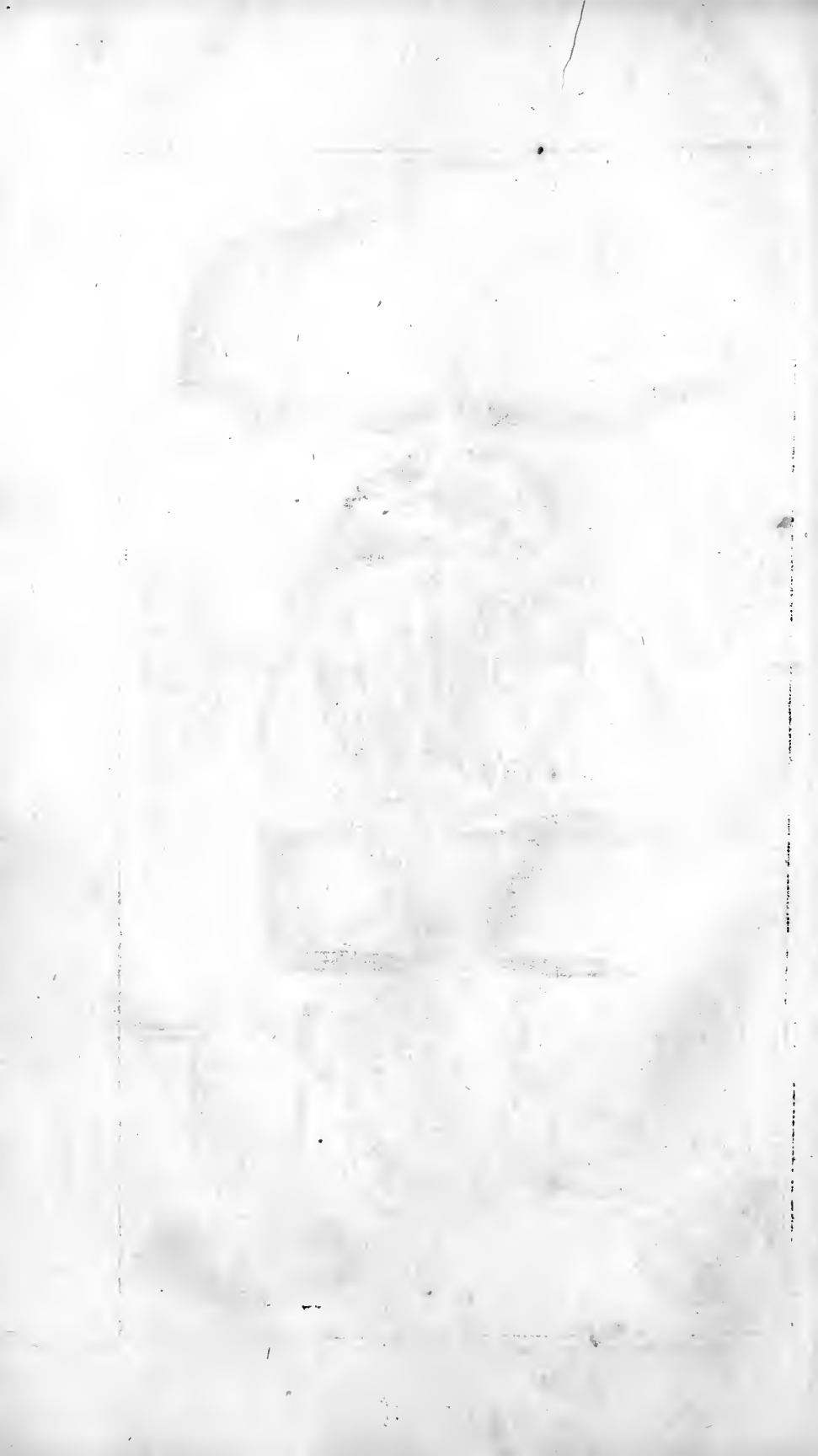
**I**N order to know, GENTLEMEN, how the Blood is made, we must not only take a View of the Parts that transform the Victuals into Chyle and part it from the Excrements, but likewise of those in which the Blood is prepar'd and purify'd.

I gave you to know that the Chyle, which is the real Substance of the Blood, was prepar'd in the Mouth by vertue of the *Saliva*; concocted and digested in the Stomach by vertue of the dissolving *Menstruum* that resides there, and at last brought to perfection in the Intestines, by encountring the Bile and Pancreatick Juice. I likewise acquainted you that after these preparations, 'tis strain'd through the small Orifices of the *Vena Lactea*, which repair to the Mesentery in great Numbers; That these Veins convey it to *Pequett's Receptaculum*, from whence it rises through the *Ductus Thoracicus* to the Left Subclavian Vein, and so glides on to the descending Branch of the *Vena Cava*, and after that to the Right Ventricle of the Heart, where its chief Transformation into Chyle commences.

Several Li-  
quors separa-  
ted from the  
Blood.

'Tis to be remark'd, that though the *Saliva*, the Acid Juice of the Stomach, the Bile, and the Pancreatick Juice, are absolutely necessary towards the preparation of Chyle, yet they are useles and even prejudicial to it when 'tis transformed into Blood; for 'tis certain, that the Blood which ought to be good and soft in order to nourish the Parts, would enjoy neither of these qualities, if all the above-mention'd Liquors were mixt with it. For Instance, if that dissolving Acid, which by its sharp and pointed Particles, penetrates and dissolves the most solid Food; If that, I say, were carry'd along with the Blood, and thrown upon a Membrane in order to nourish it, 'twould operate it as it does upon the Victuals, and occasion a sense of Pain, as it happens sometimes in Rheumatisms. If Melancholy were not severed from the Blood, 'twould





'twould be too thick; if the Urine were not evacuated, 'twould prove over-ferous: so that the Blood being a Liquor so precious and necessary for Life, must be purify'd by the Liver, the Gall-bladder, the Spleen, the Sweet-bread, the Kidneys, and the Bladder.

These are the Parts, GENTLEMEN, that are the Subject of this *Demonstration*; for they are all seated in the *Abdomen*, excepting that Part which separates the *Saliva*; and of that I shall speak in its proper place.

Of the Parts that Purifie the Blood.

The Liver is a Bowel of a considerable bulk, seated in the right *Hypochondrium* under the Midriff, at the distance of a finger's breadth from it; so that it does not incommode its motion. In a *Fœtus* it reaches to the left side; by reason that the Ventricle being never fill'd, is forced to give way to the Liver; but after the birth, it lies almost altogether on the right side. Sometimes, indeed, it extends to the left side, but that happens very seldom.

A A  
The Liver.

'Tis wrapt up in a thin tender Membrane peculiar to it self; under this Membrane we sometimes find Bladders full of Water; which are nothing else but Lymphatick Vessels swell'd up between their Valves; and upon their breaking, occasioning a sort of Dropsy call'd *Ascites*.

The Membrane of the Liver.

The Figure of the Liver is almost round, and not unlike an Ox's Foot: That side of it which faces the Midriff is Convex, pursuant to the figure of the place where 'tis lodg'd; and that towards the Ventricle is Concave. This last part is call'd the Arch of the Liver, and the Gall Bladder is inserted into it.

The Figure of the Liver.

In Men there is but one Liver, but 'tis divided into two Lobes; one of which is round and broad, and plac'd on the right; the other towards the left, being narrow and pointed. These Lobes are sever'd by a Cleft which gives entrance to the Umbilical Vein. Besides these two Lobes, there is yet another small Lobe upon the hinder part of the Liver, the flesh of which is softer, and which is cover'd with a fine thin Membrane that reaches to the Caul.

The Liver divided into several Lobes.

It is fastened by two Ligaments; the first, which is the strongest and the chief Ligament, ties it up to the *Diaphragma*, and penetrates into the Substance of the Liver, to hold it the faster. The other is slack, but broad and strong; it takes its rise from the Tunicle of the

The Ligaments of the Liver.

the

the Liver, and terminates in the *Cartilago Ensiformis*. Some give in the dry'd Umbilical Vein for a third Ligament; but I cannot agree to it: for at that rate 'twould draw the Liver downward, and consequently the Midriff, to which 'tis tied, and so would hinder its motion, especially in Expiration.

The Colour of the Liver.

Commonly the Liver is of a Red Colour, but sometimes we find it Pale and Whitish. Its Redness was one of the Arguments that mov'd the Ancients to ascribe to it the office of Sanguification; but shall be refuted, when we come to speak of the other offices they allotted to it.

The genuine structure of the Liver.

The Ancients allotted to the Liver a peculiar sort of Substance, call'd by them *Parenchyma*; which they took to be nothing else than an effusion or extravasation of clotted Blood, which fill'd up the Intervals between the Vessels. But the Moderns having taken a narrow view of the structure of the Liver, observ'd that it was interlac'd with a great many small Lobes of a Conical figure; that these small Lobes were compos'd of several small glandulous bodies, which have particular Membranes to unite and join 'em one to another; and that each Lobe of the Liver, though never so small, receives a branch from the *Vena Porta*, one from the Biliary Vessel, and a third from the *Vena Cava*. So that we may call the whole Substance of the Liver nothing else than a heap or bundle of an infinity of little glandulous bodies, and the various ramifications of Vessels.

Five sorts of Vessels in the Liver.

The Liver has five sorts of Vessels, namely, Nerves, Arteries, Veins, Biliary Pipes, and Lymphatick Vessels.

The Nerves of the Liver.

It receives two Nerves from the Eighth Pair; one from the Stomachick branch, and the other from the Intercostal; however, they do not pierce into its Substance, but only are lost in its Tunicle, and for that reason its sense is not so quick as that of the Parts which are better stock'd with Nerves.

The Arteries of the Liver.

The *Arteria Coeliaca* springing from the *Aorta*, divides it self into two Branches, one of which repairs to the Liver, and the other to the Spleen. The first, which is the least, detaches from it the Gastrick, the two *Cystica*, the Epiploick, the Intestinal, and the Gastro-Epiploick, before it enters the Liver; where, at last, 'tis divided into almost as many small Branches

as the *Vena Porta*. Some Anatomists pretend to demonstrate, that the Branches of this Artery are wrapt up in one common Membrane with the Branches of the *Vena Porta* and those of the Hepatick *Ductus*.

The principal Vessels of the Liver are the *Vena Cava* The Veins of the Liver. and the *Vena Porta*, which are equally dispers'd through the whole substance of the Liver; so that each Lobe, and all the little glandulous bodies that form the hollow and convex parts of this Bowel are equally provided with these Vessels: And 'tis not to be imagin'd that the *Vena Porta* visits only the Concave part, and the *Vena Cava* only the Convex; for the Branches of both are trac'd in all the parts of the Liver. The Branches of the *Vena Porta* do not empty themselves into those which receive the Bile, or those of the *Vena Cava*, by mutual *Anastomoses*, as some Anatomists would have it; but by the intervention of the little glandulous bodies of which the Liver consists: so that the whole Liver is equally bedeck'd with the ramifications of the *Vena Porta* and those of the *Vena Cava*; but with this difference, that the Branches of the *Porta* arrive there, and those of the *Cava* set out from thence.

The number of the Biliary Vessels in the Liver is equal with that of the Branches of the *Vena Porta*; for the one is always accompany'd by the other, and both of 'em are wrapt up in *Glisson's Capsula*. These Vessels serve to convey the Bile to the Gall-bladder, or to the *Duodenum*, of which more anon. The Bile vessels in the Liver.

'Tis observ'd by Anatomists, that the Lymphatick Vessels in the Liver take their rise from the small Conglobated Glands that are found under the Tunicle of its hollow part, towards the entry of the *Vena Porta*, in the *Capsula* of which (*Glisson* lays) these Vessels are seen to enter, though they have no communication with the Liver. This is sufficient evidence, that they do not derive their original from the *Parenchyma*, as *Bartholin* (the first Discoverer of them) imagin'd. The Lymphatick Vessels in the Liver.

These Vessels serve to carry the Lympha of these Glands to *Pequett's Cistern*; and not to convey the Chyle to the Liver, as 'twas alledg'd by those who took 'em for the *Vena Lactea*.

The Ancients took the Liver for the Organ of San- The Office of the Liver, according to the Ancients, guification, from whence the Blood was distributed all over the Body. Pursuant to this Notion, they asserted, that



that the Chyle which could not be convey'd to any other part, was carry'd thither by the same Veins which convey'd the Blood of the Liver to the Intestines.

The weakness of this Opinion will quickly appear, if we do but consider the opposite Motions that they ascrib'd to the Chyle and Blood; for 'tis not probable that two Liquors, one of which ascended, according to them, and the other descended, should pass in one Chanel at the same time. Besides, the Circulation of the Blood, discover'd in this Age, is so inconsistent with that Distribution of Blood by the Veins, that instead of conveying it to the Parts, they are only employ'd in carrying it back to the Heart.

Blood and Chyle cannot run in the same Chanel.

The Chyle does not visit the Liver.

I was further confirm'd in this Opinion, by the Dissecting of several living Dogs four hours after eating: For I immediately cut out the Liver, and having examin'd all the Blood that was spilt in the place where it lay, could not find one drop of Chyle either there, or in any part of the Liver; though at the same time the *Vene Lactea*, the *Receptaculum*, and the *Ductus Thoracicus* were full of it. This I look upon as a certain Argument that the Chyle repairs straight to the Heart, and not to the Liver.

The true Use of the Liver,

However, I do not assert, that the Liver contributes nothing towards the refining of the Blood: But 'twill here be necessary to set forth the manner of this Purification, or rather to shew how 'tis that the Liver strains out the Bile; for though the Vessels that unite with the Trunk of the *Vena Porta* perform the office of Veins, in carrying back the Blood: yet the *Vena Porta* supplies the Liver with Blood, as if it were an Artery; and doublets, that which it imports, is the Substance or Matter of the Bile: for 'tis not probable that so small a Vessel as the Hepatick Artery can make a suitable provision for that effect. Besides, 'tis well known that this Artery is employ'd in nourishing the Liver, which could not receive Nourishment from the *Vena Porta*, forasmuch as all the Parts of the Body are nourish'd with Arterial Blood; whence 'tis that the Lungs, which have large Vessels dispers'd all over their Substance, have nevertheless an Artery of their own, call'd *Bronchialis*: And in like manner, the Heart, which has four large Vessels retaining to its Ventricles,

is

is nevertheless provided with an *Arteria Coronalis* for the nourishment of its Substance.

We conclude therefore, that the Blood of the *Vena Porta* having pass'd all these Branches, throws it self into the Glands; which open likewise into the Extremities of the Biliary Vessels, the Capillaries of the *Vena Cava*, and those of the Artery which convey Blood to 'em, as well as the *Vena Porta*. Now all this Blood is filtrated in such a manner, that its Particles, which are proportion'd to the Shoots of the Extremities of the Biliary Vessels, flow perpetually into 'em; after which, some of 'em are convey'd to the Gall-Bladder, and others to the Hepatick-Duct, and from thence to the *Duodenum*: whereas the other Particles of Blood, the figure and size of which is disproportion'd to the above-mention'd Orifices, are re-conducted by the Capillaries of the *Vena Cava* into its large Trunk, and at last to the right Ventricle of the Heart.

'Twill perhaps be alledg'd, That if the *Vena Porta* performs the office of an Artery, in order to promote the Filtration perform'd in the Glands, it ought to have a Pulsation as well as the Arteries. But I answer, That though her Motion does not amount to a *Systole*, yet 'tis sufficient for that effect; for, as I intimated above, 'tis enclos'd in a Muscular Case, which is capable of dilating and contracting it self: Besides, 'tis always accompany'd by the *Aorta*, and doubtless receives considerable succours from its continual Pulsation.

However, since a Filtration cannot be perform'd without the Blood be push'd on with some force, by virtue partly of the Impulse of the Heart, and partly of that of the Arteries, as I intimated above, in treating of the Generation of the Animal Spirits; and forasmuch as the Blood of the *Vena Porta* is gross, and not Arterious; upon these Accounts, I say, Nature has taken care to join the Hepatick Artery immediately to this Vein, that its continual Pulsation may facilitate and augment the Motion of the Venous Blood. Nature has likewise confin'd these Vessels within a Sheath that is capable of Motion, to the end that its continual pressure upon the Vein may heighten the motion of Blood contain'd within it. In fine, this our Provident Mother has plac'd the Liver under the *Diaphragma* and the Muscles of the *Abdomen*, that the course of the Blood might be quickned by their continual beating.

When

**B**  
The Gall-  
bladder.  
Its four Mem-  
branes.

When we lift up the Liver, the Gall-Bladder, or the Cistern of the Gall, is expos'd to our view: This is a sort of round Bag, somewhat long, and resembling a small Pear. It consists of four Membranes, like those of the Intestines: The first (setting out from the inside) is a complication of the excretory Ducts of the Glands; the second is nervous and thin; the third consists of fleshy Fibres; and the fourth is common to the Bladder and the Liver, and indeed is nothing else but the Membrane of the Liver thrown over the Bladder.

Its Size and  
Situation.

This small Bladder is not commonly bigger than a small Hen Egg; however, in those of a bilious temperament 'tis larger than in others. 'Tis about two Fingers breadth long, and an Inch broad. 'Tis seated under a large Lobe of the Liver in its hollow part, where it sinks, as it were, into its substance. There is but one Bladder in a Humane Body, at least we very rarely meet with two.

Its Vessels.

The Gall-Bladder receives a small Nerve from a twig of the Intercostal; and two Cystick Arteries from the *Cœliaca*, which split into several Branches, and then terminate in the small Glands between its two Tunicles. 'Tis likewise provided with two Cystick Veins, which take up the remainder of the Blood imported by the Arteries, and convey it into the *Vena Porta*. To all these we must add a Lymphatick Vessel, which runs along with those of the Liver to the Receptacle of the Chyle.

**C**  
The Bottom  
of the Gall-  
Bladder.

The Gall-Bladder has two remarkable Parts, namely, the *Bottom*, and the *Neck*. The *Bottom* is round, and in its natural situation lies in the lower part of the Liver; 'tis tinged with the colour of the Gall it contains, and often-times has small Stones within it, these being form'd of the muddiest part of the Bile, which petrefies by virtue of its stay, and the heat of the place.

**D**  
The Neck of  
the Bladder.

Above the Bottom we meet with the *Neck*, which runs out in length and becomes so narrow, that it terminates in a small fine Pipe which opens into the common Duct: This Pipe is call'd *Porus Biliaris*. In that place where the Neck forms this Pipe, we find a small fibrous Ring, which dilates and contracts it self like a Sphindler, in order to imprison or give vent to the Gall in the Bladder, and prevent its recoiling to  
the

the place from whence it came. This Ring does the same service to the Bladder, that the *Pylorus* does to the Ventricle.

The Duct call'd *Cholidochus* is a long Vessel, twice as broad as the Neck of the Bladder, which runs straight from the Liver thro' the common Passage to the *Duodenum*. Some have been of the Opinion that it convey'd the Gall from the Liver to the Bladder: but for as much as the Intestine, and not the Bladder, swells when we blow into the Duct, 'tis plain that it throws the Gall directly into the Intestine, and we have reason to presume that the Gall found in the Bladder, is convey'd thither some other way.

The Common Duct or Passage of the Choler is formed by the joining of the *Cholidochus* and *Porus Biliaris*. It terminates obliquely in the end of the *Duodenum*, and sometimes in the beginning of the *Jejunum*, and but very rarely in the Ventricle. It runs between the two Coats of the Intestine and cuts through the outer Coat two Fingers Breadth higher than the inner. By this way of entring the Intestine it stands in no need of Valves to favour the Entry and hinder the retreat of the Choler; for 'tis impossible either for the Choler or the Chyle to rise through a Pipe thus inserted. When any Obstruction happens in this Duct, the Choler not having a free Egress flies back into the Blood, and so occasions a Jaundice, which oftentimes proves mortal.

Though Pidgeons and several other Animals have no Gall-bladder, yet they are furnish'd with Choler, for their Liver is bitter, and the *Cholidochus* performing the Office of the Bladder, carries the Choler straight to the Intestine.

In order to a clear Apprehension of the Uses of these Parts, we must know that there are two sorts of Choler; one is subtiler and finer, being convey'd by the Biliary Vessels to the Bladder, and from thence to the Intestine; the other is of a grosser Substance, and being strain'd out by the Glands of the Liver, in which the Shoots of the *Vena Porta* terminate, is carry'd by small Ducts to the *Cholidochus*, and from thence to the Common Passage, where the two sorts meet, and so repair with joint Forces to the Intestines.

E

The Ductus  
*Cholidochus*.

F

The Common  
Duct.All Animals  
have Choler.Two sorts of  
Choler.

L

Some

The finer  
Choler subdivi-  
ded into  
three sorts.

Some of the Moderns alledge, that the finer Choler is convey'd to the bottom of the Bladder by three different Roads, and indeed that 'tis in it self a mixture of three different sorts; the first is imported by the Biliary Pipes; this we spoke of but now. The second is imported by a Passage that *Blasius* calls *Singular*, alledging that it glides along between the two Tunicles, and terminates in the bottom of the Bladder: He assures us that this Passage has a Valve which favours the Egress of the Choler, and opposes its retreat. The third according to *Malpighius* is strain'd out by the Glandules residing between the two Coats of the Bladder.

The Bile is ne-  
cessary for the  
exalting the  
Chyle.

If the Choler were only an Excrement thrown into the Intestines in order to be evacuated along with the Impurities of the Lower Belly, Nature ought to have inserted this Duct or Passage in the great Guts and not in the beginning of the small ones, where the greatest part of the Bile mixes with the Chyle, and is reconducted to the Blood: Now without this Bile, the whole Mass of Blood would infallibly corrupt, as it happens in most Hydropical Persons after they have had the Jaundice: Besides the Bile being a potent dissolver, compleats in the first Intestines the breaking and mincing of such parts of the Aliment as were not sufficiently dissolv'd in the Stomach, so that the Bile is so far from being a mere Excrement, as the Ancients fancy'd, that 'tis a necessary Liquor, without which the Chyle would never attain to that degree of perfection that is requisite in order to its Sanguification.

Farther, the Bile, especially that of the Gall-bladder, when 'tis thrown into the Intestines, twitches and pricks their Fibres by vertue of its Acrimony, and excites such a motion as is proper for squeezing the Chyle into the *Vena Lactea*, and throwing out the Excrements by Stool. For proof of its Acrimony, we need only to consider that it congeals by mixing with Acids, and becomes more fluid when mix'd with Alkaline Oils. The acid part of the Bile is likewise very serviceable in rendring the Chyle more fluid and refin'd, and facilitating its Ingress into the *Vena Lactea*; and its oily part serves for a Natural Glyster, for by greasing the Intestines, it facilitates the Descent and Motion of the gross Excrement. 'Tis well known that the Bile which passes through the *Ductus Cholidochus*, flows into the *Duode-*

num without intermission; but we are at a loss to fix the Periods in which the Bile of the Bladder enters the Guts: However 'tis probable that this happens chiefly in the time of Digestion, by reason that upon that occasion the Ventricle squeezes it self in order to forward the Chyle to the Intestines, and at the same time stands in need of a subtilizing and quickening Force.

The Spleen is placed in the Left *Hypochondrium*, GG  
The Spleen.  
Its Situation. opposite to the Liver under the Diaphragm, and between the Ventricle and the Ribs, it lyes higher in some than in others; but 'tis always in the lateral and posterior part of the Body, being supported by the *Vertebrae*, and the Short Ribs.

'Tis very rarely seated in the Right Hypochonder. Some style it the Liver's Deputy or Vicar, upon the Plea that 'tis qualified for supplying its Defects; But the Actions of these two *Viscera* are so opposite, and their natural disposition so different, that it is impossible for the one to do the office of the other.

Though the Spleen be pretty large in Men, yet 'tis much less than the Liver: 'Tis about half a Foot long, an Inch thick, and three Fingers broad. In Melancholick Constitutions 'tis larger, for being spungy and loose, it bloats up as it receives the grosser part of the Blood; But the smallest is the most healthy. Its Bulk.

The Spleen bears the Figure of a Neat's Tongue; that side of it which faces the Ribs being convex, and the other hollow. Along the middle of it lengthways there runs a white Line with some small Knobs upon it, where the Arteries enter. Its Figure.

The Colour of the Spleen varies according to the Age; in a *Fœtus* 'tis red like the Liver; in Adult Persons 'tis blackish, by reason of the Melancholick Juice with which its stuff'd; in Riper Years its Colour approaches to a Lividity. In fine, 'tis more or less brown according as the Humour it harbours is more or less black. Its Colour.

The Spleen is tied to the *Peritonæum*, and the Left Its Ligaments. Kidney, and sometimes to the Midriff by very fine Membranes. But besides these Ligaments, its hollow Part is tied to the upper Membrane of the Cawl; and the whole Substance is fasten'd to the Stomach, by two or three remarkable Veins call'd *Vasa Brevia* or Short Vessels. from the shortness of their Passage.



Its Nerves,  
Arteries, &c.

The Nerves of the Spleen are derived from the Inter-costal Nerve: They do not stop at its Membrane, as the Ancients thought, but are dispersed in several twigs all over its Substance. Its Arteries are the Extremities of the Inner Branches of the *Cœliaca*, which after having rang'd all over its Substance by an Infinity of Branches, march out and are inserted in the Membrane: And 'tis upon this account that when we separate this smaller Membrane by Force, we meet with an Infinity of small red points, which are really so many drops of Blood springing from the torn Branches of the Arteries. The Veins of the Spleen having rang'd all over this Membrane, and thence detach'd a great number of small Branches interwoven like Nets; these Veins, I say, reunite and form the Splenick Branch. The Spleen is likewise provided with a large quantity of small Lymphatick Vessels, which twine round the Veins and Arteries, and then carry the *Lympha* to the Cistern of the Chyle, its course being regulated by an Infinity of Valves: This Lymph is yellow and sometimes reddish.

The Mem-  
brane of the  
Liver in Men.

In Man the Spleen has only one Membrane, which is very thick; its Inner Surface sends out hard Fibres which run across it: All these Fibres make a Net, the Interstices of which are of different Figures: We cannot separate this Membrane without tearing it, and 'tis that which renders it rough and uneven. These Fibres are fleshy like those of the Lungs.

The Opinion  
of the Anci-  
ents.

The Ancients took the Spleen for a *Parenchyma* made of Blood, congeal'd and thicken'd between the Fibres and the Vessels; and thought that it differ'd from the Liver only in its Substance and its Heat.

The true  
Structure of  
the Spleen.

But the Moderns, after a narrower View of its Structure, have discover'd that it consists of an Infinity of Membranes, which form small Cells of different Figures, being join'd to one another by Fibres and small Vessels running across; that these Cells have a communication one with another, and contain each of 'em small white Glands of an Oval Figure, in which the Nerves and Arteries terminate; that the Membranes which form these Cells are derived from the Tunicle of the Spleen as being all one continued Texture and Production of the Membrane that immediately surrounds the Spleen.

The Vessels  
of the Spleen.

As for the Vessels of the Spleen, it has two Nerves accompanying the Branches of the Artery, both of 'em being



being wrap'd up under one Covering; a very large Vessel springing from the *Arteria Cœliaca*, which divides it self into three or four Branches that run through the Cells, and at last terminate in the small Glands I mention'd but now; and small Veins springing from these Glandules, which by joyning together form large Vessels. Now these large Vessels upon their departure from the Spleen, unite, and so make the *Vena Splenica*, which after receiving four Branches by the way, terminates in the *Vena Porta*.

If you desire to see the Distribution of all these Vessels in a Spleen as well as a Liver, do but strip 'em both of their Membranes, and beat 'em upon a board, pouring water on continually; for by this means having dissolv'd and wash'd away what fill'd up the Intervals between the Vessels, you'll have an opportunity of admiring the prodigious quantity of these Vessels, and their industrious Fabrick.

Anatomists are so divided upon the Use of the Spleen, that one may safely say they know nothing of the matter. The Ancients made it the Cistern of the Melancholick Humour, (as the Gall-bladder is of the Bile) upon the plea that the Blood they found in it was black, but one can scarce understand what they mean by their Melancholy; not to mention that we know of no Cavity for containing that Humour, and can assign no use for it.

Others were of the Opinion that the Spleen was employed in filtrating some sharp Acid Humour, to be thrown into the Ventricle by the *Vasa Brevia*, in order to promote Digestion, raise the Appetite, and put the Aliment into a Fermentation. But this Opinion can never stand; for the *Vasa Brevia* being nothing else but Arteries and Veins, the one detach'd from a Trunk before they enter the Spleen, and the others gather'd into a Trunk before they depart from its Substance; these I say, can maintain no communication or commerce between the Stomach and the Spleen. The Arteries indeed may serve to convey Blood to the Ventricle; but that Blood does not come from the Spleen, in regard the Trunk had not reach'd the Spleen when these Branches were detach'd, so that they cannot transport any thing from the Spleen to the Stomach. The Veins are far less chargeable with it, for they carry the Blood from the Ven-

H  
The Spleen  
strip'd of its  
Membrane.

Different Uses  
assign'd to  
the Spleen.

tricle to the Splenick Trunk : Now that Trunk cannot throw Blood into the Spleen, for it carries the Blood from it to the *Vena Porta*. 'Tis therefore a necessary Conclusion, That the *Vasa Brevia* are only in the same capacity with all the other Vessels of the Body, the chief Office of which is to supply the Parts with Blood, for their Nourishment, under the name of Arteries ; and carry off what remains, in the form of Veins.

In fine, We have a convincing Argument against this Opinion, in the case of Dogs whose Spleens are cut out ; for they are so far from wanting an Appetite, that they eat more than other Dogs. But perhaps the Question may be put, How it comes that Splenetick Persons are great Eaters ? Now that proceeds from the predominant Acid in their Blood, which being thrown into the Stomach, twitches its Membranes, and so heightens their Appetite. And 'tis the same Acid prevailing in their Blood, that by galling the Nerves, occasions the unsufferable Pains they are liable to

But after all, though we should meet with no Glands in the Spleen qualify'd for Filtration, yet we cannot brand it for a useless Part : The Blood may receive some Alteration there, that may facilitate the Secretion of the Bile in the Liver. In earnest, Filtration ought always to be usher'd in by Precipitation ; that is, the *Molecula*, or little Particles, should be already separated, before they come to the Strainer : Those of the Bile, for instance, ought to be parted from those of the Blood, before they arrive at the Glands of the Liver.

This, perhaps, is the grounds that the Chymists go upon, in admitting of Ferments for all Filtrations, calling the Ferment of the Liver a Saline Sulphureous Substance ; because they observ'd two sorts of Principles in the Bile, one Saline, and the other Oily, and went upon this Maxim, *Salina Salinis, Oleosa Oleosis solvantur*. But there's no occasion for Ferments in the Precipitations perform'd in a Humane Body : For in all the Parts calculated for Filtration (excepting this) we meet the great Impulse of the Heart, the Spring of the Arteries, &c. which in their long passage continually lash the Blood, and so disunite the various *Molecula* that ought to be parted.

Now,

Now, in regard the Impulsive Force is but very weak in the Spleen; Nature, by way of Compensation, has appointed this Precipitation, and draws these two Principles of the Bile from two different Sources: The first, namely, the Oily Part, is deriv'd from the Cawl, where all the Veins lie under a very close connexion with the Fat, and receive this Oil from it. The other Principle is owing to the Spleen, by reason of the numerous Spirits that join the Blood there. In a word, we see two great Strings of Nerves terminating in the Spleen; to which we may add, that the Blood, by its stay, gives the Saline Part an opportunity of disengaging it self; and 'tis upon this account that the Spleen has indeed a very large Artery: but the Veins being much more considerable, and the Cells being capable to hold a great deal more Blood than the Artery can furnish, 'twill follow, that the Blood thrown out of the Capillaries of the Artery into these large and vast Cells, must needs make some stay there: For it is a standing Rule in the Mechanicks, that when any Liquor runs out of a narrow Chanel into a wider, it loses some part of its motion, and runs more slowly. Now, if we consider its stay in this place, added to the continual beating of the Fibres of the Spleen, which supply the want of the impulse of the Heart, and the Spring of the Arteries, we cannot but own that 'tis altered, and receives some Preparation. For 'tis plain, that when Nature means to prepare any Liquor, she drills it on through long and winding Chanels, that the prolonging of its stops may encrease the alteration.

The Animal Spirits which repair incessantly to the Spleen through these two Wreaths of Nerves that I mention'd above, promote this Preparation of the Blood two ways. In the first place, by mixing with the Blood, they attenuate and subtilize it, as being Nature's sharpest Tools. In the next place, they put in motion the Muscular Fibres of the Spleen, which grind the Blood, like so many Mill-stones. Upon the whole, we conclude, that the most probable Use we can allot to the Spleen, is that of Preparing the Blood for an easie Filtration in the Liver; and that this Preparation consists in attenuating, refining and grinding the Blood, and disengaging from it the Saline Particles of the Bile. 'Tis for this reason, that the Spleen and the Cawl, which contribute to that Filtration, are met

with in all Animals; and both the Veins of the one and the other march up and empty themselves in the *Vena Porta*, though the *Cava* is often-times nearer to 'em.

**The Pancreas.** The *Pancreas*, or Sweet-bread, is a body compos'd of a great quantity of Glands wrapt up in one Membrane. 'Tis seated under the lower and back-part of the Stomach, near the first *Vertebra* of the Loins. It reaches from the *Duodenum* to the Spleen, the principal part of it being in the left Hypochonder. 'Tis tied very fast to the *Peritoneum*, and weighs about five Ounces. Commonly it has ten Fingers breadth in length, one in thickness, and two in breadth.

Its Situation  
and Magni-  
tude.

Two sorts of  
Glands in  
the Body.

The Moderns allow only of two sorts of Glandules; to which they reduce all others, excepting those of the Kidneys. They call the one *Conglobate*, and the other *Conglomerate*. The *Pancreas* being a Member of the last class, I shall here take occasion to set 'em both in a clearer light.

Conglobated  
Glands.

The *Conglobate* Glands are those which are undivided, being of one substance and composition, which appears firm and continuous, with an even smooth surface. All of 'em are furnish'd with an Artery that imports the Blood, and a Vein that exports it after Filtration. They are likewise provided with excretory Vessels, sometimes one, sometimes more, which carry off the Liquor of the Secretion. Some of 'em have a Cavity in the middle; and Lymphatick Vessels, that empty themselves either in the Receptacle or the *Ductus*.

Conglome-  
rate Glands.

The *Conglomerate* Glands are compos'd of several little bodies, or glandulous Kernels, join'd under one Membrane; such are the Salival Glands, the Lachrymal, the *Pancreas*, and the Glands for Transpiration: Each of these Glands has, besides Arteries, Veins and Nerves, an Excretory Vessel spread through its Substance, by which the Liquors prepar'd by Secretion are convey'd to their respective Cisterns.

The Use of  
the Glands.

The Ancients were ignorant of the Use of the Glands; they thought they only serv'd to support and keep up the Distribution of the Vessels: 'Tis probable they did not give themselves the trouble to enquire whether these Vessels entered into the Glands or not; for if they had, they would have discover'd that all the Glandules in the Body separate some Liquor or other by their Natural Disposition; just as a Sieve grants passage through

through its Holes to such Particles as have a proportional figure.

The Liquors strain'd out by the Glands have different Uses ; some are employ'd in dissolving, others in moistening, and a third sort are doom'd to be voided.

The Use of the Liquors.

The Sweet-bread being one of the Conglomerate Glands, is furnish'd with all sorts of Vessels, namely, a Nerve from the Intercostal, Arteries from the *Cœliaca*, Veins leading to the Splenick Vein, and Lymphatick Vessels which run to the *Receptaculum*.

The Pancreas a Conglomerate Gland.

Besides all these Vessels, it has a peculiar Duct, call'd the *Pancreatick*, and discover'd *A. D.* 1642, by *Virsungus*, a celebrated Anatomist at *Padua*. This Duct or Passage is Membranous. When you lay it open, it presents you with a Cavity, which easily receives a small Probe that may be conducted to the *Duodenum* ; for it opens into that Intestine just by the Orifice of the Biliary Passage ; nay, sometimes the two Passages have but one Orifice. The facility of conducting the Probe all along the Cavity to the Intestine, and the difficulty of getting it in, when we mean to thrust it the opposite way, towards the Spleen ; this, I say, makes it to appear that the Passage leads only to the Intestine. The Liquor it conveys thither seems to be Yellow, by the colour of the Probe when 'tis drawn out.

The Pancreatick Duct.

This Passage does not come from the Spleen, for it does not touch it ; but from the Branches of the small Glands, of which the Sweet-bread is compos'd ; for the Passage enlarges in proportion to the uniting of these Branches. It terminates in the *Duodenum*, where its Orifice is guarded by a Valve allowing an *exit* to the contain'd Liquor, and opposing the entrance of the Chyle, and other Liquors contain'd in the Intestine. There is but one Passage of this nature, or at least 'tis very unfrequently seen double. In its natural state 'tis no bigger than a small Quill, but sometimes 'tis preternaturally enlarg'd.

This Passage penetrates into the *Duodenum*.

As for the Use of the *Pancreas*, it serves neither for a Cushion to the Ventricle, nor for a Support to the Vessels dispers'd over the *Abdomen* ; but by virtue of its Glands, to separate and strain out an acid Juice, to be convey'd through the Duct to the *Duodenum*, where it acts a Dissolving part in conjunction with the Bile, and finishes the Refining of the Chyle.

The Use of the Pancreas and Pancreatick Juice.

Before

*Capsula Atra-  
biliaris.*

Before we proceed to the Kidneys, we must take notice of two Parts, call'd by some *Capsula Atra-biliaris*, because an Humour resembling the *Atra Bilis* is sometimes found in their Cavity. Others call them *Renes Succenturiati*, because their figure is commonly the same with that of the Kidneys. Others again call 'em *Glandula Renales*, because they have a Glandulous substance, and are seated in the neighbourhood of the Kidneys.

Their Situation.

There are two of 'em, one on each side. They are plac'd sometimes above the Kidneys, and sometimes between it and the great Artery. They are enclosed in a very thin Membrane, and entangled in Fat, which occasions the difficulty of tracing 'em: That on the right side is commonly less than the other. Either of them is as big as a Wall-nut laid flat, and has a Cavity large enough, in proportion to its bigness. In a *Fœtus* they are generally as big as the Kidneys.

Their Substance.

Their Substance is scarce different from that of the Kidneys, excepting that 'tis somewhat softer, and more flaggy. It easily breaks, when one endeavours to separate 'em from the outer Membrane of the Kidneys, to which they are knit very fast.

Figure.

Their Figure is as inconstant as their Situation: They are sometimes round, oval, square, triangular; or to speak more properly, they have no determin'd figure.

Colour.

Their Colour is sometimes Red, sometimes the same with that of the Fat in which they are wrapt. In their Cavity they have small Holes which penetrate through their Substance.

They have a Nerve deriv'd from the Intercostal, which makes a *Plexus* in this place; one or two Branches detach'd from the Emulgent Artery, and sometimes from the *Aorta*, and a small Duct inserted into the upper part of the Emulgent Vein. Their Cavity has a Valve which opens towards the Emulgent Vein.

The Use of  
the *Capsula*.

Though the Use of the *Capsula* is not yet discover'd, we may nevertheless make our Conjectures from their Structure, and the Liquor they contain. I advance therefore, That probably they are Glands that make a Secretion of some Humour from the Blood, imported by the Arteries. That this Humour is afterwards conducted by their Small Vein to the Emulgent Vein,  
and



and there mix'd with the Blood, is plainly made out by the disposition of the Valve I mention'd but now; for it favours the course of the Humour to the Emulgent Vein, and hinders the Blood from flowing out of the Emulgent into the Cavity of the Glands.

The knowledge I have of the Structure of these Glands, prompts me to make this advance concerning their Use, which I take for truth. I affirm, That as soon as the Infant is born, their function is superseded; That they perform the office of Kidneys to the *Fœtus*, by separating the Serosity of the Blood imported by the Arteries, and then conveying it to the Emulgent Veins by the Duct that terminates in them. If this Opinion be well consider'd, we shall find that every Circumstance favours it. In the *Fœtus* they are very large, because then is the season of their Action; and as Age advances they dwindle, as being then useless. And as for the Kidneys in the *Fœtus*, they cannot make a Secretion of the Serosity of the Blood; and that for two Reasons. The first is, That if it were so, the *Fœtus* would be obliged to void Urine: The next is, That by that means the Blood would become too thick, the loss of the *Serum* not being repair'd by Drinking. Now the *Glandula Renales* obviate both these Inconveniencies; they separate the *Serum* before it can reach the Kidneys, and throw it into the Emulgent Veins, that its mixture with the Blood may render it sufficiently fluid, in order to a regular Circulation.

The Parts which purge the Blood of the superfluous *Serum*, call'd Urine, are of three sorts; namely, the Kidneys, the Ureters, and the Bladder: The first make a Secretion of the *Serum*; the second convey it to the Bladder, as soon as it's separated; and the Bladder serves for a Cistern where it's kept for some time, and evacuated when it swells to a sufficient quantity.

The Substance of the Kidneys is much harder than that of the Liver or Spleen: They are call'd *Renes*, from the Greek word *Ῥέν*, to flow; because the Urine flows incessantly into the *Pelvis*. They are two in number; and some Anatomists give this reason for their plurality, That when the one is indispos'd, the other might supply its defect. But that is not a satisfactory Reason; for at that rate, Nature ought to

The Parts that separate the *Serum*.

OO  
The Reins.



to have made all the Parts of the Body double, since they are all liable to disorders: It ought, for Instance, to have made two Hearts, that when the one puts a period to Life, the other might continue it. So that the alleg'd Reason wou'd be Nature's Motive. The true Reason seems to be the Perfection of the Work perform'd by these Parts; for though one Liver separates the Bile, one Spleen refines and exalts the Blood, and one Sweet-bread filtrates the Pancreatick Juice; yet in regard that the quantity of these Humours is not equal to that of the *Serum*, Nature has provided two Kidneys for the Secretion of it, one being insufficient. However, about ten years ago I dissected a Man that had but one Kidney, which was larger than ordinary, and seated in the middle of the *Abdomen*.

Their Situation.

The Kidneys are seated in the Region of the Loins, one on the right side under the Liver, and the other on the left under the Spleen: They lie under the *Psoas* Muscle, upon the sides of the *Aorta* and *Vena Cava*, without the *Peritonæum*. They are not directly opposite one to the other; for if they were, they would keep up the Serosity imported by the Emulgent Arteries, and so stop its course: But the right one is commonly lower than the left, both for this reason, and for that it lies under the Liver, which takes up more room, and descends lower than the Spleen: They are plac'd at the distance of about four fingers breadth one from the other.

Their Connexion.

They are fastened to the *Vena Cava* and the Great Artery by the Emulgent Arteries and Veins, and to the Bladder by the Ureters. The right Kidney is knit to the Gut *Cæcum*, and sometimes to the Liver: The left one is tied to the Gut *Colon*, and sometimes to the Spleen.

Figure.

Their Figure resembles that of a Half-Moon, or a Bean, or an *Asarum* Leaf: That side which faces the Vessels is hollow, the opposite side being convex.

Bigness and Colour.

Oftentimes one of the Kidneys is bigger than the other; sometimes the right, and sometimes the left. Commonly they are four or five fingers breadth long, three broad, and two thick. Their Surface is smooth and soft, like that of the Liver. Their Colour is a dark Red, at least 'tis very seldom that they have a sparkling Colour.

They

They are cover'd with the *Peritoneum*; besides which, they are immediately cover'd with a proper Membrane that keeps all their Glands in their natural order. This Membrane is very thin. Some alledge, 'tis a continuation of the Tunicle of the Vessels inserted in the Kidneys, which, by dilating themselves, line their inside; and then turning back upon the outside, cover that too. They are always cover'd with a great deal of Fat.

Their peculiar Membrane.

Each of 'em receives two Nerves; one from the Stomachick Branch, which spreads it self along the Membrane; and another from the neighbourhood of the Mesentery, which enters the hollow part of the Kidney, and is lost in its Substance. 'Tis these Nerves that occasion the Vomitings retaining to Nephritick Pains.

Their Nerves.

The Trunk of the *Aorta* sends out two large Arteries, which repair to the Kidneys; but before they enter the Kidney, they divide themselves into three or four Branches, which pass through the substance of the Kidney by its hollow part, and are lost in an infinity of little Glands, to which they convey the Blood and its *Serum* promiscuously mix'd.

PP Their Arteries.

The Blood imported by the Arteries to the Glands, that cannot pass through the Orifices of these small Pipes, is taken up by the Branches of the Emulgent Vein, which conducts it to the *Vena Cava*.

QQ Veins.

I have open'd this Kidney lengthwise, that you may see its inner structure. Its Substance is red, hard, and of a particular consistence, there being none like it in the whole Body. You may examine the Distribution of the Arteries repairing to the whole Circumference, and returning to these small Mammillary Bodies, eight or ten of which are expos'd to your view: They are call'd *Mammillares*, because they resemble the Nipple of a Woman's Breast; only they shoot out a little to a point where they are perforated, in order to let the Urine fall into the Basin.

A Kidney laid open.

The *Pelvis*, or Basin, is a Cavity made of the upper end of the Ureters, which dilates it self in the hollow part of the Kidney, and then becomes narrower in the form of a Funnel, the narrow part of which marches out of the Kidney, and makes the beginning of the Ureter. Its office is to receive the Urine that distills from the Nipples.

The Pelvis.

The Use of  
the Reins.

Authors are not divided upon the Use of the Kidneys. They all agree that they make A secretion of the Blood; so that all the Difficulty lies in adjusting the manner in which 'tis performed, without recounting the different Opinions of the Ancients upon that head, I shall only tell you that the Glands which make almost the whole Substance of the Kidneys, receive the Blood by the Branches of the Emulgent Arteries, and separate the Urine from it by vertue of the configuration of their Pores. When the Urine is thus separated, they empty it into several small Pipes, which re-unite and so form the Mammillary Pyramids; from whence it distils into the *Pelvis* and so falls through the Ureters into the Bladder.

SS  
The Ureters.

The Ureters are two Canals of a peculiar form, which spring upon each side from the *Pelvis* of the Kidneys, and are cover'd with the *Peritoneum*. They terminate in the Bladder not far from its Neck. But 'tis observable that these Canals or Passages are furnish'd with Annular Fibres, which enable them to contract themselves and so to facilitate the course of the Urine into the Bladder.

Their Size  
and Figure.

Their Length is equal to the Interval between the Kidney and the Bladder. Their Natural Bigness is equal with that of a Writing Pen; but in the case of Nephritick Pains, their Cavities are sometimes so dilated as to receive ones Little Finger. In Figure they resemble an S.

Their Membrane and  
Vessels.

They are compos'd of a Membrane peculiar to themselves, which is very strong. They are furnish'd with Nerves from the Intercostal Branch, which entitles them to an exquisite sense, and occasions the unsufferable Pains that attend the Gravel. They receive Branches of Arteries from the neighbouring Parts, and return 'em small Veins.

Their Origin  
and Insertion.

Some alledge that these Ureters take their Original from the Bladder, which has a white and Membranous Substance as well as they; But, as I take it, they derive their Original from the Kidneys; for the beginning of all Conduits must be calculated from the place where they take up their Liquor, and their end falls to the place where they drop it; so that they commence at the end of the *Pelvis*, upon their *Exit* from the Kidneys and terminate in the Bladder, which they perforate very artificially; for having pierc'd through

through the outer Membrane, they run for two Fingers breadth between the two Membranes, and then perforate the inner one near the Neck of the Bladder. By this contrivance the Urine having once enter'd the Bladder, cannot return the way it came, the Orifice of one Membrane being stop'd by the other.

The Ureters are of Use to receive the Urine separated in the Kidneys, and convey it to the Bladder. Their Use.

The Bladder is a Membranous Part which forms a considerable Cavity, fit to contain the Urine and the solid Bodies that are preternaturally bred in it, such as Stones, &c. T  
The Bladder.

'Tis cover'd with the *Peritoneum*, and seated in the middle of the *Hypogastrium*. in the large Oval Cavity form'd by the *Os Sacrum*, the Haunch-Bone, and the *Os Pubis*. Its Situation.

The Figure of the Bladder is round and oblong, not unlike a Bottle with the Head turn'd downwards. Its Figure and  
Size.

'Tis larger in some Persons than in others, and when it happens to be too small, the Person is oblig'd to piss often.

The Substance of the Bladder is Membranous, and consequently impower'd to extend and contract it self upon Occasion. 'Tis compos'd of two peculiar Membranes, its common Membrane being nothing else but the *Peritoneum* that covers it. The first of the proper Membranes is thick, solid, hard, and interlac'd with Fleshy Fibres, by vertue of which it contracts it self in the voiding of Urine. The second or Internal Membrane is thinner and finer, endow'd with a tender Sense, and full of Chinks and Clefs which facilitate its Dilatation and Contraction. 'Tis cover'd with a sort of Slime that guards off the Action of the Urinous Salts. Its Substance.

The Bladder is provided with two Nerves, one from the Eighth Pair which is inserted in its Bottom; and another from the Pith of the *Os Sacrum* which terminates in its Neck. 'Tis nourish'd by Arteries from the Hypogastrick Branches, and returns the remainder of the imported Blood by small Veins which terminate in the Hypogastrick Vein. Its Vessels.

The Bladder has two remarkable Parts, namely the Bottom and the Neck. The former is the largest Part, and best qualified for the containing of Urine. In Men it rests upon the *Intestinum Rectum*, and in Women V  
Its Bottom.

men upon the Womb. 'Tis pretty broad and wide, and growing smaller by degrees terminate in the Neck.

Its Neck.

The Neck is the narrowest and withall the thickest and most fleshy part of the Bladder. 'Tis much longer, narrower, and fuller of Windings in Men than in Women. It has a small circular Muscle call'd the Sphincter of the Bladder, by vertue of which we open and shut its Orifice at pleasure.

Its Connexion.

The Bottom of the Bladder is tied to the Navil by the *Urachus*, which holds it up to prevent its falling down upon the Neck. The Neck rests upon the straight Gut, and the Neck of the Womb in Women.

Its Holes.

The Bladder has three Holes, two Internal made by the Ureters near its Neck; and one External which gives Vent to the Urine.

Its Uses.

The Use of the Bladder is to receive and contain the Urine imported by Drops by the Ureters; to keep it as in a Cistern for some time, and to evacuate it upon occasion by the means of the Sphincter, which opens and shuts pursuant to the will of the Person.

And now, GENTLEMEN, though I've perform'd my Promise in demonstrating all the Parts that contribute to the Perfection of the Blood, and purge its Mass of all that can annoy it; yet having design'd to shew you a perfect Anatomy, I shall take occasion in this *Demonstration* to lay before you the two large Vessels of the *Abdomen*, namely the Great Artery and the *Vena Cava*.

The Great Artery and the *Vena Cava*.

The Artery is compos'd of several Membranes which are very strong; for it contains a sprightly volatil sort of Blood that suffers a continual Agitation, and stands in need of Force to resist the Motions imparted to the Blood from the Heart, On the other hand, the Membranes of the Vein are very thin and slender, for the Blood it contains in a State of Tranquillity, and 'tis employ'd in conducting it to the Heart.

Y

The Great Artery.

This Great Artery is the *Aorta*. It rises directly out of the Left Ventricle of the Heart, where it receives the Blood in order to disperse it all over the Body. Upon this Occasion I shall only shew you the Arteries it sends to the *Abdomen* after its Perforation of the Diaphragm. There are seven in number. The first is the *Cœliaca*, which splits into two Branches, one on the Right side bound for the Liver, and the other on the Left for the Spleen. The second is the Upper Me-

senterick

enterick which visits the upper part of the Mesentery. The third is the Emulgentes which run to the Kidneys. The fourth the Spermaticks which repair to the Parts that are calculated for Generation. The fifth the Lower Mesenterick which repairs to the Intestines and the lower part of the Mesentery. The sixth is the *Lumbares* which serve the Muscles of the Loins. The Seventh the Upper *Musculares* which are lost in the Flesh.

When the *Aorta* reaches the *Os Sacrum*, it gets over the *Vena Cava*, and divides it self into two large Arteries call'd the *Iliaca*. Each side has one of 'em, which subdivides it self into the Internal and External. The Internal Iliack Artery, which is the least, detaches four Arteries, namely the *Sacra*, the *Muscularis Inferior*, the *Umbilicalis*, and the Hypogastrick. The External Iliack which is the larger of the two, sends out the Epigastrick and the *Pudenda*, and then marches to the Thighs, where it changes its Name, and assumes that of *Arteria Cruralis*. Here we take leave of it, meaning to shew it in its proper place.

Where the Iliack Artery terminates, there's a Vein of the like size which we call the *Iliaca Externa*, and which receives not only three other small Veins, call'd *Muscularis Inferior*, *Pudenda*, and *Epigastrica*; but likewise the Internal Iliack Branch consisting of two Veins, namely the *Hypogastrica* and the *Muscularis Media*. These two Iliack Veins upon one side, and the other two upon the opposite side, begin about the *Os Sacrum* to form a very large Vein, call'd the ascending *Vena Cava*, which is further enlarged by the Accession of the *Sacra* and *Muscularis Superior*.

I would not have you to think, GENTLEMEN, that I was guilty of an Oversight in calling it the *Ascendens*. 'Tis true, all Authors call it the *Descendens*, upon the plea that the Blood descends through it from the Liver, in order to nourish the Parts that lie below the Diaphragm. But since we are now assur'd that on the contrary it conveys the Blood from the Inferior Parts to the Heart, we have all reason to give it the Name of *Ascendens*. It begins to assume the Name of *Vena Cava* upon the *Os Sacrum*, where the four *Iliaca* joyn. As it rises higher, 'tis join'd by four sorts of Veins, viz. The *Lumbares*, which come from the Muscles of the Logins. The *Spermaticæ* springing



*Of the Instruments of Generation in Men.*

from the Instruments of Generation. The Emulgents from the Kidneys: and the *Adiposa* from the *Membrana Adiposa* of the Reins. This done, the *Vena Cava Ascendens* strikes through the Diaphragm into the Breast, and terminates in the Right Ventricle of the Heart, where we now leave it till we come to demonstrate the Parts contained in the Breast.

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**The FOURTH DEMONSTRATION.**

*Of the Instruments of Generation in Men.*

**S E C T. I.**

**P**ursuant to my former Division of the Parts contain'd in the *Abdomen* into three classes, 'tis necessary, GENTLEMEN, that the two last *Demonstrations* of the Parts employ'd in Chylification and the refining of the Blood, should be follow'd by a View of those which are calculated for Generation. To avoid the confounding of the Parts peculiar to Man with those of a Woman, I shall make two *Demonstrations* upon this Subject.

Man comes into the World only in order to die. This is so constant a Truth that every step he makes leads him to his End. Nothing can render him immortal; and all the Succours that Physick affords, do but put off Death for some days, without being able to avoid it. The only Solace we have under this indispensable necessity of Dying, is that of seeing our selves spring up again in a Son, Now this Advantage is owing to the Parts calculated for Generation; for 'tis by them that Nature perpetuates it self by producing new Creatures to supply the room of those who are gone. And to the end that Man might be excited to the Production of his own Image; Nature has given to those Parts such a quick tender Sense, and a transporting Titillation, that without listening to Reason, he courts Satisfaction; and indeed, 'tis oftentimes  
the









