

# PHILOSOPHICAL TRANSACTIONS:

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## **Osteographia Elephantina: Or, A Full and Exact Description of All the Bones of an Elephant, Which Died Near Dundee, April the 27th, 1706. With Their Several Dimensions. Communicated in a Letter to Dr. Hans Sloane, R. S. Secr. By Mr Patrick Blair, Surgeon, &c.**

Patrick Blair

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### **References**

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# *Osteographia Elephantina :*

O R,

A full and exact Description of all the Bones of an *Elephant*, which died near *Dundee*, *April* the 27th, 1706. with their several Dimensions. Communicated in a Letter to Dr. *Hans Sloane*, R. S. Secr. By Mr *Patrick Blair*, Surgeon, &c.

S I R,

**T**HE *Elephant*, tho' an Animal so considerable for its Bigness and Strength, so remarkable for its extraordinary Endowments and stupendous Actions (if I may so call them,) that it has become the Subject of the most Curious Naturalists of all Ages, and been admir'd by all those who beheld it; yet has its Body been hitherto very little subjected to Anatomical Enquiries. This induc'd Me (when upon April 27. 1706. the last *Elephant* that was in *Britain* died near this Place) to bestow some Pains in viewing its Parts at the Opening: But the Time was so short, and Inconveniencies I labour'd under so great, that I was doubtful, whether what I had observ'd might prove worth your Own or your honourable Society's while, until I had address'd your self, and you were pleas'd to honour me with a return dated *July* the 11th following: Wherein you signify'd, ' You were glad the *Elephant* had fall'n where Notice might be taken of its Parts by Dissection, and that the Bones would be well worth Observation, for several Reasons; but chiefly one, namely, that there have been large Bones, supposed to be those of *Elephants*, found many Feet deep in the Ground, and that if there were a Skeleton to compare them by, that matter would be more certain: And there-

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fore (tho' I had told you in mine that I was able to make but a few of them) you desired me to let you have my Observations. The better to enable me to do which, you favour'd me with two Treatises on *Elephants*, which I suppose to be the only Two hitherto communicated to the *Royal Society*; one whereof gives an Anatomical Account of the *Elephant* accidentally burnt in *Dublin*, Anno 1681. written by Dr. *Moulins*; which, tho' it requires a further Enlargement, being very brief both in the Anatomy and Osteology, and the Figures not very exact, yet seems to have been the only Book which undeceiv'd the Author of the other, viz. *Wilhelmi Ernesti Tentzelij Historiographi Ducalis Saxonie Epist. de Sceleti Elephantino, Tonna nuper effosso, ad Anton. Magliabechium magni Ducis Hetruria Bibliothecarium*. This is the Treatise which describes the Bones menti<sup>n</sup>d by you, found in an Hill near *Erfurt* in *Germany*; wherein the Author earnestly intreats, 'That tho' by distance of Place he cannot expect from his Friend such a Figure of the *Elephant* at *Florence*, (as *Cyampinus* formerly obtain'd) yet, that he would, as exactly as possible, take the Dimensions of all the Bones, especially of the Head, Teeth and Tusks, their Number, Situation and Origin; and he desires further to know, how old that Sceleton at *Florence* was, how high, and when it was dissected.

Therefore, Sir, in Obedience to your repeated Request, in the several Letters you were pleas'd to Honour me with, and finding the Author of the last nam'd Treatise, has favour'd the Repository of your Society with several Specimen's of the Bones he describes, some whereof perhaps being broke, may come not to be so well known; that I may satisfy you to whom I am so much bound, for the many special and signal Testimonies of your Favour, your honourable and learned Society, for whom I have so great a Veneration and Respect, and to whom I shall be extreamly glad, if by these means I may be capable to do any small piece of Service, and the Learned *Tentzelius* in that he so earnestly desires, and wherein I do not yet understand his Friend has answer'd him: In a word, that I may satisfy the World in such Things as were of Moment in this rare and curious Animal, I shall observe the following Particulars, &c.

The Method  
of Procedure;

1<sup>st</sup>, Shew, how the *Elephant* fell in our way.

2<sup>dly</sup>,

2<sup>dly</sup>, Remove some mistakes which have been entertain'd, concerning its Original Names in the Holy Scriptures.

3<sup>dly</sup>, Give a short Historical Account from Authors of the several Natural Functions and Automatical Performances of this Animal, with the Method of taking and taming it.

4<sup>thly</sup>, I shall give such a Superficial Anatomical Description of its Parts, as the Inconveniences I labour'd under at the opening would permit.

5<sup>thly</sup>, I shall give an exact Description of all its Bones, such as is usually given in Treatises of *Osteologie*, with a particular Account of the Dimensions of these in this Subject.

6<sup>thly</sup>, A true Account of their Weight and Number.

7<sup>thly</sup>, The Method I us'd in mounting the Sceleton.

To all these I have added the Figures of the stuff'd Skin, mounted Sceleton, separated Bones in different Views, and other Parts of this Animal; all done from the Original, (and represented in several large Copper Plates) as it now stands in the Hall of Rarities in this Place; the Copy whereof the *Royal Society* has been already pleas'd to approve, as intimated in yours to me in *June* last.

After this Animal had travell'd most part of *Europe*, she came at last to this Kingdom; where, after some stay at *Edinburgh*, they conducted her to the *North*, and in their return came along the Sea-Coast; where being but few Places on the Road for making Advantage, by long and continued Marches they haltned hither; and when they were come within a Mile of this Place, the poor Beast, much fatigu'd and wearied, fell down. They us'd many Endeavours to get her on foot again, but they all prov'd ineffectual. At last they digg'd a deep Ditch, to whose Side she might lean, till she were sufficiently rested; but that proved her Ruin; for shortly afterwards there fell great Rains, which fill'd the Ditch with Water: So that after lying in the puddle a whole Day, she died next Morning, being *Saturday April* the 27<sup>th</sup> 1706. When the Keepers saw that she was Dead they came to the Ma-



Sustrates of this Burgh, and having made Oath they had done her no designed injury, they got an Attestation accordingly, and went off, having first given the Cadaver to an Ingenious Gentleman, Capt. *George Teman*, since Provost of this Town; by whose Care the People were prevented from carrying it all away in pieces, as they did one of the fore Joints, and we still continue Masters of the Remains; for the Day she di'd, he was pleas'd to go out himself, and take me along with him, in order to have the Skin flea'd off, which was his chief design, and the Body opened, which was mine. As I was very glad of the Opportunity, so I was concern'd because of the disadvantage I was at, which kept me from prosecuting what I design'd: For there went out a great Multitude, the Day was very hot, and being the last Day of the Week, the Subject could admit of no delay, especially since it lay in the high Way and open Fields: So that I scarce had any convenience to pry into, or so much as to see any thing of moment, much less to enquire so nicely into the Structure of the Parts, as the Subject requir'd. 'Twas One of the Clock in the Afternoon before all were in readiness to go out, and most of the time was spent by the Butchers in fleaing off the Skin. All I got done, was to take such narrow Inspection of the Muscles of the *Proboscis*, (or *Promuscis*, as some call it, in *English* the Trunk) as I could. Afterwards I caus'd the *Abdomen* to be open'd, and then the *Thorax*, and that by the unweildy Hands of unruly Butchers, who at opening the first, would have wholly cut through the *Ossa Innominata*, had I not hinder'd them; and at last, whether I would or not, did so slash the *Sternum*, and mangle several of the *Cartilages*, as to render them usefess, cutting and tearing where soever they came. I had not much above an Hour to bestow when Night came on, and that amidst a Throng and Rabble in mighty hot Weather. During that time I view'd the Situation of the *Viscera*, took the Figure and Dimensions of the *Liver*, extracted the *Uterus* and *Bladder*, and caus'd the *Head* to be cut off, which (with some other Parts I design'd to have dissected) were brought to Town. I had a mind to be more fully satisfy'd about the *Intestines*, *Spleen* and *Kidneys* on *Monday*; but when I went out again, the *Intestines* were all dry'd by the Heat; so that their Figure and Structure were quite spoil'd, and the Country People were so earnest to have Parts of it, that they had stole away the whole fore Foot before that time; which, after much Pains and the earnest Care of Provost *Teman*, we recover'd about 6 Weeks after-

afterwards : So that the time I design'd to have bestow'd in Dissecting the Parts I had reserv'd, was taken up in excarnating, boyling, and taking care of the Bones ; which, had not some Physicians and Surgeons gone out and assisted me on the *Monday*, had been all carried off, and the heat of the Weather was such that the other Parts would not keep. This, I hope, will be a sufficient excuse for the Lameness of the following Account.

Because the Names given to the *Elephant* in Holy Scripture have been much mistaken, tho' perhaps it may seem foreign to my Business, yet I hope 'twill not be displeasing, if from Authors I endeavour to clear them. *Junius* and *Tremellius*, *Franzius*, &c. who comment upon the 40<sup>th</sup> Ch. of *Job* v. 25. and downward, take the *Behemoth* for the *Elephant* ; but others, such as the Learned *Bochart*, *Par. 2. lib. 4. c. 15.* and from him *Dr. Patrick*, are of Opinion, 'tis not the *Elephant* which is meant there, but the *Hippopotamos*, or River Horse ; for *Buxtorf* and such others as are acquainted with the Original, agree, that the Word *Behemoth* does not properly signify any thing more than a great Beast ; and both in *Job* and *Esdras*, 6 Ch. v. 49. (where the *Behemoth* is translated *Enoch* in the *English Bible*) the *Behemoth* and *Leviathan* are nam'd together. *Esdras* makes them the Work of the Fifth Day, wherein Fishes, other Sea Animals, and Sea Fowls were created ; by which not the *Elephant*, but the *Hippopotamos* may be meant, which *Bochart* proves by the following Arguments. 1. As in *Job* 39. Land Animals, such as Quadrupeds and Fowls, are spoken of ; so in the 40 and 41. *Behemoth* and *Leviathan*, as belonging more properly to the Water, are treated of. 2. The Force of the *Behemoth* is said to be in the Navel of his Belly, whereas 'tis the softest part of the *Elephant* ; but in the *Hippopotamos* it is so thick and impenetrable, that it resists both Spears and Darts, which he abundantly proves from Authors. 3. The *Behemoth* is said to move his Tail like a Cedar ; now the Tail of an *Elephant* is long like that of an Ox, and but small in proportion to the Body ; and to move like a Cedar, would import some strong round substance, and rather seems to agree with what *Bellonius* affirms of the *Hippopotamos*, that *Caudam habet brevem, crassam & rotundam*, tho' *Bochart* renders it *Retorquet, & non arrigit Caudam*, as *Junius* has it. 4. *Bochart* says, that the Word in the Original will not imply *Nervis Testium ipsius*, as *Junius* has it, but *Nervis Femorum &c.* Not the Sinews of his Stones, but the Nerves of his Thighs are intricate. 5. The *Elephant* seldom lies down, and never in the

*The Behemoth in Job is not the Elephant.*

the Cover of Reeds and Fens; for tho' it loves Water very well, yet it would be very hurtful to such an unweildy Animal to lye down among such moisture as Reeds usually grow in, or the being among the Willows of the Brook would import. 6. At the taking of an *Elephant* they never pretend to ensnare it by the *Proboscis*; and when taken it is a most decile Creature, it being more compatible for the *Hippopotamos* to pass through Snares: The usual way of catching it being in Nets made of Iron, which they make on purpose at *Damascus*, as *Albertus* and *Vincentius* affirm; and when taken, is no ways managable, but they are forc'd to kill it with Iron Mallets, because of the thickness of the Skin. 7. Tho the Bones of the *Elephant* be proportionably big enough, yet they are far from such Strength as to make a Parallel between them and Brass or Iron; for they shall be shewn hereafter to be more porous than the Bones of most *Quadrupeds*: And although their Tusks and Teeth may be said to exceed all other Bones in Solidity and Whiteness, yet I am assur'd, that the Teeth of the *Hippopotamos* doth even exceed them; for the Ivory of an *Elephant* after some time becomes Yellow, and the Teeth of the *Hippopotamos* when apply'd to any use, continue always of a pure white Colour.

The different  
Names of the  
Elephant.

An *Elephant* in the *Syriac* and *Arabic* is *Senhab*, but in the *Chaldaic* and later *Hebrew* 'tis taken for *Elephant's Teeth*, because *Sen* in the *Hebrew* signifies a Tooth. Hence it is, that *1 Kings*, Ch. 10. V. 22. 'tis rendred by *Junius*, &c. *Ebora*, *Semias* & *Pavones*, *Ivory*, *Apes* and *Peacocks*, in our Translation; where *Senhab* is rendred by the later *Hebrews*, *Dentes Elephatorum*, but by the *Syrians* and the *Arabians*, *Elephantos*; and therefore *Bochart* thinks it should rather have been *Elephantos*, *Simias* & *Pavones*: First, because of their better Coherence; and secondly, because *Ivory* would not have been *Senhabim* in the Plural Number, but *Senhab*, *Dens Elephantis*; for *Ivory* is denoted elsewhere in Scripture by the Word *Sen*, as V. 18. of that same Chapter, where 'tis said, *Solomon* built a great Throne of *Ivory*. *Sendephil* also in the *Chaldaic* Phrase is taken for *Ivory*; for *Phil* signifies an *Elephant* both in the *Syriac*, *Chaldaic* and *Arabic*. An *Elephant* in the Ancient *Hebrew* was call'd *Alikhaban*, and by Contraction *Alkaban*, that it may be distinguish'd from *Ikhaban*, which signifies a Buffle or Bugle, because both are of that Colour: So *Bochart* conjectures, that *Sen* being prepon'd to *Kahab*, may by Contraction be call'd *Senhab*, which by a *Synecdoche* may mean the whole *Elephant*.

*Elephant*. In *Greek* it is call'd, *ἐλέφας*, and sometimes *Βουρην*, which is rendred *Bos Martius*, whereby they mean the *Elephant*. In *Latin* 'tis call'd *Barrus*, from the Voice; or some think that *Barrus* is the proper Name, as in *Horace* — *Nigris dignissima Barris*; *Hor. Epod.* and that *Barrire*, to Bray as an *Elephant*, comes from it. Thus <sup>12.</sup> we have from *Pellonius*, *Elephantes barrire dicimus, sicut Oves decimus ballare*. Amongst the *Indians* they are call'd *Prasij* and *Taxilla*. Thus *Elianus* says, *Maximi Elephantorum qui illic sunt Prasij dicti, secundi vero ab ijs existimantur Taxilla*. In the *Punic* and *Moorsish* Language it is call'd *Cesar*; hence it is, as *Servius* says, <sup>Hist. Lib.</sup> *Cesar, vel quod caso Matris Ventre natus est, vel quod Avus ejus in Africa manu propria occidit Elephantem, qui Cesar Pencerum Lingua.* It is also call'd in *Latin*, *Bos*, *Lucas*, and *Elephantas*, from the *Greek*.

The *Elephant* is said to live to a great Age: Some asserting, they live to One Hundred and Twenty Years; Others, to 200 <sup>To what Age they live.</sup> Years; some to 300; and there are who affirm, that they can live till they be 500 Years old, and that they are very strong and robust at the 200 Year. *Temzelius* tells us, that when a certain *German*, who had sometimes been in the *Indies*, saw these Bones he treats of, concluded from certain Marks the *Indians* have, that that *Elephant* could not have been under 200 Years old. *Mr. Tavernier's* <sup>Travels in India, p. 26.</sup> *vernier* says, he could never learn exactly how long the *Elephants* liv'd; but that their Keepers have told him, they knew such an *Elephant* to have been in their Great Grand father, Grand-father, and Father's Custody, which he modestly computes not to have been under 120 or 130 Years. And 'tis memorable, which *Juba* King of *Lybia* told, as it is related by *Philostratus*, that the Knights of *Lybia* at a certain time fought upon *Elephants*, some whereof had a Tower engraven upon their Teeth, others nothing; and when by the Night they were separated, such as had the Tower were beat, and fled to the high Hill *Atlas*: And that the same *Juba* after 400 Years took one of them, which had this Ensign so lively engraven, as if it had been but lately done. I am not to answer for the truth of this, but they seem generally to live to a great Age; for the Keeper told, that the *Elephant* which fell in our way was 26 or 28 Years old; notwithstanding which she seems to have been Young, according to the Term of Life, for the *Epiphyfes* separated from the Bones by Boiling as easily, as those of an Human Subject would have done at the Age of 10 or 12. However, 'tis an Animal Subject to many Distempers; so that

that tho' they may live to some of the fore mentioned Ages, yet mostly them perish before they come to such length.

*Usual bigness of the Elephant.* 'Tis certainly an Animal of considerable Bigness; but whether ever so large as to contain 32 strong Men upon its Back, as is related, *Maccab* (h. 6. v. 27. beside the *Indian* that govern'd it, is much to be doubted; and 'tis more probable that this is an Error in the Impression, as is well enough observ'd by *Grentemesnil*, who

*Bochart de Animal. S.S.* instead of *Ἀνδρες δυνάμεις δύο καὶ τριάκοντα οἱ πολεμῶντες ἐπ' αὐτοῖς, Viri fortes duo & triginta, pugnantes in ijs*, believes it should be rather, *Script. C. 27.* *Ἀνδρες δυνάμεις δύο ἢ τρεῖς ἀκόντιστοι πολεμῶντες ἐπ' αὐτοῖς, Viri fortes duo Col. 269.* *aut tres pugnantes super ipsos Faculis.* Indeed *Philostratus* speaks

*Philost. lib. 2. c. 1.* of 10 or 15 *Indians* fighting in Castles with Darts on *Elephants* Backs: And *Paulus Vineta* says, that in the *Ginger Islands* they have

*Lib. 3. C. 41.* Wooden Castles upon *Elephant's* Backs, which can contain 15 or 20 Men. But the Learned *Bochart* very pleasantly says of these Authors, that *de magnis majora loquimur*; because this is a big Beast, they delight to speak at random of it. I rather believe what *He-*

*Heliod. lib. 9.* *liodorus* says; that the Towers upon the *Elephants* Backs could contain 6 fighting Men, who from each side drew Darts, the hinder part remaining void; or *Cadamustus*, that they put Towers upon

*Cap. 62.* the Back, which can hold 3 or 4 Men that fight upon them; and *Alianus*, that they carry 3 Warriours fighting from either side, and the 4th which governs them. Which 3 last Accounts seem very well to quadrate with the usual height ascrib'd to them: About which some Authors talking more largely, tell us of 18 or 16 foot high; but the most received Account is, that they are from 13 to 8 foot: So that as our *Elephant* was none of the biggest, she did not seem to have been any of the least size. I shall give you her particular Dimensions hereafter.

*Their manner of Procreation.* The next to be consider'd, is their manner of Procreation, about which Authors differ very much. All agree that it is an Animal of extraordinary Modesty, and therefore never copulates in view of any; which because 'tis a big unweildy Body, hath put Authors to a loss as to the Posture. Some asserting, that it is Retrocoient and Retromingent; among whom is *Dr. Moullins*, from an Observation he has made of the Situation and Structure of the *Penis*. Others observing the distance betwixt the *Anus* and *Vagina*, and that the Dugs are situated between the fore Limbs, are of Opinion, that the Female is in a Supine, and the Male in a Prone Posture: Among whom is *Tavernier*, who tells us, ' That the Female gathers a great deal of Herbs and Weeds, and makes her

her Bed some 4 or 5 foot high from the Ground, where she throws herself, and lies on her Back in expectation of the Male, whom she invites by a peculiar Cry; therefore perhaps it may be, that the Duggs are placed so forward, to avoid the Pressure. A third Opinion is, that at the *Coitus*, the Female descends into a Ditch, and that the Congress with the Male is no otherwise with them than with other Quadrupeds. As to the first, I can scarce believe it probable, because there can be no such thing as a Retrocoient Animal; for that would quite invert the order of Nature, and give a far different motion to the Muscles of the Thighs, than they can be supposed to have from their Situation; and I am credibly inform'd by those, who have been at the Pains to observe them, that Hares, Cats, Rabbits, &c. who are said to be Retrocoient, do Copulate no other way than Dogs and other Quadrupeds; and that Retrograde Posture we see Dogs in at that time, is nothing but an endeavour to get rid, when (by means of the swelling of the *Glans*,) the Male and Female are too close together, and far from a design of penetrating further into the *Vagina*. As to the second Opinion, were it not for Monsieur *Tavernier's* Assertion, I should think it too unweildy an Animal, and of too small an Inclination to lye down, to acquire such a Posture. The third Opinion is, that the Natural Sagacity of the Animal disposes the Female to go into the Ditch, and both fore and hind Legs seem to be so articulated as to favour this: For when the Female would bring the Body low, she has no more to do, but to stretch forward her fore Feet, and then the Articulation of the *Humerus* with the *Cubitus* will bend backward; and to bring back her hind Feet, so as to bend the Knees forward, by which she can bring the fore part of the Body so low, as to make the *Nates* Protuberant, and bend the hind Legs, whereby to put the *Vagina* in a convenient Posture for Reception of the *Penis*, according to that of *Aristotle*, *Subsistit Femina, Clunibusque Submissis, insistit pedibus ac innititur*; and elsewhere, *Flectit certe suos posteriores Poplites modo Hominis*. Which of the two last Opinions may be true, I know not, but you have the Assertion of two famous Authors for both.

What Time they begin to Copulate is uncertain; tho' from their usual term of Life, Authors seem probably to conjecture, that some begin at the fifth Year, others much later, yea, not till the Twentieth. The time also of their going with Young is in debate; for their innate Modesty keeps such as would

observe them from any certainty. The only way to know, is (where they abound) to observe their separating themselves from the Flock; for it is a gregarious Animal, as Naturalists term them; and 'tis observ'd, when they begin to be proud, (so to speak,) that the Male and Female go apart, (and if any observe them at that time, the Male runs upon them with Fury and Madness) and do not return till the Female is impregnate. Some fondly imagine from their extraordinary Bigness, that they go with Young 9 Years, others 6, and others 2; but to me the most probable is, that of 15 or 16 Months; and if we observe the ordinary course of Gestation in other viviparous Animals, it is according to the Bigness and Term of Life, that the Female usually goes with Young. Thus you have Bitches and Cats going but 9 Weeks, while Mares and Cows go 9 Months: So that, *Ceteris paribus*, this our Animal may be suppos'd to go 15 or 16 Months; and Mr *Knox* in his Relation of the Island of *Ceylan*, tells us, they go not with Young above one Year: Some say, they bring forth after every third Year; and others, never but once in their Life. The first Opinion may be probable, but the second is scarce to be believed; for it would be still more wonderful, and next to an Impossibility, to see such Numbers of *Elephants* in Armies and Countries, as we read of. Mr. *Tavernier* tells us, 'He has been inform'd, that the Great *Mogul* keeps Three or Four Thousand *Elephants*; but that the chief Master assur'd him, he had not above 500 said to be of his House, and design'd for carrying Women, Tents and Luggage, and about 80 or 90 for War; which is a great Number of tam'd ones. And from thence we may suppose, that there must be a far greater Number of Wild ones in his Dominions, besides what are in the Kingdom of *Pegu* (where, as *Schotto* relates from *Garzias ab Orta*, at one Hunting there were 4000 taken at once) *Siam*, *Cochin* and *Boutan* near Great *Tartary*, besides these of the Island of *Sumatra* and *Ceylan*; where *Tavernier* reports for a certain truth, 'That when any *King* or *Roja* has one of them, if they bring the Breed of any other Place, so soon as the other *Elephants* behold the *Ceylan Elephants*, by an Instinct of Nature they do them Reverence, by laying their Trunks upon the Ground, and raising them up again. 'Tis said the Male never copulates with the Female after once she is impregnate; and some will have us to believe, that every Male keeps to his own Female. 'Tis also said to be a very temperate Creature, and seldom in Lust.

*Tavernier*

*Atta Lips.*  
*Suppl. Tom.*  
p. 1. pag. 39.

*Mirab. Ani-*  
*mal. Ter.*  
lib. 8.

*Tavernier's*  
*Travels in*  
*India* 195.

*Tavernier* tells us, that the Male never meddles with the Female when once he is taken, but is sometimes seized with a lustful Rage, whereof he gives this memorable Instance: ' One Day ' when *Chajehan* King of *India* was a Hunting upon one of his *Elephants*, with one of his Sons who sat by him, the *Elephant* ' became so furious by reason of his Lust, that the Governor, who ' was by no means able to master him, declar'd to the King, that ' to allay his Fury, who would else doubtless bruise him to pieces ' among the Trees, there was no way but for One of the Three ' to forfeit his Life, and that he would willingly Sacrifice his for ' the safety of the King, and the Prince his Son; only he desir'd ' his Majesty would take care of his Children; which said, he ' threw himself among the *Elephant's* Feet, who had no sooner ' taken him in his Trunk, and squeez'd him to pieces with his ' Feet, but he grew as quiet and peaceable as before. Whether this Rage proceeds from Lust, or it be a kind of Madness, which Mr *Knox* in the forecited Place tells us, they are seiz'd with at certain Seasons, which is known by the Efflux of a Liquor from their Jaws like Oyl, and which afterwards goes off of its own accord, I shall not determine; but 'tis probable to have been the latter, and that by this sign the Keeper did know the Disease. The said Mr *Knox* adds, that the Females suckle indifferently the young ones of others as well as their own. 'Tis reported of them, that they only bring forth one at once, tho' if it were not for the unanimous Assertion of all Authors, I would be ready to believe they bring forth more, for Reasons hereafter to be given; and that that one is about the bigness of an Hog, or as some say of an big Calf; which seems to quadrate with the Account of *Tavernier*, who tells us, that when the Merchants bring the *Elephants* to sell, the Children do usually leap upon their Backs, which could not be done were they higher. They are said to suck for 6 Years, or according to some 8; tho' I rather adhere to the Opinion of those, who tell us, they quit their Dame at 6 Months, if it be true, that when they are brought forth, they both see and walk; for if so, they may as soon come to purchase their Food as Colts and Calves.

The Natural Food of the *Elephant* is Grass, and when that's *Its Natural* wanting, they dig up Roots with their Tusks. This perhaps may *Food.* be one of the Reasons, why the *Behemoth* is taken for the *Elephant*, because 'tis said to eat Hay like an Ox; but that, as *Bochart* tells us, is common to the *Hippopotamos* also. They are said to have a



great delight in Cucumbers and Melons, and a particular Instinct in avoiding whatever Herbs may be hurtful to them. 'Tis also observable, they will not go near any Grass that has been trampled on by Men, for fear of Snares. When they are tam'd, they eat Hay, Oats, Barley, or such other Food as Oxen and Horses. It drinks a great quantity of Water, which it sucks up by the Trunk, and whenever that's full, it emptieth it in the Mouth. It naturally affects muddy Water rather than clear: When Tame, it drinks clear Water well enough. When they are to go to Battel, they give them Spirituous Liquors, such as Wine, &c. in order to make them drunk and furious, as appears from the History in the third Book of *Maccabees*, Chap. 6.

*Acuteness of Smelling.*

It has a very acute sense of Smelling, by which it readily finds out its Food. 'Twas pleasant, that when they came to see the Creature, with Apples in their Pockets, it pull'd them out to the astonishment of those who had them. I'm inform'd one of the greatest Mischiefs it got, was, when in the North of the Kingdom, being in an House, next to which was another with a great deal of Corn in it, and the poor Beast being hungry, and smelling the Corn, beat up and prest into a very narrow Door, where its Sides were very much crush'd, and they had much ado to get it out: And when at *Perth*, it beat up a Stable next to the House where it was, and most industriously singl'd out the clean Straw from among the Dung that lay among the Horses Feet.

*Several Natural Functions of the Elephant.*

I come next to give you some Instances of its Natural Endowments, the manner of taking it, and its wonderful Docility when Tame. *Pliny* says, that *maximum est Animal, proximumq; humanis Sensibus*; as appears in their Care of their Young, for they rather chuse to lose their own Life, than that they should lose theirs. They always go in Flocks, and the greatest go foremost, and when they are to pass a River, they lift the young ones across upon their two Tusks, and twist the *Proboscis* round about their middle; and make such as are bigger go before them, the greatest coming last; for did the greatest pass first, the River might chance to be so deep, that neither the lesser ones could pass, nor the bigger so readily assist them. When they pass by any of their Dead, they cover the *Cadaver* with Branches of Trees, Grass, or what else they can get. When any is wounded, the rest take care of him, bring him Meat, relieve him from Danger, and run together to save him from the Hunter. When a Snare is laid for them, they soon perceive it; if it be a Ditch, he that's nearest halts,

halts, (as it were by an Instinct) which when the rest perceive, they immediately return with Fury upon the Hunter. *Tavernier Loco citata.* tells us, ' That being once deceiv'd, and having escap'd the Snare, ' they are very distrustful ever after; and when they get to ' the Wood again, they break off a great Bough from one of ' the Trees with their Trunk, with which they examine every ' Step they go, before they set down their Feet, to try if there be ' any hole in their way. When they go in Troops, if one of them perceives an Herb on which any Man has tramp'd, he pulls it up, and delivers it to the next, who smells it and gives it to a third, and so on till it come to the last, who makes a great Noise, upon which all go to flight, and retire to Hills, Mountains, Shady, and other less frequented Places, where when there is no more Grass, some dig up Roots, others go and pull tender Buds, Herbs and Leaves of Trees; and the first that finds any thing, returns and convenes the rest of the Flock, that he may communicate to them what he has purchased. When they are in a Battel, such as are wearied or wounded, return to the Multitude, and such as have been less expos'd, advance of their own accord. When they are to pass over a Ditch, one or more go down (according to the breadth of it) and stand across it, where making as it were the Column of a Bridge, all the rest stepping upon their Backs, pass over. When all have past, they bring him or them out after this manner: At the side of the Ditch one of them stands, and stretches out his Foot, which he that is in the Ditch takes hold of, by twisting his *Proboscis* round it; then the rest make haste and provide Branches of Trees, which they throw in, that he may the more easily step up upon them.

Their Love, Fidelity and Gratitude is wonderful: *Ælianus* tells *Their Love,* us, when *Porus* King of *India* was subdu'd by *Alexander* the Great, *Fidelity and* he was wounded with several Darts, as was the *Elephant* he rode *Gratitude.* upon, who was careful to pull them out of his Master's Body with his *Proboscis*; and when he perceived his Master faintish by the loss of Blood, he gradually lean'd himself down, till he fell flat upon the Ground, that his Master might receive no damage by lighting off. There is also a Story related by *Athenaus*, of the Gratitude of an *Elephant* toward a Woman, who had done him *Lib. 13.* some piece of Service: She laid her Child by him, when it was only Thirty Days Old, but afterward the Woman being Dead, he fell so in Love with the Child, that he could not endure it to be absent from him, being most uneasy when he did not see it; there-

therefore when at any time the Nurse had satisfy'd the Child, she laid it in a Cradle between his Feet ; which if she had not done, he would not eat any ; but when she did it, he would eat pleasantly by the Child the whole Day. When the Child slept, he chas'd away the Flees with the *Proboscis* ; and when it cry'd, he would toss or rock the Cradle, and thereby set the Child asleep again. Several Instances of this Nature might be given from Authors, but these may suffice.

*Wrath and  
Revenge.*

*Annal. Par.  
I.*

But as their Love and Gratitude is great, so likewise are they subject to Wrath and Revenge. *Michael Glycas* tells, that when an *Elephant* at a time was brought into a Theater, he saw as he came along a Keeper of Wild Beasts sitting in the Market Place, whom in Passion he suddenly kill'd ; and that the occasion of this Revenge was, because the said Keeper about Ten Years before had stricken him with a Sword in that same Place. And *Acofia* writes, that a Soldier in the Town of *Cochina* had thrown the Kernel of a Nut at an *Elephant*, which the *Elephant* took up, and carefully hid. Some Days after, the *Elephant* seeing the Soldier passing by, threw it into his Face, made a great Noise, and went away leaping and dancing. In that same Town another Soldier meeting an *Elephant* with his Keeper, would not give way to them, whereupon the Keeper complain'd to the *Elephant* of the Affront, who some Days after standing on the River *Mangata*, which runs through the Town, and seeing the Soldier standing idle, run hastily toward him, lifted him up on the *Proboscis*, and plung'd him several times in the River ; after which he drew him out (having thus aveng'd himself) and left him where he found him.

*The Method  
of taking  
them.*

The manner of Taking them is ; first, they dig deep Ditches, and cover them with Branches of Trees, &c. which, tho' the *Elephants* may sometimes perceive, as is said, yet they are frequently ensnar'd therein : When any fall in, the rest are ready to throw in Branches of Trees, and such other Materials as they can get, to see, if by any means, they can rid their Companion. Another Method us'd by the King of *Pegu* is, he builds Prisons for them of Wooden Pillars, at such a distance as to suffer a Man to pass, but not an *Elephant* ; then he causes to be let go into the Woods some tame Females, whose *Pudenda* are anointed with a certain Oyl, for enticing the Male ; and taking care that they do not copulate, they drive all together toward the Prison, whence they convey the Females into Stables, which can contain no more but

but one at once; and the Males hot in pursuit are caught among the Pillars, and immediately some By-standers lay across Pales of Wood to hinder their Return. When they perceive the Cheat, they turn all in a Rage and Fury, and fall a groaning even to the shedding of Tears, and run up and down till they be all in a Sweat. When the Hunters design to put them in Stables, they let them see the Females again, whom they lead foremost, and the Males follow them to the intended place, which is so little, that it admits no more but one at once: Then they remove the Female, and tie the Male by the Neck to the Stall, till being wearied both by Hunger and Grief, they become more Tame, which is usually after 8 Days fasting, and then the Keeper learns and manages them as he pleases. A third Method of taking them us'd by the said King is this: He gathers a vast number of Men, by which he surrounds the whole Forest where the *Elephants* haunt, and having enclos'd them within a narrow bounds, he picks and chuses such as he has a mind for, and lets the rest go. *Garzias ab Orta* says, that at one of these Huntings there were taken 4000, but that the King caus'd them all to be let go, except 200, lest his Country should be depriv'd of them. 'Tis memorable what *Edward Lopez* says he saw, that when a young *Elephant* was catch'd in one of these Snares, the old one run with violence (notwithstanding of the By-standers) to get it out; whereof being disappointed, she threw in Earth, Trees and Stones in such abundance, that it fill'd the Ditch, and rather chus'd to destroy its own Brood, than let it fall into the Hands of the Enemy.

But if what Authors have told us of their manner of Taming be true, 'tis a wonderful Token of their Natural Sagacity. After they are taken, they hedge each of them in with great Rasters, till they be enclosed in so narrow bounds, that they can scarce have place to stand: Then they tie their Feet and Tusks so together, that they cannot move; their Keepers mount them, being girt about with two Ropes, and striking with their Heels and Clubs, threaten to beat them, and to starve them till they should Die; but if they will be quiet and peaceable, they would be kind to them, anoint them with Oyl, and give them Meat and Drink in abundance. Then they take one of these wild ones, and put it in betwixt two Tame ones, and so confine it on both sides till it be Tame enough. *Tavernier* tells, that he saw once two Wild *Elephants*, which had been lately taken, each of which had a Tame one plac'd on each side. Round about the Wild *Elephants* stood

stood 6 Men, every one having an half Pike in his Hand, and a lighted Torch fastned at the end of the Pike, and talking to the Beasts gave them Meat, and cry'd out in their Language, *Take it, Eat it.* The Food which they gave them was a little Bottle of Hay, some pieces of brown Sugar, and Rice boil'd in Water, with some few Corns of Pepper. If the Wild *Elephants* refus'd to do as they were bidden, the Men made Signs to the same *Elephants* to beat them, which they did, banging the refractory one with their Trunks on the Head and Forehead; and if he offer to make any resistance, the others thwart him on the other side, so that the poor Beast not knowing what to do, was constrain'd to learn Obedience. 'Tis said these Methods soon take with the younger sort, but for the old ones they put them into big Houses, and treat them very harshly, by wounding them with Darts, and starving them till they be half Dead; and then by gentle Methods and fair Promises they tame them. *Alianus* says, when all other Methods prove ineffectual with an old one, they have a certain kind of Musical Instrument, wherein they play the r own Natural Tune, to which they become so attentive, that they are soon taken with the sweetness of the Melody; and laying aside their Wildness, begin to look to the Meat that's offer'd them, and tho' they should take off the Fetters, forget their ancient rudeness, and fall to their Meat with Greediness and Appetite. 'Tis indeed very surprizing to think, they should understand either Flattery, Threatning or Musick, when Tame, and if when Wild they do it, 'tis much more so. However, that it is a most docile Creature the Accounts of all agree, and Authors tell you wonderful Stories of them, such as their Dancing to a Pipe, and keeping Time, Leaping, Skipping, Gathering and Strowing Flowers, exercising Fuzee and Pike, like a Soldier, and casting of Colours, playing a great many antick Tricks in Theaters, and even Writing too, and understanding Human Speech. When it is in Sorrow, it hangs the *Proboscis* low to the Ground, and 'tis by the same it makes its Gladness appear. It is an Animal very desirous of vain Glory, and very Proud, when finely drest and richly adorn'd.

A brief Description of the External Shape of the Elephant.

But leaving this, I come to the more particular Consideration of the Creature I am now treating of. I shall first take notice of its External Shape and Dimensions, and then of its Internal Parts, with their Structure. That it is *Animal Vastissimum*, I shall readily acknowledge with *Franzius*; but that it is deform'd, since those due

due proportions laid down by the Author of Nature are as well observ'd in this as in any other Animal, I can hardly grant; for nothing can be deform'd but what swerves from a general Rule. It has a big short Head, short Neck, long Nose, or *Proboscis*, hanging almost to the Ground; a Back somewhat protuberant, a short and round Body, a long Tail, four great round Legs, like so many Columns supporting such a vast weight; and short Feet, those before being broader and rounder, and those behind more long and narrow, each Shod with 4 Hoofes; a little narrow Mouth, with 2 long Tusks proceeding from the Upper Jaw, one on each side of the *Proboscis*; 4 strong Grinders in each Jaw; small, yet piercing Eyes; and large flat Ears.

The Dimensions are as follow: At the fore Leg she was 8  $\frac{1}{2}$  foot high (A. A.) and 9 at the hind (B. B.) in length 10 foot (C. C.) and a Tail 4 Foot 3 Inches long (C. D.) round the Belly 14 Foot (E. E.) from the top of the Head to the end of the *Proboscis* 8 Foot (F. F.) whereof the *Proboscis* makes up 4  $\frac{1}{2}$  foot (F. G.) from the Forehead equal with the Eye to the lower Jaw, measuring backward, 27 Inches (H. H.) from the top of the Head to the lower Jaw, measuring downward, 4  $\frac{1}{2}$  foot (F. I.) The Ear was almost square in this Subject, and small in respect of those in other Animals. Whether or not this difference might have been in regard of the Sex, I know not. 'Twas in length 19 Inches (K K.) and in breadth 17 (L L.) The Eye (U) was not so small as Dr. *Moullins* would have it; who says, they were no bigger in the Subject he treats of than those of a Sheep; whereas in this they are larger than those of an Ox. The distance betwixt them, measuring across, was 26 Inches; between the *Anus* and *Vagina* 2  $\frac{1}{2}$  foot; between the Dugs 1 foot. The fore Foot, measuring round the extremities of the 4 Hoofs, 3 foot 10  $\frac{1}{2}$  Inches (N. N.) whereof the external Hoof running obliquely forward was 5 Inches; the second on the outside, square before, was 5 Inches, and 6 in breadth, *i. e.* up toward the Skin; as was the third, square also before, and 4  $\frac{1}{2}$  half, (c) The Internal was more pointed than the External, and of the same length; the hind part of the Foot was cover'd with a tough thick Skin: The Diameter of the fore Foot, from the Right to the Left, was 14  $\frac{1}{2}$  Inches; from before to behind, 16  $\frac{1}{2}$  Inches. The Circumference of the fore Leg, at the Upper Joint, was 4 Foot 3 Inches (O. O.) At the Articulation of the *Carpus* 2 foot 6  $\frac{1}{2}$  Inches (P. P.) the Circumference of the hind Foot, round the Hoof, 3 foot 4 Inches (Q. Q.) Its

Diameter from behind to before, 16  $\frac{1}{2}$  Inches; from the Right to the Left, 12 Inches. The breadth of the outer Hoof, 4  $\frac{1}{2}$  Inches (*b.*) the fore Hoof being Semicircular, 3  $\frac{1}{2}$  Inches, (*a.*) the third and fourth Hoof 4 Inches each; both inner and outer Hoof go obliquely forward. The Circumference of the hind Leg is 2 foot 2 Inches, (R. R.) Thus you have the Dimensions of all its External Parts, taken either from the Body, when it lay Dead in the Field, or since from the Stuff'd Skin, wherein for the most part they agree; only that by reason of drying, the Legs are smaller, and the Back not so protuberant.

*The Cuticula  
and Cutis  
describ'd.*

Now I come to consider the *Cuticula* and *Cutis*, being the first subjected to Enquiry. Dr. *Moulins* has already at large insisted most judiciously on both, and indeed he had good Opportunity to do so; for he had the choice of any part of the Skin he pleas'd, (to view its Structure) that was not defac'd by the Fire; whereas in our Subject, the chief endeavour of Provost *Yeaman* being to preserve the Skin whole, in order to Stuff it, (which is now done to so good purpose and so lively, that it is become a most curious Ornament, as the Figure after the Original, which now stands in our Hall, doth represent) I had not an opportunity of making tryal upon any of it green; for on the *Monday*, while I was oblig'd to go out and take care of the Bones, the Workmen were busied in salting and preparing it, and afterwards I had not time: So that what Accounts I can give you are taken from it, as it now stands dry. But that I may give you all the satisfaction I can, I shall transcribe what of Dr. *Moulins's* Account I find agreeable to that I see in this Subject, and add my own Observations.

*Dr. Moulins's  
his Account  
of the Scabs.*

He says, ' he found the *Cuticula* cover'd all over with a strange sort of Scab, in many Places resembling old Wrats, deeply jagged, ' and the carnos Fibres of the Muscles of Beef when much boil'd ' and transversly cut, but of a dirty tawny Colour. These Scabs ' (if they may be so call'd) both slit and look like short pieces of ' Whale-bone; they did so firmly stick to the *Cuticula*, that they ' could not be pluck'd from it, nor the Parts of which they consisted (tho' they were much divided) from one another, without tearing it, and yet the *Cuticula* was very tough and ' thick.

This

This is very lively exprest, and Answers exactly to what I *Thair length* find in this Subject. He goes on, and says : ‘ The length of these in his Subject.

‘ Scabs was in some above  $\frac{1}{2}$  or  $\frac{1}{4}$ , but in other places not above  $\frac{1}{10}$  or  $\frac{1}{12}$  of an Inch. The cause of which difference, he takes to be the *Elephants* wearing, by rubbing or lying, some Parts of them, while others were slightly, or not at all worn.

The Scabs of this Subject were not so long; for as the deepest *In our*, I could find upon the *Cuticula* was not above  $\frac{1}{6}$ , so the thinnest *Tab. 3. A.B.* was less than  $\frac{1}{6}$  of an Inch; but that is not material. As to his Reason why they are thicker in some Parts than another, tho’ it may seem pretty good, yet I shall offer another by and by, as a no less probable Conjecture.

He says, ‘ He could find but very few Hairs without this Scab, *The Hairs in* but many within, and even with it. The *Elephants* Inclination. on to Itch, and to rub himself against whatever came in his way, kept those Hairs that were even with the outside of the aforesaid Scab, from appearing of any considerable length. The hardness of the Scab, by keeping the Roots of the Hairs fast, did very much contribute to their wearing on the outside, as well as to their Preservation on that within.

In our Subject the Hairs are every where pretty long, some 2, some 3 Inches; others (in Places most Subject to Rubbing, as the Doctor observes) but 1 or  $\frac{1}{2}$  Inch, tho’ indeed not so numerous as I find. There are Passages for them through the *Cuticula*. I know not what the Doctor means by distinguishing between those found in the *Cutis*, and those in the *Cuticula*, since *In our* I am convinc’d all arise from the *Cutis*, and penetrate the *Cuticula*. They are indeed black, and many of them stiffer and thicker than those in an Hog. As he by the Fire had occasion to observe some pieces of the *Cuticula* rais’d from the *Cutis*, so the Skin of this Subject is in many Places depriv’d of it, especially where the Beast lay most in the Water at its Death; and since these are means whereby to separate the one from the other, this may give occasion to enquire by what means they adhere: But I must first consider the Structure of the *Cuticula*, and then of the *Cutis*. You know some have taken the *Cutis* to be nothing but a certain Crust form’d of several Mucilaginous Particles, obducing the *Cutis*, &c. in the *Uterus*; which after the *Fetus* is *The Structure of the* come to greater maturity, is condens’d and form’d into a Skin, such as we see *Mucilages* and *Pulteses* have, when after boiling *Cuticula* they are expos’d to the Cold: Others, that the *Cuticula*, as well



as *Cutis*, is compos'd of a *Congeries* of *Membranous Fibres*, intermixt with a great many *Capillaries*, and endued with Pores fit for Perspiration: And there are Anatomists who assert, they have injected these Cutaneous Vessels in the *Cuticula* of a *Fetus*, as well as in the *Cutis*; tho' when the Animal is more adult, these *Capillaries* not only escape the view of the naked Eye but even of Opticks. That this has been the Structure of the *Cuticula* in this Animal, is most plain and obvious; for tho' I cannot determine its thickness, as Dr. *Moulins* might have done in a recent One, yet now as it is dry, it seems to be of the thickness of, or rather thicker, than common Vellum, with its inner Surface excavated, as you see a Woman's Thimble, (the Holes being much about the same Bigness, and dispos'd regularly) or in an Honey Comb. Among the Interstices of these Excavations, the Ramifications and Divarications of the Blood Vessels are obvious. At every two Lines or  $\frac{1}{6}$  of an Inch distance, for the most part are to be observ'd Protuberances compos'd of 5, 6, or 7 Columns joining, and making up a Pyramid or Cone; in the top whereof is the Pore or *Ductus*, mention'd by Dr. *Moulins*, through which the Hairs pass; they are nothing but the Interstices of the *Favi*, (so to call them) or Depressions, which arise in the *Cuticula*, and are impacted in the *Cutis*, for the better Reception of the Hair. And 'tis probable, that all the Hairs are cover'd over with thin Membranes, as Dr. *Moulins* observes, from the Extremity of their Roots to the *Cuticula*; because having pull'd out several of the Hairs, I saw them included within their proper *Involucra*, and doubt not but it was so with all the rest too, beside the common one which is both contiguous and continuous to the *Cuticula*. The Hairs are more loose, and the Pores more patent and obvious in the *Cuticula* now dry'd, than I suppose they were when recent; but whether these Pores were also designed for Separation of Vapours by Perspiration, or only to contain, and convey the Hairs planted in the *Cutis* through the *Cuticula*, is what I shall neither contradict nor affirm. To the outside of this *Cuticula* are adherent the Scabs, which I rather take to be a Super-venient Distemper incident to this Animal, when out of its own Climate, occasion'd by the Constriction of the Pores from Cold, than any wise Natural to it: And to this the Accounts of all Authors agree; who tell us, that there are two kinds of them, one of a more dark Colour, and another dusky and sad, having both their Skins of a very smooth and polite Surface; wherefore

Tab. 3. A.

The Cause of  
the Scabs.

fore the Keepers of this *Elephant* with us, call'd it the *white Elephant*, in opposition to the black ones; whereof *Horace*, in the forecited Place, says, *Nigris dignissima Parris*: But after they are affected with the Scab, this Distinction of Colours is not observ'd. Authors tell us, as you have heard, that the first thing they do when they begin to Tame them, is to anoint them with Oyl, whereby they keep their Skin smooth, soft and flexible, and relax their Pores so, that whatever gross Particles may fly off from their Blood, whose Constitution is now perhaps worse by the alteration of Dyet, and hardships they undergo at taming, may not stick to the Skin, but freely be evaporated. And I am credibly inform'd by such as have liv'd long in the *Indies*, that they take as much care to keep the Skins of the *Elephants* smooth and clear, as we do with our fine Horses. Since then these Scabs are a Disease, and not Natural to the Animal, it is reasonable I should enquire into the Cause of them; which to me seems to be à *Crassitie & Viscositate Sanguinis*, whose Particles, because of obstructed Pores, by a Cold too excessive for their Body, do not so easily fly off; but after they have past the *Cuticula*, go no further than its Surface; and because of the *Viscosity* of their Texture, do so cleave to and heap upon one another, that they appear under the form of a Scab; which by the Evaporation of the more humid Particles, harden by degrees, and by the heat of the Sun are crack'd, rent, and divided: That Coldness of the Weather will occasion gross and viscuous Blood, there's none acquainted with the Distempers in these Northern Countries will readily deny; nor that most of these Distempers proceed from the Obstructions of *Capillaries* and *Pores*, and that this may be the cause of these Scabs. I offer only this one Experiment; whatever Pieces of the *Cuticula* I observ'd, where the Scabs were thin, there the *Favi* or Depressions were large and conspicuous; but where they were very thick, there the *Favi* were very small, and almost imperceptible; which plainly implies, that wherever these Particles avolute freely, few adhere to the Surface of the Skin; but when their Force is inhibited by the strictness of the Pores, they are unable to remove any further than they adhere to, and augment the *Moles* of the Scab. These, as is said, are divided from one another by several *Rimæ*, The Scabs or Rents, which may either be occasion'd by the afore-mentioned divided into heat of the Sun, or by the different Posture the Skin is put in by several the several Motions of the Body. Hence it is, that where the *Rimæ* Skin.

*The Constitution of the Elephant's Blood.*

Skin is most wrinkled, these *Rima* are most frequent. It may be said, that this Reasoning seems to contradict what Dr. *Moullins* has asserted, *viz.* That this Animal has a very subtil Blood, abounding with a penetrating Urinous Salt; which he proves from the Vivacity of the Species, from the Urinous *Effluvia* which affected his Nostrils, and from the smarting of his Finger by the Blood, after it was cut. As to the first, that it is a very Vivacious and Spirituous Animal, both the foregoing Relation and the Account of all Authors make it apparent; but that does not hinder its Blood from being incrassated by Cold and bad Dyer, nor that these Scabs may proceed from this gross Blood. As to the second, tho' he might have been sensible of an abounding Urinous Salt in that Animal, it does not follow it should be so in all, and I am apt to believe it was extraordinary; for without doubt such a burning as the poor Beast underwent, even to its Death, must have alter'd the Constitution of its Blood, and made it quite different from what it was; and 'tis probable, that it was at such places, as were most affected with the Burning, where he felt this Urinous Smell, and the smarting of his Finger. For my part, I observ'd the Blood of this Subject to be Stypick and Restricting: So that when my Hands were imbru'd in it, I could scarce bend a Finger; which Effect I have also perceived at the Dissection of Fishes, which all acknowledge to have viscuous Blood. But it may be objected, that this our Subject dying *Morbid*, and of a languishing Distemper, the Blood of the one might be gross and viscuous, and yet that of the other Spirituous and Subtile. I should be ready to acknowledge the Objection to be valid, if I did not understand both were affected with the same Scab, and by what appears, the other seems to have been more than this.

*The Structure of the Cutis.*

I proceed next to the *Cutis*, whose inner Surface Dr. *Moullins* observ'd 'To abound with a great many Glands; when cut through, at least as far as the Roots of the Hair went, it was like the horny or callous part of Brawn, and its outer Surface abounded with a great many *Papilla*. As I said, I had not opportunity to observe any of these; but am apt to believe all to be true: And first, as to the *Papilla*; I told you already, that the *Cunicula* was endued with a vast quantity of *Favi*, or Depressions, wherein I doubt not but these *Papilla* were receiv'd, tho' the Surface of the *Cutis*, as now dry'd, is smooth; and where the *Papilla* seem'd to have formerly been, there are now rather

De-

Depressions than Protuberances. This is an Argument that there has been some kind of Liquor contain'd in these *Papilla* or Vessels, as I may call them, which at the drying of the Skin is evaporated ; and therefore I suppose this brawny part of the *Cutis* to be a *Congeries* of *ductus excretorij*, running in a Parallel Line from these Glands to the Vesicles, and conveying the Liquor to be contain'd in them, till it be evaporated by Perspiration ; and these Vessels seem to have been both so big and numerous in this Animal, that they make up at least two parts of the inner Surface of the *Cuticula* ; the Blood Vessels and the Depressions together scarce make up a third part. They seem also to be lodg'd in the *Cutis* by the one half, and in the *Cuticula* by the other ; for in some Places of the *Cutis*. I observed the Depressions as numerous, and seemingly Parallel to those in the *Cuticula* ; and that, notwithstanding the *Membranula*, where the Humour was included, which now being dry'd and collaps'd, may take up some Space in the Depression of the *Cutis*. By this Account both of the *Cuticula* and *Cutis*, I come to enquire First, how the one should so firmly adhere to the other, when there seems to be no Communication by Fibres betwixt them, as appears by their easy Separation both by Fire and Water : Secondly, how considerable the Perspiration may be. As to the First, since the *Cutis* and *Cuticula* are two distinct Membranes, their Cohesion seems to be mutual : First, these Pyramids, which receive the Hairs, are impacted in the *Cutis*, and closely surround their Roots ; and then these *Papilla* are impacted in the *Cuticula*, which so long as they are distended with the humour fit for Perspiration, will not readily quit the Depressions in the *Cuticula*, unless the Humour be suddenly evaporated by Fire, or the Sides of these Depressions or *Cellula* be relax'd by Water ; and there may be a certain Viscosity which obduces the Surface of both, as it were so much Glue, which either the Fire may dry up too much, or the Water dilate ; so that the one can be soon separated from the other, and the Hairs either be pull'd from their place, or quit their common *Involucrum*. As to the second, viz. The Perspiration, I shall offer no other Calculation than what is already made by Dr. *Moulines* : He says, ' the Pores must be both numerous and ' large for Perspiration, especially if we consider *Sanctorius* his ' Statical Observations of a Man's insensibly perspiring in a Winters Day 350. and upwards ; which is something more than  $\frac{1}{4}$  of ' an ordinary Man's weight, supposing him to be 170 lb. and at

at this rate we must suppose an *Elephant's* Perspiration to be vastly more; but (as he says) 'tis probable, the Scabs might bar it from bearing proportion to that of a Man's: So that whatever the *Elephant* might have perspir'd in an healthy State, we may reasonably suppose it to do much less, when attacked with this Disease; which may be another Argument for the *Craassities & Viscositas Sanguinis*, wherewith I alledg'd this Animal I dissected, was endu'd.

I can determine nothing about the thickness of the Skin, while recent; but as it is dry, by an Incision made upon one of the Hips, it appears to be less than  $\frac{1}{4}$  Inch, and of Substance not unlike to *English Bend* or *Sole-Leather*.

*The Cutaneous Vessels.* I had no opportunity to observe, whether there were any Cutaneous Vessels, but doubt not but there have been of them, and that in abundance; 1. from the numerous *Glands* dispers'd all over its inner Surface, which must have had Blood Vessels inserted in them; and 2. from the abundance of *Ramifications* dispers'd in the *Cuticula*, proportionable to which, it is probable, they were also in the *Cutis*.

*Panniculus Carnosus.* I can say nothing about the *Panniculus Carnosus*, neither am I fully convinc'd of what is related by *Dr. Moulins, viz.* That this Animal kills the Flies, by putting itself suddenly in a Posture to wrinkle the Skin on that side that is attacked by them; so that the Cracks are forc'd close together, and the Flies bruised; for 'tis hard to conceive such a big Animal should all on a sudden be so nimble. I rather believe, that the *Proboscis* from before, and the Tail from behind, may supply the defect of the *Panniculus Carnosus*, (if it be wanting:) For if we consider the length of each, we shall find they come near to meet about the middle; for the Body of this Subject being 10 foot in length, the *Proboscis* and Tail make up between them near 9 of it; and what is wanting, the Air, by the force of their motion, is enough to expel the Flies, even when without their reach.

*Fat.* As to the *Fat*, whether by reason of the extraordinary Leanness of this Subject, or if it be ordinary for *Elephants* to be endued but with little of it, I know not, but I could not have believed so little *Fat* to have been in any Animal as was here; for beside that there was neither a *Membrana Adiposa*, or conspicuous *Omentum*, there was not one Grain of *Fat*, either among the Interstices of the Muscles surrounding the Kidneys, nor round the *Anus* and *Vagina*, where 'tis usually found; and what is more,  
when

when I had spent near a whole Day in boiling the Bones in a Dyers Vessel, without changing the Water, except that I supply'd what was evaporated, there was not so much as a Drop of Oyl that did swim upon the Liquor.

Dr. *Moulins* takes Notice of a very strong Nervous Membrane, (which I ingenuously confess I had not time to remark, and therefore you have it in his own Word,) which obliquely descended from the *Spina Dorsi* to the *Sternum* and *Linea alba*. ' This Membrane was very tough, and near as hard to be cut as Whale-bone of the same thickness; which all along the Back-bone was about  $\frac{1}{2}$  Inch, but nearer the end I try'd it, the thinner I found it. This Membrane seem'd to terminate in the *Linea alba*, as the Tendons of the Muscles of the *Abdomen* usually do. Its Nervous Fibres were very distinguishable, and might easily be separated throughout their whole length. This doubtless was to strengthen the Creature, and perhaps that the weight of the *Viscera* contain'd in the *Abdomen*, should not distend the *Peritoneum* and Muscles adjoining, so as to let them hang lower than was convenient. A like piece of Mechanism you may remember I communicated to you not long ago, in my Observations made upon the Dissection of a *Porpeps*.

After the Skin was wholly remov'd, there being no Time to examine all the Muscles of this huge Body, I apply'd my self particularly to those of the *Proboscis*, as being of greatest Moment. Wherefore the Body being Supine, I first consider'd the Neck, and upper or fore-part of the *Sternum*, where I observ'd two Pair of Muscles to arise sharp and fleshy; whereof two in the middle, from a small Origin, were extended into large Muscles, running strait forward, and distinguish'd from each other by a white Line, till they came to the point of the lower Jaw; their other side running obliquely outward, till they came over against the Articulation of the Lower Jaw with the Upper: From thence keeping the lower part of the Lower Jaw, they return'd to the foresaid point, in Figure not unlike the *Cucullaris* in Human Subjects, with their Fibres running obliquely forward from this middle Line toward their external part. This Pair serv'd to draw back the Lower Jaw, and like the *Platysma Myoides*, cover'd all its other Muscles, with those of the *Larynx*, Tongue, and *Pharynx*. On the outside of this Pair arose two other Muscles, small at their beginning, and in their Progress passing in betwixt the *Oscula* and Scull, adhering to the *Musculus Temporalis*, and

Dr. Moulins  
Account of  
the Mem-  
brana Ner-  
vola.

Description  
of the Mus-  
cles of the  
Proboscis.

Retractores  
Proboscidis.

Tab. 3. Fig.  
1.

Tax-Wax.  
Fig. 6.

Elevatores  
Proboscides.

Fig. 6.

Fig. 1.

ascending run up below the *Meatus Auditorius*, half way betwixt the Orbit of the Eye and Top of the Head ; where becoming very thick and round, it pass over a sharp Angle of the Scull toward the Forehead ; whence descending from above the Eye, it came, and with its Partner fill'd up that hollowness in the *Os Palati* (k.) and coming still lower, made up the back part of the Trunk or *Proboscis*. Afterwards the Body being turn'd over, I had opportunity to see the *Tax-Wax* mention'd by Dr. *Moulins* ; which arises from a *Spina* in the back part of the Scull (c c.) whence running backward along the Sides of the seven *Vertebra* of the Neck, it terminated betwixt the 6th and 7th *Vertebra* of the Back, becoming still thinner in its Progress. It was about six Inches broad, pretty thick, and descended obliquely from the Top of the *Spina Vertebrarum* to above the Ribs, and cover'd all the Muscles which arise from the Neck, and support the Head ; assisting them, (as Dr. *Moulins* rightly observes) because the Head of Quadrupeds, especially of this Animal, being more pendent, have more need of Supporters than the Head of a Man, where this Contrivance is wanting. Dr. *Moulins* tells us, that it was plac'd edgewise ; the Reason of which may be, because of the *Spines* of the four first *Vertebra* of the Back, which are 4 Inches broad ; whence the *Tax-Wax*, running forward (where the *Spines* are narrow, or where there are no *Spines* at all, as in the three first *Vertebra* of the Neck) in a straight Line to the Scull, the space below it for the Muscles to move in, must be the same at the Neck as at the *Spina*, where the *Epiphyses* keep their Upper Sides at such a distance. From above this *Tax-Wax* in the Neck, do arise two Muscles, thinner and narrower at first, but thicker and broader as they go to the Scull, where they firmly adhere to the Sides of a large *Sinus* in its back part (b b.) whence ascending, being lodg'd in the Depression upon the top of the Head, and betwixt the Eminencies (d d.) they descend till they come over against the Hole for the Root of the Trunk (a.) and become thicker and round, and in their whole Descent make up the forepart of the Trunk with extremity.

Thus you have the *Proboscis* trac'd from its Origin, viz. That 'tis compos'd of two Pair of Muscles ; one whereof makes up its back-part, which arises from the *Sternum*, and passes with straight Fibres in below the *Os Zygomaticum* ; and from thence onward, till it makes up the Body of the Trunk itself. Another Pair, which arising from the Neck passes over the Head, and descending makes

up

up its forepart. The Fibres of this Muscle descend in a streight Line, till they make up the Body of the Trunk, and then begins a strong tendinous Interstice, by which they are separated from their Copartners; whence their Fibres descend obliquely to another strong Interstice, by which on each side they are separated from their Antagonist; where the same oblique Course of Fibres is again to be observ'd, that is to say, that the *Erectores Proboscidis*, (for so we may call these which make up the forepart of the *Proboscis*) (gg) unite in a tendinous Interstice (cc) Fig. 7. from whence the Fibres on each side obliquely descend: So likewise the *Retractores Proboscidis*, for so we may call these which make up the back-part of the *Proboscis*, have their tendinous Interstices running down the middle of its back part; from whence the Fibres obliquely descend, almost making an Angle of a *Demirhombus* on each side in another longitudinal tendinous Interstice, whereby the Fibres of the antagonist Muscles are conjoin'd.

Thus you see a wonderful Contexture of 4 Muscles, so contriv'd as to perform all kind of Motions; for as either in the *Fe-mora* or *Humerus*, from Flexion, Extention, Adduction and Abduction, proceeds a circular Motion; so here when the Elevator and Depressor, or Retractor act together on either side, then there is a lateral Motion: And when the Congener *Elevatores* and *Retractores* act, then there is either Elevation or Depression; and from these two, with lateral Motions on both Sides successively perform'd, proceeds a circular Motion. But this is not all; we see that any part of the Trunk, either Root or Extremity, or both at once, can be bended either upwards or downwards; and this I conceive is perform'd after this manner. These Fibres thus obliquely situated, are divided into several *Fasciculi*, which are separated by several tendinous Intersections; and that at the beginning of each Intersection, there is a considerable Branch of a Nerve from the hard Portion, inserted, by which one, two, or more of these *Fasciculi* may be set in Motion, without any other part of the *Proboscis* being concern'd.

Dr. *Moulin*, and not unfitly, calls the *Proboscis* a Prolonged Nose, both from its Situation and Use in Smelling and Breathing. And I think I may with good Reason make an Analogy betwixt it and the Tongue: For besides there is a great Affinity betwixt the Smelling and Tasting, since what's unpleasing to the Nose, cannot but nauseate the Tongue and Palate; infomuch, that the Nose may



be call'd a Taster to the Taste : They likewise agree in this Animal, by reason of the Diversity of Motions in both, and few Muscles that perform them, tho' elegantly express'd by the famous *Bellini* : '*Quis credat, says he, huic tantummodo Universo*  
' *Lingua (Proboscidi) munia deberi, ita ut paucissimis donata Mus-*  
' *culis innumeras prope dixeram obire Motiones ; Extenditur, Contra-*  
' *hitur, Dilatatur, Exeritur, Atollitur, Deprimitur, Incurvatur, modò*  
' *in Cavum aptat sese, modò in Convexum, modò usque ad Palati For-*  
' *nicem (Sursum) erigitur, modò ad Frannulum usque (Deorsum)*  
' *reflectitur, quandoque Duplicatur, aliàs Extenuatur, modò tremis.*  
By which only the Variation of *Proboscidi* for *Lingua*, *Sursum* for  
*Usque ad Palati Fornicem*, and *Deorsum* (that is downward, when  
it is brought in betwixt the Fore-Limbs, or conveys any thing  
to the Mouth) for *Frannulum usque*, all the Motions of the one are  
compatible to the other. And *Schotto* gives a brief Account of  
the Motion of the *Proboscis* : '*Circumvolvitur eum undique & max-*

*Mirab. Ani-*  
*mal. Terrest.*  
*lib. 8.*  
*ima cum celeritate, eâ caput Potum & Cibus atque in Os mittit ;*  
*nam Proboscide non edit, sed Ore ; nec Ore nec edere aut bibere*  
*potest absque Promuscidè ; hinc Manus Nasuta vocatur. Suo enim*  
*Reктору erigit & offert ut conscendat ; eâ Arbores prosternt ; eamq;*  
*cùm Aquis immergit, erigit ; eâque refat atque respirat.* Now to  
make a further Analogy with the Tongue and it : As the *Genioglossis*, by lengthening its Fibres from the fore and inner part of  
the Lower Jaw, whence it arises, to the Root of the Tongue,  
where it is inserted, stretches it forth ; So the *Levatores Probos-*  
*cidis*, by lengthning their Fibres from the *Tax-Wax* all along the  
Top of the Head to the Root of the Trunk, stretches it forth  
also : And as the *Retractores Proboscidis* can very well perform the  
Motions of pulling it in, *Analogous* to the *Styloglossis* ; so the two  
Antagonists on either side can pull it to the adverse side, that  
it may perform the Actions of the *Ceratoglossis*, while the Con-  
gener *Retractores* can pull it to that same side, where they act,  
as is said. When I say, that the Fibres from before and behind  
descend obliquely from the tendinous Insertions at the middle  
to those at the side, I do not mean that they run simply so, but  
that the Fibres of each Muscle are dispos'd into different *Sirata*,  
and that these *Sirata* do intersect each other, like Lozenges, or  
as we see the Fibres in the *Musculus oblique Ascendens* intersect-  
ing those in the *Musculus oblique Descendens Abdominis*, and so on ;  
that is to say, whereas one Series of Fibres seems to descend  
obliquely, the next underneath that ascends again, and so conti-

nuës.

run throughout the whole thickness of each Muscle. As to the circular Fibres spoken of by Dr. *Moulins*, I do not know I saw any, neither do I think them necessary for pulling up the Trunk, or diminishing it as to its length: For the great distance betwixt the Origin of these Muscles, and their Insertion at the Extremity of the Trunk, the longitudinal Position of their Fibres will they come to make a part of it, and the space they have to act it, and to swell their Belly, and their oblique Insertion in these tendinous Lines, may be look'd upon as sufficient to perform this motion; and 'tis observable for this end, that the Skin is divided into several *Plicæ* or *Links*, as we see in a Worm, when she draws up and shortens herself. Thus I conceive the forenam'd *Fasciculi* may at the beginning extremely begin to be contracted, then the *Fasciculi* next to them, and so in order till they come to the Root of the Trunk; by which successive Contractions the Bellies of all the Muscles begin to swell, and so their Fibres diminish as to their length: And there needs no more for stretching forth the *Proboscis* thus contracted, but the Fibres to resist to their former Position; which it may do with the same swiftness, as we see a Bow doth by its Elasticity when once it is shot.

These Muscles surround two large Cavities 2 Inches Diameter *The Cavities* from the Right to the Left, and 3 Inches each from above to of the *Proboscis* below, about the middle of the *Proboscis*; for as they proceed *botcis* from the Scull they are very wide, according to the Capacity of the Hole in the fore part of the Scull, whence the *Proboscis* proceeds; of which hereafter. They are divided by a strong *Cartilaginous Septum*, which runs streight from before to behind, along the middle of the *Proboscis*. This is the *Septum* whereinto the Muscles situated in the fore and back part are inserted. These Holes are Cartilaginous, all round obdused with several Nerves, whereof hereafter; and endued with a great many Glands for separating a certain *Mucus*, wherewith the inner Surface is always bedew'd, to keep it moist and preserve it from injuries of the Air it sucks in at Breathing. These two Cavities are of great use, for they draw up and contain as much Water as serves the Animal at once, which afterward it emptieth into the Mouth, as it were from a Tunnel: They serve also for Breathing, Smelling, and uttering the Voice. The *Proboscis* is not equally great, but from 38 Inches in Circumference at the beginning, it becomes gradually smaller till it be 20 Inches at the middle, and at the Extremity 11 Inches. It has an hollow Cartilage, where the

Tab. 3. Fig.  
18.

these Passages terminate. Round this is a Cartilaginous Margin, which extends itself  $1\frac{1}{4}$  Inch before, and terminates in a Point; and behind it has, as it were, an hollowness, wherein this Point fixes itself, and takes hold of any thing, as it were a Thumb passing in betwixt two Fingers, and keeps it during Pleasure. This Cartilage is of great Strength, and by it the *Elephant* can take up any thing of great weight.

Its Blood  
Vessels.

I come next to examine the Vessels and Nerves of the *Proboscis*. I do not find this Animal endu'd with any particular Vessels for this part; but these here, Analagous to those in other Animals, seem to be adapted for peculiar Uses. In searching for the Origin of the *Proboscis*, and how it proceeded from the Head, I separated the *Relevatores Proboscidis*; below which I observ'd four considerable Blood Vessels, a Vein and an Artery from each side, lying upon and descending in a streight Line above the aforemention'd Cartilages, and dispersing their Branches *hinc inde* throughout the Substance of the Muscles, with two large Nerves accompanying them. I had not time to trace their Origin, but do offer these probable Conjectures about them. The External Carotid Artery, which furnishes Blood to the Muscles of the Face and lower Jaw, has already suffer'd so many Divisions and Subdivisions in the vast Mass of large Muscles in this Animal, that 'tis not probable there should yet remain a Branch so large and of so streight a Course, as to be thus distributed in this part; and the Capillaries of the External Jugular are usually so dispersed throughout the extream Parts whence it receives the Blood, that 'tis not to be suppos'd they should so soon form so considerable Branches, and these again unite into one Trunk at such distance from the *Fasis* of the Skull, where the two Jugulars are conjoin'd: And besides this, the Situation of the Carotid Artery and Jugular Vein is so low, and those Branches I saw were situated so high, that I can scarce think the one proceeds from the other. It remains then, that I should enquire from whence they come. 'Tis observable both in Human Subjects and Quadrupeds, that there is an Hole below the Orbit of the Eye in the *Ox Maxilla Superioris*, through which the Superior Branch of the second Division of the 5th Pair of Nerves passes; surrounding in its Progress a Vein and an Artery; all which are dispersed in the Muscles of the Cheeks, Lips and Nose, and furnish Branches for the Roots of the Teeth of the Upper Jaw. This Hole is not so considerable in Human Subjects, but larger in Quadrupeds, especially

ally such as feed upon Grass or Hay; insomuch, that by the bigness of this Branch of the 5th Pair in an Oxe or Hart, we may reasonably conjecture they have a partial Taste, and a most acute Smell by the Upper Lip, the better to enable them to chuse their Food: For at the Dissection of a Calfs Head, you'll perceive both this Nerve and the Blood Vessels much bigger than what might be thought requisite for furnishing either Blood or Spirits to this part, were there not some extraordinary use for both. Now in this our Subject there is an Hole in the *Os Maxilla Superioris* (u) Fig. 1. (m) Fig. 2. (8.8.) Fig. 3. so remarkable for its Tab. 3. bigness, so commodiously situated, and so well guarded, that I have good Reason to believe it may be designed for Transmission of the afore-mentioned Artery, Vein, and Nerve, and that all these are distributed into the Trunk: For if we consider the largeness of this Hole for this Branch of the 5th Pair, as it is to be seen in the inner Surface of the *Basis* of the Scull, whose Capacity is such as to contain a Nerve of above twice the bigness of what we suppose it to have been; if we again consider the *Crena* (x x) which passes betwixt the Hole for the second Branch of this 5th Pair and the 3d (ii,) and how the Hole for the *Arteria dura Matris* (k k) is only separated from the Hole for the third Branch (ii) by a small Bony *Septum*; we may suppose that this *Arteria dura Matris* enters where the third Branch of the 5th Pair goes out, and sends up one Branch (k k) which immediately enters the *dura Mater*, and another which runs forward in this *Crena* to the Hole for the second Branch of the 5th Pair (h h.) and goes along with it, and passes out below the *Lamina*, which frames the upper part of the *Sinus* for the Orbit of the Eye (S) (2) and runs forward along with the second Branch to this large Oval Hole; where after it is come, it ascends obliquely in a *Crena*, to be still seen in the Bone, till it comes to the Root of the *Proboscis*, where it is dispersed as above; and the Vein returning by the same Hole runs along with the other two, tho' it does not enter the Scull; but running backward, passes in below the fore said *Lamina*, and descends where the *Arteria dura Matris* ascends. I cannot positively determine the Capacity of these Blood Vessels at the Root of the *Proboscis*; but they were very conspicuous, and could admit of a Goose Quill, tho' they were empty; and when they were full, I doubt not but they were above twice as big.

*His Nerves.*

This extraordinary part did not want for Nerves sufficient for it, no more than Blood Vessels: For first, it has the *Nervus Olfactorius*, whereof hereafter; whereby 'tis endu'd with a most acute Sensation of Smelling. 2dly, the aforesaid second Branch of the 5th Pair; which accompanying the Blood Vessels, is with them disse s'd throughout the whole Substance of the *Proboscis*; by which it has so acute a Sensation of Touching or Feeling, wherewith this Member is more signally endued; and by which it avoids whatever is hurtful to it, as appears by that memorable Instance of Dr. *Moulins*; who tells us, that such was the Care, in that subject he treats of, for the *Proboscis*, that it thrust it two foot into hard Ground to preserve it from the Fire. 3dly, the hard Portion of the *Nervus Auditorius*; which tho' it be dispers'd in the Muscles of the Face in Human Subjects, yet in Quadrupeds, such as Oxen, it continues undivided, till it comes to the Angle of the Lips; and here we trac'd it a good way, running forward above the Temporal Muscle, a little below the Ear, till it came to the Upper Lip; whence it proceeded to the fore-mention'd tendinous Interstice, which runs down on each side of the *Proboscis*, dispersing a Branch to each of the *Fasciculi* of *Fibres* already nam'd. This seems to be chiefly adapted for the different Motions of the *Proboscis*; for as we see in the *Musculus Rectus Abdominus*, that at each of the tendinous Interstices, whereby its Fibres are several times gather'd together, a Nerve enters at the beginning of each *Fasciculus*; So here the Muscles of the *Proboscis* being divided into several *Fasciculi*, each of them have a Branch of this Nerve dispers'd in them; and 'tis situated on each side, that it may the more conveniently disperse its Branches both to the *Fasciculi* of the *Elevatores* and *Retractores* alternatively. The Head was so mangled at the taking it off, that we could not well find its Origin, as it proceeded from the proper Hole; but its Situation here, Analogous to that in other Quadrupeds, removes the suspicion of its being any other than the hard Portion; tho' when I consider'd its bigness, being as great as one of my Fingers, and the small Hole through which it passes from the *Processus Petrosus*, I was in some doubt about it; but when again I began to consider its Texture, I was soon convinc'd it must be that and no other. 'Twas indeed very pleasant to behold it, (for several Physicians and Surgeons of us being together, we cut off a Portion of it to know its Structure) how that several small Fibres were knit together into one Bundle, and how several of these

these again were involved by common *Membranule* into different *Fasciculi*, till at length all were included in one common Tunicle. We endeavour'd by Microscopes to view the Cavity of the Fibres, but could observe none: That which I suppose made it bigger, was, that when it past through the Bone, the *Fasciculi* were more strictly coherent to one another, whereby they occupied a lesser space; but no sooner had they past it, than they began to be more loosely conjoined within the common Tunicle, by which the whole Nerve appeared to be bigger.

Thus you see how signally this Member is endued with Instruments for the Performance of its different Functions. 'Tis the principal Seat of two of the Senses, and partially partakes of the third: For by it the Animal swell'd; by it Feeling is perform'd, as by the Hands with us, wherefore the *Proboscis* is not improperly call'd *Manus Nasuta*, as before we observ'd; and by it the 5th Pair of Nerves affords a partial Idea of the Taste, to what Food it takes hold of, before it conveys it to the Mouth; and it has a great Analogy to the other two Senses, viz. to the Eye, by its 3 Pair of Nerves, namely, one for its Seeing, analogous to the other for Smelling; one for its pathological Motions, analogous to the acute Sensation, afforded to the other by the 5th Pair; and one for the Motion of its other Muscles, analogous to the hard Portion of the other; and to the Tongue, as we have already shew'd at large, by its different Motions, and by its partial Taste.

I come now to the *Abdomen*. Without having time to consider its Muscles, I caus'd it to be opened longitudinally; whereupon the Intestines jeated out in a confus'd Mass; first the Paunches or Trypes, as I may call them, (being not unlike the *Omasum* and *Abomasum* of an Ox;) and then the smaller Intestines. Being earnest to employ what Time I had in viewing the other Parts, I let these alone after they were extracted, till Monday: But then, as I told you, (by reason of their leanness, heat of the Weather, and emptiness, there being nothing in them but a little chew'd Hay or Grass) they were all spoiled; so that I could not receive any satisfaction of them, either as to their Structure, Figure, Dimensions, or Number. The Figure Dr *Moulins* gives of a part of the *Colon* and *Rectum*, seems to be pretty good; for I took a great deal of them, and stretched them out upon the Ground: They were about  $\frac{1}{2}$  foot Diameter; but I had not time to take notice of their precise length.

*The Description of the Uterus.* I next apply'd my self to the Extraction of the *Uterus* and *Bladder*, because the *Partes Generationi Inservientes* are the most taken notice of in Comparative Anatomy. I could not get the *Vasa Preparantia* preserv'd; and only got out the *Uterus* itself, with the *Cornua*, *Ovaria*, and part of the *Ligamenta Lata*, (*a. a.*) of all which see the Figure. 'Tis not unlike the *Uterus* of such Animals as bring forth several at one Litter, as they call it; for when I had inflated it, I perceiv'd several Protuberances to arise, (*e. e.*) as if they had been so many *Cellules*, such as Bitches, Cats, Hares, &c. have, for containing the several *Fetus's* with their proper *Placenta* and *Involucra*; which might have determin'd me to believe they bring forth more than one at a time, had not Authors affirm'd the contrary. For whereas the *Uterus* of such as bring forth but one at a time, is proportionably large, and the *Cornua* small; here the Body of the *Uterus* was so small (*c.*) that one would think it were nothing but a *Bivium* to the 2 *Cornua*: For after the Tube had past the *Corona*, which is pretty strong and close, I observ'd the *Cornua* (*f. f.*) to swell on every side by Inflation, leaving a *Sulcus* in the middle (*d.*) and these different Protuberances to arise with Depressions, as so many Interstices betwixt them. This Furrow (*d.*) seem'd to me to point out the *Septum*, whereby the *Cornua* were divided from each other; and these Interstices to denote, as it were, so many Membranes, whereby these Protuberances were bounded and form'd into *Cellules*, each communicating with one another. These Protuberances (*e. e.*) were regularly dispos'd, 2 or 3 in Number on each side of the *Septum*; and tho' some of them be obliterated, yet the *Vestigia* of others do still remain obvious in the dry'd *Uterus*, as it is now reposit'd in our Hall. I had a great Inclination to open one of these *Cornua* or *Cellules*, to know the truth of what I suspected; but would not adventure, for fear of spoiling the Preparation. Each of the *Ovaria* was as big as a large Apple, with the *Ova* fitly distinguish'd by their proper Membranes; being for the most part about the bigness of a small Pea, and all involv'd within a common thin and pellucid Tunicle, through which they Shone; but to defend them there was provided a loose thick wrinkled Tunicle, (*i.*) which I could remove at pleasure, it no wise adhering to the *Ovaria*; but fluctuated above them; and proceeded from the *Cornua* (*g.*) I open'd one or two of these *Ova*, and found them filled with a thin Limpid Substance, not unlike to *Hydatides*,

but

but that the Humour was more viscous; which is now evaporated in the dryed *Uterus*, and the *Ovaria* quite collaps'd. The Extremities of the *Cornua* which received the *Ova* were very narrow; for when I had inflated the *Uterus*, it retain'd the Air for some time, without passing immediately out by the *Cornua*; tho' afterwards when I had strictly ty'd the *Vagina*, I observ'd the Air did insensibly slide out, and now and then I could see small *Bullulae* arise toward the *Ovaria*. I could not see any fluctuating *Ala Vespertilionum*, nor *Morsus Diaboli*; but do suppose, that the *Ova* are received into the Extremities of the *Cornua* by an *Hiatus*, below this loose *Involucrum*, which I told you defend-  
ed the *Ovaria*. I cannot determine the precise length of the *Vagina* (b.) because I know not how much of it might have been cut off; nor Situation of the *Uterus*, because the Body lay supine, and I was obliged to take the Assistance of Butchers at the taking it out. The *Vagina* was very small and narrow, not admitting above two or three Fingers. Its Inner Surface was whitish, and moistned by a certain kind of *Mucus*, and all full of *Plica* or Wrinkles.

The *Bladder* is rounder than that of an Oxe, and much larger than Dr. *Moulin's* would have it; for he says, 'tis much about the size of an Ox Bladder; but I find, when inflated, it can contain six or seven *English Gallons*: And I doubt not but I might have stretched it out larger, had I had sufficient Instruments for inflating, for this I only did with my Mouth and Tube. 'Tis indeed very strong, and the Vessels appear very prettily dispers'd through the Tunics, which I could have easily separated, but did not design to lose it. The *Ureters* were about  $\frac{1}{2}$  of an Inch Diameter, and I could have easily discover'd their Insertion, if I had not designed to preserve the Bladder. Both *Uterus* and Bladder were involv'd within a Duplication of the *Peritoneum*, so that I had much ado to get them separated.

Since I have gone so far in giving an Account of the Parts for Generation in the Female, I hope it will not be unpleasing, if I give Dr. *Moulin's* Account of them in the Male, with my own Thoughts about them.

' In searching for the *Testes*, he found two Muscles very like them, which he suppos'd to have been them, till he had trac'd them to the inner and lower side of the *Ischion*, where he found them implanted: He trac'd the Tendons likewise, and found that when they had gone singly near upon 4 Inches, they join'd



Musculi du.  
Retractores  
Penis D.  
Mouline,  
Pag. 15.

\* in one, which went directly under the middle of the *Penis*,  
\* and reach'd beyond a Crookedness he observ'd in it. This  
\* was in length about 8 Inches, and terminated within 6 or 7  
\* Inches of the *Glans*, having expanded itself into a Membrane.  
\* There was beside these a Nervous Body, that began underneath  
\* near the aforesaid Tendons, about 8 Inches from the Root of  
\* the *Penis*, and reach'd (distinct from the Yard) 9 Inches, be-  
\* fore it was inserted again in it, at a place  $5 \frac{1}{2}$  Inches from  
\* the *Glans*.

Their Use.

‘ He is of Opinion, these Muscles in that Nervous Body be-  
‘ ing so conveniently plac’d for that purpose, that the *Elephant*  
‘ is a Retromingent and probably Retrocoient Animal. The  
‘ crookedness and bending downwards he observ’d in the *Penis*,  
‘ somewhat short of the end of the Tendon, and the confession  
‘ of those that were his Attendants, who told him, that when  
‘ the *Elephant* would make Water, they observ’d him to unsheath  
‘ the *Penis*, and bend it backwards, and so Piss between his  
‘ Legs outwards, confirm’d him in that Opinion; by which,  
‘ he says, Nature seems to prevent this unweildy Animal’s wal-  
‘ lowing in its own Excrements.

Remarks  
upon his  
Observations.

Had our Author had the good Fortune to observe the *Erectores*  
*Penis*, as well as its *Retractores*, it might have been of Service:  
For admitting there be such, (as I have no reason to call so  
ingenious a Gentleman’s Authority in question) ’tis probable  
there must have been *Erectores* also, and that upon the following  
Accounts. First, because ’tis requisite the *Penis* of the *Elephant*  
be freed of this Retraction; that whereas it is brought back at  
the *Minctus*, it may be brought forward at the *Coitus*. 2dly, Be-  
cause it is requisite that the *Penis* at the *Coitus*, be brought (if  
not altogether, yet) obliquely upwards: As we see when a Horse  
Pisses, he first unsheaths the *Penis*, which by its own Gravity de-  
clines, and if assisted by a more than ordinary Supply of Spirits,  
it tends a little forward; but in the *Elephant* there is always a  
Supply of Spirits required at the *Minctus*, both to make the  
*Penis* penetrate the Sheath, (whose inner Orifice, as our Author  
says, was shut so close, that there was not room for a Man’s little  
Finger to get in, so that he was forc’d to divide it before he  
could come at the Yard) and endue it with a certain Rigidity,  
and to swell the *Retractores*, whereby the *Penis* being render’d  
a little stiff, may be drawn back. Supposing then there be such  
*Erectores* *Penis*, we must likewise conceive them to be of a far  
greater

greater force and bulk than the *Retractores* ; for if, as according to our Author, the *Penis* at the *Mundus* be brought back far beyond the usual Posture of the *Penis* in other Animals, we may believe it also to be endued not only with Antagonist Muscles to these *Retractores*, whereby to bring the *Penis* to such a Posture as we see in Horses, but also to make it ascend so far as is requisite for the *Coitus*. And if what I have elsewhere advanc'd be not sufficient to prove this to be no Retrocoient Animal, I shall add the following Arguments : First, The *Vagina* is not plac'd behind a little below the *Anus*, as in a Mare, but below, in a direct Line with the rest of the Belly, whereby there is a Necessity for the *Penis* to ascend. 2dly, The *Ossa innominata* ascend obliquely, which must oblige the *Penis* to do so too. 3dly, The Author's Account of the *Penis* itself, (for he says 'tis bigger than that of a Horse, but not so long) so that it can hardly be suppos'd both to bend backwards, ascend again, and enter the *Vagina* so far as is requisite.

The *Testes*, he says were not contain'd in a *Scrotum* or Cap-  
 ' sula, but lay in the *Perinaum*, close joined on each side to the  
 ' *Penis*. They were neither of the usual shape, bigness, nor in-  
 ' cluded in a *Processus* of the *Peritoneum*. Their Shape was very  
 ' like that of a Chestnut. They were thicker on the side that  
 ' grew to the *Penis*, than on the opposite. They were flat and  
 ' round, and not suitable to the other Parts of his Body, being  
 ' no more than about 3 or 4 Ounces in weight. They were  
 ' joined to the *Penis* by a great many, at least 100 Seminal Tubes,  
 ' which may be properly call'd *Vasa deferentia*, and which depo-  
 ' sited the elaborated *Semen* in several *Rhomboid Cells*, plac'd in  
 ' the Body of the *Penis*, which in this Creature was the com-  
 ' mon and only Repository, where the Seed could be found.  
 ' These Cells were turgid with *Sperm*, and so were the Tubes  
 ' The latter were very large, receiving a Block-Tin Wire of an  
 ' equal thickness with the biggest ordinary Pins, or above an  
 ' Inch, when the Tube was streight, as most were ; but being  
 ' pursu'd further into the Body of the *Testes*, they became smal-  
 ' ler and smaller, till they disappear'd. The Blood came into  
 ' the *Testes* by the *Vasa deferentia*.

Our Author, as he proceeds, is somewhat perplex'd ; and therefore I chuse to continue in his own Words, that you may the better know his Thoughts of this part. He says, ' Though  
 ' these were small and disproportionable, yet he took them to  
 ' be

‘ be the *Testes*, nothing else outwardly appearing that contain’d  
 ‘ Seminary Vessels; until he understood by the Curious and  
 ‘ Learned Dr. *Needham*, that his Description of the *Testes* of the  
 ‘ *Elephant* did agree to the *Prostata* of a Bear: Upon which he  
 ‘ mistook the *Testes* for the *Prostata*, there being a great Re-  
 ‘ semblance between these Animals; and having found two Sub-  
 ‘ stances betwixt the Kidneys and Neck of the Bladder, which  
 ‘ might very well be *Testes*, and which, till he discours’d that  
 ‘ Ingenious Gentleman, he did not know what to make of. And  
 then he proceeds:

Vena Præ-  
 parantes.

‘ The *Vena Præparantes* were large: He divided that which  
 ‘ was inserted into the Emulgent lengthwise; and within a lit-  
 ‘ tle more than an Inch of its Insertion he found many Valves,  
 ‘ to the Number of about 8 or 10, of divers Shapes, all fitted to  
 ‘ hinder the return of the Blood into the variously divided Sper-  
 ‘ matick Vein, which here from 8 or 10 Rivulets became one  
 ‘ great Channel. Within about an Inch of this, and somewhat  
 ‘ more than two from the Kidneys, he found a Substance of  
 ‘ the Shape of a Pear, but near three times the bigness of a ve-  
 ‘ ry large one. He was at a loss to know what this might be,  
 ‘ and confesses he can give but an imperfect Account of it, since  
 ‘ the Butchers cut it out, and so its Continuation with the *Te-  
 ‘ stes*, *Penis*, and other Parts, could not be discovered.

‘ What he observ’d in it was, that the Spermatick Vessels  
 ‘ entred but a little way into this Substance; but below the  
 ‘ middle of it he found them more deeply plac’d, and their  
 ‘ Branches grew so small, and less numerous to the Sight, as if  
 ‘ here the Veins began. The inner part of this Substance look’d  
 ‘ of a palish, but somewhat muddy red Colour. ’Twas very  
 ‘ Spongy, not much more compact than the Lungs of young  
 ‘ Animals. He doubts not but this Substance was designed to  
 ‘ prepare the *Semen*; but by what Vessels it was brought to the  
 ‘ *Penis* or any other Repository, (itself containing none, he could  
 ‘ not discover; neither could he find any peculiar Vessel, or  
 ‘ *Ductus*, or any thing that resembled that before-mentioned  
 ‘ Substance, by which he might be directed in his Enquiry. It  
 ‘ lies lengthwise from the Kidney to the *Testes*, with the biggest  
 ‘ end lowest. He is of Opinion, from what he has heard from  
 ‘ Dr. *Needham* of these Parts, that these two Pear-fashion’d,  
 ‘ now describ’d Substances, were *Testes*; their Place, Size, Fi-  
 gure,

‘ gure, and occasional Cutting the *Vasa deferentia*, being the  
 ‘ Occasion of his former Ignorance in this Point.

‘ He could observe no *Vesicula Seminales*, nor any common Re-  
 ‘ ceptacle for the *Semen*, except the formerly mention’d Rhom-  
 ‘ boid Cells in the *Penis* itself; but doubted not there might be  
 ‘ some still, tho’ his being intent upon other things made him  
 ‘ neglect the Discovery of them. Thus He, as you find, in-  
 genuously confesses his mistake of the *Testes* twice, and he leaves  
 them in doubt the third time : However, this may serve as a Pre-  
 caution to such as may have occasion to dissect such a Subject as  
 this hereafter, and therefore I thought fit to give you his Account  
 in his own Words.

The *Intestines*, *Uterus*, and *Vesica*, being extracted, I laid aside  
 the two last, in order to a future Preparation, and went to ex- *The Liver,*  
 tract the Liver, which you know takes time in other, and much  
 more in this great Animal. Whether by the haste made in ta-  
 king it out, or not, the Liver of this Subject had any such *Mem-*  
*brana Hepar investiens*, as Dr. *Moulins* speaks of, I shall not be  
 too positive; but am ready to believe it had none, and that the  
*Membrana* mention’d by him is nothing but the proper Tunicle of  
 the Liver, rais’d by Fire, as we shall see hereafter; and my Rea-  
 son for thinking so, is, that I was very careful to have it taken out  
 whole. ’Tis true, the Intestines being taken out in haste, I had  
 not so soon an opportunity of observing the *Ductus Communis*; but  
 I view’d the rest of the Liver exactly, and caus’d the Figure  
 and Dimensions of it upon the Place to be took, (being 36 In-  
 ches long, and 22 at the broadest part) because it would not  
 keep. I was indeed in great doubt, what to think of the *Vesicula*  
*Fellis*, when I did not find it. Both the *Vena cava* and *Porta*  
 were very large, and had their *Exit* and Entrance in the con-  
 cave Part of the Liver, as you see. This had only one Lob; but  
 both the Veins dispers’d themselves, first into two large Branches,  
 and then were subdivided there, as in the ordinary manner. I  
 open’d several, and found them differ in nothing from other A-  
 nimals; the Substance being firm, as is usual, and Glands large  
 and conspicuous; the external Surface smooth, and its proper Tu-  
 nicle firmly adhering to the Glands; which is all I observ’d in it.  
 See the Figure.

But because Dr. *Moulins* does tell us of a *Membrana Hepar in-*  
*vestiens*, I shall give you his Account of it; as also of the *Bile* and  
*Porus biliaris*, which I can give no Account of my self. He says,

‘ The

*Tab. 4. Fig. 10.*

\* The Membrane that invests the Liver, was raised from it a considerable way, as if it had been joined to it. Though this Membrane seem'd to be whole, and look'd like the *Cunicula* raised by a Blistering Plaister, yet there was no *Serum* contain'd in it; and where it seem'd to be intimately join'd to the Liver, by a gentle pull it came off, without tearing any thing that I could take notice of, as if it had been but very slightly fastned to the Liver; or rather as a Bag, which contained and exactly fitted it. He takes the use of this to be chiefly to terminate the Capillary Vessels, and prevent the glecting of Serous Humours; and concludes, that he must wholly impute the clear in some Places, and in others that easy Separation of the Membrane from the Liver, to the Fire: By all which this seems to be nothing different from the proper Membrane which I observ'd, and you see the Circumstance of firmly adhering and loosely investing.

His Account of the Bile.

The Bile, as he gives an Account, was deposited at the end of the first Gut,  $4 \frac{1}{2}$  Inches below the *Pylorus*; from whence he trac'd the *Ductus Communis* to the Liver, to see the *Vesicula Fellea*; but it was wanting, and in the place of it he found the *Porus biliaris* coming out of the Liver, as the *Ductus hepaticus* usually does. He observ'd likewise, that the *bilis* found in that, differ'd both in Colour and Consistence from that he found in the *Ductus hepaticus*; for the latter was of a clear light yellow Colour, congeal'd like a Jelly, and the former of a dark Green, and somewhat more fluid than the Gall of an Ox. He hopes Time will discover such a difference in the Galls of most Animals, and that discerning Men will be excited to find out their Uses.

I fail'd also to observe the *Pancreas*, because it was taken away in *Cumulo*, with the rest of the Intestines; and therefore shall give you Dr. Moulin's Account of it too.

Of the Pancreas.

\* The *Pancreas* was very long and large; for it reach'd from about the middle of the Stomach to the *Jejunum*, which space could not be less than 6 Foot. 'Twas a *Glandula Conglomerata*, as the *Pancreas* always is, and had its *Ductus* so wide, that it could without force contain ones little Finger. It open'd into the Gut, where the *Ductus felleus* did. Whether both the Passages join'd into one before their Aperture into the Intestines or not, he has forgot. The *Succus* in the *Ductus* was not limpid, as it usually appears, but of a very dark Green Colour, and yet very fluid, seeming to contain no viscaous Phlegm.

The

The *Spleen*, of which I had not time to take the Figure, was *Of the* in this Subject  $3\frac{1}{2}$  Foot long: On the backside its Edge was *Spleen.* somewhat curv'd, almost in Shape of an unbended Bow: On the fore-side, from a narrow Point at each end, it enlarg'd itself by degrees, till it came toward the middle where the Vessels entred, where it was broadest. Whether the *Vena Splenica* went forth by one, two, or more Orifices, I cannot positively determine, it being cut off in haste; and when cut off, I saw it ragged for the space of 4 or 5 Inches; which I conceive to be because of the Orifices of so many Veins. It was thin and flaccid; what Blood was press'd out of it, was blacker than any I had seen throughout the rest of the Body. If it had not been unwarily cut by several slashes of the Butcher's Knives, I design'd to have blown it up and prepar'd it. I cut off a little of it, and press'd out of it Venal grumous Blood from several of its *Cellules*. It was in breadth from 3 Inches toward the Extremities, to 8 Inches about the middle.

The *Glandula Renales* were plac'd after the usual manner: They were about 5 Inches long, 2 Inches broad, and Oval, with a loose *Glandulæ Renales.* outer Coat, which I remov'd, as it had been a Sheath; within which was contain'd the *Gland* itself, being divided into several Lobes, like the Kidney of an Ox; from whose Interstices there pass'd several thin *Membranes*, which passing to the loose *Vagina*, kept it fast; and by which this *Vagina* was only coherent with it. Its Vessels were cut off so short, that I could make nothing of them. I cut it longitudinally, and found in it a Cavity, which could contain about 2 Ounces, all full of a black grumous Blood, in Colour much like that I observ'd in the Spleen. I shall not much insist upon the Use of these two *Viscera*, about which there is so much debate; but only tell in short, that it is probable, as the Spleen is to the Liver, so are these *Glandula Renales* to the Kidneys; that is to say, whereas the Blood after it is distributed into the Intestines by the several Arteries, which proceed from the *Aorta*, is receiv'd by the Orifices of so many Veins, as serve to make up so many *Radices Vena Porta*; it is convenient this Blood should be animated by a new Supply of Spirits, the better to enable it to continue its Circulation in the *Porta* through the Liver, and dispose it for the better Separation of the Bile; for which Use the Spleen seems to be adapted, both from its Situation in respect of the Liver, the Venal Blood of the one entring the *Porta* for the other; its Structure; *Mora* of the Venal Blood, after

after discharg'd from the Arteries; and a considerable Branch of a Nerve furnish'd to it: So the Kidney being a *Viscus* where there is a vast Separation of *Serum* required, these *Renēs Succenturiati* seem to be design'd for furnishing a new Supply of Spirits to the Venal Blood, after it has pass'd the Kidneys, and undergone this Secretion. Both which Uses I doubt not may appear from their Structure, as you have it at large declared by those accurate Anatomists, who have flourish'd in this Age.

### *Kidneys.*

The *Kidneys* were of a large and proportionable size, being one Foot in length and  $\frac{1}{2}$  Foot in breadth, of the usual Figure, much like that of a Man; their external Surface smooth, and equal with their external Coat, closely adherent to the inner Substance, without any perspicuous Lobes to be seen externally; but when I open'd one of them, I perceiv'd 6 large *Carunculi Urinarij*. Its Substance was very obvious, and correspondent to the Structure usually observ'd in the Kidneys; *i. e.* the Glandulous Substance externally was very conspicuous, for the space of about  $\frac{1}{2}$  Inch in Circumference; then began to appear the *Tubuli Urinarij*, first smaller and less obvious; then another Series larger, and a third still larger, till they began to surround each of the *Carunculi*, like so many Rays of the Sun. I had no Assistance of Microscopes, (for I open'd it in the Field on *Monday*) and therefore did not see so clearly the *Coalition* of the smaller *Tubuli* into the larger Ducts: But as it happens in all these Excretory Vessels, they did not appear branched and divaricated, as Blood Vessels usually are; but continued parallel to each other, till from the lesser to the greater, they at last emptied themselves into the common Receptacles. I am not positive, whether there was one common Ureter, into which all the six *Carunculi* did empty themselves, or if each had a particular Branch of an Ureter, into which they were discharg'd; only I remember I saw no *Pelvis*, which for the most part happens where the *Carunculi* are very large. The Reason of my uncertainty about the Ureters, is, that after I caus'd the *Thorax* and *Abdomen* to be open'd on the *Saturday*, I let alone the Kidneys till the *Monday*; but they being involv'd within a Duplication of the *Peritoneum*, and no Fat surrounding them, that Membrane was so dry'd up and stiff, that even the Butchers Knives were scarce able to pierce it: So that requiring the help of a Butcher, who assist'd at the Excarnating of the Bones, he took out the Kidneys without any regard to the Vessels; for the *Renēs Succenturiati* were luckily taken out the

Day

Day before, when all the Parts were soft and flexible. And here in general I must tell you, that the Flesh of this Animal was for the most part so strong, that no Launcet I had, how keen or strong soever, could do any Service: So that I was forc'd to make use of Butcher's Knives, when I could not admit of their Hands; and how unfit such Instruments are for Anatomical Preparations, I leave you to judge.

I come next to the *Thorax*; where there was scarce any thing remarkable. I think I need not tell, that the *Viscera* here were large and strong. One of the Lobes of the Lungs was open'd by the Butchers, and the other had nothing observable, but its bigness, which was proportionable enough. It did not adhere to the Ribs, as in Dr. *Moulin's* Subject; but lay flaccid on the one side of the Heart, as the other had done, before it was mangled, on the other side; so that I look upon this Adhesion of Dr. *Moulins* to have been in a morbid State. At first I designed to have taken out the whole *Viscera Thoracis*, till the Butcher prevented me; and as I began to direct him between the two first Ribs, I saw two large Glands, one situated on the outside of each of the *Carotides*, as they pass'd out of the *Thorax*; they were round, and near the bigness of a Turkey Hen's Egg, each having a conspicuous Artery inferted, and a Vein passing from them. These I took to be the *Thymus*; which, tho' seldom observ'd in adult Subjects, yet perhaps may at all times be seen in such a large Animal as this. I cut off one of them with part of the adherent Artery; and could observe nothing at the opening of it, but several loose thin Membranes without, which I suppose to have supported and contained in the Cavity (whose sides they describe as they run to and fro) a great deal of Fat, when the Animal was in good case; and a firm glandulous Substance within, without any Cavity. I sh. ll not positively determine, whether these were actually the *Thymus*, or only adventitious Glands; but because they were regularly situated, which seldom happens to adventitious Glands, 'tis probable they were. Their Vessels were proportionable to their bigness, but I can say nothing to their Use. When I saw I could not extract the *Viscera Thoracis* whole, I trac'd one of the Branches of the *Aorta ascendens* down to the Heart; and was surpriz'd, when I cut it above, to see a fat-like Substance jeat out of it; and pulling it, I got upwards of 2 Foot in length of a *Polypus* adapted to the Capacity of the Artery, which was about  $2 \frac{1}{4}$  of an Inch Diameter. This *Polypus* was no

Thymus.

A Polypus  
in the Aorta.



wife fibrous, but as it were so much Fat moulded after such a manner, being not unlike the Blade of a broad Sword, near to  $\frac{1}{4}$  of an Inch at the middle, and much thinner at the Edges, tough and flexible, with some grumous Blood not so firmly compacted at the Extremity.

*Heart.*

*Polypus  
Cordis.*

When I came to the *Heart*, I saw all its Vessels very large; the *Bivium Aorta* very considerably thick and strong. There was nothing about the Heart remarkable, except the bigness, which was proportionable to the Body. The *Auricles* were large, and the Left as well as the Right full of grumous Blood. At the opening of the *Ventricles*, I found them both fill'd with the same *Polypus*; which strangely twisted itself in among the Valves, both *Tricuspides* and *Semilunares*, and also among the fleshy Columns at the bottom of each *Ventricle*; which here seem'd to be so many little strong round Muscles, some  $\frac{1}{4}$ , others  $\frac{1}{2}$ , and others near one Inch long, with a round fleshy Belly, and two Tendons variously situated, as you see in the Hearts of other Animals. These *Polypus's*, from a massy Substance in the middle of the Ventricle, sent forth to all Parts their Branches, which here and there twisted themselves round these fleshy Columns, their tendinous Insertions, and the tendinous Fibres of the Valves, with a wonderful Intricacy. In a word, there was no Angle, no Corner or Cavity, which the *Polypus* did not occupy: And yet so much was it disengag'd from the Substance of the Heart, and 'twas so strong and tough, that by pulling its grosser part in the middle, all the other Branches mov'd; and by cutting a few Parts of it, where it was most engag'd, and where the fleshy Columns were thickest, I got it out altogether; and having stretch'd it out, did pleasantly behold these Ramifications, proceeding from its grosser part like so many Thongs or Laces whereinto a piece of Leather had been cut, some broad and some narrower; but none very thick; of a yellow Colour, and fat Substance; each of them weighing 1 lb. which I may safely say, was more Fat than was upon all the Body beside. From whence I may reasonably conclude, that altho' it had not met with the formerly mention'd Hardships, however it might have liv'd sometime, yet it could not live long, it being evident, that this *Polypus* would at length have prov'd its Ruin.

*The Mouth*

Having, as I told you, but little time to take Notice of the external Parts of the Head, either in respect of the Muscles which move it, the *Larynx*, *Pharynx*, or Tongue, or in respect of the Salivatory

Salivatory Vessels, which empty themselves in the Mouth; I shall only tell you, that the Mouth is very little and narrow, in proportion to the Body, and that upon these Accounts: 1. Because neither Lips nor Teeth are employ'd in gathering the Food, as in other Quadrupeds; so that the Mouth only serves to receive the Aliments from the *Proboscis*, which both gathereth and conveyeth them into it. 2. The *Dentes Maxillares* are of such a thickness, both in the Upper and Lower Jaw, but especially the latter, that they serve to render the Mouth narrow; nor need it be broader, because the Strength of the Grinders is such, that that they can at once render the Aliments so small, that there is no need for the Tongue to move them to and fro' in the Mouth, in order to have them further masticated, as in other Animals; therefore is the Tongue small, short and round, terminating in a Point, thick, and not thin and flat as in Oxen, with a soft smooth Surface, without any perspicuous *Papilla*; by which it seems not to chew the Cud.

The short View I took of the Tongue hindred me from observing that singular Structure mention'd by Dr. *Moulin*s. All I took notice of peculiar to it, was the firm Adhesion of the *Thyroïdes* to the *Os Hyoides*, which made me separate and preserve both; whereof see the Figure. As to what Dr. *Moulin*s says, it seems to me very improbable; and I am sorry the Head should have been so mangled at the cutting off, that I was neither able to receive, nor to give you any satisfaction about it. However, I shall give you his Account, and acquaint you with my doubts.

The Passage, says he, to the Ventricle, was through a peculiar Hole, near the Root of the Tongue, and exactly in the middle of that part; which Hole was the beginning of the *Æsophagus*: There was no Communication between this and the Passage into the Lungs, contrary to what happens in other Animals; for the *Membrana Pituitaria anterior* reach'd to the very Root of the Tongue, below the *Æsophagus*; so that it could emit no Voice by the Mouth, but by the Trunk. This *Membrana* had many Passages for the *Saliva* usually separated there. There was between the end of the *Proboscis* and the *Larynx*, a *Membrana Pituitaria posterior*, which had many of the same sort of *Ductus*.

This, I confess, seems to depend upon particular Observation, and yet I cannot see how it can well happen; for every one is sensible, that the *Larynx* occupies the fore part, and the *Æsophagus*

An Observation of Dr. *Moulin*s, concerning the Passage from the *Larynx* to the *Proboscis*.

*phagus* lies behind between the *Vertebrae* and *Larynx*. Now how the *Æsophagus* can lye thus behind, and yet have such a Communication with the Mouth, as to hinder the *Larynx* from communicating with it, also is to me a very great doubt.

Remarks upon the foregoing Observation. He proceeds; 'The *Aspera Arteria* was very large, and destitute of an *Epiglottis*, there being no danger of any thing falling into the Lungs from Eating and Drinking, seeing there was no Communication between the *Æsophagus* and it. Here the difficulty still remains; for how can Aliments be ingested into the Mouth, and not pass over by the *Larynx*, as is said, before they enter the *Æsophagus*; that would imply, that the *Æsophagus* lies before, and the *Larynx* behind, which would quite invert all the Rules of the *Oeconomy* of Animals: Since then the *Æsophagus* must have in its descent pass'd in betwixt the Head and Lungs, and then penetrated the *Diaphragma* or otherwise, and after it had descended a little, must have turn'd aside and pass'd behind the *Larynx*, as the *Arteria Iliaca* do over the *Vena Iliaca*, which, tho' by cutting off the Head, I could not observe, yet is what seems improbable to me; because then at the Deglutition, by the Pressure of the *Æsophagus* on the one side, and *Vertebrae* of the Neck on the other, ever and anon would the Animal be oppress'd with a difficulty of breathing when it took Food.

He says further: 'To the outside of these Cartilages he found another grow, which was fastned to them, but so as to be capable of moving up and down, by the help of some Muscles which were implanted in it. 'Twas strong on both sides of the *Aspera Arteria*; but opposite to the *Æsophagus*, or on the underside it was very Limber. This wanted about  $2\frac{1}{2}$  Inches of coming round the aforesaid Cartilages, (*viz.* the *Cartilagines Arithmoides*, which made a *Glottis*, in length about  $3\frac{1}{4}$  Inches, and in breadth about  $1\frac{1}{2}$  Inch about the middle, whose Aperture was somewhat Oval) on the upper side, or that next to the *Æsophagus*. This seem'd to supply in some measure the want of an *Epiglottis*, in lessening the *Glottis*, to prevent the creeping of Animals into it.

The Head. Being come to the Head, I have very little remarkable to add in this Place: For the Brain itself very little differeth from that of an Human one, except in bigness, and somewhat in Figure; the other being somewhat Oval, and this more round. The *Dura Mater* was a strong thick Membrane, every where disengag'd from the *Pia Mater*; which together with all the Substance of the

the Brain, was much more tender, soft, and flaccid, than could have been expected. Whether this proceeded from keeping the Head 2 or 3 Days after the Animal dy'd, before it was dissected, the Weather being then very hot, or from the languid Distemper whereof it dy'd, I know not. Its Substance, Ventricles, and other Parts, were the same as in other Animals. The *Cerebrum* had three large Productions at the *Basis*, one anterior, from whence the Nerve *Olfactorij* proceed, and two lateral on each side of the *Cella Turcica*, reaching from the *Processus Petrosus* behind to the above named Production before : For the Blood Vessels and Nerves, which enter in and proceed from the Brain, we shall discourse of them more particularly, when we come to the Holes of the Scull. I must not forget to tell you, that at the opening of the longitudinal *Sinus*, there were also *Polypus*'s, which proceeded from the Orifices whereby the Blood emptieth itself in the *Sinus*.

Thus far the Anatomical Account of the softer Parts of this Animal ; which I acknowledge to be deficient in many things, and those considerable. I rather chose to give you a lame Account of what consisted with my own Knowledge, than intrude upon you meer Conjectures for positive Truths, in order to render it more compleat.

I come now to the Fifth Thing I propos'd, wherein I hope to be more happy, as having more time to consider the Bones than formerly I had to Survey the softer Parts ; and doubt not to render this Description satisfactory to such as shall be willing to know more particularly the Structure and the Parts of the Bones of an *Elephant*. The Animal is big, the Bones large, and there be several things to be consider'd in them, which do not readily happen in the *Osteology* of other Animals ; therefore I hope you will excuse me, if I prove more tedious than might be wish'd. My chief design is to satisfy your Honourable Society, your self, and *Tentzelius* ; and if I do that, I have my aim.

I shall begin at the Head, as is usual in *Osteology* ; where I shall first take Notice of its External Shape in general ; next give an Account of the Bones whereof 'tis compos'd ; and lastly, give you a particular Description, first of its External, then of its Internal Parts ; shewing their particular Dimensions and Weight, and ascribing their Uses to each of them as they occur, and as we can probably conjecture.

A brief De-  
scription of  
the Skull.

Tab. 2.

The Head (A.) being compos'd of the Bones of the Upper and Lower Jaw, on its upper Part is almost round, having two Eminencies with a Depression in the middle before; which Depression, as it runs back, becomes a deep *Sinus*; and these Eminencies drawing nearer to one another, and as they ascend behind, inclining obliquely forward, are not unfitly compar'd by Mr Ray to a Man's Buttocks: About its middle part it is almost Quadrangular, being flat before, till it comes to the Root of the Trunk (a.) where it is depressed, for the more convenient Lodging of the *Proboscis*, till it has past over the Mouth (b.) At each side 'tis much contracted for the moving of the Muscles of the Lower Jaw (c.) at its back Part it becomes very narrow, with several Eminencies, *Sinus's* and Holes; of all which in order. At its lower and fore part, the Bone of the Palate is narrow, where the *Proboscis* hangs over: On each side of which are the *Alveoli* for the Tusks, and behind, the Lower makes up all the rest of the Head, as to its External view.

Description  
of the fore-  
part of the  
Skull.

Tab. 3. Fig.  
1.

We shall begin the particular Description of the External Parts of the Head at its fore-part; the Diameter of whose upper part is 3 Foot, the two Eminencies are almost round (d. d.) and the *Sinus* in the middle is 10 Inches from the right to the Left, and 2 Inches deep (e.) from thence descending 5 Inches, the Bone is flat before, and begins to form an Angle on each side for the Cavity, which contains the Muscles of the Lower Jaw and *Proboscis*, between which Angles 'tis 11 Inches (f. f.) thence descending gradually the Angles tend outward, till they come to the upper Production for the Orbit of the Eye (g. g.) where they are 17 Inches; betwixt which is situated the Hole for the Root of the Trunk (a.) This Hole runs across the Head, being from the Right to the Left 12 Inches, and from below to above on each side 7 Inches; for in the middle it has a Protuberance where the *Cartilaginous Septum* arose, which descends 2 Inches, and terminates in an obtuse Point. Within this Hole are to be seen several of the *Lamina*, whereof the *Cellules* which run betwixt the two Tables of the Skull are compos'd (b. b.) of which hereafter, with the *Vomer* in the middle (i.) whence the *Septum* of the Trunk arises. 'Tis pretty thick here, and is compos'd of two *Lamina*, with a spongy Bone in the middle. At its upper and fore part it communicates with the *Os cribosum*; and you may see the several Perforations, through which a great many Branches of the *Nervus Olfactorius* pass, and cover the Surface of the *Cartilaginous Septum*.

*tum.* At its lower and back-part, where it becomes gradually thinner, it divides the *Choana* into two ; whereof hereafter. At the lower part of this Hole the Bone becomes Concave (*k.*) so that measuring from the middle of the Orbit of the Eye on both sides, which are  $3 \frac{1}{2}$  Inches distant, the Depression becomes 2 Inches deep. At the middle of the lower part of this Hole begins a Suture, which runs down to the extremity of the Bone (*m. m.*) These two Bones are articulated *per Symphysin*. Dr. *Moullins* calls these *Ossa Maxilla Superioris* ; but I rather incline to call them *Ossa Palati*. They are  $\frac{5}{8}$  Inches broad at the upper part, where they are articulated with the *Ossa Maxilla Superioris*, by Dr. *Moullins* *Ossa Mala*, by the same kind of Suture (*n. n.*) From the upper part to the lower extremity of this *Os Palati* (*b.*) it is 15 Inches. After they have quitted the *Os Maxilla Superioris* on each side, they run down with an obtuse Angle ; being Protuberant on their outer side, they incline gradually toward the Suture in the middle (*m. m.*) forming a Cavity  $2 \frac{1}{2}$  Inches deep at the lower extremity, which is not so deep as at the middle. 'Tis design'd for the *Proboscis* to rest upon, and the Eminencies on each side are for granting space for the *Alveoli* ; whence the Tusks proceed (*o. o.*) which are improperly call'd Teeth, (and therefore this Bone which contains them should not be call'd *Os Maxilla*) since they only serve for a Defence to this Animal, and should rather be call'd its Horns. They are of different bigness in different Animals, and the Male seems to have them bigger than the Female ; *v. g.* The *Elephant* which was burnt at *Dublin*, had them much bigger than this which died here ; which consists with the Knowledge of several in this Place, who remember to have seen both : And the Figure which Dr. *Moullins* gives of them, even tho' broke, seems to represent them much larger than those in the Subject we have ; which are very small, not exceeding the bigness of an ordinary Cane, or not above one Inch Diameter, and streight, so far as they remain unbroke : So that I am not in a Capacity to affirm or deny the Assertion of *Aristotle*, who says, *Mares grandiores resimatosque habent, Famina minores, & contra quàm Mares, vergunt enim deorsum, pronique deviant.* Perhaps it might have been so with these ; and that the Keepers (that the difference of the Sex might not be known, by their bending downward or upward) might have designedly broke them. Indeed there is great difference between the weight and length of these, had they been entire, and those wonderful big ones whereof Authors give us an Account. *Tentzelius* tells us,

that the length of those describ'd by him is 8 Foot; and he, with several others, tells us, that there are of them which weigh 100 Pound and upwards, some 140, others 150, and those he talks of were above 200 Pound; insomuch, that *Tavernier* tells us, that in the *Indies* they make Posts of Doors and huge Pales of them: And 'tis memorable, which he says also, that the *Elephants* of the Isle of *Ceyland* have no Tusks, but the first which the Female produces: And this we have confirm'd by Mr *Knox* in his Relation of this Island, that few of the *Elephants* there have Tusks, and those only Males. There is a great debate among Authors, whether these shall be call'd Horns or Teeth. Those who would have them be Horns, say; 1st. Because they rise from the Skull. 2. Because they can be polish'd, and brought into any form, which 'tis difficult to do with Teeth. 3. Because they fall off and grow up again, which the Teeth of no Animal do, except of Man. Such as would have them to be Teeth, tell us, that 'tis peculiar to such Animals as have the Hoof divided into two, to have Horns; and that Horns are always cavous or spongy within; whereas these are altogether solid. For the first Reason, that they rise from the Skull, tho' it be granted, yet it is after a different manner from Horns; for they always either adhere to the Skull by a certain Articulation, if not cavous, as in Harts, or have a Protuberance arising from it, and filling up their Capacity, if cavous, commonly call'd the Flint. For the second, tho' it be granted they can be polish'd, &c. yet they are not capable of such Alterations, as Horns are by Boiling, or burning in the Fire, such as being made flexible. Indeed they seem more to agree by their Structure with Teeth; for they proceed from the Skull, and are planted in it *per Gomphosin*; having in these we are speaking of a large Cavity, about two Inches long, large according to the Diameter of the Tusks, at first, but as they descend tapering gradually, till they terminate in a Point analogous to the Cavities in the Roots of the Teeth, and filled up with the same kind of Substance, whereby they are kept firm in their Places. And as to their Structure, I doubt not but they have been compos'd of a mucilaginous Substance at first, as Teeth are; and that afterwards they augment by the apposition of several *Lamina*, or *Strata*, according as the Animal encreases in Years. Hence 'tis, that I suppose *Tentzelius* his Friend came to be convinc'd, that those Bones he treats of, were of an *Elephant* 200 Years Old, by such Marks as these *Lamina*, which might have been taken from the Teeth.

Teeth. These *Lamina* are very obvious in the Subject we have, and the smallness of the Tusks seems to be another Argument of her being Young, according to their term of Life. Whether they be call'd Teeth or Horns it matters not much; for if from their Substance we take their Designation, they may be call'd Teeth; and if from their use in pushing, we may call them Horns; and to avoid any debate, let them be call'd Tusks or Defences. They run in this Subject about 6 Inches high in the *Os Palati*, and adhere by a strong Ligament, as is already said.

We proceed to consider the side of the Head. We told, that *The side of the Head.* descending 5 Inches from the middle of the Depression in the fore part of the Head, which is 7 Inches from the Top of any of these Eminences, it begins to form an Angle (*a.*) and the side of 2. the Head becomes considerably depress'd, where the Muscle of the Lower Jaw and *Proboscis* is lodg'd. This Depression from its beginning (*a.*) to the *Os Zygomaticum* (*b.*) (where it is  $8\frac{1}{2}$  Inches deep) is  $14\frac{1}{2}$  Inches distant; and from the fore-part (*g.* Fig. 1.) to the *Orificium Meatus Auditorij* (*k.* Fig. 2.) is 13 Inches; also from the upper Protuberance of the Orbit of the Eye (*f.*) to the Articulation of the *Os Zygomaticum* with the *Os Temporale* (*i.*) is  $9\frac{1}{2}$  Inches. At the fore-part of this Depression is situated the *Sinus* *Sinus for the Eye.* for 'tis improperly call'd Orbit, since only the half of the part where the Eye is lodged is boney: It has 3 remarkable Protuberances; one at the upper and fore-part (*f.*) whence a strong Cartilage arises, and is insert'd in another 7 Inches distant (measuring obliquely) form'd by the Articulation of the *Os Zygomaticum* with the *Os Maxilla* (*g.*) and a third in the middle (*e.*) at  $3\frac{1}{2}$  Inches distant from each of the former. This Protuberance serves for the Insertion of the *Trochlea* of the *Musculus obliquus major*. The bottom of the Orbit has another *Sinus* (*s.*) which conveys the *Nervus Opticus* to the bottom of the Eye, the upper part whereof is compos'd of a *Lamina* of the *Os frontis*, which lies over the *Os Maxilla*: From beneath this *Lamina* not only proceeds the *Nervus Opticus*, *Motorius* and *Patheticus*, but also a considerable Branch of an Artery, Vein, and 5th Pair of Nerves, which running forward, pass through a large Hole in the *Os Maxilla* (*m.*) and are dispers'd in the *Proboscis*; whereof hereafter. This *Sinus* (*s.*) whose lower side is form'd by a *Spine* running along the *Os Maxilla*, is 9 Inches long,  $1\frac{1}{2}$  Inch broad at the middle, and one Inch deep; but as it comes forward, 'tis enlarg'd as the Globe of the Eye encreases.



The Os Max-  
illa Superio-  
ris.  
Fig. 1.

The *Os Maxilla* is a very irregular Bone. At the fore-part of the Skull it begins with a sharp Point (*p.p.*) having that part of the *Os frontis* which forms part of the Orbit (*d.* Fig. 2.) on the one side, and that part of the *Os Palati* (*m.*) which forms the Hole for the Root of the Trunk on the other; whence running 6 Inches, and inclining inward by a crooked suture, it terminates in a Protuberance; beneath which is a small *Sinus* ascending obliquely to the Hole for the Root of the Trunk (*n.*) fram'd by the Blood Vessels (whereof above) as they go to the nourishment of the Trunk; from thence it runs obliquely backward, and is articulated with the (*s.* *Palati*) by a broad squamous Suture. From the middle Protuberance of the *Sinus* for the Eye (*d.*) it runs streight backward, being articulated with that part of the *Os frontis* which forms the aforesaid lower Edge of the *Sinus* for the *Nervus Opticus* (*s.*) for the space of 18 Inches, where it begins to be overlaid with a *Lamina* of the Bone, which forms the upper and back-part; whence it descends 9 Inches, till it comes to the Root of the Teeth (*n.*) where we shall leave it, and return to the fore-nam'd Protuberance; from whence having made up a part of the *Sinus* for the Globe of the Eye, as is said, it runs backward 6 Inches, and is articulated (by a flat Suture (*g.*) which first descends  $\frac{1}{2}$  Inch, then runs obliquely backward  $2\frac{1}{2}$  Inches) with the *Os Zygomaticum*. At its beginning its  $2\frac{1}{2}$  Inches broad; plain on its inner, and convex on its outer Surface; bend- ed, as it descends, like a Horn, and terminating in a Point. From the lower part of this Suture it becomes much thicker; and having fram'd a *Sinus* about 4 Inches long, it runs toward the fore-part of the Skull. From this *Sinus*, as it has returned 3 Inches, is form'd the side of an Oval Hole, which running from before to behind is about  $\frac{3}{4}$  Inches long, and from the one side to the other two Inches. At that side which is fram'd by the *Os Maxilla*, and toward the *Processus Zygomaticus*, 'tis two Inches thick; and at its other side, it runs streight backward from the *Os Maxilla*, in a direct Line, with the great Cavity, which contains the Muscles that move the Lower Jaw and *Proboscis*. This Hole is analogous to that in a Human Skeleton in the *Os Maxilla*, beneath the Orbit of the Eye; and is larger in Quadrupeds, being destinated for transmission of a Vein, Artery, and the superior Branch of the second Division of the 5th Pair of Nerves, which in those go to the Upper Lip and Jaw; but in this Subject, as I have already shewn at large, 'tis probable they serve for the Nourishment and

and other Functions of the *Proboscis*. Tho' it be very observable, and of signal Use, yet 'tis so situated, that I was not capable to give such a View, as might afford a true Idea of it, in any of the Figures of the Head : However, I have mark'd it (*r. r.* Fig. 1.) and (*m. m.* Fig. 2.) (*8. 8.* Fig. 3.) From this Hole the *Os Maxilla* inclines 6 Inches, toward the Root of the Teeth (*n.*) where we leave it, and return to

The *Os Zygomaticum* (*s.*) (*h.*) (*i.*) which, as in all other Animals, serves for a Guard to the Muscles which move the Lower Jaw. In Men, and several other Animals, 'tis form'd of a Production of the *Os Temporale*, articulated with another from the *Os Mala*, by a particular Suture, call'd *Sutura transversa*; but here 'tis the most distinguish'd Bone of all the Head; for being 12 Inches long and two Inches broad, 'tis articulated with the *Os Maxilla* before, and running backward 6 Inches, it meets at its upper part with a Production of the *Os Calvaria* (*f.*) as we may call it, which accompanies its lower part other 6 Inches, and then terminates in an obtuse Angle. 'Tis loosely join'd with this Production, and 'tis probable, that 'tis capable of considerable Motion, upon the following Accounts. 1. The *Sinns* in the back-part of the Scull, as shall be shewn, for receiving the *Condyles* of the Lower Jaw, are larger than the *Condyles* themselves, by which they have a pretty good space to move from the Right to the Left; and the extremity of the *Os Zygomaticum* being their Guard on each side at the outer part, which way they move, these may be suppos'd to yield. 2. The Lower Jaw is of such weight, that its Muscles must require a great space to act in, and that may be conciliated by the Motion and Yeilding of this Bone. 3. The Grinders of the Lower Jaw are much longer than those of the Upper, and therefore they require a greater space to move in, for the better Performance of Mastication, (because the Upper Jaw in this, as in most other Animals, is immovable) to which the Motion of this Bone must very much assist. Add to these, the manner of its Articulation; for it rests upon the Production of the *Os Maxilla* before; and behind it moves, as it were, to and fro, upon the Production of the *Os Calvaria*, which rests upon it.

The back-part of the Scull is next to be consider'd: At its upper part the two Eminences formerly mention'd now appear more considerable, because of the intervening *Sinns*, which from two Inches deep, and 10 Inches from the Right to the Left, be-

The back-part of the Head.

comes

Fig. 3.

comes 4 Inches deep; for the Eminences (*a. a.*) approach (as they run backward) much nearer to one another, and the *Sinus* running obliquely downward becomes still deeper, having a *Spina* (*c.*) 6 Inches long and one Inch deep. This *Spina* serves for

Fig. 6.

Insertion of the Muscles, which move the Head. The Bone on each side of it is very rugous; which seems to be an excellent Contrivance, because there is such a deal of Strength requir'd here in the Tendons, for supporting the weight of the Head of this great Animal, 'twas requisite the Surface of the Bone whence they arise should be very unequal, that their Fibres may be the more firmly impacted therein. Here 'tis also that the *Tax-Wax* formerly mention'd was inserted. By means of this *Spina* in the middle, and the Eminences on both sides of the *Sinus*, the Surface of the Bone is much more enlarg'd, and the Muscles with their Tendons are more capable to move the Head, either directly or obliquely to either side, than if the Bone had been plain. After the *Spina* of the *Sinus* is ended, the Bone swells out toward the back-part 3 Inches, and then descends  $1\frac{1}{2}$  Inch till it comes to

Fig. 33

the Hole for the Spinal Marrow (*d. d.*) and here the Bone from above the *Orificium Meatus Auditorij* (*f.*) on each side, becomes Protuberant 10 Inches (*e. e.*) till it comes to the *Processus Condylodes* (*c. c.*) This Protuberance has the same Office as the *Apophyfis Mastoides* in other Animals, *viz.* for Insertion of the Muscles which bend the Head inward. The *Processus Condylodes* (*c. c.*) are  $7\frac{1}{2}$  Inches distant inclusive; each of the *Condyles* being  $2\frac{1}{2}$  Inches broad from the Right to the Left, as they arise gradually from their outer side, and from below to above arising (as it were Semicircularly) 5 Inches long. The Hole for the Spinal Marrow (*d. d.*) at the upper part betwixt the *Condyles* is 3 Inches broad,  $2\frac{1}{2}$  Inches at the middle, and 2 Inches at the lower part, till at last it terminates in a Point. 'Tis  $3\frac{1}{4}$  Inches long, and its Margin about the middle of the *Condyle* is 2 Inches thick. Below these *Condyles* the Bone becomes more flat; insomuch, that tending inward there is a *Sinus* fram'd, above which the *Processus Styloides* arises (*g.*) being there articulated *per Synchondrosin*. This *Processus Styloides* is cartilaginous about one Inch (*h.*) at its Base; whence arising hard and solid 4 Inches (*k.*) flat on its inside, and convex on its outside, being one Inch broad, it is afterwards divided, sending out another Bone  $5\frac{1}{2}$  Inches long (*i.*) which bending toward the Scull, but outward from that place whence it proceeded for the space of two Inches, it becomes gradually

gradually smaller, till it terminates in a Point not unlike that part of a Pen wherewith we write. This Bone is so situated in the *Basis* of the *Scull*, that 'twas impossible to give any Idea of it *in Situ*, and therefore I caus'd them to take the Figure of it apart. Betwixt the *Sinus* below the *Processus Styloides* and the *Condyles*, at  $1 \frac{1}{2}$  Inch distant, is situated the Hole for the jugular Vein (*m.m.*) through which also passes the *Par vagum* (See *n.* Fig. 14.) which being Oval, is  $1 \frac{1}{4}$  Inch long, and  $\frac{1}{2}$  Inch broad. On the outside of the *Processus Styloides*, is to be seen the Hole for the hard Portion of the *Nervus Auditorius* (*l.*) This is so near to the Root of the *Sinus*, that it could not be well shewn in the Figure. Betwixt the Origin of the *Processus Styloides* (*g.g.*) and the Hole for the jugular Vein (*m.m.*) is lodg'd the boney part of the *Aqueduct* (*n.n.*) which descends 5 Inches; 'tis  $\frac{1}{2}$  Inch broad, and so flat that it could scarce be represented in the Figure. From thence is a *Crena*, whose Orifice is represented by (*o.o.*) where its fleshy part was contain'd, which communicated with the *Palate*; it descends 3 Inches obliquely inward. From the foresaid Hole for the jugular Vein (*m.m.*) is situated the Hole for the Carotid Artery, which is so large as to admit the Point of ones Little Finger (*p.p.*) Descending in a streight Line from the *Processus Styloides* (*g.*)  $3 \frac{1}{2}$  Inches, you come to the Hole where the *Arteria dura Matris* enters the *Scull*, and by which the 3d Branch of the 5th Pair of Nerves passes out: Here also the Vein, which returns by the great Hole in the *Os Maxillare* from the *Proboscis*, (after it has past some space beneath the *Lamina*, which makes up the upper edge of the *Sinus* for the Orbit of the Eye,) passes out, and runs back to be joined with the jugular Vein. These Holes are situated on each side, betwixt the *Aqueduct* and the *Sinus* for reception of the Lower Jaw (*y.*) and are both receiv'd within a like *Sinus*, so that they could not be represented by an Orifice. The Bone for Reception of the *Processus Styloides*, as I have said, is deprest; and from thence for the space of two Inches, till you come to the Hole for the Carotid Artery (*p.p.*) it is rais'd for the *Aqueduct* (*n.n.*) From thence, betwixt the two Holes, 'tis gradually Protuberant to the *Condyle*: From below this Hole (*p.p.*) streight downward, during the Progress of the two *Aqueducts* (*n.n.*) which are 3 Inches distant, 'tis deprest, till you come to the *Choana*, or Passage betwixt the *Palate* (*t.*) and the Root *Fig. 1.* of the Trunk (*i.*) Between the two Holes for the *Arteria dura matris* 'tis 6 Inches (*q.q.*) The length of the *Sinus*, called in Human

man Subjects the *Glenoid* Cavity, measuring from that part of it which is toward the Hole for the *Arteria dura matris* (q. q.) till you come to the extremity of the *Os Zygomaticum*, is  $5 \frac{1}{2}$  Inches long. This *Sinus* is scarce at all depressed; 'tis rather Protuberant, with a Semicircular Surface from above to below: 'Tis well enough guarded on both sides; so that notwithstanding this Protuberant Reception for the *Condyles*, yet their Dislocation is prevented by the extremity of the *Os Zygomaticum* on the outside (x.) and on the inside, first by an hollowness, and then by a Rising in the Bone. And this Contrivance seems to facilitate the Motion of the Jaw very much; for had this *Sinus* been proportionably so deep (however Superficial it may be) as in Human Subjects, its Motion had not been so very free, as we see it is: For by this half round Surface, the *Condyles* have the more space to move backward, and the Lower Jaw to be depressed, that it may move forward, and press the Aliment against the Upper Teeth with the greater Force; the Muscles also prevent its falling too much back, and the *Os Zygomaticum* its inclining too much to either side, as is observ'd. Above the big Process of the *Os Maxilla*, which is articulated with the *Os Zygomaticum*, is the *Orificium meatus Auditorij* (k.) which being Oval, is one Inch long, and  $\frac{1}{2}$  Inch broad. Betwixt this external Orifice and the *Processus Petrosus*, the *Meatus* is 8 Inches long; whereof hereafter. By means of this great *Sinus* on each side, the *Basis* of the Skull is so contracted, that from the Hole (q.) down toward the Root of the Teeth (3. 4.) which is 9 Inches long, the breadth is but  $7 \frac{1}{2}$  Inches. From the extremity of the boney part of the *Aqueduct* downward, the Base of the Skull is compos'd of two cavous Bones, about  $2 \frac{1}{2}$  Inches thick, and a large *Sinus* in the middle  $3 \frac{1}{2}$  Inches Diameter (s.) at the end of the *Sinus* for the fleshy part of the *Aqueduct*, and at the Root of the Teeth  $4 \frac{1}{2}$  Inches. This *Sinus*, after 'tis become 2 Inches deep, terminates in the *Choana*. This Passage is 8 Inches long, and  $2 \frac{1}{2}$  Inches broad, with the *Vomer* in the middle (u.) extending from hence to the Root of the Trunk 8 Inches. The back-part of this *Vomer* is sharp and thin, but its fore-part thicker, consisting of two *Lamine*. Dr. *Moulin*s is of Opinion upon Observation of the Tongue, whereof before, that the *Elephant* only Breaths by this Passage, and not by the Mouth. I do not find that this Passage is proportionally more Patulent in this Animal than in any other, only it seems to be more direct; for as in other Animals this Hole communicates

municates with the Root of the Nose, and the Bone gives the Air at its *exit* another direction; so here the fore and back-part of the *Choana* are directly opposite, but then the Trunk itself gives the Air a quite other direction than in the Bones of other Animals. Indeed there is one Argument which seems to strengthen Dr. *Moulin's* Opinion, *viz.* That by the Trunk the *Elephant* sucks up any Liquor it has occasion for, which it afterwards empties into the Mouth; and so by drawing in of the Air, it is able to keep in its Extremity any thing it takes hold of. However, the Objections advanc'd against this Opinion formerly, seem to be of greater Moment, than these Arguments here propos'd, are for it. These two cavous Bones on each side the *Choana*, are fill'd up from the two firm, solid, white, weighty Teeth (3. 4.) the *Teeth, or* back one whereof does not grind, but serves, as it were a wedge, *Grinders of* to keep that before firm in its Place (5.) This Tooth runs ob- *the Upper* liquely backward 3 Inches from the fore Tooth. That part of it *Jaw.* which is without the Jaw Bone is half round, being 6 Inches in Surface from its Root on the one side to that on the other, very polite, as *Tentzelius* is pleas'd to term it, and smooth like Glass. How far this Tooth or the other may go up, I cannot positively determine, neither give any Account of the Figure within the Bone, unless I had broke the Scull. However, I shall insist more upon the Teeth, when I come to the lower Jaw; all I shall add at present is, that their *Alveoli*, especially that which contains the hind Tooth, are as thin as can be imagin'd. The length of each of the Teeth is 7 Inches. These Teeth are not alike on both sides; for that on the Right is but one Inch without the *Alveolus*, throughout its whole extent, on the outer side; and on its inner, 'tis one Inch Protuberant at its fore, and two inches at its back-part; whereas that on the Left side is only one Inch Protuberant before on the outside, and 3 Inches behind, where it forms a kind of Angle, as it is join'd with the hind Tooth; and on the outside 'tis  $\frac{1}{2}$  Inch Protuberant before, and 2 Inches behind. The Tooth on the Right Side (7.) grinds with that of the lower Jaw, throughout its whole extent; whereas that of the Left, after it has run back 6 Inches, runs up with an half round Surface two Inches (5.) before 'tis join'd with the hind Tooth. It would seem, that this difference betwixt the Shape, Situation, and Dimensions of the Right Tooth from the Left is not singular here, for Dr. *Moulins* doth likewise take notice of it, in that which dy'd at *Dublin*; for he says, 'The length of the Teeth of the Right Upper Jaw is 4 Inches, but that of the opposite was but 3: The

‘ two outward or fore Teeth of the Upper Jaw, were somewhat longer than those of the Under. He takes no notice whether the hind Teeth of the Upper Jaw grind or not; but here, as I have said, not only both the hind Teeth are free from grinding, but also part of the fore Teeth of the Left side. These Teeth, as Dr. *Moulins* well observes, are all *Molares*, being 2 Inches broad; that part of them wherewith they Grind is  $6\frac{1}{2}$  Inches on the Right Side, and  $5\frac{1}{2}$  on the Left. Their Surface, tho’ flat, yet is very unequal; for they have alternatively plac’d (running from the Right to the Left) an hollowness, and then an Eminence, and this Eminence is surrounded by a rough Protuberant Border. There are nine of each of the Hollownesses, and as many Eminences, undulated, as they use to paint Sea Waves; which seems to quadrate with what Mr *Ray* says, viz. That these Teeth have 8 or 9 parallel undulate Lines in their Surface. The Situation of these Teeth, for what I know, is peculiar to this Animal; for instead of running from above to below, as in other Quadrupeds, they run from before to behind, as in human Subjects, being plac’d at . . . Inches distance at the beginning, or fore-part, and . . . Inches at their hind part. From the fore-part of these Teeth the *Os Palati* runs down . . . Inches, having that division in the middle (whereof formerly) much enlarg’d (10.) This Bone, as to its thickness in this Subject, is correspondent to the Tusks, which are implanted in each side of it, as is said. It seems to be thus plac’d upon two Accounts; 1. That it may answer to the distance, or cover that part of the Lower Jaw which runs betwixt the fore-part of the Grinders above (*c. c.*) and the Process at its lower and middle part (*c.*) 2. That it may afford space, as we formerly observ’d, for the Trunk to rest upon, lest it should be obnoxious to the Mouth.

Fig. 7.

The Lower  
Jaw.

Fig. 7. 8.

The Lower Jaw is the only External Part of the Head, which comes now to be consider’d, consisting of one big Bone, and compos’d of its fore and hind part, and five Processes, viz. two *Condyles* (*a. a.*) two *Processus Corona* (*b. b.*) and one *Processus Mentis* (*c.*) ’tis articulated with the Upper Jaw, as in all other Animals, by a double *Artrodia*. The two *Condyles* (*a. a.*) are 12 Inches distant inclusive; their Surfaces Convex, both from the Right to the Left, which is  $3\frac{1}{2}$  Inches, and from before to behind, which is 2 Inches. They are received into the *Sinus* of the Upper Jaw (*x.*) which, as I have said, is  $5\frac{1}{2}$  Inches: So that they have space enough to move at Mastication. The Neck below the *Condyle* is 3 Inches from before to behind at its smallest part, whence descend-

Fig. 3.

descending 3 Inches, it becomes 6 Inches broad (*b.*) and two In- Fig. 8.  
 ches thick at its back-part, where it forms an obtuse Angle ;  
 whence running forward at its outer side 2 Inches, it begins to  
 form a *Sinus* for Infertion of the Muscles which move the Jaw.  
 This *Sinus* running forward 4 Inches more, terminates in a  
 sharp edge of the Bone, which descends to make up the *Processus*  
*Corona* (*b. b.*) This *Sinus* is 8 Inches from above to below : At  
 the upper part of the *Processus Corona*, 'tis 8 Inches broad from  
 before, where 'tis sharp, to behind, where 'tis thick and obtuse,  
 and at its middle  $9\frac{1}{2}$  Inches (*b. b.*) the *Processus Corona* from a- Fig. 9.  
 bove to below 6 Inches, with, as it were, a Semicircular edge,  
 but somewhat more Protuberant, where 'tis not so sharp as the  
 Margin above. How we come to the inner side of the same part  
 of the Bone, where we find that descending 7 Inches from the  
*Condyle*, till we come a little below the foresaid obtuse Angle,  
 there are the beginnings of a large Hole (*b. b.*)  $3\frac{1}{2}$  Inches long, Fig. 8.  
*viz.* from the first framing of its *Sinus* to its lower part, and  
 $1\frac{1}{2}$  Inch broad. This Hole is for receiving the Vessels fit for  
 forming and nourishing the Teeth ; whereof hereafter : Here the  
 Jaw begins to be about 4 Inches thick behind, being convex in  
 its back-part ; whence running 4 Inches forward, it inclines a-  
 bout  $2\frac{1}{2}$  Inches inward, where it forms a large *Sinus* for infertion  
 of the *Musculus Masseter*, and whereof no *Idea* could be given in  
 the Figure ; for the outside always obstructed the view of the in-  
 side. This *Sinus* descends obliquely from the Neck of the *Con-*  
*dyle*, till it comes to the Root of the Teeth (*c.*) 9 Inches, which  
 space does not appear so large in the Figure, because of the Posi-  
 tion of the Jaw ; and from the fore part of the *Corona* backward,  
 till the Jaw become thick,  $5\frac{1}{4}$  Inches : From the back-part of the  
 Jaw at the foresaid obtuse Angle, till you come to the Point of  
 the *Processus menti* (*b.*) in a streight Line, is 27 Inches. The  
 Arch of the back Surface from the same Angle, till you come  
 equal with the beginning of the Teeth, or lower part of the *Co-*  
*rona* (*c.*) is  $14\frac{1}{2}$  Inches ; from whence measuring outward from  
 the Root of the Teeth, it is 3 Inches to the foresaid lower part  
 of the *Corona* ; from thence to the middle of the back part 5 In-  
 ches ; and from the Root of the Teeth at the External to the same  
 place at the Internal Part, is 16 Inches ; and here the Jaw is a-  
 bout 4 Inches thick behind. At the joining of the two Teeth  
 streight downward, 'tis  $6\frac{1}{2}$  Inches ; and here it inclines gradually  
 outward for above 3 Inches ; whereas its inner Surface is almost  
 plain, or at least for the space of 4 Inches, and then inclines ;  
 gradually



Processus  
Menti.

Fig. 7.

Fig. 7. 8.

Sinus for  
lodging the  
Tongue.  
Fig. 8.

Fig. 9.

gradually outward below, forming an Arch in its Progress. Streight downward from the lowest part of the *Corona*, the Jaw is at the thickest (*c.*) and here it begins to run obliquely forward, till meeting with the same part of the Bone from the other side, it terminates in the *Processus Menti* (*b.* Fig. 9. *e.* Fig. 7) which about 2 Inches runs obliquely outward, and seems very convenient for defending the Mouth from the Inconveniencies of the Trunk; which by its weight would press too much upon it, were it not defended both by that part of the *Os Palati*, which runs down from the Teeth in the Upper Jaw, upon which it leans; and by this *Symphysis* or *Processus Menti*, *b. e.* which keeps it still inclining downward, and suffers it not to bend inward: Add also, that this Process may assist the *Proboscis* somewhat in its Elevation, when the Animal bending the Head a little forward, may make the Point push or bear up the *Proboscis* from above it. As the lower part of the Jaw in its Progress forward runs obliquely downward, so its upper part of the Root of the Teeth runs streight forward, or rather inclines a little upward (*c. e.*) so that whereas 'tis only  $6\frac{1}{2}$  Inches from above to below at the joining of the Teeth, now 'tis  $7\frac{1}{2}$  Inches streight downward, (and here its Surface is more plain, for before 'twas convex, and as it were half round) but along the edge of the *Sinus* for lodging the Tongue. (*d. e.*) to the outmost point of the *Processus Menti*, 'tis 9 Inches. Now we consider the inner part from the Place where we left it, and find it still more plain; where measuring from below the foresaid joining of the two Teeth streight forward, 'tis 4 Inches on each side, till both meet in a Semicircle (*f.*) about 3 Inches Diameter at the lower part, and somewhat nearer at the Root of the Teeth. After it has run 2 Inches upward, it runs streight forward with a convex Surface 4 Inches thick; thence it ascends 4 Inches more to the Root of the Teeth (*d.*) This *Sinus* is for lifting the Tongue, which is very narrow and pointed. Thus having given a particular Account of the External Figure and Shape of the Lower Jaw, we shall consider it in general. The *Condyles* are 12 Inches inclusive distant; whence the Bone running downward, and somewhat backward 3 Inches, forms an obtuse Angle, which is 17 Inches exclusive distant from its opposite; and here the Bone begins to swell to a considerable thickness by degrees: From thence descending gradually 8 Inches, 'tis 18 Inches distant; thence inclining obliquely forward 8 Inches more, 'tis  $14\frac{1}{2}$  Inches distant; inclining still more forward to the Base where the two Bones meet, the Bone still becoming thinner,

'tis 9 Inches; from which on each side, till you come to the *Processus Mentis*, 'tis 7 Inches: Thus far as to its back-part. Now to its fore-part: First, there is the *Condyle* (a. a.) then there is a sharp Spine which runs obliquely to the *Corona* (b. b.) whence to the Root of the Teeth 'tis thicker and of a Semicircular form: Opposite to this, the Bone begins to swell at its outer side, and becomes plain at its inner; that is to say, as to that which regards the Mouth, and that which doth not. Its Surface on both sides is very polite and smooth, having a great many Holes for immision and egress of the Blood Vessels, which nourish the Bone; and at its fore-part, it has two large Holes for the *Maxillaris inferior* (Z. A.) or Branch of the 5th Pair of Nerves, which are dispers'd at the Roots of the Teeth. Next we come to the inner Substance of the Bones, so far as can be guess'd, because the preserving of the Sceleton entire, has kept me from penetrating so far into the Knowledge of it, as my Inclination might have led me. Every one is sensible, who knows any thing in *Osteology*, as well Human as Brutal, that immediately below the *Corona*, or thereby, there is a pretty large Hole in proportion to the Animal, for the emission of a Branch of the External Carotid Artery, Jugular Vein, and 5th Pair of Nerves, call'd *Maxillaris inferior*, which are dispers'd in the Roots of the Teeth for their Nourishment, and for conciliating to them that lively Idea of Pain, which those affected with the Tooth-ach are very sensible of; and that in this Hole in Sheep, Calves, and other Quadrupeds, especially such as are young, as also in Children before the 7th Year, and even afterwards for some time, in the cavous part of the Bone, where the Teeth do not penetrate the Jaw, there are Rudiments of Teeth to be seen cavous in that extremity, which is toward the Base, (in which the Ligaments that keep the Root fix'd are firmly impacted) and solid at the other extremity; so in this Animal from the fore-mention'd big Hole, I observ'd several of these Rudiments of Teeth lying *Stratum super stratum*, or rather placed perpendicularly across the Bone of each others side, from the Hole (b. b.) till the Teeth began to appear. Those that were plac'd nearest the Hole were smaller, not above one Inch in breadth, and  $\frac{1}{2}$  Inch in length, i. e. from above to below, cavous, as is observ'd, at the lower or back-part, (for reception of the Ligament, which is guarded by two thin hard *Laminae*) and solid at the other. Those nearest the Hole were two or three times intersected by Membranes, whereby they could be disjoin'd. But after I had taken out several, I found no more such a Sepa-

Fig. 9.

T. b. 2.

Maxillaris interior.

The Rudiments of the Teeth.

Fig. 8.

ration, but that from the Right to the Left, they were wholly cavous: Each of them was invested by a membranous Tunicle, as it were a *Periosteum*, and had something like a Cartilaginous Substance betwixt the two. Their Surface is very unequal at the Orifice, where they receive the Ligaments and Vessels (c.) and as if they had been folded into several *Plicæ*, and afterward taken asunder, from which there run several Ridges and *Sulci* (b.) from one extremity to the other; where the Ligaments cease, they become extremely solid and ponderous, and at their upper Extremities half round, and sometimes form'd into Digitations (a.) When they approach to that part of the Bone at which the Teeth appear, they begin to quit the *Periosteum*, by which they were distinguish'd, and unite close together, so as to form one Bone. 'Tis observable, that at their upper Extremity there is a *Lamina*, which being Convex toward the Jaw, and Concave toward these Rudiments of Teeth, do as it were knit their solid Extremities together, from which 'tis also separated by an intermediate Membrane at the beginning; but afterward that ceasing, this *Lamina* conjoins them at the Extremities, as they are at the Sides, before they appear without the Jaw. And thus I conceive these Teeth to be form'd, and 'tis by these I am perswaded the Jaw becomes so ponderous and thick; and that which strengthens this Opinion is, that the hind Teeth of both Jaws (for I doubt not but these *Rudimenta Dentium* are in the Upper Jaw also) before they come to grind, have their Upper Parts Semicircular; and that both before and after the Grinders are form'd, the Lineaments of these *Rudimenta* appear plainly like so many Ridges (d.e.) having intervening Furrows, where they formerly had been distinguish'd by Membranes: And I suppose tho' at the upper Extremity they are united into one compact Bone, yet at their lower Extremity they have still the same Hollownesses for Reception of the Ligaments and Vessels as formerly; which Opinion is confirm'd by *Tentzelius's* Account. The Lower Jaw has 4 Teeth, 2 on each side (d.e.) as well as the Upper, all Grinders, but no Incisors, or fore Teeth. The hind Teeth are 8 Inches distant, and the Fore not 4, betwixt which is plac'd the *Sinus* for the Tongue (d.e.) and 'tis observable, that from thence to the bottom the *Sinus* is so contracted, as only to be one Inch broad (f.) The hind Tooth on the Right Side is 4 Inches, on the Left 5. The one half of their Surface, where they begin to appear, is Semicircular, with the fore mention'd Ridges and *Sulci* running transversely, 4 on the Right Side, and 5 on the Left. The other

Tab. 3. Fig.  
19.

Fig. 9.

Fig. 7. 8.

other half has 5 of those Eminences, where it Grinds, (whereof formerly, when speaking of the Upper Jaw,) and 4 on the Left. Each of the fore Teeth is 6 Inches long, and has 6 or 7 of the fore-mention'd Eminences, and as many Depressions. The hind Teeth of Dr. *Moulin's* Elephant seem to have been of an equal length on both sides, and much longer than the fore Teeth. 'Tis observable, that the Ridges at the sides are correspondent to the Eminences where they Grind, and the *Sulci* to the Depressions. The Teeth of the Lower Jaw exceed those of the Upper about 2 Inches in length; by which it appears, that the motion of the Lower Jaw must be very great in Mastication, and that the *Elephant* for the most part moveth the Jaw from behind to before; and scarcely from one side to the other, as in Animals that ruminate, or chew the Cud. These Teeth are the most firm, solid, and weighty Bones of any Animal yet known, and are as good Ivory as the Tusks themselves. Before we quit the Lower Jaw, I hope it will not be impertinent to enquire, whether or no these *Rudimenta Dentium* may be suppos'd in process of Time to descend and expell those Teeth already form'd, and succeed in their place; and if not, what may be their Use. For the first question, 'tis true, Children have two ranges of Teeth, tho' not equally solid, the second whereof expels the first at or about 7 Years of Age, and succeeds them, the first being only so many Sheaths or Covers, whereby the second, being yet but a soft Mucilaginous Substance, are defended from External Injuries, till in process of time they have attain'd to a convenient hardness; and that there is a great difference in the Teeth of some Quadrupeds, such as young Horses, whose Foal or Colt Teeth, as they are call'd, have some Marks, which are obliterated after a certain period of Years (well enough known to Jockies;) so that it would appear, if these Teeth are not expell'd, yet their Surface by degrees is abraded, and instead of that their Roots are augmented, and the Teeth receive such an alteration, as their Age is no more known by these Marks. I have already observ'd, that there are several Ridges and Furrows in the Teeth of this Animal, which seem to be an Evidence, that these *Rudimenta* have grown together and become one Tooth; but whether the *Rudimenta*, which have not as yet appeared without the Jaw, do ever expel these which have appeared, and succeed them, is the question; no Experiment yet being made concerning the Production of those in this Animal. The period of the Time that *Elephants* live, and the Age of this we treat of being unknown, we can give no positive determination in this Mat-

The Teeth;  
or Grinders  
of the Lower  
Jaw

ter : Yet I am apt to believe, these Teeth as well as the *Rudimenta*, have been à *prima formatione*, and that because, 1. The Jaw Bone so firmly adheres to the Teeth on both sides, so soon as they appear, and the place of their Roots is so well known (by the Protuberance on the outside of the Jaw) to be enlarg'd within the *Alveoli*, that I do not see how they can be expell'd by a succeeding Set. 2. When one Set of Teeth expels the other, the second is usually below the first, and not plac'd in the same Rank, as these are; which obliges me to enquire, what may be the use of these *Rudimenta* : Which I suppose to be, 1. To fill up the Cavity of the Lower Jaw. 2. By their Weight to add Strength in Mastication. 3. That there may be so many different Bones to assist the Teeth in their motion; and 4thly. To serve instead of a Wedge for keeping the Teeth firm in their Place. For the first, 'twas convenient the Lower Jaw should bear an equal proportion in its bigness to the Upper, and have sufficient space for Insertion of the Muscles fit for its Motion; and if a proportionable bigness, than either the Bone must be altogether solid, or cavous and stuff'd with some other ponderous Substance; for, if spongy or cellulous, then would it have been too light, which would have been very inconvenient. As to the second, the Weight is of considerable Moment, for the more exact Attrition of the Aliment, which is here requisite, because the Tongue of this Animal is both small and polite on its Surface, without those sharp cartilaginous *Papillæ* those Animals are endued with, whose Teeth are not sufficient to grind their Food. As to the third, I conceive that these *Rudimenta*, with their intermediate Membranes, may be the more helpful to the Teeth in their Motion, if they have any, or Pressure, than if the surrounding Jaw had been one whole continued solid Bone. For the fourth, a hard and soft Substance alternately plac'd, is certainly more convenient for keeping any thing firm than either of the two alone; for had they been hard Substances that lay upon one another, then neither would yield to Pressure; and if soft, tho' they yielded, yet would they not so well retain the Pressure they receive, and keep any thing firm thereby, as if they had some intermediate Substance : In a word, be the use of these *Rudimenta* what it will, the Teeth and they together have rendered this so ponderous as to amount to 45 lb Weight. And thus have we ended the External Parts of the Head.

N. B. The remaining Part of this Discourse (with the Figures) will be inserted in the following Transaction.