PHILOSOPHICAL TRANSACTIONS.

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VIPERA CAUDI-SONA Americana, *Or the* Anatomy *of a* Rattle-Snake, *Diſſected at the* Repoſitory *of the* Royal Society *in* January 168$\frac{3}{4}$ *by* Edw. Tyſon *M.D.* Coll. Med. Lond. *Cand. & R. S. Soc.*

THe *Obſervations* I ſhall here give are ſuch as a ſingle *Subject* would afford, not what might compleat the *Hiſtory* of ſo *Curious* an *Animal.* And tho it were mightily to be wiſht that we had at leaſt the moſt accurate account, and exacteſt *Anatomy*, of one of every diſtinct *Species* of *Animals*; yet this can't be expected but of

thoſe that are moſt common; where frequent repeated *Diſſections* might fully inform us of *Natures* admirable contrivance, and *Mechaniſm* of *Animal* Bodies.

This which We *Diſſected* was ſent to Mr. *Henry Loades*, a Merchant in *London*, from *Virginia*; who was pleaſed not only to gratify the curioſity of the *R. Society* in ſhewing it them alive, but likewiſe gave it them when dead, and ſo afforded them an opportunity of farther ſatisfaction in obſerving the *inward parts* of it; which I find ſo conformable in almoſt all reſpects to thoſe of a *Viper*, that I have taken the liberty of placing it in that *Claſſe*, and (ſince it has not yet, that I know of, any Latine Name) of giveing it that of *Vipera Caudiſona*; for as I am inform'd by Merchants, 'tis *Viviparous*, and the *Epithet* ſufficiently differences it from thoſe that have no *Rattle*, although of theſe too there ought to be made a Subdiviſion. But I ſhall concern my ſelf at preſent only with the *Anatomy*, which I think is yet given by *None*; tho to me it ſeems the moſt principal part in a *Natural Hiſtory* of *Animals*; and for other Accounts I ſhall refer to *Georg. Marcgravius*, *Gul. Piſo*, *Johnſton*, *Nierembergius*, *Joan. de Laet*, *Fran. Hernandez*, and others that have wrot of it; who deſcribe it under the Names of *Boiçininga*, or *Boiçimininga*, and *Boiquira*, which are the *Braſile* Names. By the *Portugues*'s 'tis called *Caſcavela* and *Tangador*; by the *Dutch*, *Raëtel-Schlange*; by thoſe of *Mexico*, *Teutlacocauhqui*, or *Teuhtlacot zauhqui*, (i.e.) *Domina Serpentum*, and from its ſwift motion on the *Rocks* like the Wind, *Hoacoatl*.

But as to our *Buſineſs*, before we look within we ſhall take a ſhort ſurvey of its *outward* parts. This therefore that we diſſected was 4 foot 5 Inches long; the girth of the *Body* in the largeſt place, which was the *middle*, was 6½ Inches; the girth about the *Neck* 3 inches; near the *Rattle* 2 inches; the Head flat on the top as is the *Viper*, and by the protuberance of the *Maxillæ* ſomewhat repreſenting the head of a *bearded arrow*; at the extremity of it were the *Noſtrills*, † between them and the *Eyes*, † *Tab. Figs.* but

* *Tab.* 2. *Fig.* 5. *b.* but ſomewhat lower, were two other *Orifices*, * which I took for the *Eares*, but after found they only led into a *bone* that had a pretty large *cavity*, but no *perforation*. *Vipers* have not theſe *orifices* in the *head*; and *Charas* ſaith that they hear by the *Noſtrills*; and that to them run not only the *Olfactory*, but *Auditory Nerves* alſo. The *Eye* was round, about $\frac{1}{4}$ of an Inch *diameter*; in *Colour*, the make of the *Pupill*, and other reſpects, like a *Vipers*, as indeed except in the *Rattle*, was the whole external ſhape of this *Animal*. There was a large *Scale* jetting over the Eye, which ſeemed to ſerve as a *Palpebra* for defending it from any thing falling on it; but I could not perceive 'twas capable of *cloſing*, tho *inwards* it ſeem'd to have a *membrana nictitans*, which removes any duſt that might adhere to the *Eye*.

The *Scales* on the *head* were the ſmalleſt of any; thoſe on the *Back* larger, and ſo proportionably greater to the biggeſt part of the *Body*; and ſo diminiſhing thence again to the ſetting on of the *Rattle*; all in figure ſomewhat reſembling *Parſnip Seeds*. Their *colour* various; thoſe on the *Head*, like the colour of the feathers on the back of a *Green-finch*; ſpeckled with ſmall *black ſpots*; whereof there were *four* larger and more remarkable. Thoſe on the *back* were a dark *Feuillemorte*, a black and a darkiſh yellow, and ſpeckled, making a curious checquer or dappling on the back by this intermixture of colours; but as they grew nearer the *Taile* they became darker, and at laſt almoſt *Black*. The *Scales* on the *back* had an *edged riſing* in the middle, which was ſtill leſs protuberant as they grew nearer the ſides, where they were flat.

The *Belly* ſeemed flat, covered with long *Scales* of a yellowiſh colour, ſpeckled black. From the Neck to the *Anus* we number'd 168; beyond the *Anus* were two *half Scales*; thence 19 whole *Scales* of a black lead colour with yellowiſh Edges; from thence to the *Rattle* 6 orders or rows of ſmaller *ſcales* of the ſame colour.

The *ſcales* of the *Belly* were joyn'd to each other by diſtinct *muſcles;* the lower *Tendon* of each *muſcle* being inſerted into the upper edge of the following *ſcale;* and the other *Tendon* of the ſame *Muſcle* inſerted about the middle of the foregoing *ſcale.* Theſe * *Muſcles* were more fleſhy towards the middle of the *ſcale;* and then its *fibres* did run obliquely aſcending. To each *ſcale* was appropriated a *Rib*, whoſe point did joyn with the extream of it, which muſt much advantage the uſe *Nature* ſeems to deſign them for, by ſtrengthening them to perform their *reptile motions*; for the *ſcales* are as ſo many *feet*, which being free, and open downwards, they thereby take hold of the ground, and ſo contract their *body* forwards, and then ſhoot out again, and ſo perform their *motion.* Whence tis obſerved by [a] *Nierembergius*, that on *Rocks* their motion is much quicker, than on the *Earth*, or *Plains*; which he needed not to make a wonder of, ſince here they have the firmer footing. But in ſoft ground, tho their belly be flat, yet they can contract it to an *Ellypſis* or an *acute angle*, that ſo they may take the deeper hold, as I have obſerved in a *Viper.* * *Fig.* 1. *ssss.*

Since they muſt be always grovelling on the *ground*, 'tis a great proviſion of *Nature* in furniſhing them with this coat of armor for their defence; which is ſo curiouſly contrived, that tho it covers the whole, yet by its frequent *joyntings* it admits of all *motions.* And for this too, the *vertebræ* of the *Spine* ſeem admirably contrived; there being a *round ball* in the lower part of the upper *vertebra*, which enters a ſocket of the upper part of the lower *vertebra;* as the round head of the *Thigh* bone does the *acetabulum* of the *os Iſchii*, by which means it can turn it ſelf any way.

Having placed it on its *back*, we opened it; and obſerved that the *Tendons* of the *Abdominal muſcles* made a *linea alba* in the midſt of the *ſcales* of the *Belly*; where likewiſe did run a large * *blood Veſſel*, ariſing from the *Vena cava*, towards the lower part of the Liver. But not to be too * *Fig.* 1. *rr.*

a *Hiſt. exotic. l.* 12. *c.* 1.

nice

nice here, we proceeded to examine the *Viſcera*, and ſhall here give the remarks in ſhort, which I made of the *Wind-pipe*, *Lungs*, *Oeſophagus*, *Stomack*, *Guts*, *Heart*, *Liver*, *Gall-bladder*, *Spleen*, *Kidneys*, *Organs* of *generation*, the *Sent-bags*, and then deſcribed the *Head*, the *Venemous Teeth*, the *Sceleton* and *Rattle*: and for the better Underſtanding the *Uſes* of theſe *parts*, we ſhall often make a *Comparative Survey* of them with thoſe of other *Animals*.

The *Wind-pipe* here was differing from that of moſt other *Animals*; which uſually having their *cartilages* annular, or at leaſt conjoyned by a membrane, do forme a *fiſtula* for conveying the *air* into the *Bronchiæ*; which thence is tranſmitted into the ſmall *Bladders* of the *Lungs*. But * here, which is common with it to the *Viper-kind*, as ſoon as it enters the *breaſt*, preſently meeting with the *Lungs*, it conſiſts onely of *ſemi-annular Cartilages*; which being joyned at both ends to the *membrane* of the *Lungs* inwardly is quite open, and immediately tranſmits the *air* to the *Veſiculæ* of the *Lungs* as will better appear by the || figure. For dividing the * *Wind-pipe* we perceived it eaſily extended above 1½ Inch wide; whereas before it meets with the *Lungs* the *Cartilages* are annular. The *Trachæa* or *Wind-pipe* was 20 Inches long, terminating near the *Heart* and beginning of the *Liver*, and reaching to that part of the *Lungs* which made the great *bladder*. The *Cartilages* of the *Trachæa* near the beginning were ½ of an Inch, but toward the end ¼ of an Inch, and lying flattiſh from end to end. Theſe *Cartilages* were not ſo diſtinct as in other *Animals*; but often running into one another.

* *Fig.* 1. *aaa.*

|| *Fig.* 4.
* *aaaa.*

The Uſe of the *Trachæa* is plain, for conveying the *air* into the *Lungs*; which how conſiderable an *Organ* they are Nature ſeems to ſhew us by the admirable *contrivance*, and *Largeneſs* of their *Structure*. They begin from the *Throat*, and run down 3 Foot in length. * The *upper* part of them that lay in the fore part of the body for the length of a foot, and did reach to the *Heart*, was made of ſmall *Veſiculæ* or *Cells*, like the Lungs of a *Frog*: but from the

* *Fig.* 1. *b.*

the frequent branchings and checquer of the *blood veſſels* there, appeared of a florrid red. This part tapers proportionably to the *Body*; the loweſt part of it near the *Heart* moderately blown, was in compaſs 5 ½ Inches; a little lower, for the ſpace of 4 Inches, the *Cells* gradually diſappeared; ſo that they ſeemed at laſt to form only a *reticular compages* of *valvulæ conniventes* on the inſide of the *membrane* of the *Lungs*; and the compaſs of the greateſt place here was about 6 ½ Inches; but from thence to the end of the *Lungs* was only a large* *Bladder* without any *Cells*; compoſed of a thin, but ſtrong tranſparent *membrane*, the compaſs of which blown as the former was 8 ½ Inches. * cccc.

The *Lungs* of the *Salamandra Aquatica*, and ſome other *Animals*, are only two large *bladders*. In the *Frog*, *Crocodile* &c. are two large *lobes*, filled with *membranous veſiculæ* or *Cells*. Our *Rattle-Snake*, and all that *Family*, tho they have but one *lobe* of *Lungs*, yet in that they compriſe the 2 former Sorts; the fore part being filled with numerous *Veſiculæ*; the later an entire large bladder.

In the *land-Tortois* there are two *lobes*, one on each ſide; but theſe are ſubdivided into ſeveral others, according to the partitions of the *Ribs* that are fixed to the *ſhell*; and they ly chiefly in the *belly*, that is, the lower part of the body. But what I would remark is, that where the *Bronchiæ* firſt enter theſe ſubdiviſions 'tis *reticulous*; then they form a large cavity: ſo that in theſe *Animals*, where the *nixus* of *Reſpiration* is not ſo frequent, *Nature* provides a ſufficient ſtore-houſe for this (ſo neceſſary a *Pabulum vitæ*) in theſe larger bladders, whence 'tis diſpenced according to the exigency of the *Oeconomia Animalis*. For the *Tortois*, *Viper*, *Rattle-ſnake*, *Frogs*, *Toads* &c. which ſleep a great part of the year; as before they betake themſelves to this repoſe, they take in their ſtore of Food; ſo perhaps that of *air* too, a more conſtantly requiſite ſupply of *Life*. For when thus ſtupidly *aſleep*, and ſometimes to all appearance *Dead*; it may be queſtioned

ned whether they have any *motion* of thoſe parts, which is required for drawing in freſh Air in inſpiration. But ſince their life here is ſo imperceptible and ſmall; this ſtock may be ſufficient, the decay being ſo little. So the *Salamandra aquatica*, that lives under water, for Lungs has two *large Bladders*, not unlikely for this Reaſon; that it might not be forced ſo often to raiſe it ſelf out of the Water to breath in freſh air when the former is ſpent and decayed.

In a *Viper* I lately Diſſected, which remained alive ſome daies after the *Skin*, and moſt part of the *Viſcera* were ſeparated, I obſerved the *Lungs* all this while not riſing and falling, as in *Inſpiration*, and *Expiration*, but conſtant, equally extended with *Air*; that as ſoon as it *dyed*, it *expired*, and they *fell*. But the *Stomack* was empty, and I doubt not was ſo ſome conſiderable time before; as was the [b] *Rattle-Snake's*, which for 4 Months at leaſt had eatten nothing: ſo that although they can live ſo long without *Food*, yet *Nature* is mighty provident in ſupplying them with *Air*, in beſtowing on them ſo large *Receptacles* for receiving it. So the *Ephemeron*, the *Silkworm* and other *Butterflies*, which all their life time, when in that ſtate, do not eat, or take in any food, yet have their *Bronchiæ*, or Lungs, remarkably large, and numerous, as if they were ſufficient alone for maintaining their *Life*, for if they be occluded with *Oyl*, or otherwiſe, they are ſtrait *ſuffocated*, and dye *convulſed*.

But wee ſhall now take notice of thoſe parts that are for receiving the *Food*; And firſt of the *Oeſophagus*, or *Gula*, which ſerves for the tranſmiting it into the *ſtomack*; and indeed this ſeems the only uſe of this part in moſt other *Animals*; but here *Nature* may be thought to intend it for ſomethiug more, and to make uſe of it upon occaſion as a *Stomack*, or *Stomacks* too; for upon blowing † *Fig.* 1. *d f.* up this part, I obſerved two large † *ſwellings*, as repreſen-

b *Narrant multi, qui eum Serpentem domi alere ſolent atque educare, annum integrum durare abſque cibo ullo potuque*, Nicremberg. *Hiſt. Nat. l.* 12. *cap.* 1

ted

ted in the *Figure*; nor was the true *Stomack* capable of that *extenſion* as theſe were. The whole length of the *Oeſophagus* was two Foot 3½ Inches; the length of the proper † *Stomack* 5 Inches, lying in a ſtraite line with the *Oeſophagus*, but thicker than it, having a remarkable coat more on the inſide, eaſily diſtingniſhable by its colour, ſubſtance and *Plicæ*, and jetting over the inſide of the *Gullet*; and in all reſpects as in the *Viper*. From the *Pylorus* the * *Ductus* ſtraitened again for 1½ inch; and then formed a large ‖ *Inteſtine*, which afforded a pleaſant ſight, by the *weaved Rugæ* of its inward coat; which *Gut* after ſome ſmall windings, ended at laſt in the † *Rectum*, whoſe capacity was much leſs than the former. In the *Stomack* and Guts I obſerved abundance of *Lumbrici teretes* which is a diſeaſe *Vipers* likewiſe are ſubject to. The whole length from the *Throat* to the *Anus*, is but a continued *Ductus*; tho oft variouſly diſtinguiſht, according to *Natures* different intention in the ſeveral *ſpecies* of *Animals*; in none tis ſo plain and Simple, as in the *Atus Marinus*, where you have neither *Oeſophagus* or *Stomack*, but only a ſtraite paſſage, and that too without any *valves*, only growing a little more taper towards the *Anus*. In other Fiſh there is no *Oeſophagus*; in ſome but a very ſhort one. In other *Animals* tis not only long, but by its *Swellings* in ſome places, has acquired different *Names*; as the *Ingluvies*, or *Crop* in Birds; the *Paunch* or Μεγάλη κοιλία in *Quadrupeds*; and what uſe they do perform the ſame I take theſe *Swellings* in the *Gullet* of the *Rattle Snake* to doe likewiſe; they being convenient *receptacles* for retaining what Food the Stomack cant yet well receive; and here it ſeems the more requiſite, ſince they feed but at one time of the year.

† g.

* Fig. 2. g.

‖ e e e.

† f f f.

But ſince in that promiſcuous food they take in, which they ſwallow always whole, there are often ſome parts unfit to be digeſted, and therefore to be returned again; the *Gullet* here being very long, and upon that account incommodious for this action, *Nature* has provided theſe ſwell-

ings

ings in it, where they may be reſpited, till recouting its force, it gives them another lift, and upon a Third effort at laſt wholly ejects them. And if what is confidently reported by many, be true, that on occaſion of danger they receive their young into their *Mouths*, theſe are fit places for receiving them.

The food before it can prove aliment, muſt be comminuted, and broaken into the ſmalleſt particles; which in theſe membranous *Stomacks*, I can't ſee how it can be performed, but by corroſion.

A principal *menſtruum* in doing this, I take to be that liquor, which is diſcharged by the *Glands* that are ſeated in ſome fat the begining of the Throat, and are called *Salival*, or juſt above the Stomack or *Gizard* of Birds, and called the *Echinus*, or in others in the Stomack its ſelf, and called the *glandulous coat*; and ſuch I take the inward coat of the *Stomack* of our *Rattle-Snake* to be.

When comminuted tis diſcharged into the *Guts*; which that the *Chyle* might not paſs off, with the *Fæces*, are often convoluted, or winding as * here; that ſo by impeding a too quick deſcent of it this way, or by *Valves*, a ſeparation may the better be made; and then the *Fæces* as uſeleſs, can't quicker be diſcharged than by the *rectum*; which where the *Fæces* are hard, is furniſht with a ſtronger *muſcle* the better to help its *action*; and ſuch ſeemed the *rectum* here; and the *Fæces* harder then uſual in *Vipers*.

* *Fig.* 2. *eee.*

So that the whole *Ductus Alimentalis* from its uſes, may ordinarily be divided into 4 parts. 1 That which conveys the Food, the *Oeſophagus*. 2 That which digeſts or corrodes it, the *Stomack*. 3 That which deſtributes the *Chyle*, the *Inteſtines*. 4 That which empties the *fæces*, the *Rectum*. But a *Leech* is all *Stomack*, from one end to the other, and do's devour at a meale ſeveral times the weight of its whole body: The *Stomack* when ſwell'd and ſtrecht with *blood* is far bigger than the *Leech* it ſelfe; nay ſeveral times exceeds it. But I miſtook the number, it was notone, but many *Stomacks*; for the cavity is divided by ſeveral

tranſverſe *membranes*, into divers diſtinct *Camera's*; but theſe *membranes* in the middle have a *hole* that leads from one into the other: but by the pouching out of each ſide, each of theſe may be reckoned alſo two; in all we may number, (there being 10 or 11 of theſe *Camera's*, beſides thoſe 2 long ones which at laſt run to the *taile*) at leaſt two, if not four and twenty *Stomacks*, but the *Rectum* which lyes between the forking of the 2 laſt long *Sacculi*, or Stomacks, is but ſmall, and ſhort in reſpect of the whole; but of this perhaps more in my Anatomy of this *Animal*. To proceed

We ſhall next take notice of the † *Heart*, which was placed near the bottome of the *Trachæa*, on the right ſide of it. The length of it was 1 ½ Inch, its figure rather flat than round; encompaſſed with a *Pericardium*, and the * *Auricle* larger than the heart it ſelf. It hath but one *Ventricle*, the *valves* ſmall, and fleſhy: and the inſide of the *Ventricle* diſtinguiſh't by 4 or 5 croſs furrows. Why *Charas* ſhould make the Heart of the *Viper* to have two *Ventricls*, I ſee no reaſon; I ſhould much more eaſily allow a double *Auricle*, one at the entrance of the *Vena cava* of which there are two || branches deſcending and one aſcending; the other for the *Arteria Aorta*, which has two aſcending and one deſcending [] branch as in the figure.

† *Fig.* 1. K.

* *l.*

|| *nnn.*

[] *mmm.*

A little below the *Heart* lies the * *Liver*; which was about an Inch wide in the largeſt place, and ſeemed divided on one ſide by the *Vena cava* into two *lobes* of an unequal length; for that on the left ſide was about 10 Inches, and that on the right ſide abcut a foot long; its colour a brown red, and its uſe no doubt for the ſeparating the *Gall* that was contained in a † bladder ſeated at ſome diſtance below it. It was once the opinion of *Sylvius*, that the Gall was tranſmitted hence into the *Liver* to be mixed with the blood, and not there ſeparated from it; but what the famous *Malpighi* wrote to the contrary, in a great meaſure brought him off it: and our Subject here is an

* *oo.*

† *p.*

Ar-

Argument againſt him, where the *Gall Bladder* is placed
*Fig. 192. c. ſo remote from the *Liver*, and the * *Ductus* for conveying it into the *Inteſtine*, is ſo evident, whereas that which brings it from the *Liver* is more obſcure, and hard to be found. The *Gall-bladder* here was 2 Inches long, the colour of the Gall contained in a graſs-green, which ſweating through it's coates had deeply tinged all the adjacent parts, the taſt of it in a *Viper* which ſeems the ſame, for I did not taſt it here, was firſt ſalt, then a ſweet bitter.

The *Ductus Cyſticus*, by which it emptyes it ſelf into the *Inteſtine*, ariſes from the top of the Bladder; ſo gently deſcending paſſes through that part which *Charas* takes for
□ d. the □ *Pancreas*; but which the Ancients called the *Spleen*, and ſo enters the beginning of the large *Inteſtine*.

Indeed in *Vipers*, the Colour of this part, and ſituation ſo neare the *Inteſtine*, ſeems an Argument for *Charas* his conjecture, for he modeſtly propoſes it as ſuch; but here in our Subject, it's *Colour* which was deep red, and ſuch hitherto I have obſerved the *Pancreas* to be in no *Animal*, as likewiſe its figure, not ſpreading but more compact, theſe ſeem to favour the Opinion of the Ancients; I ſhall move no contraverſy about this part, which has made ſo many with all *Anotamiſts*; having little to ſay of it, but that 'twas about the bigneſs of a large bean; that it adhered to the ſide of the *Inteſtine* at the begining of it; and that through the middle of it, as is already obſerved, the *Ductus Bilarius* did paſs. I was taken off from a farther Scrutiny into this part by the raviſhing beauty of another, I ſhall preſently deſcribe, the *Kidneys*.

But I muſt firſt obſerve the Fat which was very plentiful and is ſaid by [c] *Nardus Anton. Recchus* to be uſed by the Phyſicians of *Mexico* with good ſucceſs, in the Sciatica and all pains of the Limbs, and for diſcuſſing preternatural *Tumors*.

The Membrane it adhered to, I take for the *Omentum*;

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c *Rerum Med. Novæ Hiſpan. Hiſt. lib. 9. c. 17. p. 328.*

which incompaſſed all parts contained in this lower *Belly*; and was joyned to both ſides of the *Ribs*, ſo running to the *Rectum*, and forming a bagg that inveloped the parts here, but was free, and not conjoyned towards the *Belly*. The lower *Belly* I call it to diſtinguiſh it from the reſt of the *Trunk*, for the whole was but one continued cavity; there being no partition of it by any *Diaphragme*; and I have repreſented the parts contained here, in my *ſecond Figure*, as the others are in the *Firſt*; but proportionably much larger as appears by the Deſcriptions.

For the two *Kidneys*, which lay to the back on each ſide of the *Spine*, but not very firmly conjoyned, were about 7 Inches long; that on the right ſide ſomething longer than the left; and about ½ Inch broad each; tho one continued body, yet plainly diſtinguiſhable into ſeveral leſſer *Kidneys*, as I remember in one I numbered 15, but all ſo very curiouſly contrived and with ſo great beauty, that I want Words to expreſs what the *Pencil* could not imitate, much leſs can be repreſented in a *Print*. I ſhall therefore in my Deſcription, the better to help out and illuſtrate my meaning, have a conſtant reference to the *Figures*; which being covetous of making as well as might bee, ſpent ſo much time, that I had not an opportunity of ſatisfying my curioſity in all reſpects (the parts drying) as I deſired; but did obſerve, as likewiſe ſeveral *Others* who viewed them, when firſt taken out of the body, that the whole ſeemed a delicate *Compages* of *veſſels*, and the intermixture of thoſe of the blood, with thoſe other white ones, that are the *Secretory*, compoſed moſt regularly formed Bodys. In my* *figures*, That on the left ſide repreſents the upper *ſuperficies* of the *Kidney*, which appears firſt in the *Diſſection*; the other, the lower ſide which lyes to the *back*; in both there are two large *blood veſſels* runing down each ſide; one marked (*n n n*,) the other, where the *vas deferens* runs; but is not here repreſented; and from theſe ariſe ſeveral leſſer branches (*o o o*) at ſet diſtances, which curiouſly ſpreading themſelves do forme

* *Fig.* 2.

as

as it were *ramifications* of *Trees*. As many as there were of theſe *emulgent veſſels* (for ſo I take them to be) ſo many *Kidneys* were in each; the *Interſtices* (*p p p*) of theſe *blood veſſels* were filled up with other *White* ones; which I doubt not are for the *ſecretion* of the *Urine*, and on this ſide did appear more numerous, than on the other; but tis impoſſible to repreſent the curious interweavings of both; but here in the under ſide of the right *Kidney* in ſome places they appeared more diſtinct; for (*Q Q*) ſhews the large *blood veſſel*, whence ariſes the *Emulgents* (*r r r*) which ſpreading themſelves very thick into the *bodys* (*s s s*) make them appear all bloody, between which for a little ſpace there appears a ſmall body of the White *Secretory veſſels* (*t t t*)

This curious ſtructure of the *Kidneys*, and peculiar order of the *veſſels*, do further confirme me in my opinion concerning the make, and fabrick of theſe parts; but having at large delivered my thoughts hereof, in my *Adenologia* or Diſcourſe concerning the *Glands* of the Body which it may be I may hereafter publiſh; I ſhall not at preſent further inſiſt upon it: but ſhall only remark, that in *Birds*, *Fiſh*, and *Reptiles*, the *Kidneys* are uſually long; in other *Animals* often more compact; the ſeveral *Glandulous bodys* that compoſe them, being conglomerated, and cloſer ſet together, tho in ſome they appear perfectly diſtinct: as the *Bear*, the *Otter*, the *Porpeſs*, *Oſtridge* &c. and as I have remarked in the [d] *Porpeſs*, in each of theſe there may be obſerved diſtinct *Emulgents*, *Ureters*, *Pelves*, a *Cortical* or *Glandulous* part, and the *Corpus Papillare*, which is made up of the *Tubuli urinarij*, which convey the Urine into the *Pelvis*. And the *Kidney* in a man tho it ſeems but a ſingle one yet it is really made up of as many, as there are *Corpora Papillaria*. So here in our Subject, tho the Subſtance of the *Kidney* ſeems continued, yet there ought to be reckoned as many as there are diſtinct

d *Phocæna or the Anatomy of a* Porpeſs *p.* 24.

ſyſtems

ſyſtems and Orders of *veſſels*; each making a peculiar *gland* or ſmall *Kidney*; which according to the advantage of the body of this Animal, are placed here at length, not piled on one another. The uſe of them is for carrying off the *Lixivial* and ſuperfluous *Serum* of the blood, which is of ſo great conſequence, that even thoſe Animals that drink not at all, or but very little, yet by Nature are furniſht with them, as the *Rattle Snake* may be thought. When the ſeparation of this humour is made in the Kidneys, 'tis conveyed thence by the *Ureters*, into a bladder, if the too frequent excluſion of it might be inconvenient to the Animal, or if it be made in leſſer quantity, into a *Cloaca*, juſt at the *Anus*, and ſo to be ejected.

The *Ureters* in our Subject did run almoſt the length of the *Kidneys*: being a common Trunck that received the leſſer Branches that went to each ſingle *Gland* (it is in part repreſented by the * letters [*v. v.*]) and did both terminate near each other in the *Cloaca*, making a riſeing there; for our *Rattle-Snake*, like *Birds*, had a *Cloaca*, which in the female *viper*, receives the Orifices of the *Ureters*, and the two *Uteri*; and in part may be ſaid that of the *Rectum* too, which yet had a convenient *Valve* that covered it. * *Fig.* 2

Near the Verge of the *Cloaca*, we obſerved two other orifices which ſeemed covered by the folding of the Skin, and theſe led into thoſe two † *Baggs* which I have taken the liberty to call the *Scent-baggs*. *Charas* is much miſtaken, who ſuppoſes them to be the *Paraſtates* or Conſervatorys of the Seed, as likewiſe thoſe he would refute that would have them to be other *Teſticles*: and I the more wonder at this his miſtake, ſince he could not but have obſerved them as I have in the female *Vipers* too; which ſufficiently ſhews his error. One of them was about an Inch long, and as big as a Gooſe quill, but Taper towards the end, and from the colour of the Liquor it contained, appeared darkiſh; the other Bagg was ſomething leſs, and it's colour † *Fig.* 2 *m m.*

colour as in the *Viper*, This difference I ſupp ſe may be accidental: The Liquor included in them was ſomething craſs, and of a ſtrong and very unpleaſant Smell; ſuch, but in a more intenſe degree, as the Animal did emitt before diſſection, which [d] *Martial* likewiſe takes notice off, having placed it in the laſt but one in his Catalogue of Stinks, where he ſaith

Quod Vulpis fuga, Viperæ cubile,
Malles, quàm quod oles, olere Baſſa.

And [e] *Jo. de Laet* makes mention of ſome Snakes in the *Weſt Indies* that ſtink worſe than any *Fox* or *Pole-cat.*

I have long ſince taken [f] notice how the *Fætors* of all ſtrong ſcented *Animals*, are collected in theſe *Baggs*, but deſigning ~~there~~ may be hereafter a farther Eſſay on this Subject; I ſhall not here inlarge upon it: Only take notice, that our common Snakes have a far greater *Fætor* (Which lyes in the ſame *baggs*) than our *Adders* or *Vipers*. And I have been told by Travellers, that ſome *Crocodiles* will leave a ſtrong, but gratefull Smell behind them: which if ſo I doubt not, but it may be upon the ſame cauſe. But uſually tho this Liquor when new, and in great Quantity be offenſive, and of an ill ſmell (and ſuch is *Civet* likewiſe which is nothing elſe) yet when dry and in leſſer Proportions it may prove more gratefull. Thus the liquor in the *Scent baggs* of a *Weaſell*, being dryed, on a Paper and kept ſome time, did not ſeem unpleaſant to me; but rather the contrary: and I ſee no reaſon why *Pole-Cats* may not be *Civet-Cats*, though they may not turn to that account. But in a *Lyon* I diſſected, the Liquor contained in the *Scent-baggs* was in the opinion of all that ſmelt it, much like that of Oyl of *Aniſe* or *Fennel ſeed*; which almoſt was the only difference I could find between the *Lyon* and a *Cat*; for in a *Cat* this Liquor is ſcented.

d Martial: *l.* 4. *Epigr.* 4. e *Hiſt. Indiæ Occident. l.* 15. *c.* 6. *p.* 555.
f *In* Dr. Plots *Natural Hiſt. of* Oxfordſhire. *c.* 9. *p.* 305

But

But we ſhall now come to the *Organs* of *Generation*: and I find that *Charas* is as unhappy in the Deſcription of ſome of them, as he was in his conjecture about that part, we call the *Scent-bagg*. We ſhall begin with that, wherein the *Seed* is firſt made, the * *Teſtes*, which are very unproportionate in length; the *Right* being 2 ¼ inches long, the *Left* but 1¼ inch long, ſcarce ſo big in compaſs as a Gooſe-quill. The unequal length of this part *Charas* takes notice off in *Vipers*. I ſhall add, that the *Ovarium* of the *Female Viper* is the ſame; for that of one ſide was as big again as the other. The colour of the *Teſtes* was white, as is uſual, and ſo was their Subſtance. I did take notice of the *Vaſa præparantia*, which had nothing uncommon: But the † *Deferentia* were remarkable; for tho they did run in a ſtrait line almoſt from the *Teſtes* to the *Penis*, and did form no large body, yet this *Ductus* was ſo often involved, that were it unravel'd and extended it's whole length, 'twould be twice as long: which made me think, that it was only the extention of the *Epidydymis*, for the whole *Teſtis* is but a *Congeries* of curiouſly convoluted *Veſſels* which terminate in the *Epidydymis*, whoſe continuation makes the *Deferens*: and where it's convolutions are many upon the Body of the *Teſtis* it ſelf, there the *Deferens* is an even *Ductus*; but as in our ſubject it making no ſuch body there, or but a very ſmall one, in its paſſage downwards it was every where crimpled, and about the middle of the *Kidneys* often convoluted, which is repreſented in our Figures.

* *Fig.* 2. *kk.*

† *jj.*

Where they emptied themſelves I could not ſo well obſerve in the *Rattle Snake*; Since the parts which I had laid out for making the *Scheme* ſoon dryed before I had an opportunity of nicely examining them. But ſince upon the diſſection of a *Viper* I found that they † were continued along the *Penis* ſingle, where the *Penis* was ſo; and afterwards divided, and did run to the end of each. Nor were there any *veſiculæ ſeminales* or *Proſtates* here to receive them; and a reaſon for it I ſhall alledge when I have

† *Fig.* 3. *a.*

* *Fig.* 2. K. have deſcribed the* *Penes* which here were very remarkable, not only for their ſtructure, but number likewiſe, there being 4 in all, two on each ſide, which lay ſheathed in the Body that upon firſt opening it they were not to be perceived, but only the large *Orifices* where they were drawn in as a finger of a Glove may be by a thread faſtned to the end. But having protruded them || *Fig.* 2. L by a *Probe*, they appeared as is repreſented in the || Figure. And I did obſerve that toward the *Baſis*, or *Root*, they were ſingle of each ſide, and that here they were thick beſet with prickles, whoſe points looked backwards, and were very ſharp, and ſeemed, eſpecially when dry, like the ſubſtance of the *Briſtles* of a *Hedg-hog*: but hence they were divided, and did form two round bodys, of the bigneſs of a ſmall Gooſe quill, about ¼ of an Inch long of a red Colour, but the whole, as protruded, was above an Inch long. When protruded I found they could eaſily † *l. l.* be retracted, and drawn in by the help of large † *Muſcles*, that were faſtned to them and did run along under, and were at laſt inſerted at the end of the *Tayle* at the ſetting on of the firſt *Rattle*; which upon the trial was ſo plain that we need not doubt of the uſe of them, and I ſhall therefore call them *Retractores Penum*. But *Charas* ſeems to miſtake them in *Vipers*, for the *Penes* themſelves; which he deſcribes to have their Origine from the extremity of the *Tayle*; as does [g] *Baldus Angelus Abbatius*, [h] *Ulyſs. Aldrovandus* and others who it may be miſled him in the account of theſe parts. Nor as to the other extream are they more in the right, which by their Picture, and Deſcription, they make to be altogether ſingle, and covered and quick beſet with Prickles like the Skin of a *Porcupine*. Whereas this part in *Vipers* too, as well as in the *Rattle-Snake*, divides and forms two large round bodys, or two diſtinct *Penes*. And this *Baldus*, or rather *Camentius* who made the diſſection for him, ſeems to

g *De Viperæ natur. & facultat. cap* 19. *pag. mihi* 60. h Aldrovandus *de Serpent. & Dracon.*

have obſerved where he ſaith, *Quando turgidi fiunt, aut extra violenter emittantur, uti ſæpe apud Paulum vidimus, Penes hanc formam referre & aſpectu aſpero ut Erinaceus.* For in *Vipers* they are Hiſpid to the end; but no tin the *Rattle-Snake*, as is plainly repreſented in the figures of both.

There are ſeveral Animals have no *Penis* at all, but *Vaſa deferentia*, as moſt *Fiſhes*. All *Quadruped's* that I know of have but a ſingle one. Some *Birds* have but one. Moſt others if they may be ſaid to have any have two but very ſhort. In *Crabs*, *Lobſters* &c. there are two long ones, one on each ſide; but *Earth-worms*, *Leeches*, *Shell-ſnails*, &c. are *Hermaphrodites*, and have the perfect Organs of both Sexes. But where the Sex is ſingle, the *Rattle-Snake* and that Family have theſe Organs of Generation the moſt numerous of any I have hitherto met with. But why the Male *Rattle-Snake*, or the Male *Viper* ſhould have 4 *Penes*, when the Female has but two *Uteri* for receiving them, ſeems a difficulty to me. Amongſt many Conjectures I have had about it, what ſeems the moſt to ſatisfy me, is this: That they have the *Penis* here on each ſide double, or forked, that ſo being enter'd the *Uteri*, by ſpreading themſelves like the *Pythagorean* Y, they may the better and more firmly be retained there till they have performed their Duty. And this too ſeems one uſe of the *Aculei* or *Briſtles* towards the Root of them; for having their points looking backwards when once they have enterd the *Pudendum*, they muſt needs lock them in, and retain them there, till ſuch time as the parts being tired, and ſubſiding, have leave to retreat. For in Animals which have no *Veſiculæ Seminales*, 'tis requiſite that the *Coitus* be long, that ſo the Seed which cannot quickly, may leaſurely be tranſmitted from the *Teſtes*: but where 'tis before hand ſtored up in the *Veſiculæ*, there the *Coitus* is ſoon over; but when they muſt expect the Generation, or at leaſt a ſluggiſh deſcent of it, Nature makes proviſion for the more convenient performing it. So in *Dogs*, which have no *Veſiculæ*

ſeminales

ſeminales, near the Root of the boney *Penis* there is a large body made up of an abundance of Cells and Veſſels; which upon the ruſhing in of the blood, and ſpirits, is ſo mightily extended, and ſwelled, that it forceably keeps him in, 'till ſuch time as the *Impetus* be over, and the part ſubſides. So the *Lamp-fiſh*, on its Breaſt has a large round body curiouſly contrived, like the tail of a *Leech*, or the *Acetabulum* of the *Polypus*; by which it can firmly adhere to the Female, and ſo by this means, tho its *Penis* be very ſhort, yet be able to perform a *Coitus*. *Cats*, *Lyons*, &c. which have likewiſe very ſhort *Penes*, that they may the better cling, are forced to make uſe of their Teeth, and Claws, and from the pain of theſe, not from the ſcalding of the Seed, come thoſe fierce ſcrecks, and hideous youlings.

Therefore in our *Rattle-ſnake*, (where, as we have obſerved, there are no *Veſiculæ*, and where the *Vas deferens* is all along crimpled and winding; and ſo upon both accounts muſt be thought to be long in *Coition*) the contrivance, and ſtructure of theſe parts ſeem very requiſite. For altho in this action they twiſt their body, which may be ſome advantage too, yet not ſufficient alone; for otherwiſe upon a little occaſion the parts would be apt to ſlip out, which now they cannot, being forked, and hooked in too by the *Aculei* or Briſtles. But the *Deferentia* being continued to the end of the *Penes* do likewiſe ſhew this muſt be the uſe of them. But that the Female may recieve no injury by theſe *Spines*, Nature has made that part of the *Uteri* which they enter ſtrong and griſtly; as we obſerved in a *Viper*: and that the Male too might not be harmed by an over Extention of theſe parts, thoſe ſtrong Muſcles which ſerve for retracting anddrawing them in, do likewiſe ſecure them in this reſpect too. It may be likewiſe conſidered, ſince they are naturally ſo cold and frigid, whether theſe *Aculei* may not ſerve to incite them, and ſtir them up. But we ſhall paſs off from theſe parts, that ſerve for increaſing themſelves, to thoſe that

often prove the Deſtruction of Others, *The Poyſonous Teeth.*

But firſt I ſhall remark ſomething of the other parts in the Mouth: as the *Tongue*, the *Larynx*, and the ſmaller *Teeth:* and in General, that the Head was but ſmall, yet the *Rictus* was very large, but the Reaſon of it we ſhall give when we ſpeak of the *Bones*. And as to

The †*Tongue* it was in all reſpects ſo like that of the *Viper*, that the Deſcription of the one may ſuit the other. 'Twas compoſed of two long round *Bodys*, contiguous and joyned together from the Root ⅓ of it's length; with great Agility they could dart them out, and retract them again; and that part which appeared out was of a black Colour, whereas that which lay ſheathed within was Red; for 'twas faſtened below the Throat, and thence was covered with a *Vagina*, or ſheath, to the place where it iſſues out, which was near to the End of the *Larynx*; and for the better Ejaculation of it, the under *Jaw* too was here * divided, leaving a conſiderable ſpace. For if 'twere conjoyned as in other *Animals* and beſet with Teeth, they would be apt to injure the Tongue; or at leaſt it might prove incommodious to the uſe 'tis deſigned for, which in part I ſuſpect with *Charas* to be for catching Flys, and ſuch ſmall Creatures they have a mind to devour. But *Jo. Baptiſta Hodierna* thinks 'tis rather for picking the dirt out of their *Noſes*, which would be apt elſe to ſtuff them; ſince they are always grovelling on the Ground, or in Cavern's of the Earth.

† *Fig.* 5. *g.*

* *Fig.* 5. *i.*

Over the || *Tongue* did lye the *Larynx*; not formed with that variety of *cartilages* as is uſual in other Animals; but ſo as to make a Rime or Slit for receiving or conveying out the Air. Nor was there any *Epiglottis* for preventing other bodys from ſlipping in; this being ſufficiently provided for, by the ſtrict cloſure of them: And the Air paſſing through only ſuch a ſlit, without the contrivance

|| *Fig.* 5. *f.*

i *Apud Severinum in Viperâ Pythiâ p. m.* 254.

of

of other parts for modulating it, can only make ſuch a ſound as we obſerve in their hiſſing.

†*Fig. 5. c c. h.* The *Teeth* are of 2 ſorts,† 1. The leſſer, which are ſeated in each *Jaw*, and ſerve for the catching, and retaining

* *Fig. 5 d d.* *Fig. 6. h.* *Fig. 7.* the food. 2. The *Poyſonous* * Fangs which kill it, and are placed without the *Upper Jaw*, they are all *Canini* or *Apprehenſores*; for ſince they do not chew or bruiſe their Food, but ſwallow all hole as they meet with it, there is no need of *Molares*.

Of the firſt ſort of *Teeth;* In the *Lower Jaw* there are two Rows on each ſide, 5 in a row, the Inward leſſer than the Outward, ſo that there are here 20 in all: In the *Upper Jaw* there are but 16, 5 on each ſide placed backwards and 6 before. Theſe do no harm, which was known to *Mountebanks* (as *Ciſalpinus* and others obſerve) formerly; who to give a proof of the force of their *Antidotes*, would ſuffer themſelves to be bitten by *Vipers*, but firſt took care to ſpoil them of their Fangs.

Theſe *Fangs* are placed without the *Upper Jaws*, towards the forepart of the mouth, not faſtened to the *Maxilla*,

|| *Fig. 6. g.* † *f.* as the other Teeth; but the || two outmoſt and largeſt *Fangs* were fixt to that † *Bone*, which if any, may be thought to be the *Eare Bone*. The other Fangs I could not perceive were faſtened to any *Bone*, but to *Muſcles* or *Tendons* there. Theſe Fangs or larger Teeth were not to be perceived upon firſt opening the Mouth, they lying couched under a ſtrong *Membrane* or Sheath; but ſo as did make a large riſeing there on the out ſide of the *Leſſer Teeth* of the *Maxilla*; but at pleaſure when alive they could raiſe them to do execution with; not unlike as a *Lyon* or a *Cat* does it's claws. Theſe *Teeth* were hooked and bent like the Teeth of a *Barbaroſſa*; but ſome of the

* *Fig. 7.* *ſmaller of them were bent at *Right Angles*; but their ſhape and bigneſs will be beſt underſtood by the * Figures we have made of them. On each ſide we met with about 6 or 7 not altogether placed ſo exact as is repreſented in the Head in the 5 Scheme; which was don for the ſhewing

ſhewing them more diſtinct. For the 2d *Tooth*, upon raiſing it, did lye more on the ſide of the firſt; and the other being faſtened only to *Muſcles* or *Tendons* which are flexible, 'tis difficult to aſſign them their poſture. In all theſe Teeth, eſpecially the larger, we took notice of a pretty large *Foramen* or Hole towards the Root of it, and towards the point there was a plain viſible and large Slitt, like the cut of a Pen ſloping; and that part from the Slit to the Root was perfectly hollow; which firſt of all was diſcovered to us, by preſſing gently with our finger the ſide of the *Gumme*; for then we did perceive that the Poyſon did readily ariſe through the hollow of the *Tooth*, and iſſued out of the *Slit*. This we tryed ſeveral times; which tryals, as likewiſe our ſearching for all the *Teeth* wee could here find, did ſpoyl our Enquiry into the *Baggs* and the *Glands* that furniſh them with that Liquor. But our defect herein may well be ſupplyed with what *Monſ. Charas* and *Sen. Redi* have wrote of the ſame parts in *Vipers*. Nor do I think there may be any material difference as to theſe particulars in both Subjects. This poyſnous Liquor I obſerved to be of a Water colour, lightly tinged Yelow; perhaps in ſome it may at ſometimes be deeper: & this, it may be, has given occaſion to that fond Opinion of thoſe who have imagined that it was tranſmitted by a Veſſel from the *Gall bladder*. Indeed ſcarce any Subject in Philoſophy has admitted more controverſy's than this of the Poyſon of *Vipers*; in what it conſiſts, what it is, and how it produces it's dire Effects. *Severinus* in his *Vipera Pythia* has made a large collection of them; and who ſo pleaſes may there ſatisfy their curioſity about it. But of late, famous has bin the conteſt between *Sen. Redi*, a Noble *Italian*, and [k] Mr. *Charas* a *French-man*. 'Tis *Redi*'s opinion, 'That the Yellow liquor contained

k *Vid. Fr. Redi obſer. de Viperis ejuſd. Epiſt. ad Aliquas oppoſitiones in ſuas Obſervat.* Mr. Charas *New Experim. upon* Vipers. *A Continuation of the new Experiments by* Charas.

'in

'in the *Veſicles* of the *Gummes* of the *Vipers*, is the only 'and true ſeat of the Poyſon; That this *Juice* is not vene- 'mous, when taken in at the mouth, but that it is ſo, when 'let into wounds made by a *Viper* whileſt ſhe is alive, and 'even in thoſe which ſhe may be forced to make ſeveral 'daies after ſhe is dead, provided the Yellow Liquor do 'intervene; That the ſame Liquor drawn from a live *Viper*, 'as well as that of a dead one, is alwaies Venemous, if let 'into the wound, and mingled with the blood of the Ani- 'mal wounded, whether it be uſed when liquid, or after 'it is dryed, and reduced to a Powder: and that it kills 'all kind of Animals, into the wounds of which it ſhall 'have bin intromitted. But Mr. *Charas* wholly oppoſes 'this, and aſſerts, 'That the Poyſon of a *Viper* is no where 'but in her inraged Spirits; That the Yellow *Juice* as wel 'of a live *Viper*, and even a vext one, as of one that il 'either newly dead, or hath been ſo for ſeveral daies, cons 'tains in it no poyſon at all; neither taken inwardly, nor 'in the biteing, nor put into the wound, nor mingled with 'the blood, nor any other way wherein it may be uſed: 'That it kills nor infects no kind of Animals, and that it 'is nothing but a meer innocent *Saliva*. Both inſiſt upon Experiments for the proof of their own opinion, which being ſufficiently known, I ſhall not here repeat, or interpoſe in the Controverſy, but, ſhall only offer that whereas[1] *Charas* makes this Liquor to be a meer *Saliva*, and that 'it ſerveth not only to moiſten the Ligaments, and to 'make them fit for the bending of the Teeth, but alſo to 'nouriſh them, and to make thoſe grow that are there, as 'it were in a Nurſery; and are, if we may ſo ſay, in ex- 'pectation to ſerve inſtead of the many Teeth, whether 'theſe come to fail in their force, or fall out of themſelves. This I think is not ſo well aſſerted, the offices of the *Saliva* being others; and it ſeems no way proper for Nouriſhment of the Teeth: nay, the Fabrick of the Teeth makes

1 *New Experiments upon* Vipers. *p.* 27. *mihi.*

more

more for Senior *Redi*'s opinion, they being thus hollow, and having that large ſlit towards the end, and this *Juice* ſo readily and naturally iſſuing through them; this ſeems to me to argue, that Nature deſignes it for other uſes than Nouriſhment, for if ſo, by giving them ſo large a vent ſhe would be fruſtrated of her end. But they being ſo ſharp and ſtrong at the ends, and the ſlit too plac'd towards the back, not inſide of the Tooth; what can be more conveniently contriv'd both for making the wound and infunding the Poyſon? For if the ſlit was inwards, by the ſtrugling and withdrawing of the Animal aſſaulted, this ſlit would be apt to be ſtopt and occluded; and the deſcent of the poyſon prevented; but being thus formed, it gives a greater advantage for its infuſion. Thus the *Scorpion*, the *Bee*, the *Emmet*, nay the Sting of a [m] *Nettle*, at the ſame time they make a wound, they leave behind them a drop of liquor, which excites thoſe dreadful *Symptoms*; whereas the wound without it, would be inconſiderable. For *Nierembergius*, or rather [n] *Hernandez*, from whom he tranſcribes the whole Hiſtory of this *Viper*, tells us; *Caninis in uſus Medicos ſervatis pungunt* Mexicani Medici *collum, cervicemque, doloris Capitis placandi gratiâ*; but firſt I preſume they clean them well from the Poyſon, which more than the irritation of the *Animal Spirits* might otherwiſe endanger the exciting moſt dreadfull pain's. I am confident in a *Nettle* there is not that irritation of Spirits and Fury, which yet to a conſiderable degree will (when aſſaulted) create pains and ſwellings; tho not ſo fatal as the other Poyſons. For I am not yet ſo fully convinc'd (tho I have a juſt Deference for Mounſieur *Charas*, and a due regard for his laborious Reſearches and Inquiries) of his ſentiment of the Innocence of this Liquor; and what has had ſome weight with me, is a Relation I

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m Hooks *Micrographia. Obſ.* 25 *p.* 144. n *Rerum med. Novæ Hiſpan. Hiſt. l.* 9. *c.* 17. *p* 328. Johnſon *de Serpent. l.* 1. *p.* 27.

lately

lately had from an Intelligent and knowing Perſon; who informed me, That being in the *Indies*, there came to him, and his Company, an *Indian* with ſeveral ſorts of Serpents, and offered to ſhew them ſome Experiments about the force of their Poyſon, and the difference of them, and that this Practice is common with them: having therefore firſt pull'd out a large One, the *Indian* told him that this would do no harm; therefore making a Ligature on his Arm, as they do in letting blood, he expoſed it naked to the Serpent, having firſt whipt and irritated him to make him bite it. The blood that came out of the wounds made by his Teeth he gather'd with his Finger, and laid it on his naked Thigh till he had got near a Spoonful. After this he takes out another call'd *Cobras de Cabelo*, which was leſſer, and inlarges much upon the greatneſs of it's Poyſon; and to ſhew them in part an Inſtance of it, graſping it about the Neck, he expreſſes out ſome of the Liquor in the *Baggs* of the *Gums* about the Quantity, as he thought, of ½ a graine, and this he puts to the coagulated Blood on his Thigh, which as ſoon as mixt with it ſtraight put it into a great Fermentation, and working like Barme changed it into a Yellowiſh Liquor. The ſame has been likewiſe obſerved by others, and does ſeem to give us ſome light, how 'tis that this Poyſon acts and confirmes the known [o] obſervation, that the biting of a *Viper* will cauſe the yellow *Jaundice*. A preſent *Antidote* for this Poyſon is ſaid to be the Snake ſtone, *Pierre de Cobras de Cabelo* 'tis called by the *Portugueſes*, and is famous all over the *Indies*; 'tis deſcribed by *Garcias ab Horto*, by *Kircher* and others; particularly by [p] Senior *Redi*, who renders very much ſuſpected the Relations that are commonly had of it's great force and Virtue; for in an abundance of Experiments which he made with it, he could never meet with any happy ſucceſs: and altho the Tryal happened otherwiſe to Father *Kircher* in a Dog; and

o *De le Boe Sylvij Prax. Me..l.* 1. *c.* 47. p *Fr. Redi Experimenta circa Res Nat. p.* 5. *&c.*

Charolus Magnini in a man at *Rome* where both did well; yet he aſcribes it rather to the force of Nature, than the Stone, that was able ſtoutly to withſtand and conquer the weak force of the Poyſon. Indeeed I muſt acknowledge the ſaying of [q] *Hippocrates* to be true, Ἡ πεῖρα σφαλερὴ *Experientia fallax, judicium difficile*, and there is nothing more common, then impoſing upon our ſelves an *Elenchus non Cauſæ pro Cauſa*. That it ſhould always ſucceed, may as juſtly be queſtioned, as that it ſhould allways faile; and that it does not the latter, ſome Accounts I have had of Perſons relieved by it here in *England*, make me think ſo. One inſtance is remarkable, that was told me by an Eminent Phyſitian in *London*, of a Perſon near the Town that was bit by a *Viper*; his Hand and Arm ſoon ſwelled with great Extremity of Paine; but upon the Application of this Stone for one Night both were aſwaged; and he thought himſelf well, and took of the Stone, which ſtill did firmly adhere: but not long after his former *Symptoms* violently returning, he had recourſe to his *Antidote*, and then ſuffered it to continue there 'till it fell of it ſelf, and ſo was cured. Other Tryals likewiſe the ſame Phyſitian has made of it in different caſes; and he thinks it has done him ſome ſervice. One I ſhall mention, I formerly did my ſelf, in a Patient troubled with the *Gout* in her *Stomack*, having removed it thence, it ſeized her *Toe*; but ſhe being impatient of the Pain, that I might ſeem to do ſomething, and to hinder her uſeing aboundance of Medicines, which every body was ready to adviſe her to, and might be apt to ſtrike it to her Stomack again, I thought of this; holding the Stone therefore in my hand, and without acquainting her, I put it near the joynt where her pain was moſt; and being very near it, *I* perceived it move out of my hand, and readily adhere to the

q *Hip. Apher. Sect.* 1. *Aph.* 1.

part

part. Soon after ſhe acquainted me, that ſhe very ſenſibly perceived a great drawing and trickling all down her Leg and Thigh; and afterwards owned an abatement of her Paine. In Peſtilential Swellings very probably it may be of uſe. But *I* have already too far digreſſed and ſhall now go on in finiſhing my Account of the Anatome of the *Rattle-ſnake* in deſcribing the *Skeleton*, and ſhall make amends for my former prolixneſs by being more conciſe and ſhort in this.

And firſt of the *Bones* of the *Head*. I obſerved that *Fig. 6. a.* the * *Cranium* here was entire, without *Sutures*, as repreſented in our Figure: only where ſome other Bones were joyned to them, as forwards over the *Noſtrils*, were * *c. c.* two * ſmall Bones, to which were faſtned the || *Carti-* || *d.* *lages*, or rather Bones which divide the *Noſe*. The other *Bones* ſeemed admirably contrived for the great Extenſion, and widening of the *Maxillæ*; which ſeems a great proviſion of Nature; for ſince it muſt ſwallow all things whole, and its Head is but ſmall, without this moſt Mechanical contrivance it were impoſſible to do it. The *Upper Jaw* forward was joyned to the *Bone* that recieves the Poyſonous *Fange*; and which had a large *Cavity* in it, * *Fig. 5. b* which opened outward, and was thought to be the * *Foramen* of the *Ear*; but inwards we obſerved no perforation for a Nerve, unleſs there might be one that comes to † *Fig. 6. e. e.* it under that † Bone which conjoynes it to the *Cranium*. This Articulation ſeems advantagious, both for the motion of the Fang, which lyes ſometimes couch'd, ſometimes erected; as the Jaw too: but its principal and moſt remarkable advantage for Swallowing large bodies, is the curious Articulation of the *Maxillæ* backwards to the *Cranium*, by two Bones, which from their uſe (ſince we know no Name to diſtinguiſh them by) we ſhall call *Maxillarum Dilatores*. Their ſhape, bigneſs, and aptneſs for this motion will readily enough be concieved by the [] *Fig. 6, n. o.* Eye, in obſerving the Figure. [] For the lower Jaw being

not conjoyned at the *Mentum*, as is uſual in other Animals, but parted at a good diſtance; upon the receiving a large body; as the Membrane here to which they are faſtened eaſily extends, ſo by lifting up, as alſo by bringing theſe two Bones more to a ſtrait line, it muſt needs conſiderably widen the *Rictus* of the Mouth: and for this cauſe too they are made two, not one, for performing this motion more eaſily. This Articulation * of the *Dilatores* (which is very curious) with the upper and lower Jaw, makes thoſe protuberances of the Head, which we liken'd to that of a Bearded Arrow, as do's the Poet, it may be upon the ſame account as well as its ſwiftneſs, where he ſaith * m

Rumpat & Serpens iter inſtitutum,
Si per obliquum ſimilis Sagittæ
Terruit Mannos.

The lower Jaw of each ſide was compoſed of two Bones, as appears in the Figure, but firmly conjoyned. The fore Bone was for recieving the ſmall teeth, the hinder towards the Articulation grew broad; as likewiſe did the Bone of the upper Jaw anſwerable to this place in the lower. But this upper Jaw towards the poyſonous *Fang* divided into two Bones; One was faſtened to the Bone of the poyſonous Fang outwards; the other, which recieved the ſmall teeth was inſerted into the ſame Bone more inwards.

The *Vertebræ*, according to the whole Figure of the body, were ſmalleſt towards both extreems, and largeſt in the middle. From the Neck to the *Anus* there were as many obſerved Scales on the Belly, *viz.* 168. but from the *Anus* to the ſetting on of the *Rattle* 29 more in number than the Scales. The former *Vertebræ* had a flat † upright Spine towards the back; and a ſlender * round oblique deſcending one inwards to the belly. To each *Vertebra*, beſides † Fig. 8. a. * b

thoſe

* c.d those *Spines* juſt mentioned, there were other * *Proceſſus*'s for the advantage of ſetting on of the Ribs, and the Articulation with one another; but what was moſt remarkable is (what I have already hinted) that round

† c. † Ball in the lower part of the upper *Vertebra*, which enters a ſocket of the upper part o the lower *Vertebra*, like as the head of the *Os Femoris* does the *Acetabulum* of the *Os Iſchij*; by which contrivance, as alſo the Articulation with one another, they have that free motion of winding their bodies any wayes. The Ribs in the Neck were ſmall, but larger towards the middle of the body, where they were about 2 Inches long; but towards the Tail they grew leſſer and ſhorter again; and did all terminate at the beginning of the Scales of the belly. In the *Vertebræ* of the

* Fig. 9. b b Tail inwards there were two * *Spines*, whereas in the other *Vertebræ* there was but One; as likewiſe there were here

|| c c tranſverſe ſlender || *Proceſſus*'s ſomething analogous to Ribs.

To the laſt *Vertebra* of the Tail was faſtened the * *Rattle*; in our Subject there was but 5, but ſome others ſeemed to be broken off. That next the Taile was of a lead-colour; the others of a cinericeous. 'Tis well deſcribed by * Dr. *Grew*, who ſays: 'They are very hollow, 'thin, hard, and dry bones; and therefore very brittle, 'almoſt like glaſs; and very ſonorous. They are all ve-'ry near of the ſame bulk, and of the ſelf ſame figure; 'moſt like the *Os ſacrum* of a man: for altho the laſt of them 'only ſeems to have a rigid Taile, or *Epiphyſis* adjoyned 'to it, yet have every one of them the like; ſo as the 'Taile of every uppermoſt bone runs within two of the 'bones below it; by which artifice they have not only a 'moveable coherence, but alſo make a more multiplyed 'ſound; each bone hitting againſt two orhers at the ſame 'time.

* Fig. 11. 12

The uſe of this *Rattle* (ſince I know no other) I ſhall give in the words of [t] *Gulielm. Piſo*, who tells us; *Huic tam pernicioſo Colubro, benigna natura cautionis quaſi grat-*

t *Muſæum Reg Societ. pag.* 51.

tia

tiâ crepitaculum addidiſſe videtur; ut illius Sonitu admonitus quilibet homo non ſolum, ſed & qualecunque Pecus, vel Jumentum, tempeſtivè ſibi caveat à vicino Hoſte. But why he ſhould make it ſo dangerous, if thruſt into a mans Fundament (which how it can I don't well ſee) as to be more fatal than the poiſon of his Teeth; I know no reaſon. Both he and *Nierembergius* and others do aſſert, that every year there is an addition of a new *Rattle*, which Dr. *Grew* ſuſpects, for then he muſt live 16 years, for ſo many joynts there are obſerved in ſome in our Repoſitory; I have been told in ſome there have been above 20. Theſe Rattles are placed with their broadeſt part perpendicular to the body, not Horizontal. And the 1. is faſtened to the laſt *Vertebra* of the Taile by means of a thick * Muſcle under it, and by the membranes that conjoyn it to the Skin. I have not given the figure of the whole Sceleton, ſince what is wanting may be ſufficiently underſtood by the deſcription; and whoſo pleaſes may view the Sceleton it ſelf, in the Repoſitory of the Royal Society, very curiouſly prepared by that ingenious young Gentleman *Rich. Waller* Eſq; a worthy Member of the Society; whoſe great aſſiſtance to me, I muſt hear gratefully acknowledge; as to the Deſigns; and otherwiſe: his curious Penſil illuſtrating what my Pen was often leſs able to deſcribe.

* *Fig. x. b*

[Guil. Piſo *de Indiæ utriuſque re Nat. & med. l. 5. c. 2. p. 274*

THE

THE EXPLANATION OF THE FIGURES.

FIGURE I.

Repreſents that part of the body opened, which containes the *Lungs*, the *Heart*, the *Gullet*, *Stomack*, &c.

aaa *The* Arteria aſpera, *or Windpipe.*

B *The upper part of the Lungs, which is Veſiculous.*

ccccc *The lower part of the Lungs, which makes a large Bladder.*

d *The firſt ſwelling* Oeſophagus, *or falſe Stomack.*

eee *The* Oeſophagus *or Gullet, and that part of it, where 'tis ſtraiter.*

f *The ſecond ſwelling of the* Oeſophagus, *or ſecond falſe Stomack.*

g *The true Stomack.*

h *A ſhort ſtraightening of the Gut, a little below the* Pylorus.

i *The Inteſtines.*

k *The Heart.*

l *The Auricle.*

mmm *Three Arteries, whereof there are Two Aſcending, and One Deſcending.*

nnn *Three large Veins, whereof two are deſcending, and the third aſcending, which laſt does ſeem to divide the Liver into two Lobes.*

oo *The Liver.*

p *The Gall-bladder.*

q *The Spleen, as 'tis call'd by the Antients; but by* Charas *the* Pancreas.

A

rrr *A large Blood-veſſel, that runs in the midſt of the Scales of the belly.*

ss *The Muſcles belonging to the Scales of the belly.*

FIGURE II.

Shews thoſe parts, that are contained in the lower part of the body.

a *The Inteſtines cut off juſt below the* Pylorus.

b *The Gall-bladder.*

c *The* Ductus Bilarius, *that paſſes through the middle of the Spleen, or as call'd by* Charas, *the* Pancreas; *and enters the large Gut.*

d *The Spleen, or* Pancreas.

ee *The Inteſtines which was very large and winding but ſhort.*

ff *The Rectum.*

g *The Anus.*

hh *The Teſtes.*

iiii *The* Vaſa Deferentia.

kk *The Penes on each ſide, which firſt at the Root are conjoyned and are thick be ſet with Briſtles*

ll *The Muſcles that ſerve for the drawing in the Penes.*

mm *The Sent. baggs.*

nn *A large Blood-veſſel that runs on one ſide of the left Kidney.*

ooo *The Emulgents that ariſe from the ſame.*

ppp *The Secretory veſſels.*

qq *The large Blood-veſſels of the right Kidney.*

rrr *The Emulgents ariſing from it.*

sss *A round body of Blood-veſſels.*

ttt *Secretory veſſels.*

uu *The Ureters.*

FIGURE III.

Repreſents the *Penes* of one ſide of a *Viper.*

a *The* Vas deferens, *which afterwards divides, and runs to the end of the Penes.*

b *The Penes.*

c *The Muſcles which retract the Penes in.*

FIG.

FIGURE IV.

Repreſents part of the *Lungs* opened by the *Trachea*.

aaaa. *The* Arteria Aſpera, *divided in the middle.*

bbb. *Some larger branches of Blood veſſels.*

ccc. *The* Veſiculæ, *or cells of the Lungs.*

FIGURE V.

Exhibites the Head of the *Rattle-Snake*, with its mouth opened to ſhew his Teeth, and other parts there.

a. *The hole of the Noſtril.*

b. *The* Foramen *which leads to a large Cavity, which has no Perforation for any Nerve inwards, but yet tis thought to be for hearing.*

cc. *The ſmall Teeth in the upper Jaw.*

dd. *The large Fangs, or poyſonous Teeth.*

eee. *The place where the Bladders of Poyſon lye.*

f. *The* Larynx.

g. *The forked Tongue.*

h. *The Teeth in the lower Jaw.*

i. *The place where the lower Jaw is divided at the* Mentum.

FIGURE VI.

Repreſents the Scull.

a. *The* Cranium *without any ſutures.*

bb. *The* Orbits *of the Eyes.*

cc. *Two ſmall bones over the Noſe.*

d. *The Griſtly [or rather Boney* Sepimentum *of the Noſe.*

ee. *A ſmall Bone, that lyes between the* Cranium, *and that bone, in which is fixt the Poyſonous Fang.*

ff. *A Cavity in that Bone, to which is faſtened the poyſonous Fang, whoſe Outward Orifice is repreſented in the Fifth Figure by the letter* (b) *and is thought to be the Ear.*

g. *The large Poyſonous Fang, which is faſtened to the Ear-bone.*

h. *The Other Poyſonous Teeth, which are not fixt in the bone but to Muſcles.*

ii. *The Upper* Maxilla, *which contains the ſmall Teeth.*

kk. *One ſide of the lower* Maxilla, *with its double row of teeth, which in the middle ſeems to be joined by a ſuture.*

l *The Diſtance at the* Mentum, *between the two ſides of the lower* Maxilla *or Jaw.*

m m *Where the two* Maxillæ *are joined together backwards, and by a* Tendon *are faſtened to anotther Bone, which from its uſe, and for diſtinction ſake; we call* Dilatores Maxillarum.

n n. *The* Dillatores *of the Jaws.*

o o. *A ſhort bone which joynes the* Dilator's *to the Scull or* Cranium.

p. *The* Vertebræ *of the Neck.*

FIGURE VII.

Repreſents the Poyſonous teeth.

FIGURE VIII.

Shews one of the *Vertebræ* of the Back.

a. *The Outward ſpine of the* Vertebræ, *which is flat longwayes.*

b. *The Inward Spine of the* Vertebræ, *which is round.*

c. *A large flat* Proceſſus, *for the Articulation of the* Vertebræ.

d. *Small tranſverſe* Proceſſus's *for the ſetting on the Ribs.*

e. *A round ball, like the head of the* os Femoris, *which enters a ſocket of the lower* Vertebra, *as that do's the* Acetabulum *of the* Os Iſchij.

FIGURE IX.

Shews one of the *Vertebræ* of the Tayle.

a. *The ſpine towards the Back.*

b b. *The two inward Spines.*

c c. *The tranſverſe Spines,* Analogous *to Ribbs.*

FIGURE X.

Repreſents the *Vertebræ* of the Tayle and the muſculous fleſh which faſtens the firſt Rattle.

a. *The* Vertebræ.

b. *The* Muſcle *on which is faſtened the Rattle.*

FIGURE XI.

Exhibits a ſingle Rattle, which has three Joynts: the firſt and largeſt appears when conjoyned with Others; the two other ſerve for the faſtening on the ſucceeding Rattles, and are covered by them.

FIGURE XII.

Shews the five Rattles as joined together.

Mar-

Fig: 1.

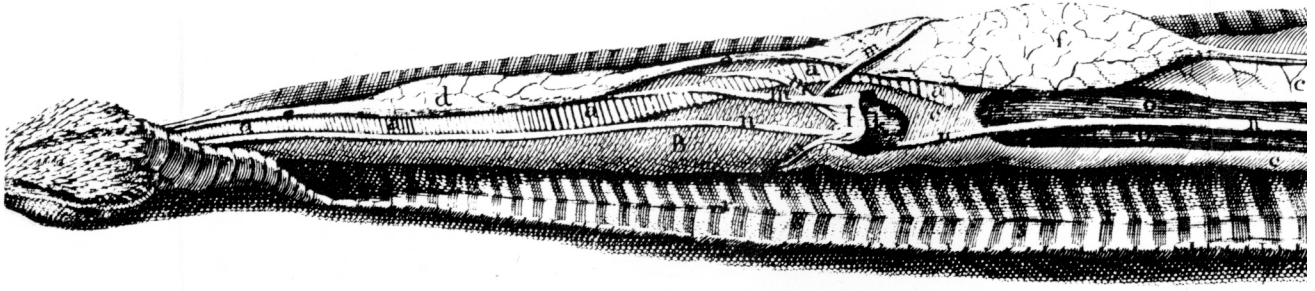


Fig. 2.

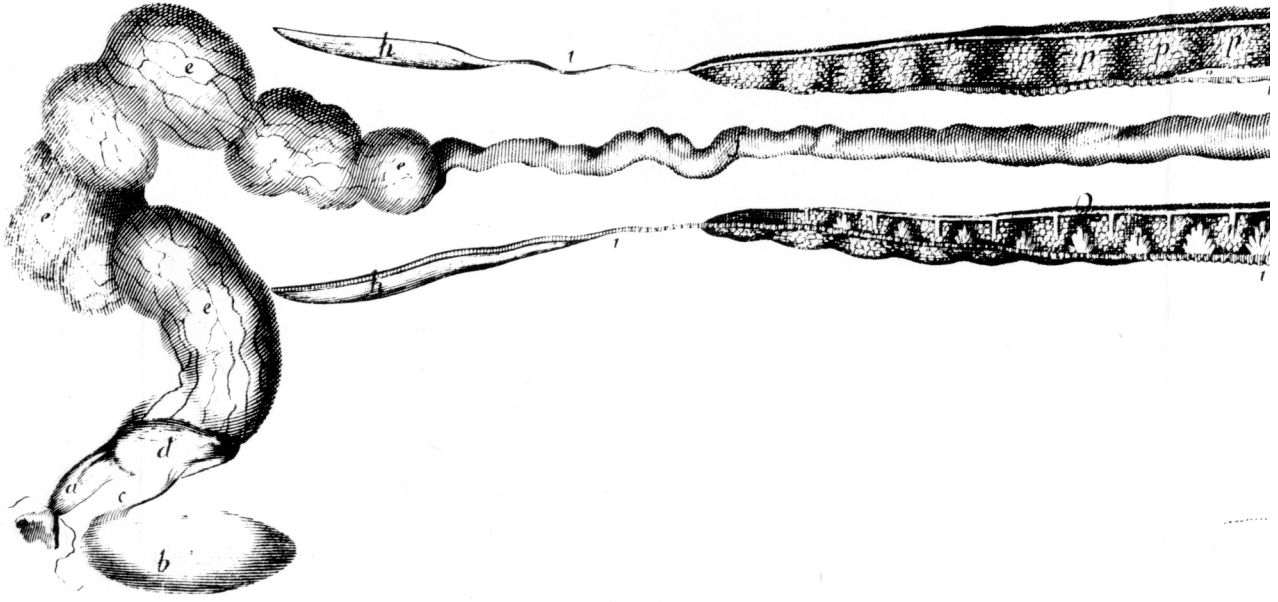


Fig: 1.

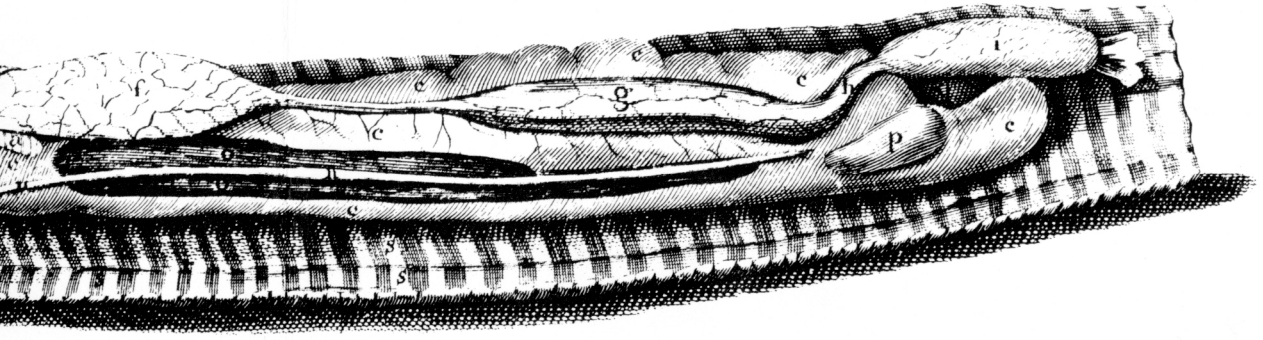


Fig. 2.

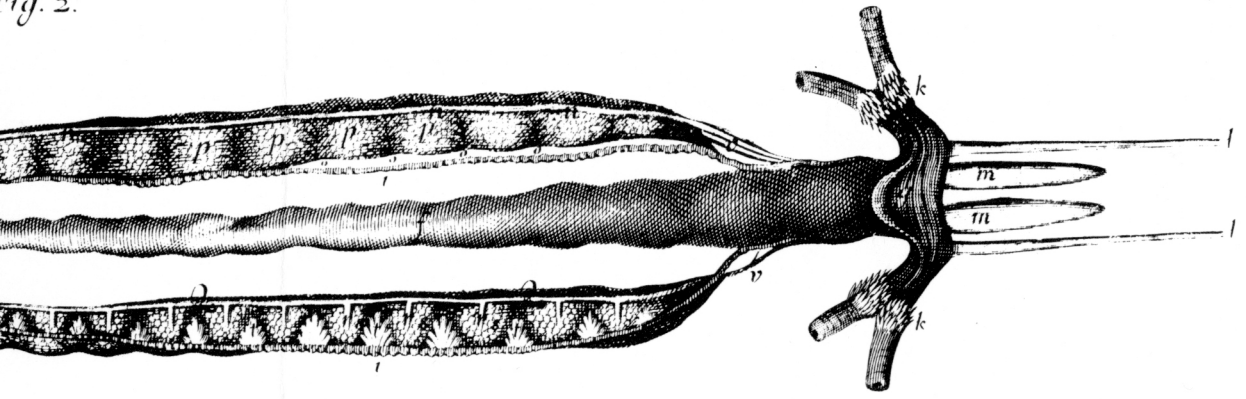
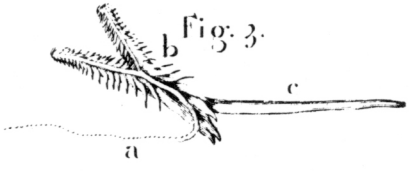
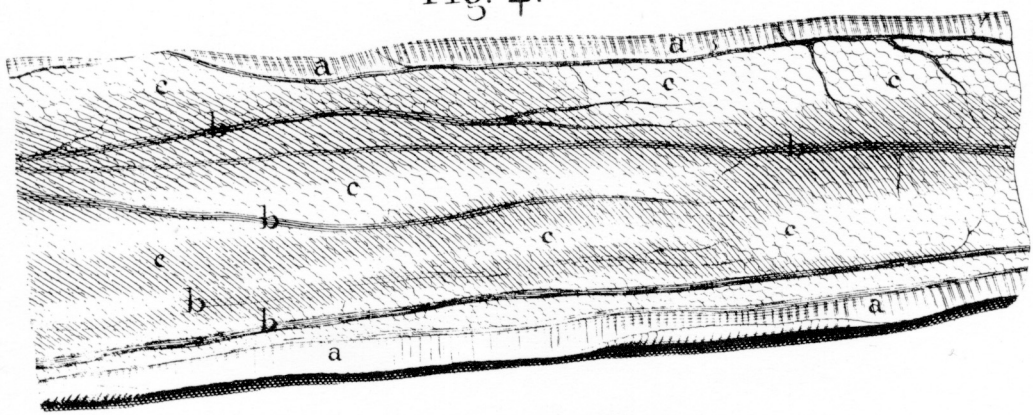


Fig: 3.



MBurghers sculp

Fig: 4.



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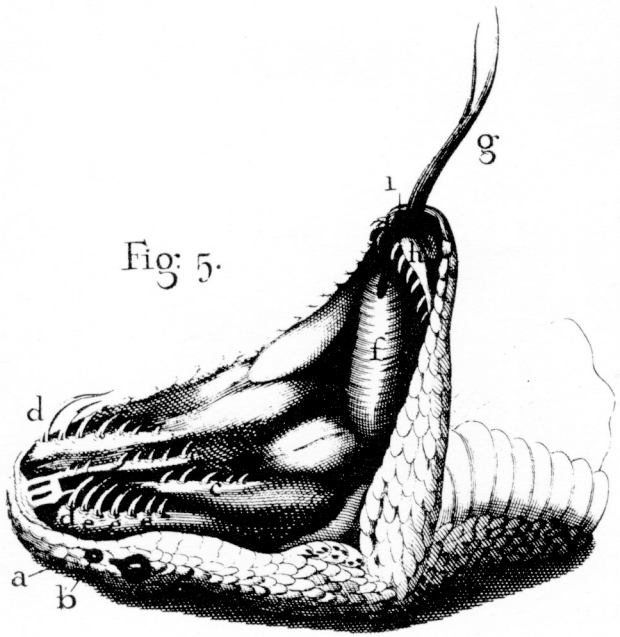

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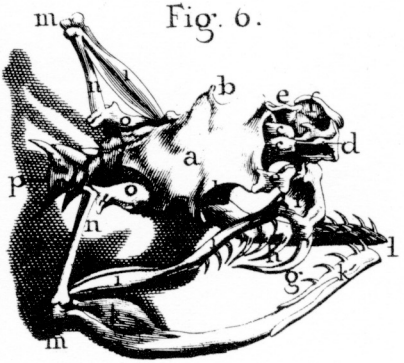


Fig: 7.

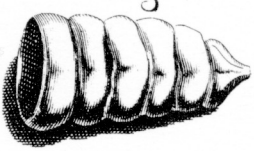
Fig: 8.

Fig: 9.

Fig: 10.

Fig: 11.

Fig: 12.



MBurg. Sculp.

Fig: 1.

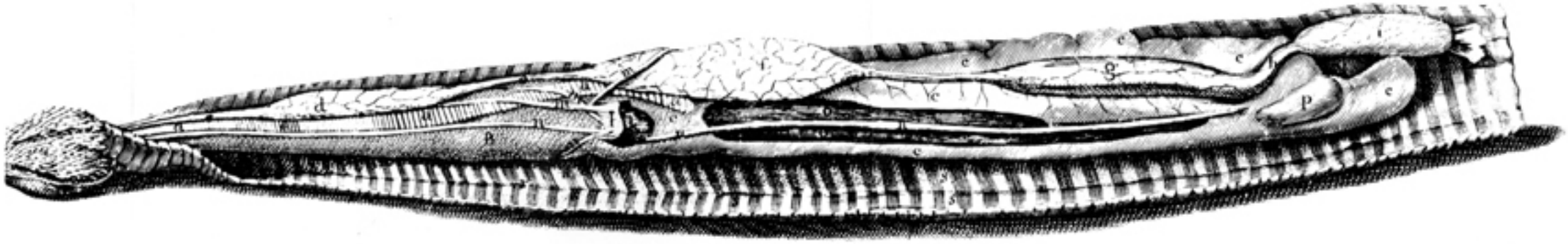


Fig. 2.

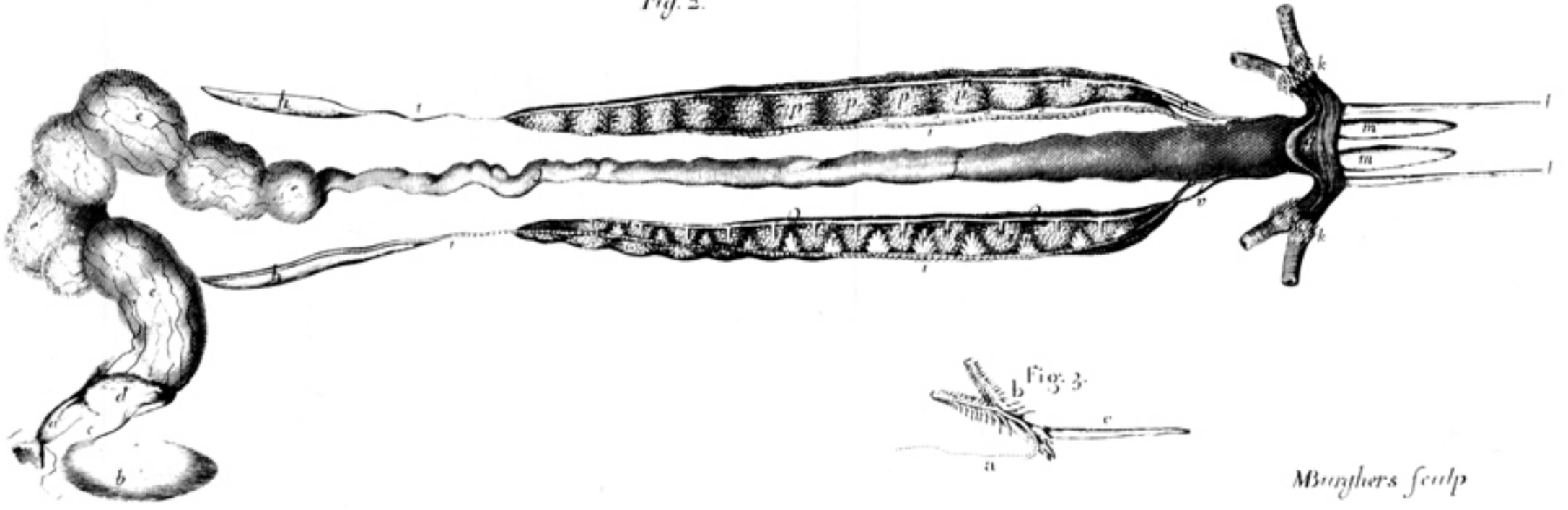


Fig. 3.

MBurghers sculp