PHILOSOPHICAL TRANSACTIONS.

February 10, 168$\frac{2}{3}$.

The CONTENTS.

VIPERA CAUDI-SONA Americana, *Or the* Anatomy *of a* Rattle-Snake, *Dissected at the* Repository *of the* Royal Society *in* January 168$\frac{2}{3}$. *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

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 *Boiçininninga*, 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 *Teuhtlacotzauhqui*, (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*, but †*Tab.1.Figs.a*

* 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 $\frac{1}{12}$ 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. Nat.* lib. 11. cap. 11.

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 ⅛ 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

* *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 9 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 question-

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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 eaten 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 up this part, I observed two large† *swellings*, as represen-

† *Fig.* 1. *df.*

b *Narrant multi, qui eum Serpentem domi alere solent atque educare, annum integrum durare absque cibo ullo potuque*, Nieremberg. *Hist. Nat. l.* 11. *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 *Acus 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.

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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-

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ings in it, where they may be reſpited, till recounting 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 not one, 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 $\frac{1}{2}$ 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 about 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.*

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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
[illegible] d. the [illegible] *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*, *Vreters*, *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 suppose 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 1 ¼ 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. hh.

† ii.

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 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 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

|| Fig. 2. I.

† l. l.

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 *Lump-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 $\frac{1}{3}$ 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 ishues 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 [i] *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 Caverns 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 Vipera Pythica 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. b. The *Teeth* are of 2 ſorts,† 1. The leſſer, which are ſeated in each *Jaw*, and ſerve for the catching, and retaining the food. 2. The *Poyſonous* * Fangs which kill it, and are placed without the *Upper Jaw*, 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*.

* Fig. 5 d d. Fig. 6. b. Fig. 7.

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*, 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 * 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

|| Fig. 6. g. † f.

* Fig. 7.

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, 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 oppose's '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 is 'either newly dead, or hath been so for several daies, cons 'tains in it no poyson at all; neither taken inwardly, no, '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 be-ing sufficiently known, I shall not here repeat, or inter-pose in the Controversy, but, shall only offer that where-as [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 *Sali-va* being others; and it seems no way proper for Nourish-ment 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. Indeed I muſt acknowledge the ſaying of [q] *Hippocrates* to be true, Ἡ πεῖρα σφαλερή *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. Aphor. 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. || d. two * small Bones, to which were fastned the || *Cartilages*, 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 † e. † 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; *Hui 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

f 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 *Trachæa*.

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.*

eee. *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.*

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

nn. *The* Dilatores *of the Jaws.*

oo. *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.*

bb. *The two inward Spines.*

cc. *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-

Philosoph. Transact. N. 144.

Fig. 1.

Fig. 2.

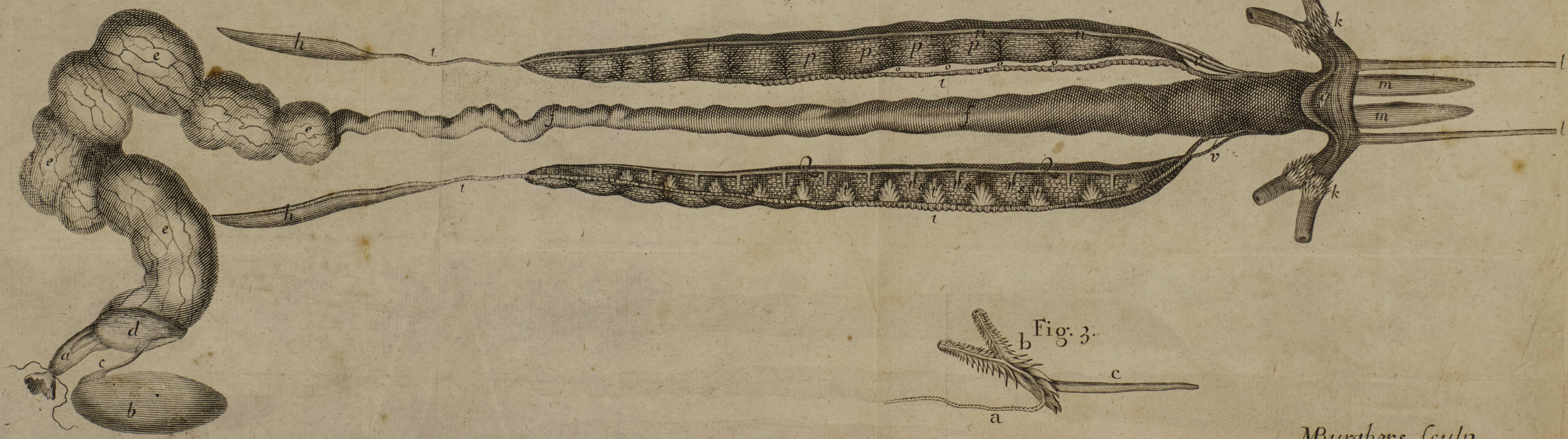
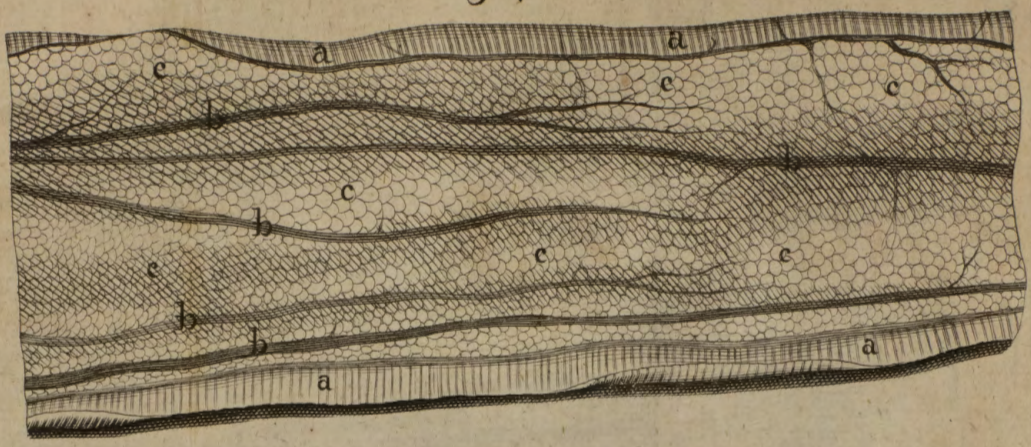


Fig. 3.

MBurghers sculp

Fig: 4.



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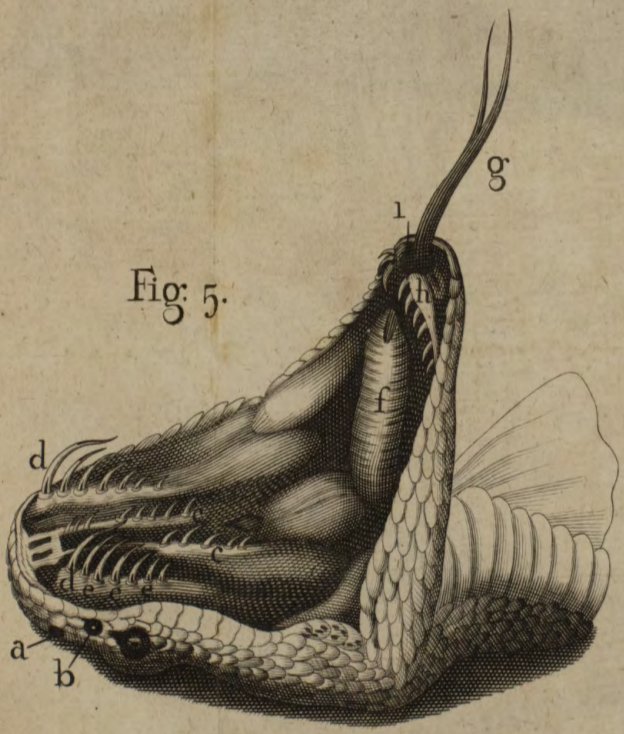

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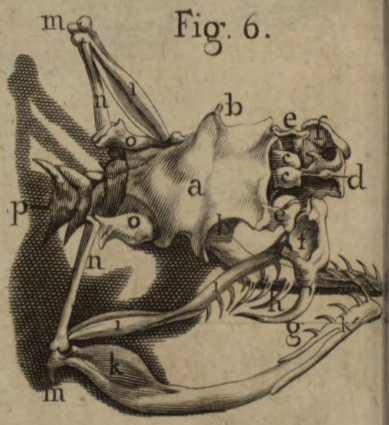

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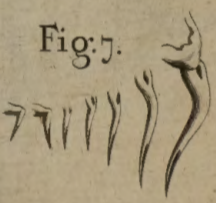

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Fig: 9.

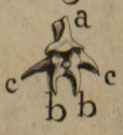
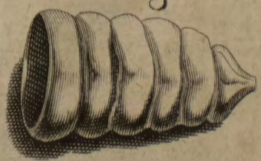


Fig: 10.

Fig: 11.

Fig: 12.



MBurg. sculp.