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VOL VII
1719-1733

PHILOSOPHICAL
TRANSACTIONS

(From the Year 1719, to the Year 1733)

A B R I D G E D,

A N D

Dispos'd under General HEADS.

By Mr JOHN EAMES, *F. R. S.*

A N D

JOHN MARTYN, *F. R. S.* Professor of *Botany*
in the University of *CAMBRIDGE*.

V O L. VII.

C O N T A I N I N G,

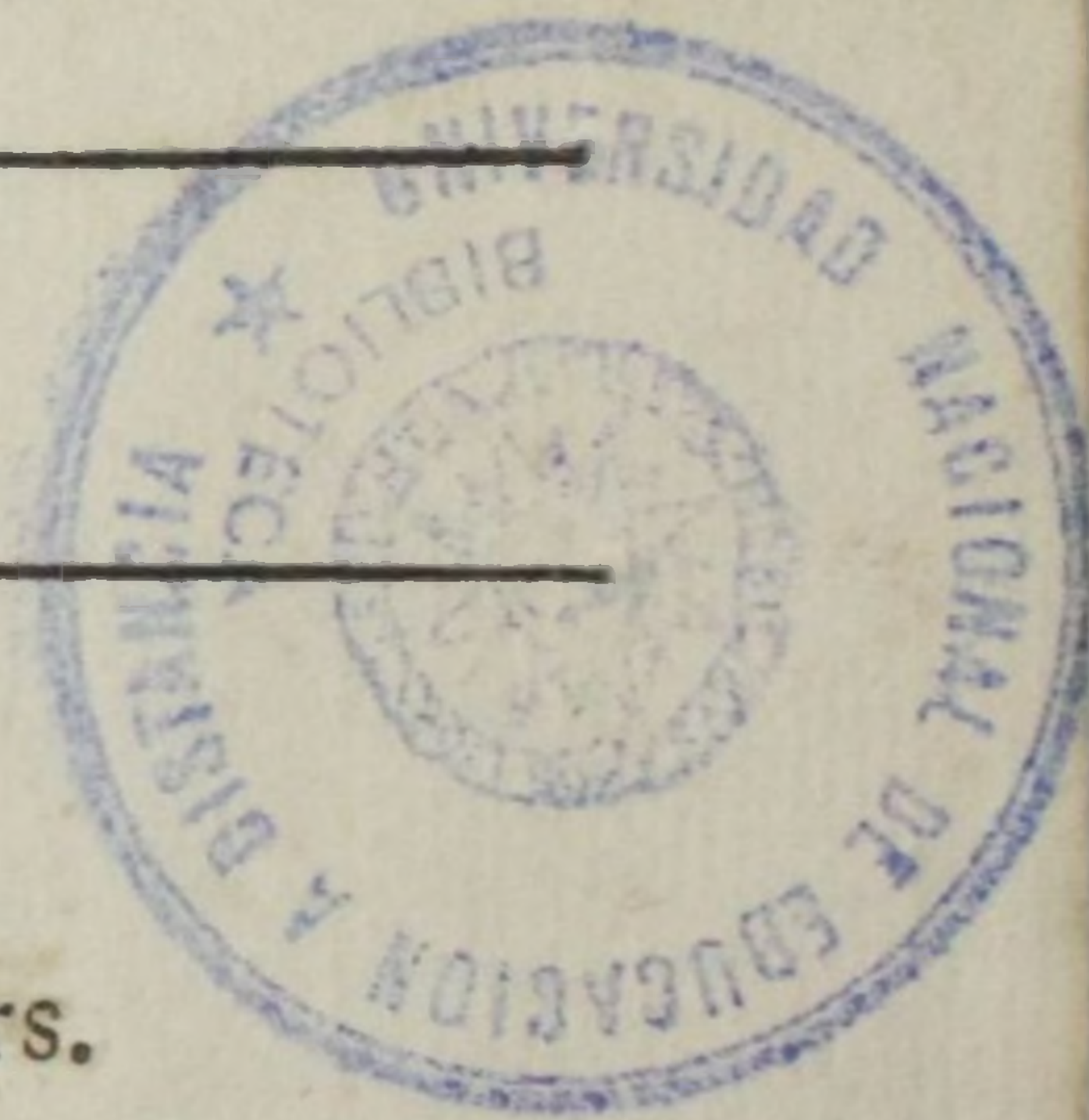
PART III. The ANATOMICAL and MEDICAL Papers.

A N D

PART IV. The PHILOLOGICAL and MISCELLANEOUS Papers.

L O N D O N:

Printed for J. BROTHERTON, J. HAZARD, W. MEADOWS,
T. COX, W. HINCHLIFFE, W. BICKERTON, T. ASTLEY,
S. AUSTEN, L. GILLIVER, and R. WILLOCK. 1734.



THE

PHILOSOPHICAL
TRANSACTIONS

(From the Year 1719 to the Year 1733)

ABRIDGED

AND

Disposed under General Heads.

By Mr. John James, F. R. S.

AND

John Martin, F. R. S. Professor of Botany
in the University of Cambridge.

VOL. VII.

CONTAINING

PART III. The Anatomical and Medical Papers.

AND

PART IV. The Philosophical and Miscellaneous Papers.

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THE
Philosophical Transactions
ABRIDGED.

PART III.

CONTAINING THE

Anatomical and Medical P A P E R S.

C H A P. I.

ZOOLOGY, and the Anatomy of ANIMALS.

I.



THE Hunter in a clear Sun-shiny day, takes a Plate, or Trencher, with a little Sugar, Honey, or Molasses, spread on it, and when got into the Woods, sets it down on a Rock or Stump: this the Bees soon find out; for 'tis generally supposed a Bee will scent Honey or Wax above a Mile's distance. The Hunter secures in a Box or other Conveniency, one or more of the Bees as they fill themselves, and after a little time lets one of them go, observing very carefully the Course it steers; for after it rises in the Air, it flies directly, or upon a streight Course, to the Tree where the Hive is.

A Method lately found out in New-England, for discovering where the Bees hives in the Woods, in order to get their Honey. By the Hon. Paul Dudley Esq; F. R. S. No. 376. p. 148.

In order to this, the Hunter carries with him his Pocket-Compass, his Rule, and other Implements, with a Sheet of Paper, and sets down the Course, suppose it be West; by this he is sure the Tree must be somewhere in a West Line from where he is, but wants to know the exact Distance from his Station; in order to determine that, he makes an off-set either South or North (we'll suppose North)

A Method to discover where Bees hive.

a hundred Perch or Rod, (if it be more, it will still be more exact, because the Angle will not be so acute) then he takes out another Bee and lets him go, observing his Course also very carefully, for he being loaded will, as the first, (after he is mounted a convenient height) fly directly to the Hive; this second Course, (as I must call it) the Hunter finds to be South, 54 Degrees West; then there remains nothing but to find out where the two Courses intersect, or, which is the same thing, the Distance from *B* to *A*, or from *C* to *A*, as in the Figure, for there the Honey-Tree is.

Fig. 1.

For which Reason, if the Course of the second Bee from *C* had been South west, and by South, viz. to *D*, then the Hive-Tree must have been there, for there the Lines are found to intersect.

I cannot dismiss this Subject, without acquainting you, that all the Bees we have in our Gardens, or Woods, and which now are in great numbers, are the produce of such as were brought in Hives from *England* near a hundred Years ago, and not the natural produce of this part of *America*; for the first Planters of *New England* never observed a Bee in the Woods, until many Years after the Country was settled; but that which proves it beyond question is, that the *Aborigines* have no word in their Language for a Bee, as they have for all Animals whatsoever proper to, or aboriginally of, the Country, and therefore for many Years called a Bee by the name of *English-Man's Fly*.

I will mention another thing with respect to Bees, tho' I do not know but it may have been commonly observed; and that is, when they swarm they never go to the Northward, but move Southward, or inclining that way.

I should have taken notice in the proper place, that when one Bee goes home from the Sugar-plate, he returns with a considerable number from the Hive.

Observations
about Wasps,
and the Difference
of their
Sexes. By the
Rev. Mr Der-
ham, F. R. S.
N^o. 382. P.
53.

II. In the Beginning of July 1723, being on the Top of our Collegiate Chapel in Windsor Castle, I observed a Cluster of three Wasps closely embracing each other; one of which was a large Female Wasp, the other two of a lesser sort. Soon after, I found eight or ten Wasps closely hanging together, and divers other such like Parcels. In the midst of all which was constantly a Queen Wasp, and only one; the rest being always of a different Sort from either the Queen or the common Wasps; which gave me a Suspicion of their being Male and Female. And therefore examining another Company of them with greater Strictness, I found the Queen Wasp, in coitu, with one of the other Wasps, so closely joined Tail to Tail, that it was some Time before they were parted.

After this I caught all the Wasps I could, on the top of our Chapel, but could not see one of the common labouring Wasps among them; but all were for the most part Male Wasps, with now and then a Queen, or Female, among them, and she generally in coitu.

And

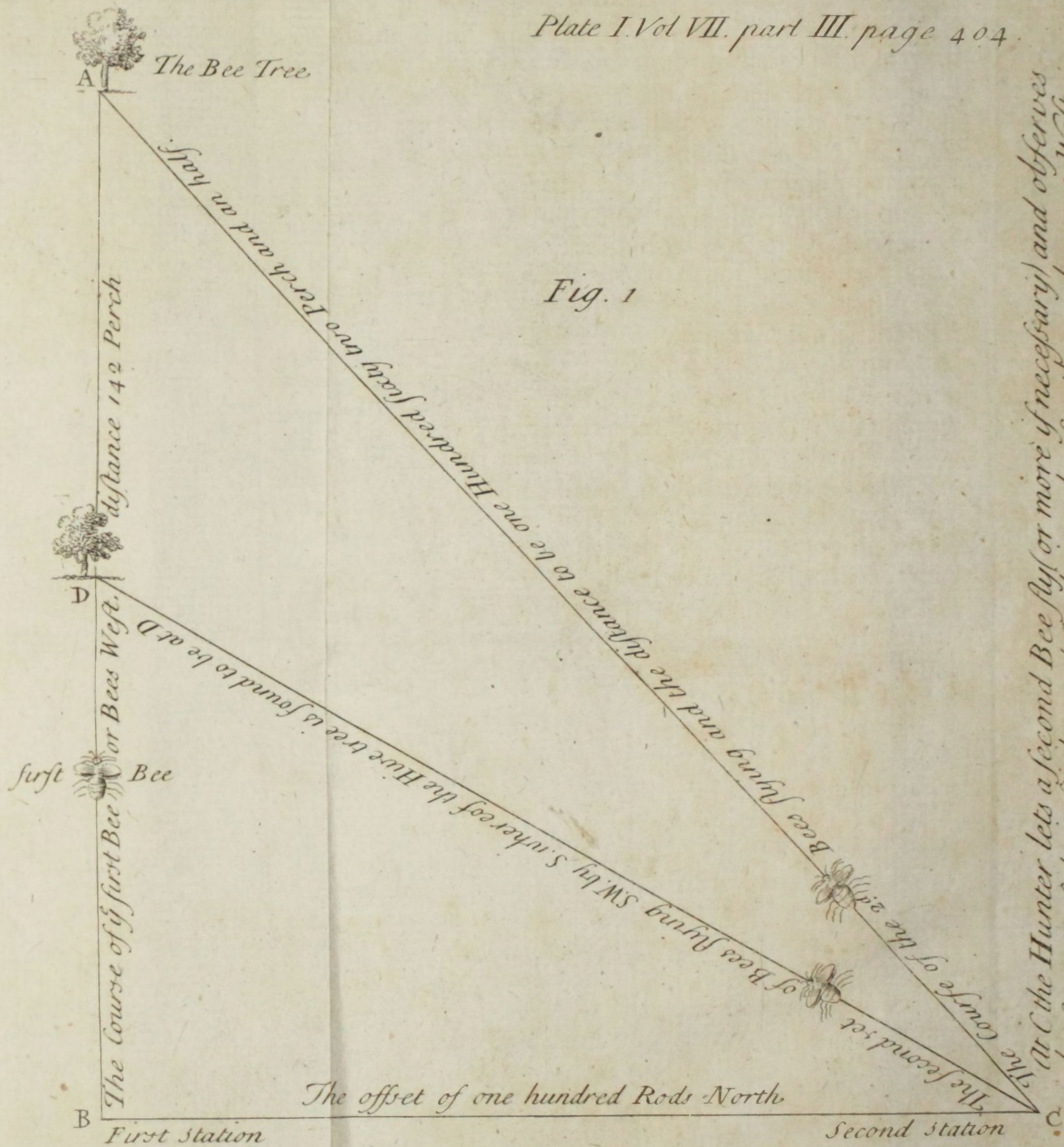


Fig. 1

At C the Hunter lets a second Bee fly (or more if necessary) and observes the Course of their flight and finds it to be South 54 degrees West.

At B the Hunter stands and having with his sugar &c procured one or more Bees observes the Course of the first Bee & finds it to be due West

N.B. If the Hunter is not satisfied of the Courses of either first or second by the flight of one Bee, he lets more fly until he is very certain.



And now from this History of my Observation, it appears, That there are three sorts of *Wasps*; The *Queens*, or *Females*; the *Kings*, or *Males*; and the *common Labouring Wasps*; each of them very distinct.

The *Queen*, or *Female Wasp* (by many called the *King-Wasp*) is much longer in the Body, and larger than any other *Wasp*.

The *Male Wasps* are lesser than the *Queens*, but as much longer and larger than the *common Wasps*, as the *Queen* is longer and larger than these. These *Males* also have no Stings, which the *Queens* and *common Wasps* all have. And these are those which *Moufet* saith Authors call *'Αξένης*, and take to be *Females*, although he is of another Opinion, imagining all *Wasps* to have Stings; upon his examining a *Wasp's Nest*, at *Ham*, Anno 1587. in which he found no *Wasps* without a Sting. But I wonder how that curious Enquirer missed of these sting-less *Male Wasps*. Surely he was too hasty in his Examination, and not being aware of the difference, he thought the *Males* (which are but few in number to the *labouring Wasps*) were the same and had Stings as well as the rest; or else he made his Enquiry at a Time when perhaps the *Males* had deserted the Nest, which probably they may do, as the *Male* or *Drone-Bees* are forced to do: or else the Year 1587. (in which *Moufet* made his Observation) might produce fewer *Wasps*, at least fewer *Male Wasps*, than this last Summer, of 1723, did, in which I made my Observation; which was observed to have a greater abundance of *Wasp Nests* than hath been known in many Years. And in all the Nests that I searched into, I constantly found *Male Wasps*, either many or few, according to the Size of the Nest, and Number of *Wasps*. And the Part of the Nest where these *Males* are bred, or at least where I found them most to reside, was chiefly the two uppermost Cells, or Partings, between the Combs, but one.

Another thing by which the *Male Wasps*, may be known from the rest, is their *Antennæ*, or *Horns*; which are longer and larger than either those of the *Queen*, or *common Wasps*; and with them they seem, in running, to feel more than the others do.

But the chief Difference, is in the *Parts of Generation* of these *Male Wasps*, quite different from other *Wasps*. I dissected them with all Care, and shall describe them, as well as I can, without Figures, which I could not get drawn.

For the Discovery of these Parts, if the *Alvus* be pressed, an *Horny* or *Shell-like Part* will be thrust out, of a shining black Colour, which consists of two Parts, somewhat resembling the *Castagnets* used in Dancing; at the extreme Part of each of which grows a *Hook*, somewhat like those of the *Earwig's Tail*, but much less; in the Middle, between these Hooks, appear three Parts, the middlemost of which is a stiff brown *Tube*, very curiously made, with the Forepart like a Spoon or Ladle, and the other End (within the Body) is

Observations about Wasps.

neatly branched and braced to each Side within the two Shells I spake of. A little above which Branching, is a *φυμάτιον* or Swelling, like that of a Dog's Pizzle, and perhaps serves for the same Use, if this Tube is (as I imagine) the *Penis* of the Wasp.

On each Side this *Penis*, lies a stiff Part (in Number two) branched at the Top with somewhat like Hairs, giving them the Resemblance of *Brushes*. At the Bottom of which are two curious black *Cells*, with an *Opening* on one Side like that of the *Concha Veneris*, with small whitish Hairs growing on one Edge thereof. What the Use of these two Brush-like Members may be, I know not, unless it be to strengthen and support, or direct, the *Penis in coitu*, or provoke therein.

Behind all these Parts, more within the Body lies a long contorted white *Vessel*; which at first I took to be the real *Penis*, penetrating the *Ladle-like Tube* I spake of. But upon farther Examination, I rather take it to be the *Spermatic Vessel*.

As to the Use of the two little *Hooks* I mentioned at the End of the *Uropygium*, or *Shells*, I take them to be, to catch hold of the *Female's Podex*, and to direct and assist the Penetration of the *Penis in coitu*.

As for the *Parts of Generation* in the *Queen*, or *Female Wasp*, nothing was to be seen so remarkable as in the *Male*; but those Parts are very like what we see in the *common Labouring Wasps*: Indeed, with the most accurate Observations I could make with my *Microscopes*, I could not perceive any Difference at all. For which Reason I suppose it is that most of the Writers upon *Wasps* and *Bees*, have been very confused and wavering about the Sexes of these two Tribes of Insects. It would be endless to cite the Authors and their Opinions, especially concerning the *Bee Tribe*. I think *Swammerdam* * (who as he was one of the first that rejected Equivocal Generation, so was one of the most judicious Writers of Insects) that his Opinion, I say, is the most just, *viz.* That of *Bees*, there are three Sorts, *viz.* 1. *Rex, aut verius Regina, siquidem sequioris sexus est.* 2. *Fuci, qui Masculi proprie sunt.* 3. *Apes Operariæ, quarum Sexum distinguere non possumus, cum in iis nec Masculas nec Fæminas partes observemus: quæ perbellè distinguuntur in Fucis seu Regibus, & Reginis, quæ tralatitio errore Reges solent salutari. In Reginis certè invenimus Ovarium apud incomparabilem illum Anatomum Joh. van Horne, &c.*

There is a Story seriously told by *Mouset* †, that deserves our Observation, *viz.* That in the Year 1582, being on the highest Ridges of the *Cartmel-Hills*, (I suppose in *Lancashire*) he saw among the Rocks two Species of *Wasps* desperately fighting: That they differed only in Magnitude; that the larger trusted to their Strength; and the lesser to their Numbers, there being six of the lesser engaged against only one of the larger

* Swam. Hist. Insect. p. 92.

† Mouset Theat. Insect. l. 1. c. 8.

size, and that the Battle was not in the Air, but among the Grass, and lasted for some Hours in the hottest Sun, not being at an end in two or three Hours space. The Cause of this Engagement *Mouset* thinks was, that the great Wasps are wont to rob the lesser of their Honey and Young, or do them some other such like Mischiefs; and the lesser being very revengful, and naturally full of Courage, did out-brave even *Mars* himself in assaulting their Enemy. But this Engagement I take to be such another, as that which I have given the History of, namely one under the Conduct of *Venus*, not of *Mars*.

And as there is no Doubt to be made of it's being such, and that the Engagement seen by *Mouset* was on the highest Tops of *Cartmel* (*in summis Cartmeli montium jugis*) as that I saw was on the very Top of our *Chapel*, it may deserve Observation, whether the Wasps ever copulate in lower Places, obvious to Disturbance, and every one's Eye, or only on such Eminencies where they can be more out of Sight, and consequently in greater Safety: And if at any time they should be found in Copulation, they may all with Safety be seized with the naked Hand, provided it can be secured against the *Queen Wasp*, which is the only one in the Company that is provided with a *Sting*.

For a Close of these Observations about the Sexes of Wasps, I shall take Notice of *Mouset's* Experiment, (which I tryed) viz. If you take a Wasp by the Feet, and suffer her to buz, that those Wasps, which have no Stings, will fly to her, but not any that have Stings. Which some, he saith, use as an Argument to prove that some Wasps are Males, some Females. This Experiment I was minded to try with a *Queen Wasp*, more especially, not knowing but that Wasps, particularly the Males, might be as fond of their *Queens*, as the *Bees* are of theirs, who will not forsake them, but will live and die with them. But I did not find it to succeed so among the Wasps. For although I put some *Queen Wasps*, and others also, near the Entrance of some large *Wasp-Nests*, yet I did not see any Flock near them, only now and then one of the common Wasps, for a little while, to see their Fellow confined. But indeed the *Queen Wasps* which I confined were weak, and did not buz long; as also the time of Copulation was probably past, it being *August 12.* when I tryed the Experiment.

III. On the Sixteenth of *May*, 1724, I happened to hear, what is commonly called the *Death-Watch*, and, as I cast a diligent Eye over the sedge Bottom of a Chair, I happened, to hit luckily upon the Place where the Insect was beating; so that it discovered itself to me by it's own Pulfations.

It lifted up itself upon it's hinder Legs, and somewhat extending, or rather inclining, it's Neck, beat down it's Face upon the Sedge, with great Force and Agility; the Sedge, upon which I found it, was bared of it's outward Coat, for about the Length of half an Inch; the Insect stood upon the inward bulbous Part, and beat upon the

An Account of the Scarabæus Galeatus Pulfator, or Death Watch, by Mr Hugh Stackhouse. No. 385. pag. 159.

the outward Coat, as if it had been working it off as it went; the Impressions of it's Strokes were very visible, the Coat of the Sedge being depressed, where it had beaten, for about the Compass of a silver Penny; whether it beat for Exercise, or Food, I cannot certainly say; but very probably it might be for the latter; and I am rather inclined to think so, because there were more than one such Places upon the Sedge, where it had been at work, and where, 'tis likely, it might have been a Sojourner for some Days.

As to what Mr *Derham* has observed, that the Beatings are a sort of Prelude for Copulation, I could not discover that this Beetle had any other of the same Species near it; and therefore I am inclined to think, that it beat for the Preparation of it's Food, at this time, at least, whatsoever it might do at other times, for Pleasure. The Description Mr *Allen* gives of the Insect, as far as I can find by this (which I took from the Chair where I found it, into a Box) is very true: 'Tis about a Quarter of an Inch in length, of a dark, dirty Colour, having a broad *Galea*, or Helmet, over it's Head; under which, when quiet, it draws up it's Head; so that this *Galea* is, when this Insect rests, a very notable Defence against such Falls, as are frequent in rotten and decayed Places, in which, this Insect seems to be very conversant. The second Day after I took it, I opened the Box wherein it was, and set it in the Sun: The Insect was soon very brisk, and crept backwards and forwards along the Pieces of Sedge, and rotten Wood, that I had put with it into the Box, till at length, getting to the End of one of the Pieces, it immediately struck out it's Wings, and was just going to take it's Farewel; but having the Lid of the Box ready in my Hand, I shaded it over, and it soon drew in it's Wings, and was very quiet. I could not before perceive, though I had the Use of a tolerable good Glass, any the least Sign of a Fissure upon it's Back; and, for that Reason, did greatly question, whether it had any Wings or not, till I set it, in the Sun. The Head of the Insect appears to be of a very fine Contexture, as it is seen, when it creeps about, and stretcheth it forward; but when 'tis drawn up under it's *Galea*, it seems to be covered with a Membrane thick set with fine Hairs.

It lived with me about a Fortnight, but I could never perceive that it beat, after it was confined in the Box.

A remarkable Accident relating to the Venom of Spiders, in New-England, by Mr Thomas Robie, No. 382. p. 69.

IV. Sept. 13. 1722, one *Nat. Ware* of *Needham* was bit by a small Spider which he could not give an exact Description of, crushing it to Pieces between his Stocking and Leg; the Account he gave is this; viz. That getting up early in the Morning, and putting on his Stocking he presently felt something bite his left Leg a little above his Ankle, about $\frac{1}{2}$ an Hour after he felt a Pain in that Leg, and about $\frac{1}{2}$ an Hour from his first perceiving Pain in his Leg, he felt a Pain in his Groin, and at the same time Time a creeping Pain in the Calf of his left Leg; and about one Hour after it got into the

Small

Small of his Back, and then round him, and in his Stomach, and in his right Thigh, and afterwards Numbness in his Head; the Pains were not constant and fixed, but erratic and very acute. His Pulse was very low and heavy. He came to *Cambridge* to a Physician there, and I was also desired to go and see him, which I did, and he gave me this Account.

Sept. 14. In the Morning the Man abovesaid came to see me, and was much better tho' he had but little Sleep in the Night. The Means the Doctor used were only *Sp. Cor. Cerv. & Sal Vol. Corn. Cerv.* with *Vinum Viperin.* and Onions or Garlic externally applied to the Wound. These things raised his Pulse, and so, I suppose, assisted Nature to throw off the Venom.

V. At *Milan* I found a Viper-Catcher, who seldom was without Sixty, or more, Vipers alive, kept together in a back Room open at the Top; he had them from all Parts of *Italy*, and sold them dead or alive, according to the Uses they were designed for. He having got one day a female Viper big with young, gave me notice to see her manage her Prey; whereupon we caught some Mice, and throwing them in one at a Time, amongst all that Number of Vipers, (which were rather above Sixty) there was none of them, that in the least concerned himself about the Mouse, till the pregnant female Viper and the Mouse interchanged Eyes; whereupon the Mouse startled, but the Viper raised her Head, and turned her Neck into a perfect Bow, the Mouth open, the Tongue playing, the Eyes all on Fire, and the Tail erect. The Mouse seemed soon recovered of his Fright, would take a Turn or two, and sometimes more, pretty briskly, round the Viper, and giving now and then a Squeak, would run with a great deal of Swiftmess into the Chops of the Viper, where it gradually sunk down the Gullet. All this while the Viper never stirred out of it's Place, but lay in a Ring.

Some Observations upon Vipers; by C. J. Sprengell, M. D. F. R. S. No. 376. p. 296.

It is to be observed, that no Viper will feed, when confined, except a female Viper impregnated.

The same I saw at *Brussels*, where a Soldier had caught a large Viper big with young. The House, where I and some of my Companions lodged, was near the Fish-Market, where my Landlord had a Sow, and five small Pigs of nine or ten Day old. We caused one of the Pigs, to be bit by the Viper in the Tail, and in four Minutes time chopped off the Tail, the Pig appearing to be sick and dizzy, and the remaining part of the Tail being swelled; but I believe the bleeding saved it, for the next Morning it was well again. The same happened to another Pig, which we had got bit in the fore Foot, and staying seven Minutes after the Bite, cut off his Leg about two Inches above the Bite. After these two, we took the other three, and had them bit in several Places, whereof two died that Night, and the third recovered, we having given it, about five or six Minutes afterwards, ten Grains of Emetic Tartar.

This I tried afterwards upon Dogs bit by Vipers, and I found that they all recovered upon the Emetic Tartar.

An Account of
the Rattle-
snake, By the
Hon. Paul
Dudley, Esq;
F. R. S. N^o.
376. p. 292.

VI. 1. The Rattlesnake is reckoned by the *Ab-origines*, to be the most terrible of all Snakes, and the Master of the Serpent-kind; that which causes their Terror, without doubt, is their mortal Venom, and the Ensign of it is their Rattle; and it is most certain, that both Men and Beasts are more afraid of them, than of other Snakes; and while the common Snake avoids a Man, this will never turn out of the Way.

There are three Sorts, distinguished by their Colour, *viz.* a yellowish Green, a deep Ash Colour, and a black Sattin.

The Eye of this Creature has something so singular and terrible, that there is no looking stedfastly on him; one is apt, almost, to think they are possessed by some Demon.

A Rattlesnake creeps with his Head close to the Ground, and is very slow in moving, so that a Man may easily get out of his Way: His leaping and jumping to do Mischief, is no more than extending, or uncoiling himself; for they don't remove their whole Body, as other Creatures do, when they leap; so that a Man is in no Danger of them, if his Distance be more than their Length; neither can they do any Harm when they are in their ordinary Motion, until they first coil and then extend, or uncoil themselves, but they both are done in a Moment's Time.

When a Rattlesnake rests, or sleeps, he is coiled, and they are observed to be exceeding sleepy.

Our People at first took the Noise this Creature makes, to be owing to some little Bones, or hard loose Kernels lodged in their Tails; but soon discovered their Mistake, and found the Tail to be composed of Joints, that lap over one another, somewhat like a Lobster's Tail; and the striking them one upon another, forms that Noise, which is so terrible to Man and Beast. The fiercest Noise is observed to be in clear fair Weather, for when 'tis rainy, they make none at all; for which Reason, the *Indians* do not care to travel in the Woods, in a Time of Rain, for fear of being among these Snakes before they are aware. One other Circumstance of their rattling has been observed, to wit, that if a single Snake be surprized and rattles, and there happen to be others near him, they all take the Alarm, and rattle in like manner.

I dare not answer for the Truth of every Story I have heard, of their charming, or Power of Fascination; but yet I am abundantly satisfied from many Witnesses, both *English* and *Indian*, that a Rattlesnake will charm both Squirrels and Birds from a Tree into his Mouth. A Man of undoubted Probity some time since told me, that as he was in the Woods, he observed a Squirrel in great Distress, dancing from one Bough to another, and making a lamentable Noise, till at last he came down the Tree, and ran behind a Log: The Person
going

going to see what was become of him, spied a great Snake, that had swallowed him.

And I am the rather confirmed in this Relation, because my own Brother, being in the Woods, opened one of these Snakes, and found two striped Squirrels in his Belly, and both of them Head foremost. When they charm, they make a hoarse Noise with their Mouths, and a soft Rattle with their Tails, the Eye at the same time fixed on the Prey.

Their general Food consists of Toads, Frogs, Crickets, Grasshoppers, and other Insects, but principally of Ground Mice; and the Rattlesnake again serves for Food to Bears, and even our Hogs will eat them without Harm.

They are viviparous, and bring forth generally about twelve, and in the Month of *June*. A Friend of mine, in the Country, being desirous to discover the Nature and Manner of the Generation of the Rattlesnake, gave me the following Account, *viz.* About the middle of *May*, the Time when the Rattlesnakes first come abroad, he took and opened one of them, and in the *Matrix* found twelve small Globes, as big as a common Marble, in Colour like the Yolk of an Egg; in three or four Days more, he took and opened another, and then plainly perceived a white Speck in the Centre of the yellow Globe; in three or four Days more, he dissected a third, and discovered the Head of a Snake; and in a few Days after that, three Quarters of a Snake was formed, and lying round in a Coil. In the latter End of *June*, he killed an old one, and took out perfect live Snakes of six Inches long. In *September*, when the old ones take their Young in, and carry them to their Dens, they are not quite a Foot long. They couple in *August*, and are then most dangerous.

I cannot say, what other Serpents, or poisonous Creatures, may do, but I am satisfied the Rattlesnake does not traject his Poison; and that unless the Skin be first broke, or an Incision made with his Teeth, his Venom can do no Harm; for my Friend assured me, that he had made an Experiment of it in this manner: He took the Breech of his Gun, and set it upon four or five of them. and after they had bit it, and left several Drops of their Poison, he with his Hand wiped it off without any Harm.

Our People have several Remedies for the Sting of a Rattlesnake; among others, that which is much made use of, is a Root they call Blood-root, I suppose so named, from the Colour of the Root, and the Juice, which is red like Blood. It grows in great Abundance in our Woods; they bruise the Root, and bind it above the Place that is bit, to prevent the Poison's going farther, at the same Time scari-fying the Place affected; some of the Root is also boiled, and the Person poisoned drinks the Water.

They are generally from three to five Feet long, and do not commonly exceed twenty Rattles; and yet I have it attested, by a Man

Effects of the Poison of the Rattlesnake.

of Credit, that he killed a Rattlesnake, some Years since, that had between seventy and eighty Rattles, with a sprinkling of grey Hairs, like Bristles, over his Body; he was full five Foot and a half long, and as big as the Calf of a Man's Leg.

They shed, or throw off, their Skins every Year, some time in the Month of *June*, and turn it inside out when they throw it off. It has also been observed, that the Skin covers not only the Body, but the Head and Eyes.

They generally den among the Rocks in great Numbers together, the Time of their retiring is about the middle of *September*, and they do not come abroad till the middle of *May*, when our Hunters watch them, as they come out a funning, and kill them by hundreds.

*Experiments
on the Effects
of the Poison
of the Rattle-
snake. By
Capt. Hall.
N^o. 399. p.
309.*

2. In *South Carolina*, on the tenth of *May*, Anno 1720, having got a fine healthful Rattlesnake about four feet long, I persuaded three or four Gentlemen, and one Mr *Kidwell* a Surgeon, to assist me in making some Experiments on the Effects of it's Poison.

We got three Curr-Dogs, the biggest not larger than a common Harrier, and the least about the bigness of the largest sized Lap-Dog, all of them smooth-haired

The Snake being tyed and pinned down to a Grass-plat, we took the largest of them, which was a white one, and having tyed a Cord round his Neck, so that it should not strangle him, another Person held one end while I held the other; the length was not more than four Yards each way from the Dog.

Immediately on our bringing the Dog over the Snake, the Snake raised himself near two feet, and bit the Dog as he was jumping; the Dog yelped, by which I perceived he was bitten; and upon it I pulled him to me, as fast as I could, and perceived his Eyes fixt, his Tongue between his Teeth, which were closed, his Lips so drawn up as to leave his Teeth and Gums bare: In short, he was quite dead in a quarter of a Minute; but one Person (beside myself) was of Opinion it was in half that time: The first was the Opinion of the By-standers, who were five or six; but I believe, none of them so much used to measure time as the Gentleman and I were, from our constant making use of the half Minute, and quarter Minute Glass at Sea. We could not see where the Dog was bitten, nor any Blood: Upon which we ordered some hot Water to scald the Hair off; when we could find but one Puncture, which looked of a bluish Green a little round it; it was just between his fore Leg, and his Breast; where (when the Legs are distended) the Hair is much thinner than in some other places.

Half an Hour after the first Bite we took a second Dog, which was somewhat less, of a Liver-Colour, and in like manner brought him over the Snake, which in a very little time bit his Ear, so that we all saw it; he yelped very much, and soon shewed the signs of being very sick, holding that Ear that was bit uppermost. He reeled and

staggered

staggered about for some time ; then he fell down, and struggled as if convulsed, and for two or three times got up, each time wagging his Tail, tho' slowly, and attempting to follow a Negro-Boy, who used to make much of him. We put him into a Closet, and ordered the Boy to look after him.

About an Hour after the second was bitten, we took the third Dog in like manner : The Snake bit him on the right side of the Belly, about two Inches behind the long Ribs ; for we saw he had drawn Blood there. The Dog for about a Minute, seemed not to be hurt ; so we let him go, being one we could get again when we pleased. For that Day we put up the Snake, imagining his Poison was very near, if not quite, expended.

Two Hours after the second Dog was bit, the Boy told us he was dead.

About an Hour after I persuaded Mr *Kidwell* to open him, and I was in no small Haste to examine the Heart, where I persuaded myself, I should discover something extraordinary ; but could not perceive any remarkable Difference between that and many others I had seen, where there was no Poison in the Case. Mr *Kidwell* laid open the Skull, and was of Opinion, that the Brain was more red and and swoln than any he had ever seen ; and he told me a little while after, that the Blood turned very black.

For that Day we heard no more of the third Dog which was bitten ; but the next Morning the Woman who owned him came to me, complaining of my Cruelty for killing her Dog. She did not know when he died, but said she saw him at seven that Evening, which was about three hours after he was bit ; and that he was so sick he could scarce wag his Tail. None of these Dogs were swoln before they died.

On the Fourteenth, we got two Dogs both as big as common Bull Dogs. The first Dog, which he bit on the Inside of his left Thigh, died in half a minute exactly, in the Opinion of two Gentlemen, who kept their Watches in their hands all the while : There were two very small Punctures in his Thigh, which looked livid, tho' no Blood was drawn. This Dog did not swell for four Hours after he was dead.

The second Dog was bit about an Hour after the first, on the out side of his Thigh, where we perceived the Blood at two places : He soon sickened, and died in four Minutes.

We thought his Poison was not spent ; so we got a Cat (for we could get no more Dogs) which he bit about an Hour after, though I cannot say where. The Cat was very sick, and we put her up in a Closet : By some means the Cat was let out in less than an Hour and a half after she was bitten. The next Morning early she was found dead in the Garden, and much swoln ; so that no body cared to examine or search where she was bit.

About a quarter of an Hour after he had bitten the Cat, he bit a Hen twice: The Hen seemed very sick and drooping, and could not, or did not fly up to her usual place of Roost among the rest that Night; but the next Day she seemed very well, and continued so till Evening, when I ordered her to be killed, and her Feathers scalded off: There were two Punctures in her Thigh, and a Scratch on her Breast over the Claw, all which looked livid.

About a Week after, having got a large Bull Frog, we brought that over him as usual: He bit it with much force; so that he seemed to fasten for a small space. The Frog died in two minutes or thereabouts. In less than an quarter of an Hour he bit a Chicken, which was hatched the *February* before, that died in three minutes; I can not say where it was bit, and I was at a loss to try any further Experiments for a long time, for want of proper Subjects. Dogs and Cats were not to be had; for the good Women, whose Dogs had been killed, exclaimed so much, that I durst not meddle with one afterwards.

About the Middle of *June* I took him out according to Custom, and having got a common black Snake, not of the Viper-kind, about two and a half or near three Feet long, in good Health, just taken; I put them both together, and irritated them both, that they bit each other, and I perceived the black Snake had drawn Blood of the Rattlesnake before I took them asunder.

In less than eight Minutes the black Snake was dead, and I could not perceive the Rattlesnake at all the worse or sick.

On the last Day of *June*, I took him out to try, whether if he bit himself, it would not prove mortal to him. I hanged him so, that he was not above half his Length on the Ground; and with two Needles at the End of a Stick, one to prick, the other to scratch, irritated him so much that he soon bit himself, after having attempted to bite the Stick many times. I then let him down, and he was quite dead in eight minutes or thereabouts, but am sure it did not exceed twelve Minutes.

A Gentleman persuaded me to cut the Snake in five Pieces which he gave to a Hog, the Head-part first, in Sight of many of us. The Hog eat up all the Snake, and ten or twelve Days afterwards I saw the same Hog alive and in Health.

This was no more than I had seen before; but doubted they had taken some other Snake for a Rattlesnake: For being at the House of *Charles Hart Esq*; they shewed me a Snake, which a Negro told me he had killed just before; it was in three pieces, the Head of it bruised into the Ground. While I was looking on, a Sow came and eat it up very greedily, the Negro-man endeavoured to hinder her, being afraid it would kill her; for she had Pigs following her.

I

I never

I never heard she was sick for it, tho' I inquired; and about ten Days after I saw her in very good Health. I have heard fifty Relations of the same kind, and am told that those Hogs which feed in the Marshes will run after the common sort of Watersnakes, which are not poisonous, and will feed on them greedily: And, in *Maryland*, last *August* was two years, I saw a Hog eat up the Head of a Rattlesnake just cut off, and while it was gasping very dreadfully; and I was told, it was a common thing, and it would do them no harm.

On the tenth of *June* 1723, Mr *Thomas Cooper*, a Gentleman who practises Physic at *Charles-Town*, sent to me to let me know, he had got a fine Rattlesnake which had been taken not above four Days, was about three feet and a half long, and that he designed to try whether he could save some of the Dogs after the Snake should bite them. He provided a large quantity of *Venice-Treacle* or *Mitbridate*, I can't positively say whether, which he divided into two Potions, each about two Ounces; to one of them he put a large quantity of *Diaphoretic Antimony*.

The first Dog which the Snake bit on the Inside of the Thigh, died so soon (*viz.*) in about half a minute, that we could not get the Potion, which was that *without Antimony*, down his Throat soon enough to expect it could have Effect.

Above an Hour after, the second Dog was bitten by him, and had two Punctures or Holes in the fleshy part of the Inside of his left fore Leg, which did bleed more than any I had seen before: We immediately got down his Throat that Preparation *with Antimony*. He soon grew very sick and strove to vomit; but I think brought up very little, if any; he frothed at the Mouth, and bit at the Grass, which he champed, as if he were mad; and indeed we were all afraid of him. We therefore put him into a Room and there kept him till next Morning, where I saw him as I thought recovered: We threwed him some Meat, which he eat, so we let him out and he went home. About a Month after that, the Dog's Hair came off, and his Master killed him, being so ugly to look at; for he told me, he looked like a Leprous Person (that was his very Expression). I never heard that this Dog swelled.

The third Dog which he bit was a Shaggy Spaniel, about an hour and a quarter after the second. He was bitten on the foremost part of his right Shoulder, as we perceived by the Blood. The Dog seemed to bite at the place himself, and was very sick for about two or three hours; but, without any means or application, he recovered and I never heard he was sick afterwards.

The Anatomy
of the Poison-
ous Appara-
tus of a Rat-
tlesnake, with
an Account of
the quick Ef-
fects of it's
Poison; by
John Ranby,
Esq; F. R. S.
No. 401. p.
377.

Fig. 2.

Fig. 3.

Fig. 4.

3. This Animal was sent from *Virginia*, and placed in my Hands, on purpose to make such Experiments with it as might inform Man-kind of the Symptoms which attend it's Bite, and the Appearances in the dead Bodies of such Animals as have been bit by it. It is only by this Method, and a Number of Facts faithfully stated and compared with each other, that we may hope one Time or other to discover the Manner of the Poison's operating, and perhaps to find out some Remedies, internal or external, to relieve Persons bit by it. The Anatomy of the Rattlesnake having been so accurately described by the late ingenious Dr *Tyson*, very little more can be added to his Account; I shall therefore only take Notice of the *Instruments* of it's Poison, some of which are different from what that celebrated Anatomist observed. Removing then the common Integuments of the Head, the *Muscles* that raise the poisonous Fangs appear; the first of which arises with a short fleshy Beginning from the upper Edge of the lower Jaw, near the Articulation of one of those Bones which Dr *Tyson* calls *Maxillarum Dilatores* Fig. 2. A. and sends a few carnous Fibres to the Side of the *Cranium*; then becomes tendinous, and so marches to it's Insertion in the Outside of the Bone which receives the poisonous Fang, Fig. 3. Displacing this Muscle there appeared a *Gland*, Fig. 2. B. about the Bigness of a small Pea, which I take to be one of the *Maxillary* Glands, for the following Reasons: *First*, The Structure of the Parts, and it's Distance from the Fang, make it unlikely to be designed for separating the poisonous Fluid, but rather a *Saliva* to moisten the Aliment, in order to make it pass down the *Oesophagus* with Ease, the Stomach of those Animals being but small, and the Gullet considerably larger; not without some Analogy to the *Ingluvies*, or Crop, of granivorous Fowls, where the Food stops for some time and is moistened, before it is capable of descending into the Stomach. *Secondly*, These Parts are so contrived, that on opening the Mouth to receive the Prey (at which Time such a Fluid is most wanted) the Muscle, above mentioned, pressing on the Gland promotes the Discharge of it's Contents into the Mouth. The *Duct* of this Gland seems to open between the Upper Lip and the Jaw, but as the excretory Ducts of so small a Gland are rarely to be seen with Certainty, I will not pretend exactly to determine it's Aperture. Under this Gland lies another Muscle smaller than the former, which arises and is inserted near it Fig. 2. C. these two Muscles draw the Bone Fig. 2. D. in which the poisonous Fang is fixed a little outwards and upwards. Between the last described Muscle and Gland passes a *Nerve* to the upper Part of the Bone which receives the Tooth Fig. 2. E. and Fig. 3. B. and it is probable that this *Nerve* has been taken for the excretory Duct of the Gland before mentioned. Opening the Mouth, two small *Eminencies* appear in the Fore part on the Inside of the upper Jaw, being a *Membrane*, raised by the Fangs and drawn over them like the Mouth of a Purse Fig. 4. A. B. Fig. 3. C. This
Membrane

Membrane is thick and strong, and, placed in a Microscope, appears to have a Number of Glands, some of which are even visible to the naked Eye. In a common Viper I observed one on each Side the Fang. These Membranes prevent the involuntary Discharge of the Poison out of the Fangs (which, in my Opinion, are the only Repositories of that Fluid) into the Mouth, as also the killing with the Fangs little Animals on which they sometimes feed. Putting back this Membrane, the fatal Fangs appear, which on first View seemed to be only one on each Side, till searching further there appeared four more; the first and largest is fixed in a Bone, which is articulated to the fore Part of the upper Jaw *Fig. 2. F.* The four others are fastened in and covered with strong tendinous Membranes, and lie as it were one over another *Fig. 3. B. Fig. 4. C. and E.* These Teeth are crooked and bent as in *Fig. 6.* especially the first, and have each two Perforations, the one on the upper Part, the other the lower Part of its convex Side; which last comes quite to the Point, and resembles the sloping Cut of a Pen. The upper Perforation *Fig. 5. A.* I imagine receives the Poison, the other transmits it into the Wound *Fig. 5. B.* All these Fangs are tubular, the largest of which contained a small Quantity of a transparent Fluid of a light yellowish Colour, which, on putting the Snake into Spirit of Wine, changed to a beautiful Red (the Fangs of the common Vipers I have examined had the lower Perforation nearer the middle). Freeing the Mouth of the Membrane, a Muscle appears about the Size of the first described above, which arises from the Middle of the *Maxillarum Dilatores Fig. 4. D. D.* and is inserted on the under Side of the largest Tooth, for the Force required to pull down the Fang being less than to raise it, fewer Muscles are required. This Animal was in my Custody about a Month, during which Time he bit three Dogs, and a Cat; the two first were bit at the *College of Physicians*, and of these the first died about two Minutes after the Bite, and the Moment he was bit he grew convulsed, and lost the Use of his Limbs. The Wounds were exceedingly small, and between the pectoral Muscles. Upon opening the Dog, the Skin and *Membrana adiposa* for the Breadth of a Crown were livid about the Wound, as if from a violent Blow. The second Dog had the same Symptoms with the first, but lived near a Quarter of an Hour, and had bloody Stools. Three Days after, I carried the Snake to bite another Dog and Cat. The Dog was larger than either of the two former, and having been bit at the Extremity of the Nose he was immediately affected, howled, shook, fell down and foamed at the Mouth; and in about ten Minutes discharged his Excrements involuntarily, tinged with Blood: He died in about two Hours. The next Day I opened the Body and observed the *abdominal* Contents very much inflamed, especially the Stomach and Intestines, which appeared nearly equal to the finest Injection; opening the Stomach and Intestines they contained a mucous Matter,

Fig. 6.

Matter, the greatest Part of which was Blood, and the fine villous Coat which is so visible in these Animals was entirely destroyed. About an Hour before he was bit he had a plentiful Meal of coarse Beef, of which there was not the least Appearance. Opening the *Thorax*, the *Pleura* and other Membranes looked as if injected; the Heart was turgid with Blood, as were also it's Vessels. The Vessels of the Membranes of the Brain made a most beautiful Figure from the Quantity of Blood contained in them, as did likewise the Blood-Vessels of the Nerves; there was a small Quantity of Water between the two Hemispheres. The Blood contained in the Heart, and it's Vessels, was an even Mass about the Consistence of Cream. The Cat had upon opening nearly the same Appearances, and lived about five Hours.

The Hirudina Marina, or Sea-Leach, by Mons. Garcin. Translated from the French, by John Martyn, F. R. S. No. 415. P. 387.

Fig. 7.

VII. I found this Worm in the empty Stomach of a Fish, called by the *Portugeze*, *Bonite*: It was fastened, by it's Protuberance, upon one of the Folds of the inner Membrane. It made a pretty deal of Resistance when I endeavoured to pluck it away.

It's Shape, came very near that of a *Leach*; it had all the Motions of that Animal, together with some of it's own. Fig. 7. represents this Insect in it's natural Bigness, and according to it's most constant Dimensions; it's Body is round throughout it's whole Length almost, but a little flatted towards it's Belly B; so that it's Circumference, taken according to it's Thickness, is almost elliptic. It is adorned all along with little circular Furrows parallel to each other, and very close together, but so fine, that one can scarce perceive them without a Microscope. It is of a greyish Colour, and it's Body is a little transparent. On it's Back, as well as underneath, two black Lines begin by an acute Angle towards the Neck, and running through the whole Length of the Body, seem to be terminated towards the *Anus*. These Lines are Tubes, or Bowels, which serve for Nutrition, or Chylification, which appear through the Integuments. I shall divide the Length of this little *Leach* into two Parts, distinguished by the Center of a little Protuberance C, which is under it's Belly, and is a muscular Body, in Form of a spherical Bladder. These two Parts of the Body are in the Proportion of four to three. I shall call them the fore Part and the hind Part. This little Protuberance, in it's greatest Extension may be compared to the Cup of an Acorn, with the Mouth a little contracted. The Head, E, which makes the smallest End of this Worm, has a hollow Body underneath, of a conical, or almost hemispherical, Figure, which seems to serve it for a Mouth to suck, as well as to fasten itself on the various Bodies which come in it's Way, after the manner of the other *Leaches*.

The Belly, B, is of a dark Colour, because several Bowels, which are contained in it, are filled with a thick, black Liquor, which makes it look as if the Skin was of that Colour. The fore Part, CE, is variously shaped, according to it's different Motions; sometimes

it

Fig. 2.

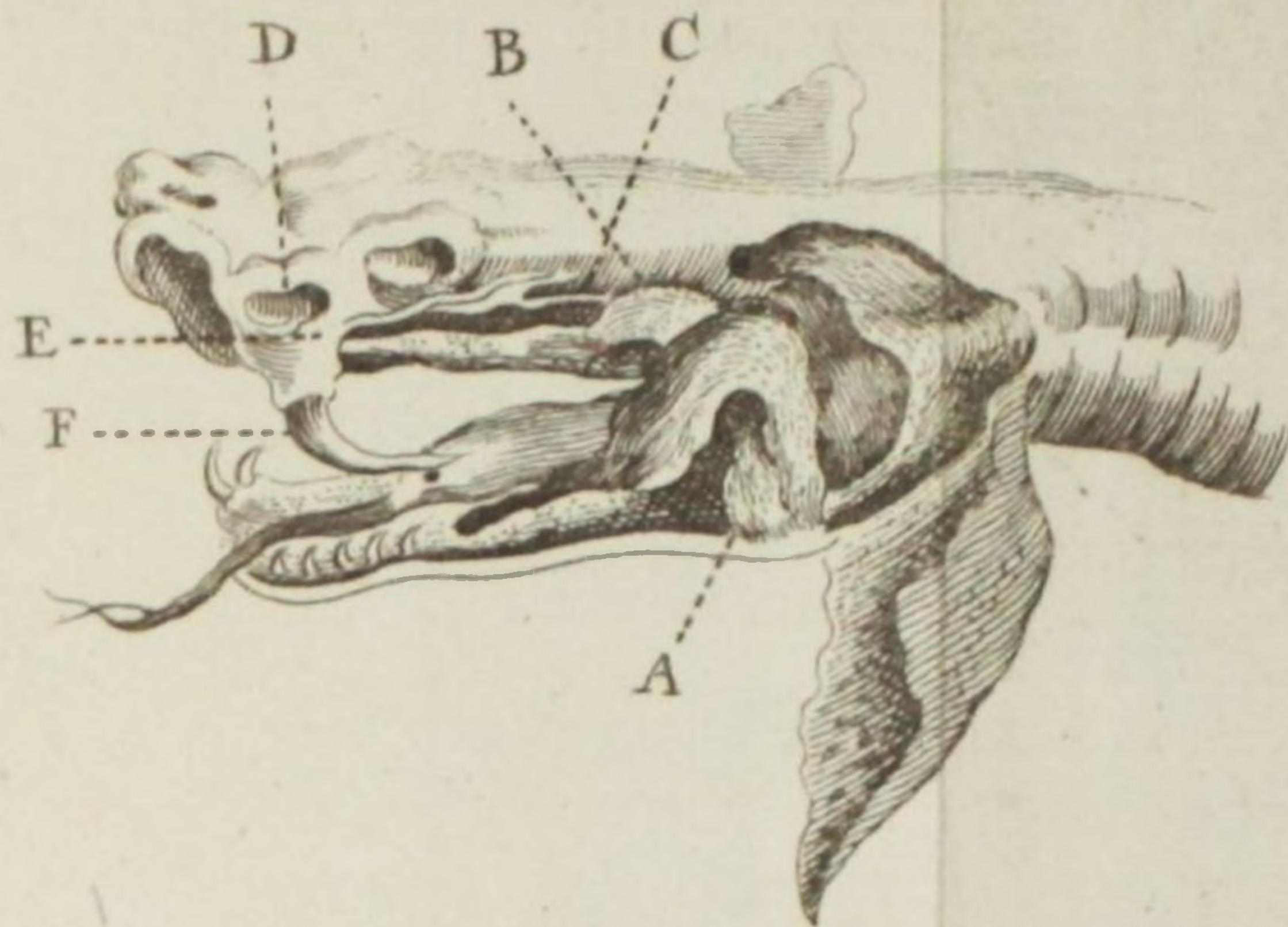


Fig. 3.



Fig. 4.

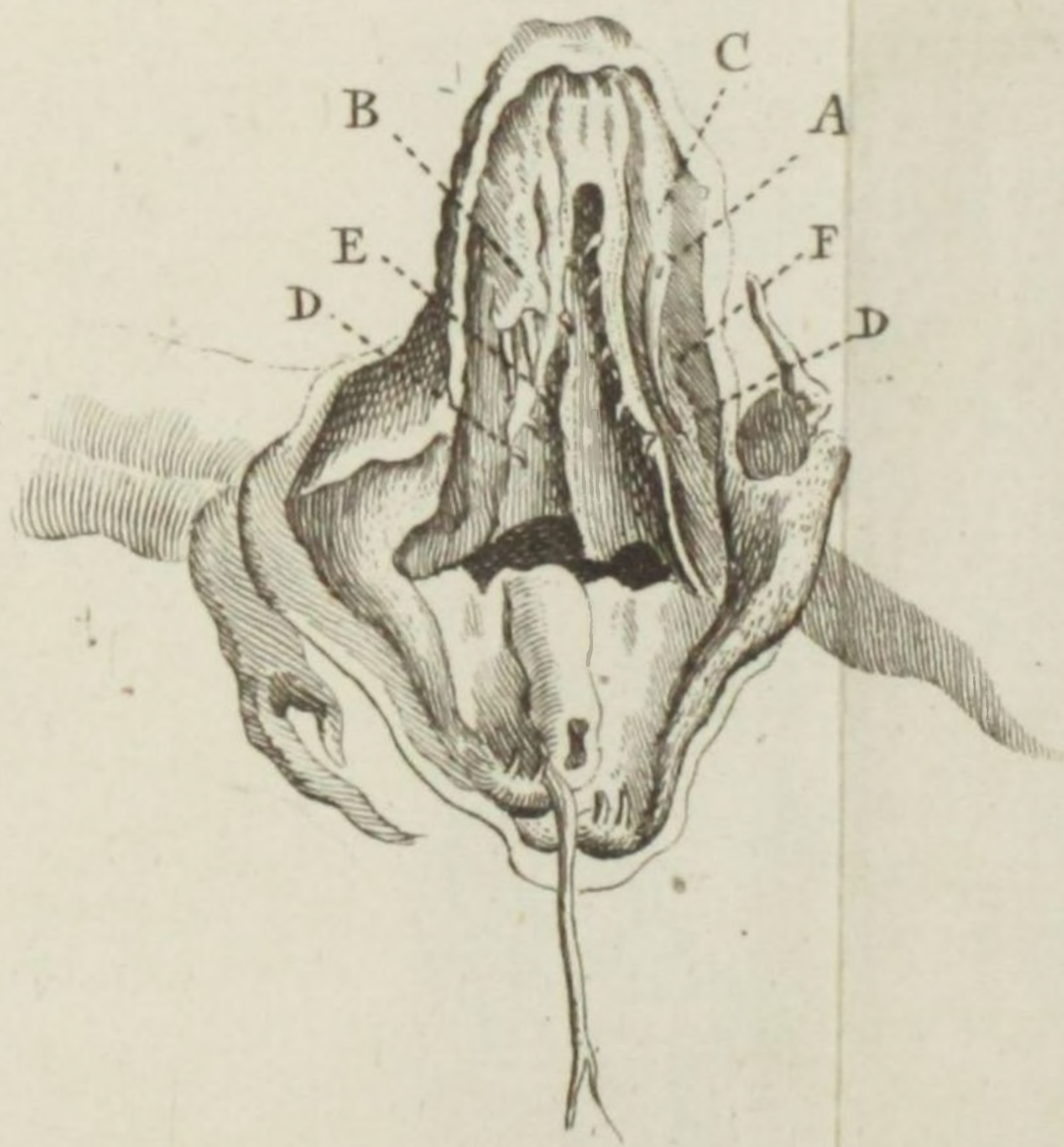


Fig. 5.

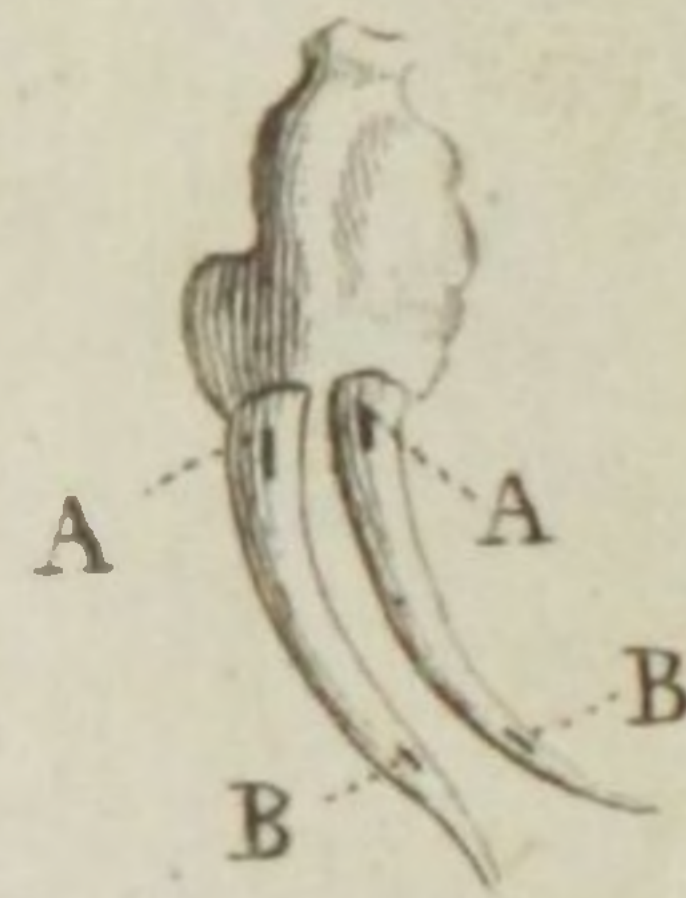
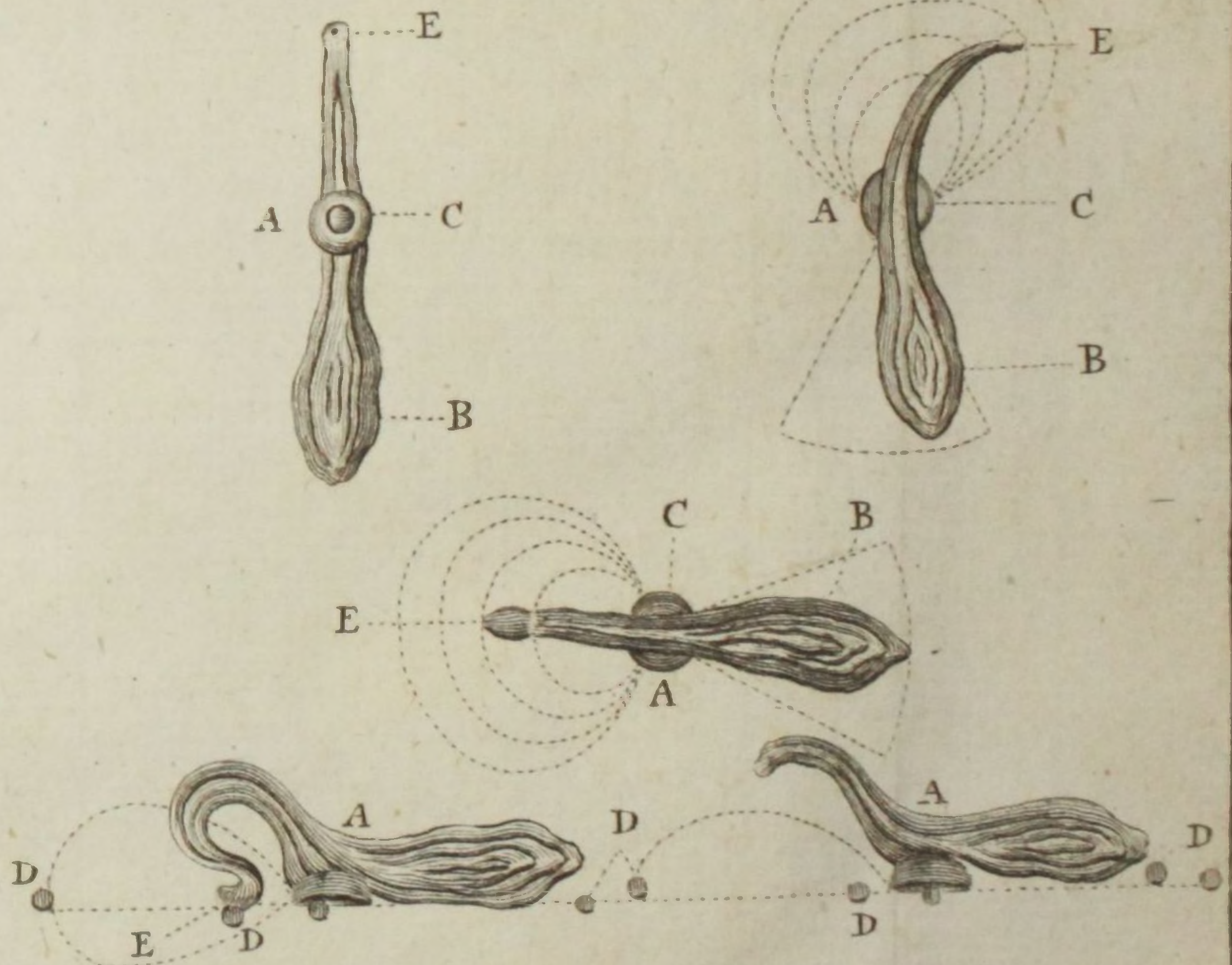


Fig. 6.



Fig. 7.



it prolongs itself, and then it becomes slender, the Diminution being made by Degrees up to the Head; and sometimes it contracts itself, and then, the Thickness encreasing, it becomes all of an equal Bigness. The hinder Part CB does not change it's Figure, because it moves but slowly, and very seldom. When this Insect stops itself any where, it holds strongly by means of the Protuberance. Before it applies it, it shortens it, by withdrawing the Edges, or the Circumference towards it's Centre; and after it has applied the Orifice of it's Protuberance upon the Surface of any Body, it lifts up a little the Centre, or Bottom, towards it's own Body; afterwards it swells it, and stretches it on all Sides, according to all it's Dimensions. This Protuberance thus applied, stretched and void of Air, makes that which endeavours to enter, press it externally on all Sides, and hold it so fast, that it is above the Strength of the Animal to separate it from it's Place where it is applied. This Animal being thus fastened, and detained by it's Protuberance, it's fore Part is always in Motion, whilst it's hinder Part remains almost immoveable. It stretches it's Head sometimes to the Right Hand, sometimes to the Left, by lengthening and shortening it's fore Part, which bends and streightens itself very frequently. I have marked the Extent of all these Motions by pricked Circles of different Bignesses, all which touch one another at one Point of their Circumference, at the Center of the Protuberance, which is as it were the Beginning and fixed Point of all these Motions. When this little Animal desires to change it's Place, it makes use of it's Protuberance and it's Sucker, which is the little Hollow under it's Head, and seems to serve it for a Mouth: It applies this Part to the Place D, whither it would remove it's Body, and after being prolonged by it's fore Part to reach the Place, where this Application should be made, it draws it's Protuberance and Sucker together, by bending it's fore Part circularly, after the Manner of some *Caterpillars*. It's Protuberance being applied, it loosens it's Sucker and prolonging itself, applies it to another Place more forward: The Sucker being fastened, it bends itself circularly again to bring the Protuberance up to it, and apply it as before. By this we see that the Worm prolongs itself to apply it's Sucker, and contracts itself to do the same with it's Protuberance. Thus these Motions and Applications are made successively, and as often as there is occasion. The hinder Part fastens itself to nothing, but is always drawn by the Part which goes before it.

This little Animal did not live above two Hours after it was taken out of the Place where I found it. It grew languid as soon as it was exposed to the Air, and recovered some Vivacity as soon as it was put into a little Sea-water. As soon as it was put in the Water, it sent out from it's Mouth a little green, almost imperceptible, Thread, which kept itself suspended in the Water, and was about as long as it's Body, and was as fine as the finest Thread of a Spider's Web:

After this Thread was put forth, it emitted also from the same Place some little Bubbles of Air. The Body of the Worm decreased in Bulk by little and little as long as it was alive, and after it's Death, this Diminution either ceased, or became less sensible. Having cut it's Belly through with a Pair of Scissars, as soon as it was dead, and squeezed it, there came out a black, thick, Liquor.

From these Facts we can draw but very slender Consequences. It is certain that this Insect cannot live out of the Water; so that one cannot imagine it could live in the Stomach of any Land-Animals, unless they came near the Nature of the Amphibious; for the Worms which grow upon, or within the Bodies of Animals, ought to be of the same Nature with them, with Regard to the Elements in which they live. Our Worm seems to be incapable of living any where but in the Bodies of Fish, seeing it kept alive but a very little Time in the Sea-water, in which I put it, having been exposed to the Air but one Moment at two different Times; which was not sufficient to alter it's Parts, and cause it's sudden Death. The almost immediate Diminution of it's Bulk in the Water is another Mark that it cannot live in the Sea out of the Body of the same Fish; for if the Water, which was more natural to it than the Air, was injurious to it, much more would the Air, to which I exposed it, have been prejudicial. The fine Fibre which it put forth, and the Decrease of it's Bigness, were signs that it suffered some Uneasiness. The black and thickish Juice, which came out of it's Entrails, could be nothing but some half coagulated Blood, which it had sucked in the Stomach of the Fish.

As the *Bonite* is a Fish of Prey, living on other smaller Fishes, it is probable that this little *Leach* usually fastens itself on those which come into the Stomach, and that it lives on their Blood.

The Stomach, in which I found it, was quite empty, so that it was probably as hungry as the *Bonite* could be; for this Fish is not easy to be caught but when hungry. However, it was the first Time I found it so very empty, though I have seen a great Number opened.

Concerning the
flocking of the
River Mene
with Oysters,
by the Rev.
Mr Rowlands,
No. 369. p.
250.

VIII. The River of *Mene*, that divides *Anglesey* from *Carnarvonshire*, has at present the Bottom of it's Channel for some Miles in length, all bedded with good Oysters, in such Plenty, that in the Season, several Boats are daily employed to dredge them up, and have done so these eight or nine Years last past to their great Profit; but what I recommend as observable, is, that about twenty four Years ago, we have good Assurance, that there were none to be found on that Bottom: but that a Gentleman about that Time, caused three or four hundred large Oysters to be dropped into the Channel, just under his Land; from the Spat or Seed of which, it is most probable, the Flux and Reflux of Tides dispersing it, all the Bottom at length, where small Stones and a large Cultch received the

the Sperm, became covered with Oysters. And what favours this Conjecture, that they are a Brood of Oysters begun at that Time, is, that at the first finding, they appeared young and small, but have since yearly increased in Bulk and Plenty, though prodigious Quantities have been taken up of them.

IX. It is not easy to conceive, how an Hermaphrodite can be formed in a Species whereof each Sex has the Parts subservient to Generation, single and necessarily situated in the same Parts of the Body; at least without either a very remarkable Mal-formation of the Body in general, or so perverted a Situation of those Parts, as must very much impair their Uses. But in those Animals whose Parts of Generation are double and independant on each other, as the Lobster, Crab, and many Birds, the Parts proper to both Sexes may possibly be formed in the same Subject without Prejudice to their Uses: But in that Case the several Parts can be but single; and consequently, the Subject so formed cannot be termed perfect as to it's Species, in regard to either Sex, though it may be perfectly of both Sexes so far as regards Generation.

A Hermaphrodite Lobster dissected by F. Nicholls, M. D. F. R. S. No. 413. p. 290.

Under this Idea of a *Hermaphrodite*, I may venture to say, the Lobster referred to my Examination is truly one; and, if split from Head to Tail, is Female on the right Side, and Male on the left Side.

To illustrate this, I shall give a short Account of the Structure of the male and female Lobster, so far as relates to the Difference between the two Sexes, and then proceed to shew in what Manner they were combined in this Subject.

It has already been observed that the Lobster, both male and female, has all the Parts of Generation double, except that the female has one Passage only, through which it is probable the *Ova* are emitted out of the Trunk, in Order to be affixed to the small Appendages under the Tail.

The *Penis* of the male Lobster arises from the Testicle, and is no more than a Continuation of the *Vas deferens*; it is reflected and re-torted once, after which it grows thicker, as to it's Substance (probably forming a *Corpus cavernosum*) and terminates, not in the last Leg but one, as *Willis*, in his Treatise *de Animâ Brutorum* has observed, but at a small perforated Tubercle in the first Bone of the last Leg. A A, the two Penes.

Fig. 8.

Between the two last Legs and the two Legs above them are two Processes, which, from their resembling the *Nymphæ* of Women, I shall term *Nymphæform* Processes. These Processes are covered with Hair, and unite at their Bases without leaving any Passage. B B.

Below the two last Legs, towards the Tail, are two Appendages, which, from their Similitude, I shall term the *Styliform* Appendages. These in the Male are thick, hard, and void of Hair. C C.

A Hermaphrodite Lobster.

The Tail is continued from the Trunk in a gradual Decrease of it's Dimension, and is covered by Plates, which extend themselves but little below the Substance of the Tail, and terminate in acute Angles, without any Ways diverging. D D.

It is to be observed, that sometimes these Plates are edged with short and thin Hair, and sometimes have no Hair.

The Female on the other Hand, in the Place of the Testicle has an Ovary, which, like the Testicle, extends itself from the Stomach to near one half of the Tail. From the Middle of the Ovary a Duct descends to the Legs, which opens at a round Hole edged with Hair in the first Bone of the last Leg but two: This is the *Uterus*. A A, the Entrance into the two Vaginæ.

Fig. 9.

The two Processes, (BB), which I have termed *Nymphæform*, in the Female make a more obtuse Angle at the Union of their Bases; are less hairy, and leave a Passage (D), through which it is probable the *Ova* are emitted, to be affixed to the Appendages under the Tail.

The two Styliform Appendages in the Female are soft, thin, and edged with long Hair, C C.

The Plates covering the Tail are extended much farther under the Tail than in the Males, beside which they diverge, in order to leave a greater Space for containing the *Ova*; for the better Defence of which they terminate broad, and are edged with thick and long Hair, F F.

In the *Hermaphrodite Lobster* I found all these Parts proper to both Sexes regularly disposed, but in such Manner that the Parts proper to the Female were to be found only on the right Side, and the Parts proper to the Male only on the left Side.

Fig. 10.

In the antepenultimate Leg the *Os uteri* (A), was very obvious on the right Side, as in the Females, but had not the least Mark of any such Passage in the same Leg on the left Side.

The *Nymphæform Process* on the right Side made an obtuse Angle at it's Insertion into the Body, and was soft and perforated as in the Females, while the corresponding Process made a less Angle, was more hairy and rigid at it's Basis, as in the Male, B.

The *Styliform Process* on the right Side (D) was soft, flat, and edged with Hair, as in the Female; but on the left Side (E) it was stiff, hard, and void of Hair.

In the last Leg on the left Side the perforated Tubercle for the Passage of the *Penis* (H) (as in the Male) was very conspicuous, but without the least Appearance of such Tubercle in the corresponding Leg on the right Side.

The Plates covering the Tail (F) were extended on the right Side considerably below the Substance of the Tail, and were edged with thick and long Hair, and terminated broad, as in Females.

Fig. 8.

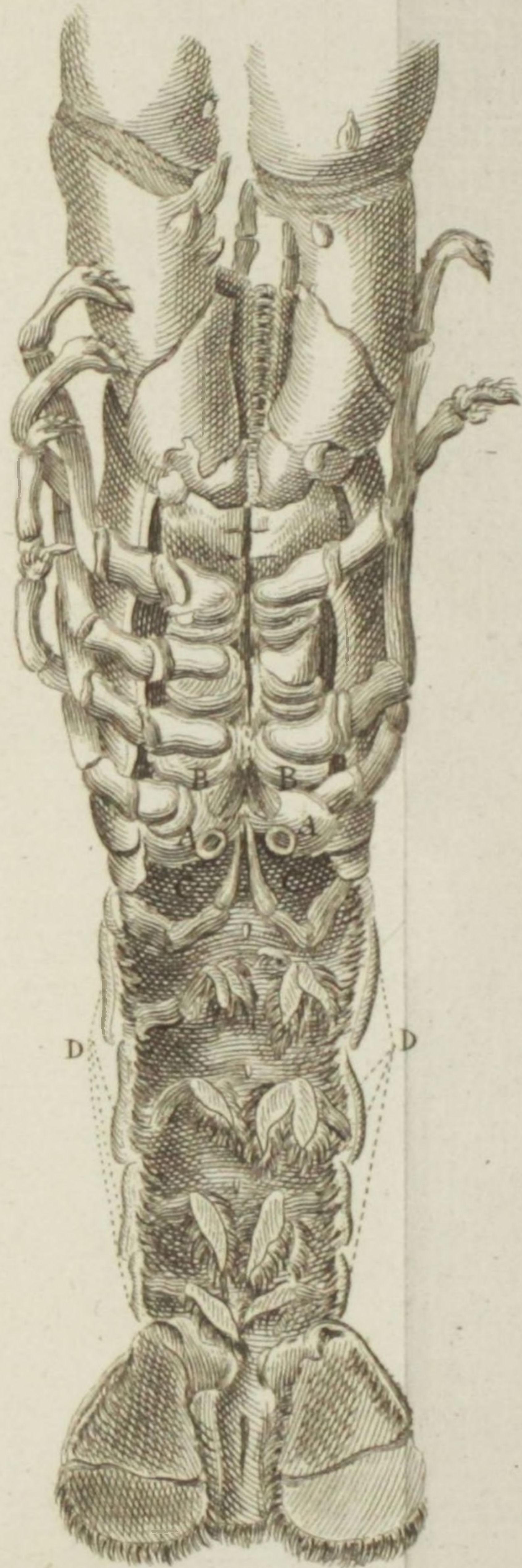
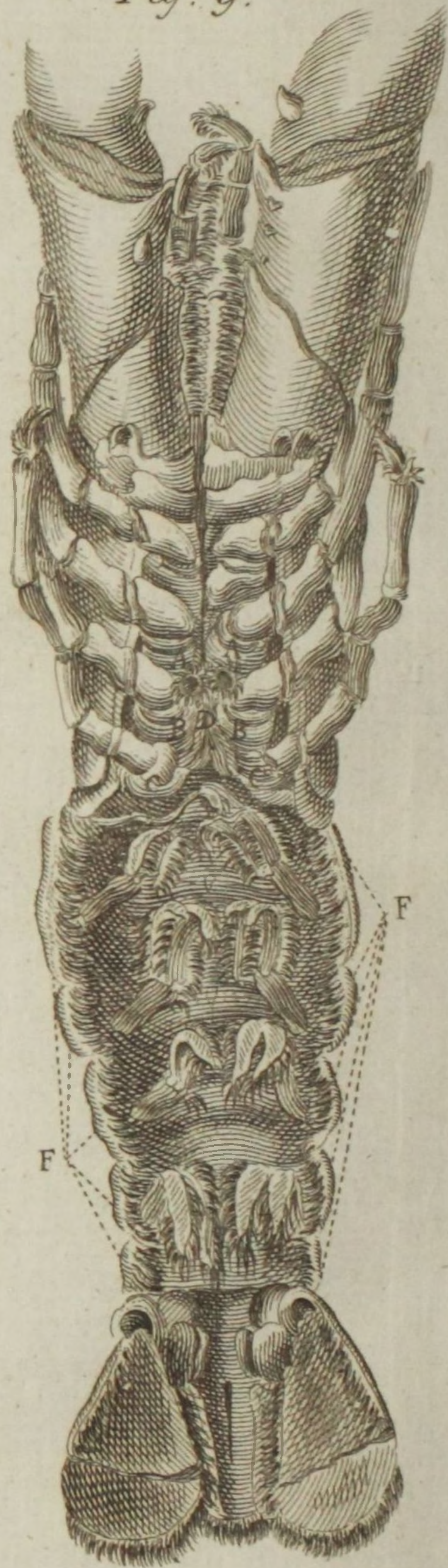


Fig. 9.



On the left Side, these Plates were much less extended below the Tail; were almost totally void of Hair, and terminated in acute Angles, (G).

These Plates diverged likewise on the right Side, as in the Females, but not on the left Side, as in the Males. A, the diverging of the Plates on the right Side; B, the Plates no Ways diverging. Fig. 11.

Upon removing Part of the great Shell, I found the internal Parts of Generation in both Sexes exactly corresponding to those externally described.

In the right Side adjacent to the Heart, the Ovary (F) was regularly disposed, it was full of Ova, and sent off it's Oviduct or Uterus (G), to the antepenultimate Leg.

In the left Side the Testicle was rightly disposed as to it's Form, Substance, and Situation; Part of which I was obliged to remove, in Order to shew the Penis (E), which terminated as in all Males, at the Tubercle in the first Joint of the last Leg. I, Part of the Testicle unremoved.

I had some Thoughts of removing so much of the great Shell as was necessary to shew the Course and Terminations of the Uterus and Penis, at their proper Orifices. But considering that by that Means the Tail would too easily separate from the Trunk, and the Appearances of the other Marks be rendered less obvious, I chose only to lay them open at the Back, believing that to be sufficiently satisfactory to those who understand the Structure of that Animal. I have steeped it in three different Spirits, and carefully disposed it in a Glass, which I have stopped in the best Manner I can, that it may remain in the Repository, as an undeniable Proof of so remarkable a Fact.

X. Two short Miles from my House we have a fine Pond, of half a Mile over, with little or no Communication with the Sea. An ingenious man, some threescore Years ago, for an Experiment, took a Pail of large Smelts from the River and put them into this Pond, where they have increased abundantly, but are degenerated to a very small sort; for our River-Smelts I suppose are full as large as those of the Thames, some of them I know, will weigh two Ounces and a half, whereas these small ones will not weigh five Penny-Weight. We reckon the Pond-Smelt eats much better than the other, they are very transparent, and of a beautiful shining Pearl-Colour.

XI. I. The most learned Part of Mankind are still at a Loss about many Things, even in Medical Use; and, particularly, were so in what is called Ambergris, until our Whale Fishermen of Nantucket, in New-England, some three or four Years ago, made the Discovery.

Cutting up a Sperma Ceti Bull Whale, they found accidentally in him, about twenty Pound Weight, more or less, of that Drug. After which, they, and other such Fishermen, became very curious in searching

Of the degenerating of Smelts, in New-England, by the Hon. Paul Dudley Esq; F. R. S. No. 374. p. 232.

Ambergris found in Whales, communicated by Dr Boylston of Boston in New-England, No. 385. p. 193.

searching all such Whales they killed; and it has been since found in lesser Quantities, in several Male Whales of that Kind, and in no other, and that scarcely in one of an Hundred of them. They add further, that it is contained in a Cyst, or Bag, without any inlet or outlet to it, and that they have sometimes found the Bag empty, and yet entire.

The Bag is no where to be found, but near the Genital Parts of the Fish. The *Ambergris* is, when first taken out, moist, and of an exceeding strong and offensive Smell.

2. The following Account respects only such Whales, as are found on the Coast of *New-England*. And of these there are divers Sorts.

An Essay upon the Natural History of Whales, with a particular Account of the Ambergris found in the Sperma Ceti Whale, by the Hon. Paul Dudley, Esq; F. R. S. N^o. 587. p. 256.

The Whale-bone Whale.

The Right, or Whalebone, Whale is a large Fish, measuring sixty or seventy Feet in Length, and very bulky, having no Scales, but a soft fine smooth Skin, no Fins, but only one on each Side, from five to eight Feet long, which they are not observed to use, but only in turning themselves, unless while young, and carried by the Dam on the Flukes of their Tails; when with those Fins they clasp about her Small, and so hold themselves on. This Fish, when first brought forth, is about twenty Feet long, and of little Worth, but then the Dam is very fat. At a Year old, when they are called Short-heads, they are very fat, and yield to fifty Barrels of Oil, but by that Time the Dam is very poor, and termed a Dry-skin, and will not yield more than thirty Barrels of Oil, tho' of large Bulk. At two Years old, they are called Stunts, being stunted after weaning, and will then yield generally from twenty four to twentyeight Barrels. After this, they are termed Scull-fish, their Age not being known, but only guessed at by the Length of the Bone in their Mouths. The Whale-bone, so called, grows in the upper Jaw on each Side, and is sometimes six or seven Feet in Length. A good large Whale has yielded a thousand Weight of Bone. 'Tis thought by some, that the hairy Part of the Whale-bone, and which is next to the Tongue, serves in the Nature of a Strainer of their Food.

The Eye of a Whale is about the Bigness of an Ox's Eye, and situated in the After-part of the Head on each Side, and where the Whale is broadest; for his Head tapers away forward from his Eyes, and his Body tapers away backward; his Eyes are more than half way his Depth, or nearest his Under-part; just under his Eyes are his two Fins before-mentioned; he carries his Tail horizontally, and with that he sculls himself along.

The Entrails of this Whale are made and situated much like those of an Ox, and their Scalps are sometimes found covered with Thousands of Sea-lice. One of these Whales has yielded One hundred and thirty Barrels of Oil, and near twenty out of the Tongue. The Whale-bone Whale is the most valuable, except the *Sperma Ceti* Whale.

The

Fig. 10.

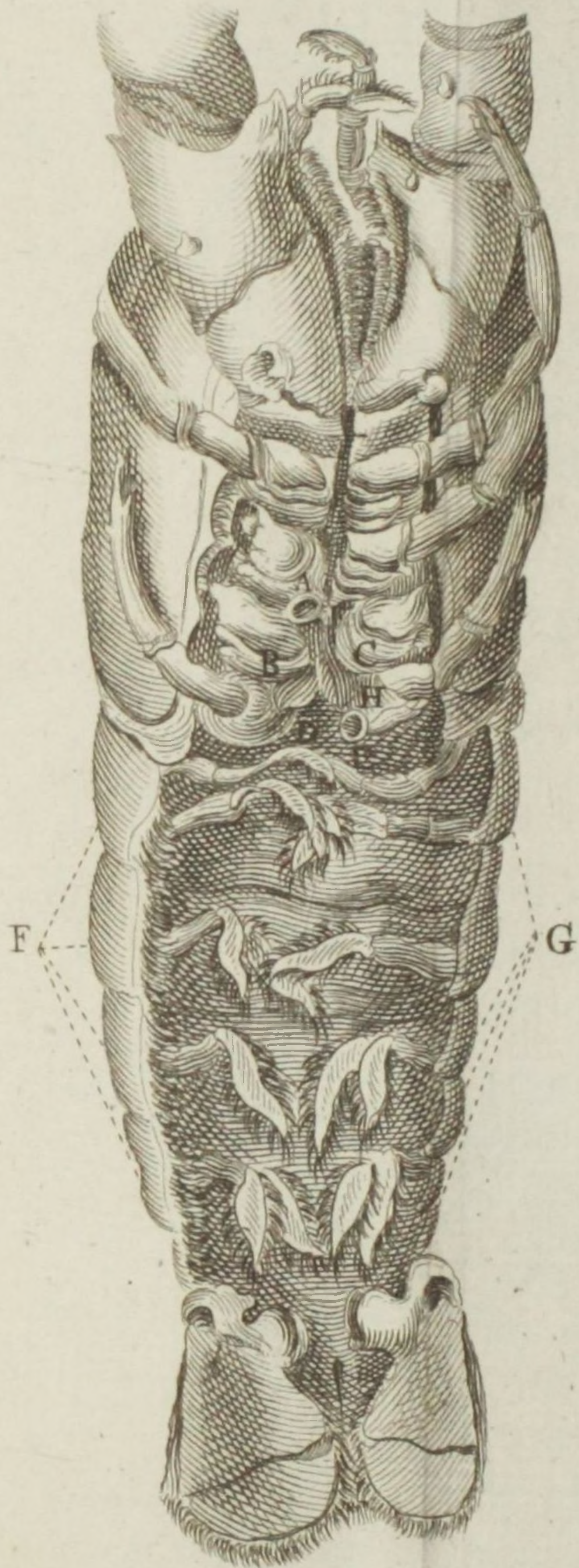
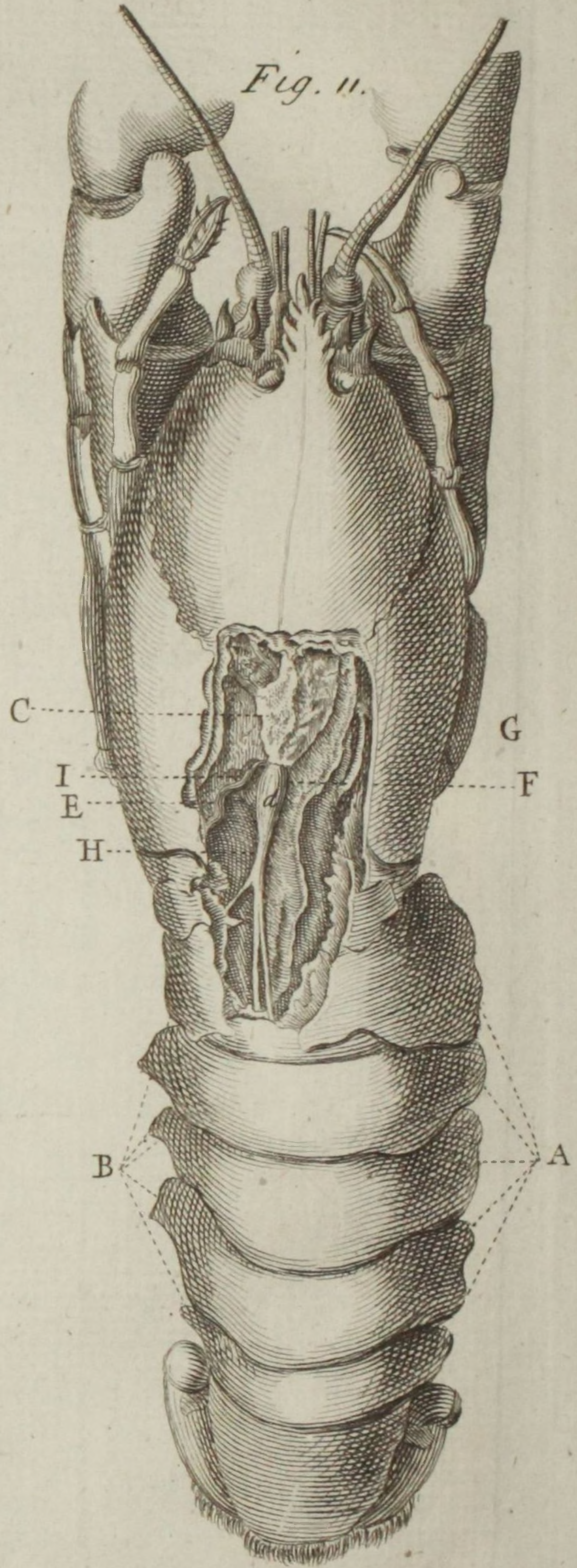


Fig. 11.



The Scrag Whale is near a kin to the Fin-back, but, instead of a Fin upon his Back, the Ridge of the After-part of his Back is scragged with half a Dozen Knobs; he is nearest the right Whale in Figure and for Quantity of Oil; his Bone is white, but will not split.

The Scrag Whale.

The Finback Whale is distinguished from the right Whale, by having a great Fin on his Back from two Feet and a Half, to four Feet long, which gives him the Name; he has also two side Fins, as the Whale-bone Whale, but much longer, measuring six or seven Feet. This Fish is somewhat longer than the other, but not so bulky, much swifter, and very furious when struck, and very difficultly held; their Oil is not near so much, as that of the right Whale, and the Bone of little Profit, being short and knobby. The Belly of this Whale is white.

The Finback Whale.

The Bunch or humpback Whale, is distinguished from the right Whale, by having a Bunch standing in the Place where the Fin does in the Finback. This Bunch is as big as a Man's Head, and a Foot high, shaped like a Plug pointing backwards. The Bone of this Whale is not worth much, tho' somewhat better than the Finback's. His Fins are sometimes eighteen Feet long, and very white; his Oil much as that of the Finback. Both the Finbacks and Humpbacks are shaped in Reeves longitudinal from Head to Tail on their Bellies and their Sides, as far as their Fins, which are about half way up their Sides.

The Bunch or humpback Whale.

The *Sperma Ceti* Whale. This Fish is much of the same Dimension with the other, but of a greyish Colour, whereas the others are black; he has a Bunch on his Back like the Humpback, but then he is distinguished by not having any Whale-bone in the Mouth; instead of which, there are Rows of fine ivory Teeth in each Jaw, about five or six Inches long. One of these Teeth I have sent the Society. The Man, who gave it me, says, the Whale was forty nine Feet long, and his Head made twelve Barrels of *Sperma Ceti* Oil. They are a more gentle Fish than the other Whales, and seldom fight with their Tails; but when struck, usually turn upon their Backs, and fight with their Mouths. The Oil, which is made of the Body of this Fish is much clearer and sweeter than that of the other Whales.

The Sperma Ceti Whale.

The *Sperma Ceti* Oil, so called, lies in a great Trunk about four or five Feet deep, and ten or twelve Feet long, near the whole Depth, Breadth, and Length of the Head, in the Place of the Brains, and seems to be the same, and disposed in several membranous Cells, and covered not with a Bone, but a thick grizzly Substance below the Skin, through which they dig a Hole, and lade out the clear Oil. Not but that the Head, and other Glandulous Parts of this Fish, will make the *Sperma Ceti* Oil; but the best, and that which is prepared by Nature, is in the Trunk aforesaid: And an ingenious Man, who has

The Sperma Ceti Oil.

has himself killed many of these Whales, assures me, that only the Trunk will afford from ten to twenty Barrels. Besides the *Sperma Ceti* Oil, this Fish will yield from twenty to fifty Barrels of common Oil.

The Propagation of Whales.

They generate much like our neat Cattle, and therefore they are termed Bull, Cow, and Calf. They bring forth but one at a Time, and but every other Year. When the Cow takes Bull, she throws herself upon her Back, sinking her Tail, and so the Bull slides up, and, when he is slid up, she clasps him with her Fins. A Whale's Pissel is six Feet long, and at the Root is seven or eight Inches Diameter, and tapers away till it comes to about an Inch Diameter: his Stones would fill half a Barrel, but his Genitals are not open or visible, like those of the true Bull. The Calf, or young, Whale, has been found perfectly formed in the Cow, when not above seventeen Inches long, and white; yet, when brought forth, is usually twenty Feet, but of a black Colour; it is supposed they go with their Young about nine or ten Months, and are very fat in that Time, especially when they bring forth. When the Female suckles her Young, she turns herself almost upon her Back, upon the Rim of the Water, she has two Teats of six or eight Inches long, and ten or twelve Inches round. The Milk is white, like that of a Cow; and upon opening a young sucking Whale, the Milk was found curdled in his Bag, just like that of a Calf.

Their Care of their Young.

Their Care of their Young is very remarkable, they not only carrying them on their Tails, and suckling them, but often rising with them for the Benefit of the Air; and however they are chased or wounded, yet as long as they have Sense, and perceive Life in their Young, they will never leave them, nor will they then strike with their Tail, and if, in their running, the young one loses his Hold and drops off, the Dam comes about, and passing underneath, takes it on again. And therefore Care is taken by those who kill these Mate Fish (as they are called) only to fasten the Calf, but not to kill her, till they have first secured the Cow. For so soon as ever the Calf is dead, the Cow perceives it, and grows so violent, that there is no managing her.

Whales very gregarious.

The Whales are very gregarious, being sometimes found a Hundred in a Scull, and are great Travellers. In the Fall of the Year, the Whale-bone Whales go Westward, and in the Spring they are headed Eastward. But here it must be noted, that the several Kinds of Whales do not mix with one another, but keep by themselves.

Respiration.

Their Way of Breathing is by two Spout-Holes in the Top of the Head. The *Sperma Ceti* has but one, and that on the left Side of the Head. Once in a Quarter of an Hour, when not disturbed, they are observed to rise and blow, spouting out Water and Wind, and to draw in fresh Air: but, when pursued, they will sometimes keep
under

under Water half an Hour or more; though it is observed when any Cow has her Calf on her Tail, she rises much oftner for the young one to breathe, without breathing herself. Out of their breathing Holes they spout great Quantities of Blood, when they have received their Death Wound.

For the first Year they all suck the Dam. After they are weaned, the right Whales, as is generally supposed, live upon some ouzy Matter, which they suck up from the Bottom of the Sea. The Triers, that open them when dead, acquaint me, that they never observed any Grass, Fish, or any other Sort of Food in the right or Whalebone Whale, but only a greyish soft Clay, which the People call *Bole Armoniac*; and yet an experienced Whale-man tells me, that he has seen this Whale in still Weather, skimming on the Surface of the Water, to take in a Sort of reddish Spawn, or Brett, as some call it, that at some Times will lie upon the Top of the Water, for a Mile together. Here also it may be observed, that though the Body of this Whale is so very bulky, and so exceeding fat; yet when cut open, they are seldom found to have much more Draught than that of an Ox, and they dung much as neat Cattle do. Their Swallow is not much bigger than an Ox's; but the Finback Whale has a larger Swallow: for he lives upon the smaller Fish, as Mackarel, Herring, &c. great Sculls of which they run through, and, with a short Turn, cause an Eddy or Whirlpool, by the Force of which, the small Fish are brought into a Cluster; so that this Fish, with open Mouth, will take in some Hundreds of them at a Time. The *Sperma Ceti* Whale, besides other Fish, feeds much upon a small Fish that has a Bill; our Fishermen call them Squid Fish. The small Peices of these Squid Bills are plainly to be discerned in the Ambergris, and may be picked out of it; they appear glazy,, and like little Pieces of broken Shells.

Their Food.

Mr Harris in his *Bibliotheca Navigantium*, &c. has given a very particular Account of the Method of taking Whales at *Greenland*, and though our way in *New England* differs very much from that, yet I shall wave it, as not so strictly appertaining to Philosophy. Only I would take notice of the Boats our Whale-men use in going from the Shoar after the Whale, They are made of Cedar Clapboards, and so very light, that two Men can conveniently carry them, and yet they are twenty Feet long, and carry six Men, viz. the Harponeer in the Fore-part of the Boat, four Oar-men, and the Steersman. These Boats run very swift, and by reason of their Lightness can be brought on and off, and so kept out of Danger. The Whale is sometimes killed with a single Stroke, and yet at other Times she will hold the Whale-men in Play, near half a Day together, with their Lances, and sometimes will get away after they have been lanced and spouted Blood, with Irons in them, and Drugs fasten'd to them, which are thick Boards about fourteen Inches square. Our People formerly used to kill the Whale near the Shore; but now they go off

The way of killing Whales.

to Sea in Sloops and Whale boats, in the Months of *May, June, and July*, between *Cape-Cod* and *Bermudas*; where they lie by in the Night, and sail to and again in the Day, and seldom miss of them; they bring home the Blubber in their Sloops. The true Season, for taking the right or Whalebone Whale, is from the Beginning of *February*, to the End of *May*; for the *Sperma Ceti* Whale, from the Beginning of *June*, to the End of *August*. And it has been observed by our Fishermen, that when a *Sperma Ceti* Whale is struck, he usually, if not always, throws the Excrements out of the *Anus*.

Their prodigious Strength.

The wonderful, and even prodigious, Strength of this Creature, lies principally in their Tail, that being both their offensive and defensive Weapon. Many Instances of this Kind I have had from credible Persons, who were Eye-witnesses; I will mention but a few. A Boat has been cut down from Top to Bottom with the Tail of a Whale, as if cut with a Saw, the Clap-boards scarce splintered, tho' the Gunnel upon the Top is of tough Wood. Another has had the Stem, or Stern-post of about three Inches through, and of the toughest Wood that can be found, into which the Ends of the Cedar Clapboards are nailed, cut off smooth above the Cuddee, without so much as shattering the Boat, or drawing the Nails of the Clapboards. An Oar has been cut off with a Stroke upwards, and yet not so much as lifted up out of the Thole-pin. One Person had an Oar cut off, while in his Hand, and yet never felt any Jarring.

A few Years since, one of the Fin-back Whales came into a Harbour near *Cape-Cod*, and towed away a Sloop of near forty Tun, out of the Harbour into the Sea. This Accident happened thus: It is thought the Whale was rubbing herself upon the Fluke of the Anchor, or going near the Bottom, got the Fluke into her Nisket, or the Orifice of the *Uterus*, and finding herself caught, tore away with such Violence, that she towed the Ship out of the Harbour, as fast as if she had been under Sail with a good Gale of Wind, to the Astonishment of the People on Shore, for there was nobody on board. When the Whale came into deep Water, she went under, and had like to have carried the Sloop with her, but the Cable gave Way, and so the Boats that were out after her, recovered it. This Whale was found dead some Days after on that Shore, with the Anchor sticking in her Belly.

After a Whale is dead, it has been observed, that the same way the Head lies, so the Head will lie if not forcibly turned, and let the Wind blow which Way it will, that Way they will scull a Head, tho' right in the Eye of the Wind, and they are much easier towed to the Shore, if they die that Way with their Head, than any other.

Their Enemies.

The Enemies of the Whale, or the Fish that prey upon the Whales, and often kill the young ones, for they will not venture upon an old one, unless much wounded. Our Whale-men have given this Fish

Fish the Name of Killers. These Killers are from twenty to thirty Feet long, and have Teeth in both Jaws that lock one within another. They have a Fin, near the middle of their Backs, four or five Foot long. They go in Company by Dozens, and set upon a young Whale, and will bait him like so many Bull-dogs; some will lay hold of his Tail to keep him from threshing, while others lay hold of his Head, and bite and thresh him, till the poor Creature, being thus heated, lolls out his Tongue, and then some of the Killers catch hold of his Lips, and if possible of his Tongue; and after they have killed him, they chiefly feed upon the Tongue and Head, but when he begins to putrify, they leave him. This Killer is without doubt the *Orca*, that *Dr Frangius* describes in his Treatise of Animals. His Words are these, *Quando Orca insequitur Balænam, ipsa Balæna horribilem edit Muggitum, non aliter quam cum Taurus mordetur a Cane.* These Killers are of such invincible Strength, that when several Boats together have been towing a dead Whale, one of them has come and fastened his Teeth in her, and carried her away down to the Bottom in an Instant. And sometimes they have bit out a Piece of Blubber of about two Foot square, which is of that Toughness, that an Iron, with little Beards being stuck into it, will hold it till it draws the Boat under Water. The Killers are sometime taken, and make good Oil, but have no Whale-bone. The Carcases of Whales in the Sea, serve for Food for Gulls, and other Sea-Fowl, as well as Sharks, for they are not very nice.

Many and various have been the Opinions even of the learned *Ambergris*. World, as to the Origin and Nature of *Ambergris*; some have reckoned it a *Bitumen*, and to issue from the Entrails of the Earth; others that it was produced from some Insect, as Honey, Silk, &c. The famous *Mr Boyle*, as I find it, in the Second Volume of *Lowthorp's Abridgment of the Philosophical Transactions*, communicates an Account of *Ambergris*, from a *Dutch Merchant*, who first denies it to be the Scum or Excrement of a Whale, and then gives it, as his Opinion, that it is a fat Gum that issues from the Root of a Tree, and that you may raise it in Quantities by planting those Trees by the Shore, and so the Stream will cast it up to great Advantage. But it is now found out, that this *Occultum Naturæ* is an Animal Production, and bred in the Body of the *Sperma Ceti* Whale, analogous to what is found in some Animals of the Land, as the Musk Hog or *Taiacu*, the Musk Deer, the Bezoar Sheep, and some Amphibious Animals, as the Musquash, &c. who have their valuable Scent in a particular *Cystis* or Bag. I am apt to think, that which first gave Occasion to the Notion of *Ambergris* being the Production of the Whale, was because it was found in considerable Quantities on the Shores of the Summer Islands, and among the *Bahama's*, where the dead Whales are frequently wreck'd and broke up with the Sea, and the *Ambergris* found floating, or on the Shore; but here again, the Ingenious, un-

til very lately, were at a Loss, and divided in Opinion, for though they agreed it to come from the Whale, yet some took it to be the true and proper *Semen*, being found only in the Bull, at the Root of the *Penis*, near the Testicles; others again thought it was the Or-dure or Excrement of the Whale.

The best and most exact Account of Ambergris, that I have been able to procure, I very lately received from one Mr *Atkins*, now an Inhabitant at *Boston* in *New England*, who used the Whale Fishery, for ten or twelve Years together, and was one of the first that went out a fishing for the *Sperma Ceti* Whales, about the Year 1670, and then began to discover the Ambergris; and being a sober ingenious Man, what he says may safely be depended on; tho', for Substance, I have had it from several of the Whale-men.

His Relation, which was taken a few Days since from his own Mouth, is as follows:

“ The Ambergris is found only in the *Sperma Ceti* Whales, and
 “ consists of Balls, or globular Bodies, of various Sizes, from about
 “ three Inches to twelve Inches Diameter, and will weigh from a Pound
 “ and an Half to twenty two Pounds, lying loose in a large oval
 “ Bag, or Bladder, of three or four Foot long, and two or three Foot
 “ deep and wide, almost in the Form of an Ox's Bladder, only the
 “ Ends more acute, or like a Blacksmith's long Bellows, with a
 “ Spout running tapering into and through the Length of the *Penis*,
 “ and a Duct, or Canal, opening into the other End of the Bag, and
 “ coming from towards the Kidnies; this Bag lies just over the
 “ Testicles, which are above a Foot long, and is placed lengthways
 “ at the Root of the *Penis*, about four or five Foot below the Navel,
 “ and three or four Foot above the *Anus*. This Bag or Bladder is
 “ almost full of a deep Orange coloured Liquor, not quite so thick
 “ as Oil, and smelling strong, or rather stronger of the same Scent
 “ with the Balls of Ambergris, which float and swim loose in it; the
 “ Inside of the Bag is very deeply tinged with the same Colour as the
 “ the Liquor, which may also be found in the Canal of the *Penis*;
 “ the Balls seem to be pretty hard while the Whale is alive, inasmuch
 “ as there are many Times found upon opening the Bag, large concave
 “ Shells, of the same Substance and Consistence, that have scaled off
 “ from them, and the Balls themselves seem to be composed of se-
 “ veral distinct Coats inclosing one another, something like the Coats
 “ of an Onion.”

As to the Number of Balls, Mr *Atkins* never found above four in a Bag, and in the Bag where he found one that weighed 21 Pounds, which was the largest he ever saw, there was no other.

He further says, “ That to one *Sperma Ceti* Whale that has any of
 “ these Balls, there are two, that have nothing but the deep Orange-
 “ coloured Liquor aforesaid in their Bags.” This Remark confirms
 what another Whale-man told me, “ That the Ambergris was found
 only

“ only in such *Sperma Ceti* Whales as are old and well grown.” It is the general Opinion of the Whale-men, that the Ambergris is produced only by the Male or the Bull *Sperma Ceti* Whale. As to this Particular, Mr *Atkins* says, “ He never saw, nor certainly heard of, “ a *Sperma Ceti* Female taken in his Life, the Cows of that Species “ of Whales being much more timorous than the Males, and almost “ impossible to be come at, unless when haply found asleep on the “ Water, or detained by their Calves.” This is certain, the Boats can never come near them, when they are awake, they are so very shy and fearful.

Mr *Atkins*'s Method of getting the Ambergris out of the Whale was thus; after the Fish is killed, he turns the Belly upwards, and fixes a Tackle to the *Penis*, then cuts a Hole round the root of the *Penis*, thro' the Rim of the Belly, till he comes to the Entrails, and then searching for the Duct or Canal at the further End of the Bag, he ties it pretty near to the Bag, and cuts the Duct off beyond it, upon which he draws forth the *Penis* by the Tackle, and the Ambergris Bag, entirely follows it, and comes clean and whole out of the Belly.

The Rev. Mr *Prince* of *Boston*, who took the preceding Relation from Mr *Atkins*, apprehends the Bag aforesaid to be the urinary Bladder, and the Ambergris Ball to be a certain Concretion, formed out of the greasy odoriferous Substance of the Liquor aforesaid contained within it. As for my own Part, I dare not pretend to give any Opinion upon the Point, but content myself with relating Matter of Fact.

XII. I cut a piece of Cod into small Slices, some according to the length of the Fibres, and others directly across them, in order to observe, whether these Muscular Fibres were composed of great numbers of small Vessels running according to the length of the Fibre. And in effect I found, that when I had cut the Fibres dextrously thro', there appeared in the Microscope as great a number of small Vessels running along these Fibres, as I had formerly seen in the Muscular Fibres of a Whale.

Of the muscular Fibres of Fish, by Mr Lewenhoeck, F. R. S. No. 368. p. 191.

But what appeared to me the most remarkable, was, that in a great number of Fibres, in which I was not able to discover any Vessels running according to their length, I observed abundance of small Vessels, which seemed to me to proceed from the Membranes encompassing the Fibres. For in one Fibre, these Vessels appeared to come out of the Circumference, or circular Tunicle of the Fibre, and to pass on to the opposite part of the Tunicle. And in another Fibre, cut transversely, I saw Vessels arising from the Circumference, and dividing themselves into smaller Branches about the middle of the Fibre; all which, as far as I could perceive, ended again in the Circumference of the Fibre. In one Fibre I saw at least fifty of these Vessels running through one another.

Upon this Discovery, I found I had been mistaken in what I had at first imagined, which was, that the Vessels, which arose from the Membranes,

Membranes, proceeded no farther, than just through the Tunicle of the Fibre, and so discharged the Fluid into the Fibre for it's Nourishment. Whereas, now I perceived, that the Vessels, which arose from the Membrane, and entered into the Fibre, did not end there, but spread themselves into smaller Branches proceeding every way from the inside to the Tunicle of the Fibre. This caused me to think, that the nutritious Juice might circulate in these small Vessels, just as the Blood does in the Veins and Arteries; and that what the Muscular Fibres received from them, might be no more than what oozed thro' the Tunicles of these small Vessels, as in Land-Animals, which have no other end than the Artery coming from the Heart, and the Vein terminating in the Heart; the Artery and Vein thus making one continued Vessel.

Having now a great number of Fibres lying before me, in which I could see very plainly the Vessels just now treated of, yet I could not discern in the transverse Sections of the Fibres any appearance of those Vessels, which run along their length, and compose the greatest Part of the Body of each Fibre. This I imputed to the cutting of those Vessels not directly across, but something obliquely, by which their Apertures had been closed in such a manner, that I could not perceive them, nor the least Resemblance of them.

I have several times observed, between the Muscular Fibres of the Fish, a great number of Vessels lying together, which composed what is commonly called a Membrane, which Vessels surrounded the Muscular Fibres, and lay so many of them together, that the thickness of the whole *Fasciculus* of Vessels was equal to that of a Muscular Fibre, and, as I imagined, was afterwards to be dispersed in smaller Ramifications between the Fibres.

In taking a View of an entire Muscle of a Cod-fish, and the Fibres of which it was composed, I found the thick end of the Muscle to equal the Back of an ordinary Knife, and the thinner end not to exceed the thickness of a single Fibre. Many of these Fibres are twice as long as the thickness of the Muscle, and between the Muscles lie what are commonly called Membranes, which are nothing else but a *Congeries* of Vessels. These Vessels do not only run between the Fibres, but into the very Substance of every Fibre, as we see, when the Fibres are cut transversely. By these Vessels the Muscular Fibres, and the entire Muscles themselves are so firmly bound together, that they serve instead of Tendons to one another.

In like manner the Muscular Fibres are united to the Bones, by the Vessels proceeding from the Bones, which Vessels compose what in Land-Animals is called the *Periosteum*.

In order to give a clear Notion of what I mean, when I speak of the Muscles of a Cod-fish, I have here caused two of those Muscles to be delineated, lying close together, as they are united to one another and separated from the other Muscles, *A, B, C, D*, the Part designed by

by *A, B, C*, having been covered with the Skin near the Head of the Fish. And it is my Opinion, that the Body of the Cod-fish, from Head to Tail, consists of a continued *Series* of such Muscles.

I have likewise caused a single Muscle of the Fish to be represented by *E, F, G, H*, where *E, H, G*, shews the Thickness of the Muscle; and it's thin Edge, which is no thicker than the Edge of a Knife, is marked by *E, F, G*. Fig. 13.

When these Muscles had lain several days upon a Paper, yet they were not dried so hard, but that I could split them into thin Shivers, one of which is designed between the Letters *I* and *K*, in order to shew the oblique Course of the Fibres, which are represented by small Lines. Fig. 14.

I now turned my Thoughts to the River-fish, and particularly to the Pearch; and, as I imagined that an old Pearch had no greater number of Muscular Fibres than a young one, but only that the Fibres encreased in bigness during the Growth of the Fish, and that the larger these Fibres were, the more plain and distinct must be the small Vessels, of which the Fibres were composed; I procured one weighing three Pounds and an half, and seventeen Inches and an half in length *Delft* Measure, which is the same with the *Rhinland*.

I cut off four pieces from this Fish, two from the Back near the Head, and two others from the Belly in the thick part of the Fish, with design to make my Observations upon them the next Day.

Accordingly, at that time, I took a view of the Muscular Fibres both in length and breadth, and found that the Fibres of this great Pearch were not so thick as those of the Cod-fish. Upon cutting them through lengthwise, I saw the Apertures of the small Vessels in so great a number, as I could hardly have believed, if I had not seen them. I next cut some of the Fibres transversly, and plainly found them thinner in this Pearch, than in a middling Cod-fish, and saw the small Vessels, that compose the greatest part of the Bulk of the Fibre, lying as close together, as ever I saw them in any kind of Fish or Flesh.

To give a better Notion of these Muscular Fibres, and of the great number of small Vessels, of which they are chiefly composed; I had, some Weeks before, placed some of them cut transversly in pieces before a Microscope, with design to have them drawn by my Painter, but had been obliged to defer it, by reason of the great Severity of the Weather. These had been a little moistened before they were placed upon the Glass, in order to make them stick to it the better; and I have caused a small portion of these Muscular Fibres of the Fish, cut through transversly, after they were grown dry, and in their shrinking had been torn off from the small Vessels, that encompassed them, to be represented, as at *L, M, N, O*. The openings of the small Vessels in these Fibres were distinctly to be seen, but appeared in such Fig. 15.
great

great Numbers, and were so exceedingly small, that it was impossible for the Painter to represent them any otherwise than by Points.

In this Figure are represented what we call the Membranes, but which indeed are nothing else but a *Congeries* of small Vessels, which not only surround the Fibres, but enter into their very Substance. These, in the drying and shrinking of the Object upon the Plate, had been torn off from the Fibres, as may be seen at *P, P, P.*

Fig. 16.

When this was done, I put a small drop of Water, about the size of a Pin's head, on this small Portion of Fibres, into which it immediately insinuated and swelled them to the same bigness, as when they were first laid upon the Plate: After which, I desired the Painter to draw them, as they then appeared to him, but to omit representing the small Vessels, and only to define the Circumference of every Fibre, which he did, as appears at *Q, R, S, T.*

Fig. 17.

I then clove a grain of Millet through the middle, and placing one half of it upon the Glass, beside the Portion of Fibres represented in Fig. 15. I desired the Painter to observe the difference in bigness between the half grain of Millet-feed, and that portion of Fibres; who told me, that the half grain appeared larger than the portion of Fibres, and so said likewise a second Person that viewed them. By which one may easily imagine, in how small a space that number of Fibres is comprehended, each of which consists of so many Vessels. I caused the Painter to represent the half grain of Millet at Fig. 17.

I likewise made my Observations upon the Muscular Fibres of a Pike, a Roach, a Schar, and Flounder, in each of which I found the Fibres to be composed of small Vessels, like those of a Cod and Pearch.

I took the largest dried Sprat I could light on, which was a little more than five Inches in length, and I found that the Fibres of the Sprat were but little thinner than those of the large Pearch spoken of before, and that the Vessels of which the Fibres were composed, were nearly as numerous as in the Fibres of the Pearch.

Fig. 18.

From these Observations some Persons may be apt to conclude, that the Muscular Fibres of Land Animals are of the same thickness with those of Fish. But for the satisfaction of those, who have not seen the Objects here spoken of, I have caused a small portion of the Muscular Fibres of a large Ox to be delineated, as they appeared through the same Microscope with the former, to shew the thickness of the dried Fibres, and the Vessels that compose them, *X, Y, Z.*

I desired the Painter to tell me, how many Vessels he could see in the transverse Section of one of these Fibres; who, after some pause, replied, That he counted five and twenty Vessels in one Fibre.

Some time after this, I had a small Smelt brought me, of the length of about two Joints of my Finger; and cutting some of it's Muscular Fibres transversly, I placed them before a Microscope, and saw not only that these Fibres were twice as thick as those of an Ox, but

Fig. 12.



Fig. 13.



Fig. 14.



Fig. 15.

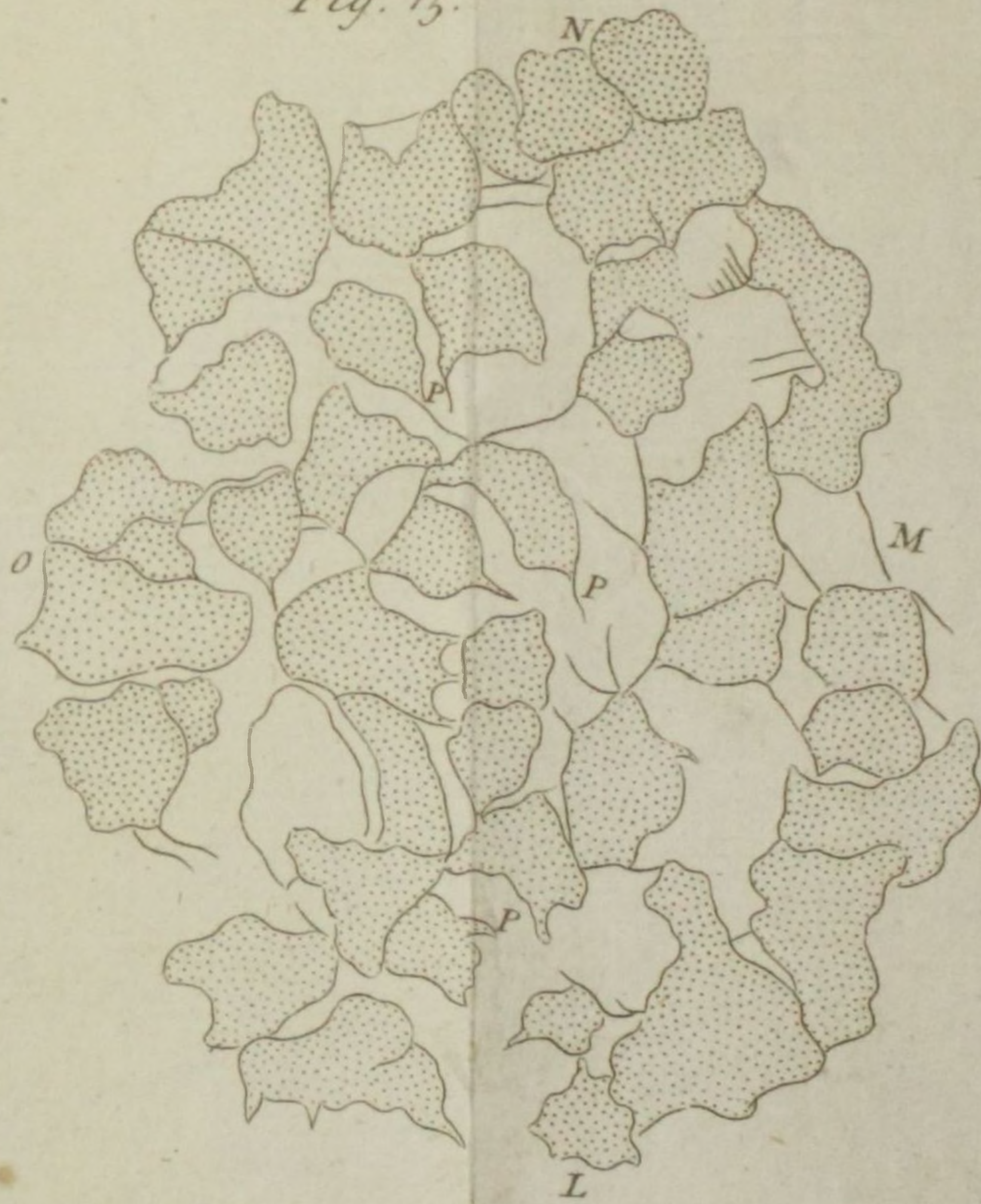


Fig. 16.

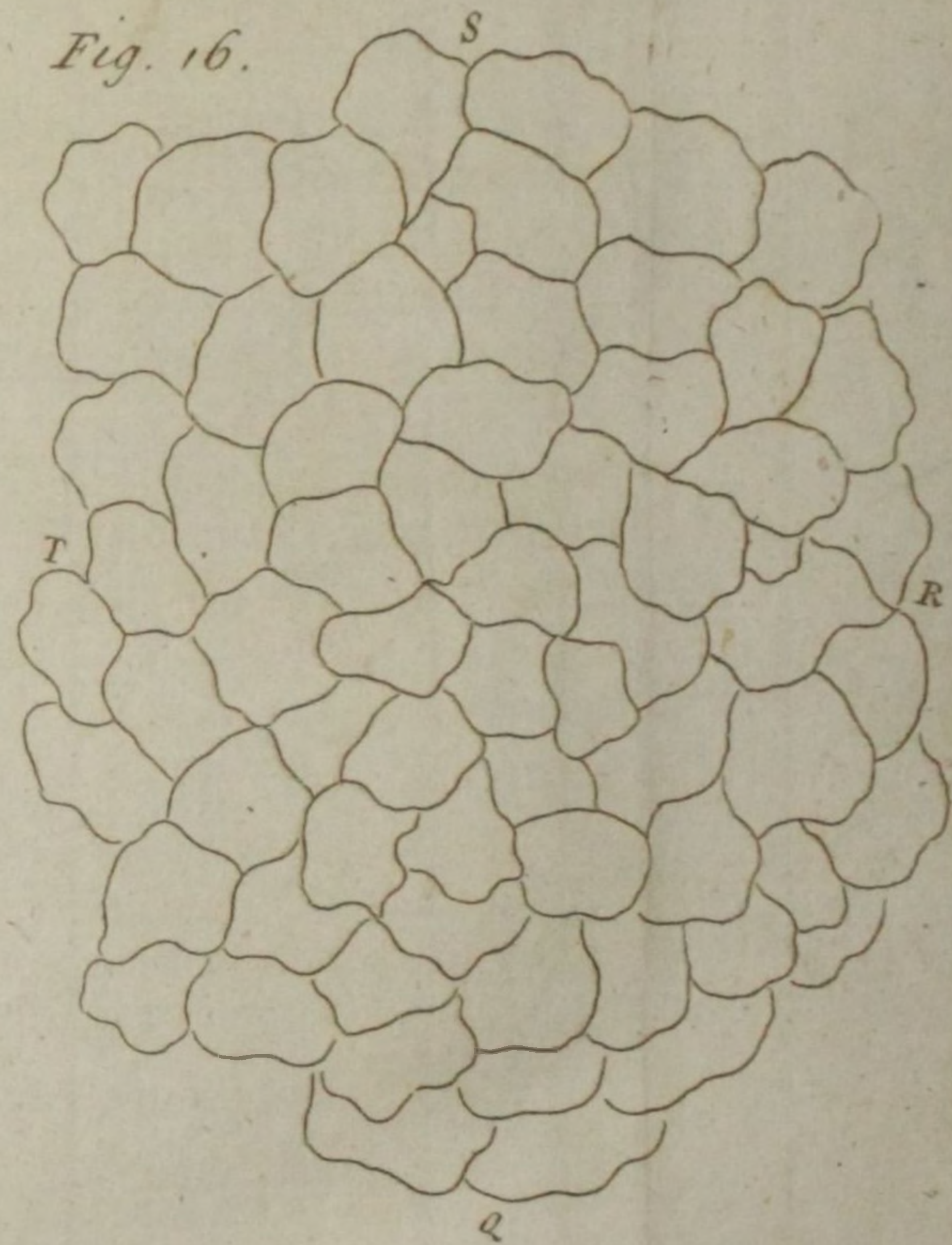


Fig. 17.

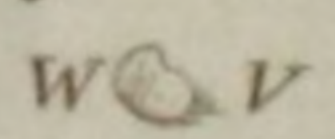
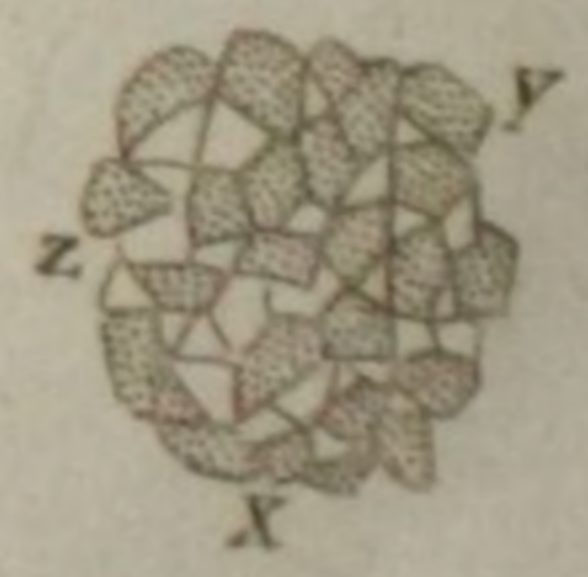


Fig. 18.



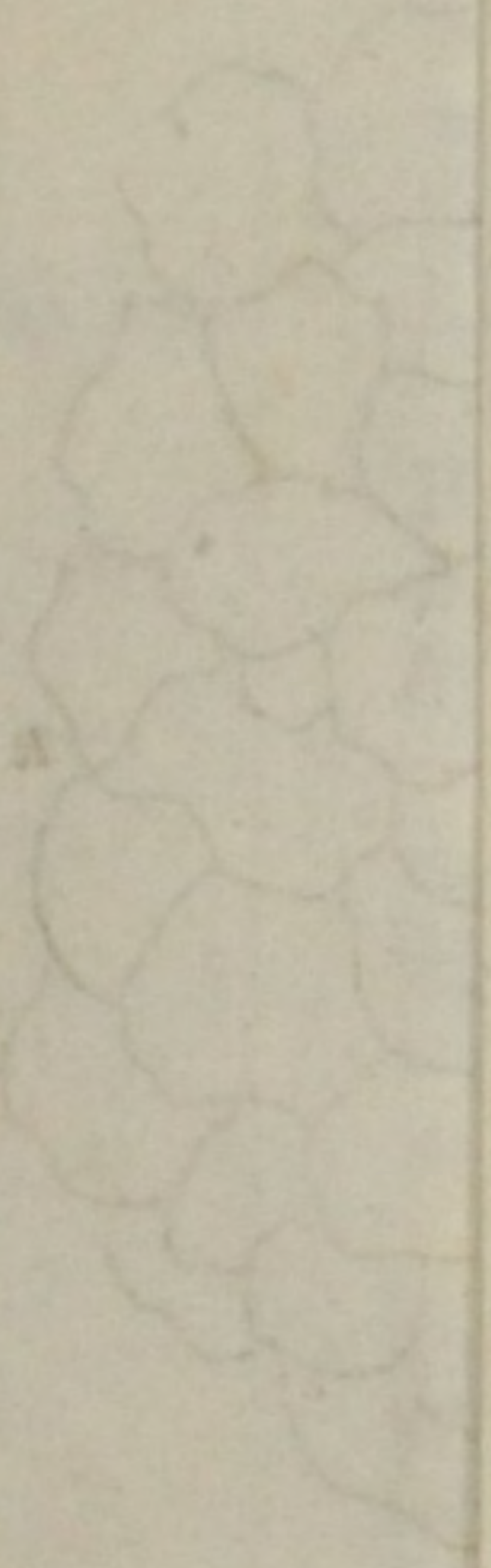


Fig. 12.



Fig. 13.



Fig. 14.



Fig. 15.

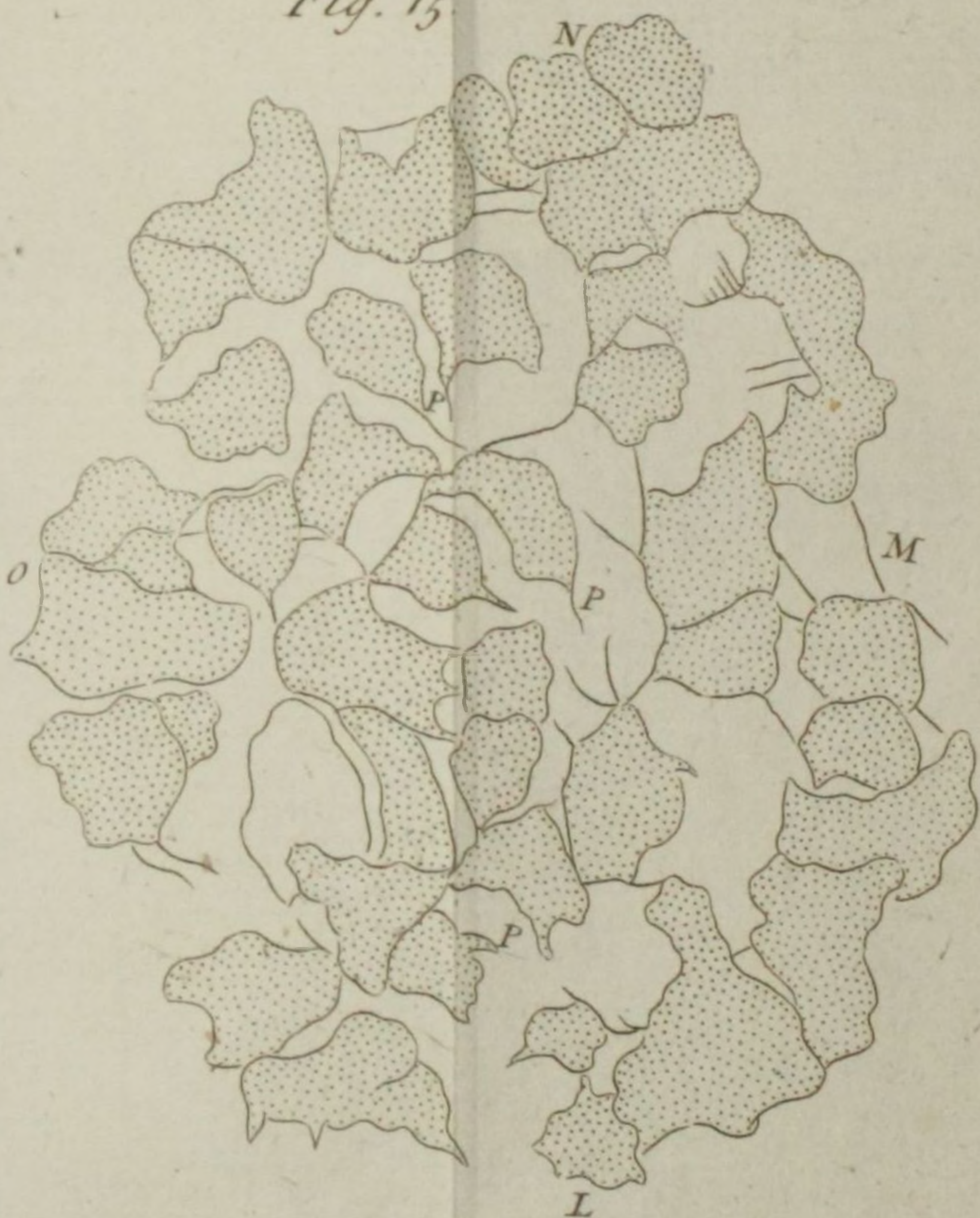


Fig. 16.

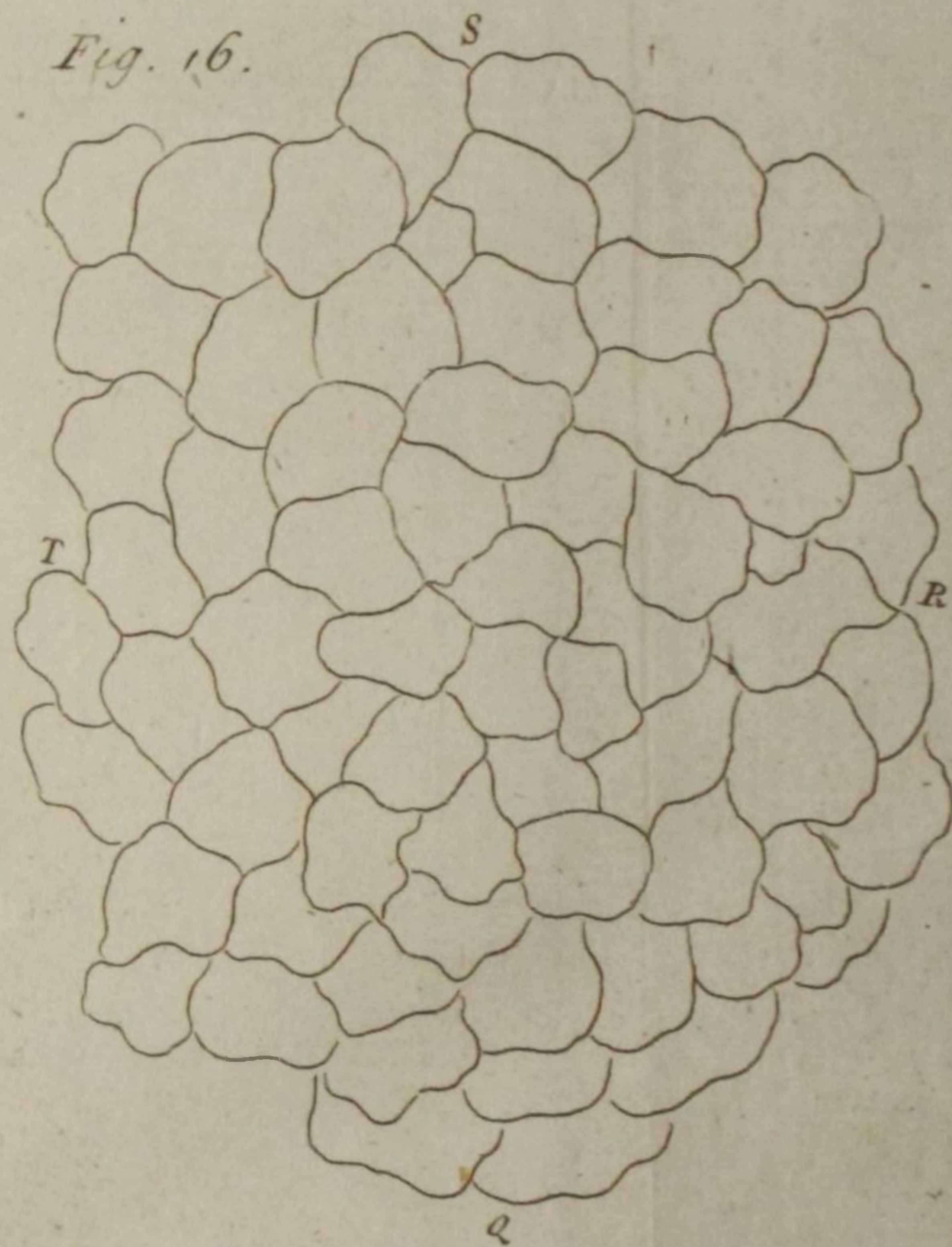


Fig. 17.

W, V

Fig. 18.



but likewise that they were provided with as great a number of Vessels as the Fibres of other Fish.

Upon thus observing that the Muscular Fibres of Fishes were much larger than those of Beasts, I set my self to consider, for what Reasons the great Creator of the Universe had made this Disproportion between them. All the Satisfaction I could meet with, in my Thoughts upon this Subject, was, that as the Fish swim in the Water, their muscular Fibres need exert very little force, to support their Bodies in the Water, because they are very nearly of the same specific Gravity with the Element, in which they swim. All the force they exert is in their progressive Motion, in pursuit of their Food. Whereas, the Muscular Fibres of Land-Animals exercise a great force, not only in supporting and moving their own Bodies, but in carrying Burthens and other Labour they are put to. And we must allow, that the smaller and finer the Fibres are, to make a Body of any determinate thickness, the stronger will be the Composition, and therefore the Muscles in the Flesh must be stronger than those of Fish. But this I leave to better Judgments.

XIII. 1. Having separated the Muscles of the *Abdomen*, which in this Subject were only two oblique Pair, we observed, between their *Tendons*, which were very strong, and the *Peritonæum*, which was exceeding thin, a thick Layer of sevous Fat, whose Office, considering the Smallness of the *Epiploon*, and the few adipose Vesicles of the *Mesentery*, with the Thinness of the *Peritonæum*, might probably be to supply the Part both of *Epiploon* and *Mesentery* in other Animals, as to lubricate the Intestines.

An Ostrich dissected by Mr John Ranby Surgeon, F.R.S. No. 386. p. 223.

There were, in our Subject, two distinct Ventricles, contrary to the Observation of the *Royal Academy at Paris*. The first, and in it's natural Situation, the lower, which the Members of the said Academy, call the *Craw*, and suppose to be only a Dilatation of the *Oesophagus*, was considerably larger than the second, and uppermost Muscular One; besides, that it had strong Muscular Fibres, both circular and longitudinal: The *Duodenum* comes immediately out of the second Ventricle.

Both Ventricles were distended beyond their usual Form, and filled up with so large a Quantity of Food of different kinds, as Stones, Bones, Sticks, Grain, and other Food, that it was almost impossible for them to perform their Office of Digestion, which very likely was one of the chief Causes of the Animal's Sickness and Death; and, really, the Contents of both seemed to have undergone but very little or no Alteration. The *Epiploon* partly covered the first Ventricle, but was no Ways proportionable to the size of the Animal.

The Spleen was fastened, by a Membrane, to the right Side of the second Ventricle, and was very small, considering the Size of the Animal.

The Glands of the *Mesentery* were hardly visible, but the Veins and Arteries very conspicuous.

The *Cæcums*, in our Subject, were near three Foot in Length, the Diameter one Inch eight Lines; they were fastened to the *Ileum*, and not to the *Colon*, as the Gentlemen of the *Royal Academy* assert.

To their Description of the Kidnies, I have nothing to add, except that the two *Ureters* lay upon their Surface, as they do in other Birds, and by their different Branches, coming from all the Parts of the Kidney, of which the superior was very conspicuous, entered the Kidney about it's Middle, and formed there a very large *Pelvis*.

The Liver was in one Cavity with the Heart, of which it covered near one half; it had no Gall Bladder, and but one *Ductus Biliaris* inserted into the *Duodenum*, about two Inches below the *Pylorus*, which seemed to have an immediate Communication with the *Vena Portæ*, because by blowing into it, this latter was also distended. The Heart and Liver were separated from the Intestines, by a membranous *Diaphragm*.

Both Heart and Liver were suspended by one common *Mediastinum*, by the Help of it's several Membranes, and eight strong Muscles on each Side, arising from the upper Part of the Ribs, going from thence over the Lungs, and ending in a very strong tendinous Membrane, which is inserted into the *Spina Dorfi*.

The Liquor contained in the *Pericardium*, was small in Quantity, and perfectly transparent.

The Lungs lay under the *Diaphragm* and it's Muscles, in a deep Cavity, formed by the five true Ribs. They were pretty thick about the middle, and exceeding thin and sharp towards the Extremities

In viewing the Eye external, it somewhat resembled the Human Eye, except that it was less convex, with a free and moveable upper Eye-lid, with Eye-lashes, as most Terrestrial Animals have, besides a *Tunica Nictitans*, as in other Birds. Besides the seven Muscles of the Eye, as they are in Brutes, it had two more, one arising from the fore-part of the *Sclerotica*, which soon formed a small *Tendon*, obliquely surrounding the Optic Nerve, and then joined to another Muscle, which arises opposite to the former, from which the *Tendon* continues it's Way, and is inserted in the *Tunica Nictitans*. The *Aqueous Humour* we found in greater Quantity, than is common. The *Crystalline* was of an uniform Substance, but less convex on the inside, than without. The *Vitreous* was small in Quantity, considering the Largeness of the Eye; the *Choroides* was intirely black, without that Variety of Colours at it's Bottom, which is common to most Brutes. The fore-part of the *Sclerotica*, where it is annexed to the *Cornea*, was bony, consisting of 15 bony Scales joined one to another, so as to make one circular Bone round the *Cornea*.

Fig. 19. shews the upper Part of the *Thorax*, the *Sternum* being removed, with the Heart and Liver and neighbouring Parts, in their natural Situation. A A the membranous *Diaphragm*, in which are observed

served several distinct Cavities. *aaa*. The Ligament that suspends the *Diaphragm*. *bb*. The Ribs. *B*. The Heart. *CC*. The two Lobes of the Liver immediately above the Heart. *cc*. The Brachial Artery. *d*. The Vein. *ee*. *Vena Cava*. *f*. A Gland, on the Brachial Artery. *gg*. Part of the *Aspera Arteria*. *bb*. Part of the *Oesophagus*. *ii*. Two Muscles arising from the *Sternum*, and inserted into the *Aspera Arteria*.

Fig. 20. The inferior Part of the *Thorax*, the Heart and Liver being removed. *AAA*. The lower Part of the *Diaphragm*, immediately covering the Lungs. *BB, &c.* Eight strong fleshy Muscles arising from the Ribs, and inserted into the *Diaphragm*, forming a Cavity for the Heart and Liver. *cc &c.* the Ribs *D*. the descending Trunk of the *Aorta*. *EE*. The left Lobe of the Lungs freed from the *Diaphragm*. *F*. Part of the *Aspera Arteria*.

Fig. 21. Part of the Globe of the Eye. *a*. The *Cornea*. *bb*. The Ciliary Ligament. *ccc*. The fore-part of the *Sclerotica*, composed of 15 bony Scales.

Fig. 22. The back Part of the Globe. *aaa*. The back Part of the *Sclerotica*. *bbb, &c.* The seven Muscles. *ccc*. The eighth and ninth; the *Tendon* of which (*dd*) goes round the Optic Nerve, *f*, and is inserted into the *Tunica Nictitans*. *ee*. *Membrana Nictitans*.

Fig. 23. The Kidnies with their Vessels. *AA*. The Kidnies. *BB*. *Aorta descendens*. *CC*. *Vena Cava*. *DD*. The Emulgent Arteries. *EE*. The Emulgent Vein with it's Ramifications. *FF*. The Ureters. *G*. The Union of the superior and inferior Ureter.

2. To the preceding Account I beg Leave to add two or three Observations which escaped my Notice in my former Dissection. And First, the Eye, the Figure of which, when taken out of the Orbit, I think particular, being almost triangular, with some little Variation in the bony Scales. The Contents of the Stomach were of such a Kind, that they were hardly capable (without very great Alteration) of passing the lower Orifice, which is very small.

Material Observations upon dissecting an Ostrich, by the same. No. 413. p. 275.

The Diameter of the *Duodenum* much smaller than any of the Intestines, and free from *Valves*, as are the *Jejunum* and *Ileum*, except the latter, which has a few *Valves*, as it approaches near the *Colon*. The *Colon* was uneven, with very regular Cells: These Cells were formed by *Valves*, which were on the Inside, and transversly situated each making more than half a Circle.

The Parts in other Respects answer the Description given by the several curious Gentlemen that have dissected this Animal.

3. Dr *Brown* has so well described the Parts of the *Ostrich* which he dissected [*Philos. Collect. No. 5.*] that I think, there is not much to be added. But he affirms it has no *Epiglottis*; whereas in this Subject that Cartilage was plainly visible; and indeed, the *Rimula* appeared too open not to require one. The *Os Hyoides* is three Inches long from the Basis; the *Musculi Directores Asperæ Arteriæ* were very plain, large and strong; the Ring composed of three Cartilages at the Divarication

Observations upon the Dissection of a Male Ostrich, by Mr Geo. Warren, Surgeon in Cambridge. No. 394. p. 113.

tion of the *Aspera Arteria* very bold; the two Glands on the Carotid Arteries, of the Size of small Eggs. There was nothing in the Lungs or Heart, but what it has in common with other Birds. The two Stomachs, *viz.* the Crop and the Gizzard, were filled with half-digested Grass, in which were some Nails, some Stones of the bigness of Walnuts, and about fourteen or fifteen Pieces of Silver and Copper Money. The first Stomach or Crop was exceeding tender, and contained, crammed as it was, between three and four Quarts. The Glands on the top of the Crop were very large and numerous, in the Order described by Dr *Brown*, and of the Bigness of little *Oculi Cancrorum*, and of a watery-brown Colour; which being so different from the Colour of the Stomach, that added to the pretty Order they are placed in makes them very remarkable. The Crop lay within the *Thorax*, but so that the Gizzard lay higher. The Looseness and Likeness to Flannel, of the inner Coat of the Gizzard mentioned by Dr *Brown*, was very remarkable in this Bird; but the Texture in the Muscular Part of it did not seem proportionably strong to that in other Birds, being broader, thinner, and more flaccid. The Guts, as near as I could measure them, were about twenty six Yards long. The two *Cæcums*, which are about thirty four Inches long each, and have beautiful spiral Valves, were Appendages of the very beginning of the *Colon*. The Testicles lay as in other Fowls, very high, and less than Pidgeons Eggs, but longer. I found the Liver to have four Lobes, and thought I had met with a Gall-bladder, but it appeared at last to be only the Membrane of the Liver raised by some Accident from it's inner Substance. The Gland under the Stomach, which Dr *Brown* supposes to be the Spleen, and the *Pancreas* and Kidnies answer his Description; and the Ureters were, as he says, firm, strong, white, long, and opening into the *Rectum*. The Eye is said to be exactly like the Human Eye; but is indeed, a perfect Goose-Eye for it's Colour, and, I believe, for the rest of it's Parts, as they are well described by Mr *Ranby*: It was flatter than the Human Eye, as it is, I believe, in all Birds; and it had that simple Look so peculiar to the Goose. The bony Circle described by Mr *Ranby*, this Bird has in common with other Fowls both of the Water and Land, with this difference only, that the Ring in Water Fowls consists of fifteen, and in Land Fowls but of fourteen Bones. They are so disposed, that one Bone lies over the Ends of two others, then three or four lie over one another, like the Scales of Fish; then one Bone lies under the Ends of two others; and then two or three more follow again like the Scales of Fish: but unless there be a *Lusus Naturæ*, I think Mr *Ranby*'s *Icon* does not express it so very justly, as I believe it might be done. There was no *Musculus suspensorius Oculi* in this Animal, nor do I believe it is to be found among Birds, and indeed there seems to be no Reason for it.

The Crop was so stuffed with Grass, or rather Greens (proper Food for a Goose, or one of that Kind) that I do not think the Bird could
have

Fig. 19.

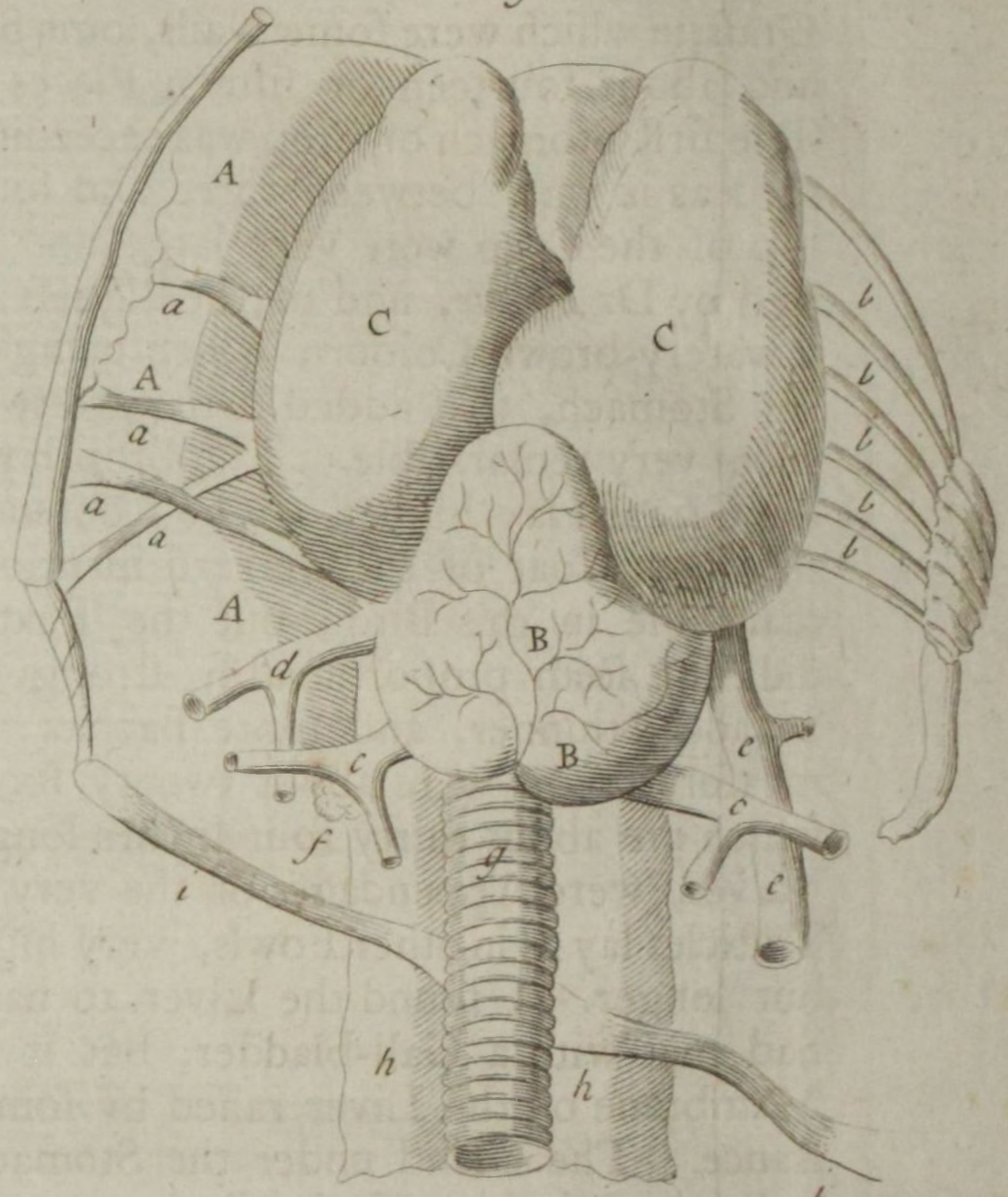


Fig. 21.

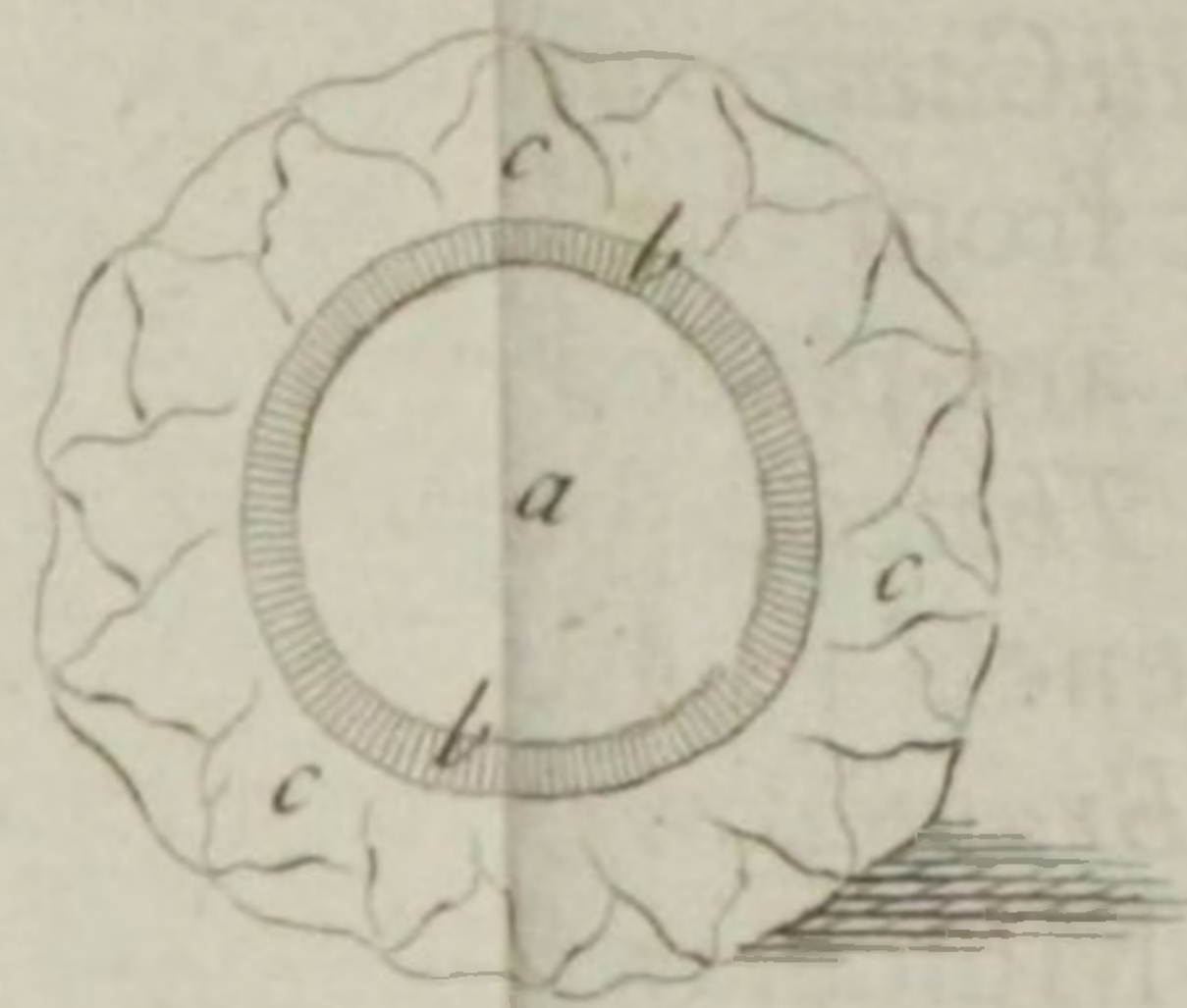


Fig. 20.

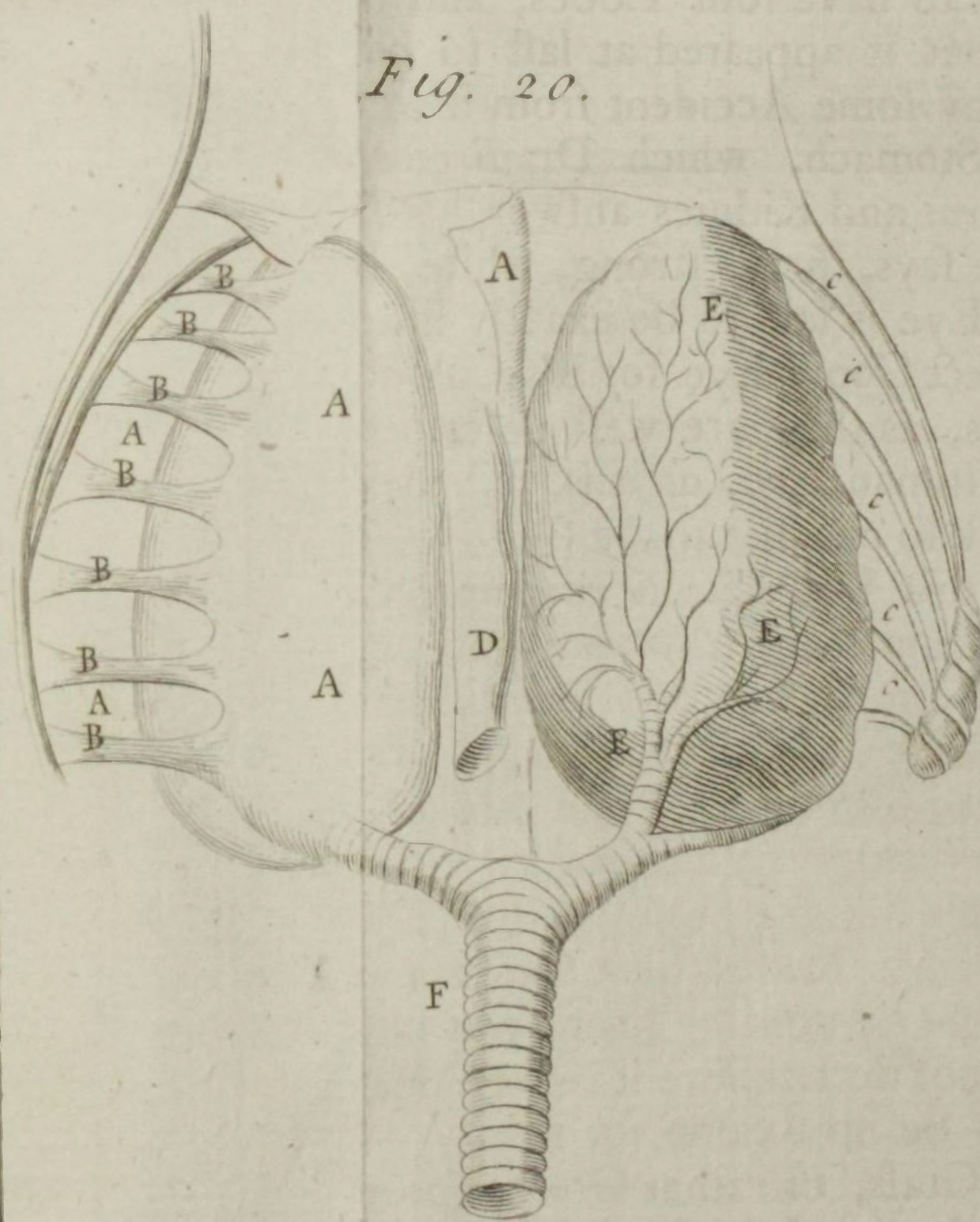
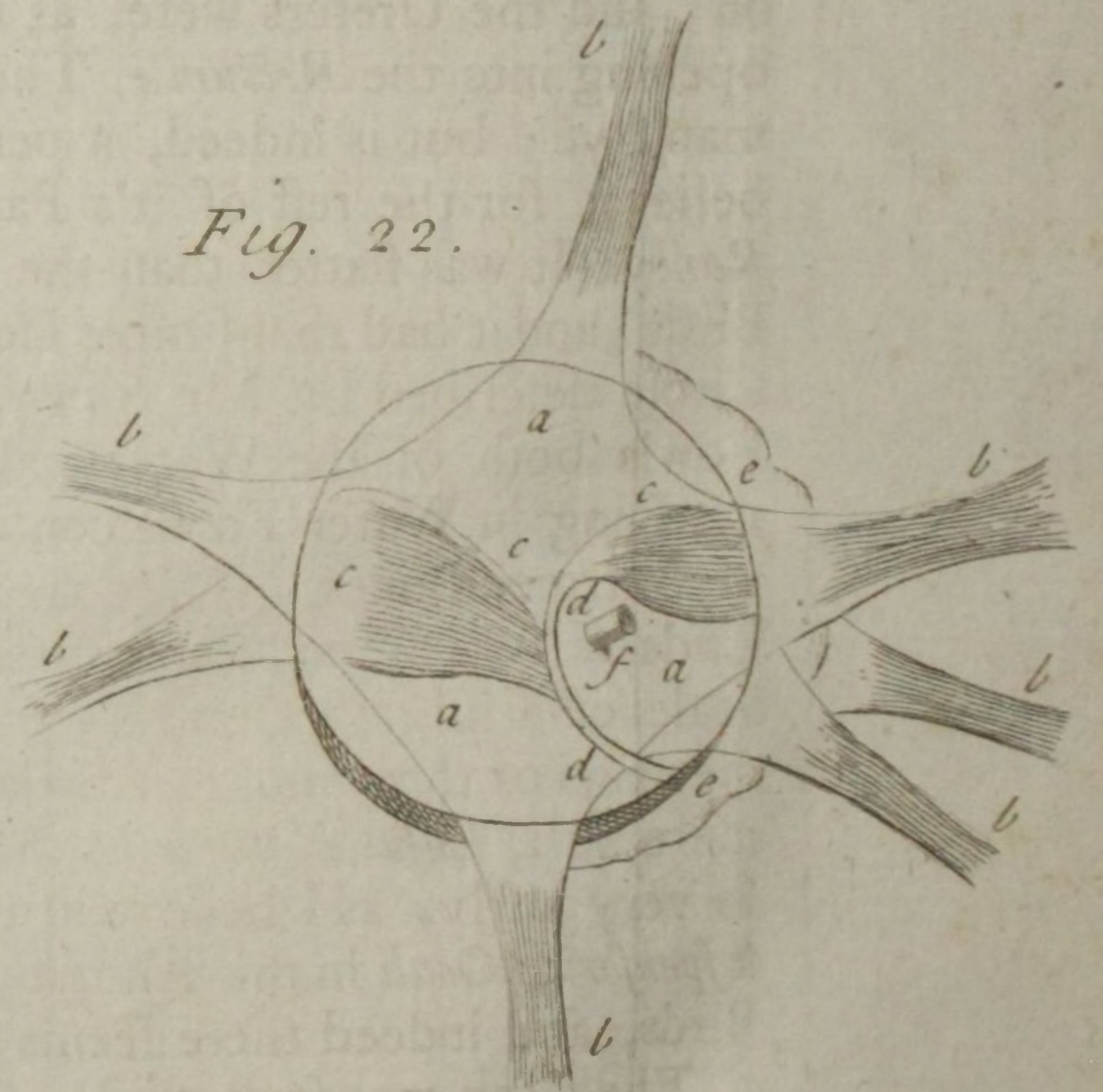


Fig. 22.



The History of the Discovery of a New Kind of Oil

I have been informed that there has been a great discovery
 made in the East Indies, and what was the
 nature of it. The first account I had of it was
 from a Dutch merchant who was lately returned
 from a voyage to that country. He told me
 that he had seen a great quantity of a
 substance which he called the Oil of the
 East Indies. This substance was of a
 yellowish color, and had a strong
 odor. He said that it was used by
 the natives for medicinal purposes, and
 that it was very valuable. He also
 mentioned that it was found in great
 quantities in several parts of the East
 Indies, and that it was exported to
 Europe in great quantities.

I was much interested in this
 discovery, and I determined to make
 a voyage to the East Indies in order
 to see the source of this oil, and to
 learn more of its properties. I
 accordingly set out on my voyage, and
 after a long and tedious journey, I
 arrived at the place where the oil was
 said to be found. I was very
 surprised to find that the oil was
 indeed of a yellowish color, and had
 a strong odor, but that it was not
 as valuable as I had been told. I
 found that the natives used it for
 medicinal purposes, but that it was
 not so highly valued as I had been
 informed. I also found that it was
 found in great quantities in several
 parts of the East Indies, and that it
 was exported to Europe in great
 quantities.

I was very much disappointed in
 this discovery, and I determined to
 make a further search. I accordingly
 set out on another voyage, and after
 a long and tedious journey, I arrived
 at the place where the oil was said to
 be found. I was very surprised to
 find that the oil was indeed of a
 yellowish color, and had a strong
 odor, but that it was not as valuable
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 as I had been informed. I also found
 that it was found in great quantities
 in several parts of the East Indies,
 and that it was exported to Europe
 in great quantities.

have digested it all, if there had been no other Reason for it's Death. The Gizzard was not so stuffed as the Crop, and what was therein, seemed undigested. The Guts contained a thick deep green Juice, even to the *Cloaca*. The Money both of Silver and Copper in the Gizzard was very remarkably worn away; the Edges, in particular, were made round, and the Bust and Reverse scarce perceptible in some Pieces, and quite obliterated in others. The *Ærugo* and *Sulci* in many of the Pieces would make one believe (that besides the Attrition) there may be a *Menstruum* in their Gizzards not unfit to dissolve Metals. Within an Inch of the End of the *Rectum* was the *Cloaca* or Expansion of that great Gut, which was thinner than the other Part of the Gut, in proportion to it's Expansion, and would hold above half a Pint. The End of the *Rectum* (from the *Cloaca*) opened into a Cavity big enough to hold my two Fists; and for want of another Name, I will call it the *Receptaculum Penis*, because therein the *Penis* was always lodged when flaccid. I know, that Part is called by Dr Brown, a kind of *Præpuce*; but upon Dissection, it appeared plain enough to me to be a very strong Muscle composed of circular Fibres, and to be designed for a Sphincter of that Part wherein the *Penis* was to be lodged, and to be a Sphincter of the *Rectum* too; round which I traced the same Muscle above an Inch; and this being but one Muscle, must be the reason that the *Penis* always came out some Inches when it mated, as they told me it did. The *Penis* flaccid as it is, is five Inches and an half long from the Skin of that *Receptaculum*, and, as Dr Harvey says, not unlike a Hart's Tongue. I do not find a Cartilage in it, as Dr Brown suggests; but at it's Origination it is so hard, that, I believe, if the Bird had lived some Years, it possibly might have become cartilaginous. There are two Bodies that are joined to the *Crura Penis*, which I suspected to be the *Vesiculæ seminales*; and the more, because there are two Vessels enter them, which I believe to be the *Vasa Deferentia*; but of this I am not certain: For though I found *Semen* in the *Urethra*, I have not been able to trace a Passage from these supposed *Vesiculæ seminales*, or those Vessels, or any other Part into the *Urethra*. I call it *Urethra*, because there is no other Term fixed that I know of, though the Urine do not pass that way; but as in other Birds, is mixed with the grosser Excrements in the *Cloaca*. The *Urethra* then, is only a *Sulcus*, or Gutter, from one end of the *Penis* to the other; which *Sulcus*, as the *Penis* lies flaccid in the *Receptaculum*, as I venture to call it, lies on one side; but upon Erection, the *Penis* turns towards the Belly, and the *Sulcus* is then at the Top, and lies conveniently enough for Conveyance of the *Semen*. If those two Bodies are not the *Vesiculæ seminales*, they must be Elongations of the *Crura Penis*; but I think, they are of much too loose a Contexture to serve that purpose. Whether the *Vena Cava*, dividing into two Branches to go into the Kidnies, and uniting again when it comes out, is singular to this Bird, or is in common with Geese and other Water-Fowl, I do not yet know; but

An Account of a Stone taken out of a Horse,

so it was in the Ostrich. I will suppose it to be in common, till I have examined further, since I know, that the *Cæcums* of the Ostrich, which are so much taken notice of, are no more than what it has in common with other Fowls; and that a Chicken has two, as large, and as long in proportion as the Ostrich: I had too little time allowed me, and the Ostrich had too much Fat for me to make a more accurate Dissection. The *Omentum* upon the Stomachs and Guts was six Inches thick at the Top, and decreasing gradually, was near two Inches thick in the Vent, and was divided into two Parts in the Middle from the Top to the Bottom. What I found, that I was sure was in common with other Fowls, I have not taken much notice of, unless represented by others differently from what I found, or so as if peculiar to this Bird. I forgot to take notice, that the Basis of the *Os Hyoides* is shaped, as in *Fig. 24*, and the round Part of the Top is lodged in a proper Cavity in the top of the Tongue. Partly under the Basis of the *Os Hyoides*, lies a Cartilage in the Front and very beginning of the *Aspera Arteria*, which is not unlike the *Thyroïdes*; but other Cartilages in that Part it has none, but what forms the *Rimula*. The first 28 Cartilages of the *Aspera Arteria* are not annular, the rest (being about 226) are entirely annular; but as soon as it divaricates to go into the Lungs, they are not so again.

Fig. 24.

An Account of a Stone taken out of a Horse, at Boston in New England, in 1724. By the Hon. Paul Dudley, Esq; F. R. S. No. 398. p. 261.

XIV. The Owner of the Horse never perceived that he ailed any thing, till within a few Days before he died, and then suspected that he might be troubled with the Gravel or Stone, by the great Pain the Horse seemed to be in, when he staled or dunged; for he would groan and sweat prodigiously. Upon which he got a Farrier, who applied something to break the Stone; but in a very short time the Horse died, and the Farrier being somewhat curious, was resolved to open him, and in the great Paunch, found a Stone of $5\frac{1}{2}$ Pounds Weight, almost as round as a Globe; for it measured 17 Inches round one way, and $17\frac{1}{4}$ Inches the other. The Grit was like your *Newcastle* Grindstone; but was worn smooth in the Horse's Stomach, the Colour somewhat like that of a Nutmeg, but more of the ordinary Millstone. I could not persuade the Owner to break it, but by the likeness of it, considering it's Bulk, I am apt to think it might be porous within. How long this Stone was generating, or what produced it, is altogether uncertain. The Owner of it was a common Carter to a Grist-Mill; and some have thought that the Horse might either in his Provender out of the Mill, or by licking of Mill-Stones that sometimes stand up by the side of the Mill, get the first Seed of this Stone into his Stomach. The Weight of the Stone at length made a Fracture in the Paunch, which proved his Death: For before the Breach, and while the Stone rolled in his Stomach, he was very well.

The largest Stone found in any Animal that the *Philosophical Transactions* give an Account of weighed but four Pounds four Ounces.

XV. In

XV. In the Stomach of the Cow I find two Things well worth observing: The first is, that the *Villi* composing the villous Coat (which are in Man so very small as to be scarce visible when examined separately) are in this Animal so very large, as to allow an exact Scrutiny into their Structure. Each Villus is formed by a Duplication of the internal *Lamina* of the vascular Coat; from which it receives three Blood Vessels, as in *Fig. 25.* which represents one of the *Villi* of the Stomach of an Ox magnified. Whether the two Side-vessels are Arteries, and the Middle-vessel a Vein; and whether those small Branches arising from the Side-vessels are secretory Ducts carrying a Fluid from those Arteries into the Cavity of the Stomach, making a kind of *Rivus* perpetually running through the *Ductus Alimentalis*, I must leave others to judge.

Of the Stomachs of Oxen,
by Charles
Price, Esq;
No. 404. p.
532.

Fig. 25.

The other Thing remarkable in the Stomachs of these large Animals is, that their internal Surface is covered by a Production of the Cuticle, which descends from the Lips quite through the alimentary Passage. I am induced to believe, that the Cuticle is continued thro' the Intestines as well in Man, as in large Animals; though it's exceeding Fineness may make it less observable.

I have sent you a Piece of the first Stomach of an Ox, in which the Vessels running in the *Villi* are filled with Wax, and the Cuticle raised in Part; by which the above Particulars are sufficiently proved.

XVI. Many Years since, Mr *Doyly* found a pair of extraordinary large and strangely shaped Horns in a Cellar, or Warehouse, at *Wapping*, where they had suffered much by Worms and otherwise, being eaten pretty deep on their Surfaces, in many Places. They had lain there so long, that when he bought them, no Body could inform him, either of the Country whence they came, or when, or how they had been lodged there. They resembled in several things the Horns of Goats, which made many People think, that they had belonged to an Animal of that kind, in all likelihood as large as the *Mouse-Deer*, in *America* is of it's kind. The Royal Society being informed of this matter, Mr. *Hunt*, their Operator at that time, made a design of them, on which Dr *Hook* read a Lecture at a Meeting of the Society at *Gresham-College*. This Lecture and the Design, are, I think, lost; but I remember, that he suspected them to be the Horns of the *Sukotyro*, as the *Chinese* call it, or *Sucotario*, a very large and odd-shaped Beast, mentioned and figured by *Nieuboff* in his Voyages and Travels to the *East Indies* (a) where he gives the following Description of it: *It is of the Bigness of a large Ox, with a Snout like a Hog, two long rough Ears, and a thick bushy Tail. The Eyes are placed upright in the Head, quite different from other Beasts; on the side of the Head next to the Eyes stand two long Horns, or rather Teeth, not quite so thick, as those of the Elephant. It feeds upon Herbage, and is but seldom taken. Many People thereupon went to see them at Mr Doyly's, who afterwards made me a Present of them.*

An Account of
a Pair of very
extraordinary
large Horns.
By Sir Hans
Sloane. Bart.
No. 397. p.
222.

(a) Page 360. of the English Edition.

They

An Account of a Pair of very extraordinary large Horns.

Fig. 26.

Fig. 27.

They are both almost streight for a considerable length, and then turning crooked, they run on tapering towards a small and pretty sharp end. They are not round, but compressed and flattish, and have large transverse *Sulci*, or Furrows on their Surfaces, waved or undulated on their under parts. They differ some small matter in largeness. Measuring one from the great end, or *Basis*, AB, where it was fixed to the Head, along the outward Circumference, I found the length ACD to be six Feet, six Inches and a half, the length by the Line BD was four Feet $5\frac{1}{2}$ Inches, the Diameter of the *Basis* AB was $6\frac{1}{4}$ Inches, and it's Circumference one Foot five Inches. This weighed 21 Pounds, 10 Ounces, and contained in the hollow part exactly five Quarts of Water. In the other, the length of the outward Circumference ACD was six Feet four Inches, the Line BD four Feet seven Inches, the Diameter of the *Basis* seven Inches, and it's Circumference one Foot six Inches. This weighed 21 Pounds $13\frac{1}{2}$ Ounces, and contained in the hollow part 4 Quarts and a Pint, but would have held more, if it had not been very much broken at the large End.

The Commander of an *East-India* Merchant Ship told me, that he had seen such in the *Indies* on a large *Bufalo's* Head. I am inclined to think, that they must belong to a very large sort of Bulls or Cows, which are Natives of *Æthiopia*, and other of the midland Parts of *Africa*, and are mentioned by many of the Ancients, perhaps not without some fabulous Additions, though, which is strange, very few of the Modern Writers take any notice of them.

Agatharchides, a *Cnidian* who flourished about the CLth *Olympiad*, near 200 Years before Christ, is the first among the Ancients, who mentions and describes this large and voracious Bull; and it will appear by what follows, that most of the subsequent Writers have copied him. His Description of this Animal, in some Remains of his Treatise of the Red Sea, which are extant in *Photius's Bibliotheca*, (b) and were from thence printed in the *Geographiæ veteris Scriptorum Græciorum minores*, published by Dr *Hudson*, is, according to the Translation of *Laurentius Rhodomannus*, as follows, *De Tauro Carnivoro. Omnium, quæ adhuc commemoravi, immanissimum & maximè indomitum est Taurorum genus, quod carnes vorat, magnitudine crassius domesticis & pernitate antecellens, insigniter rufum. Os ei ad aures usque deductum Visus glauco colore magis rutilat quam Leoni. Cornua alias non secus atque aures movet, sed in pugna ut firmo tenore consistant, facit. Ordo pilorum inversus, contra quam aliis animantibus. Bestias etiam validissimas aggreditur, & cæteras omnes venatur, maximè que greges incolarum infestos reddit maleficio. Solum est lancea & arcu invulnerabile, quod in causa est, ut nemo id subigere, (quamvis multi id tentarint,) valuerit. Ideò rectè putatur, etiam à Troglodytis, fortitudine leonis, & velocitate equi, & robore Tauri præditum, ferròque cedere*

(b) P. 1364. Cap. XXXIX.

Fig. 23.

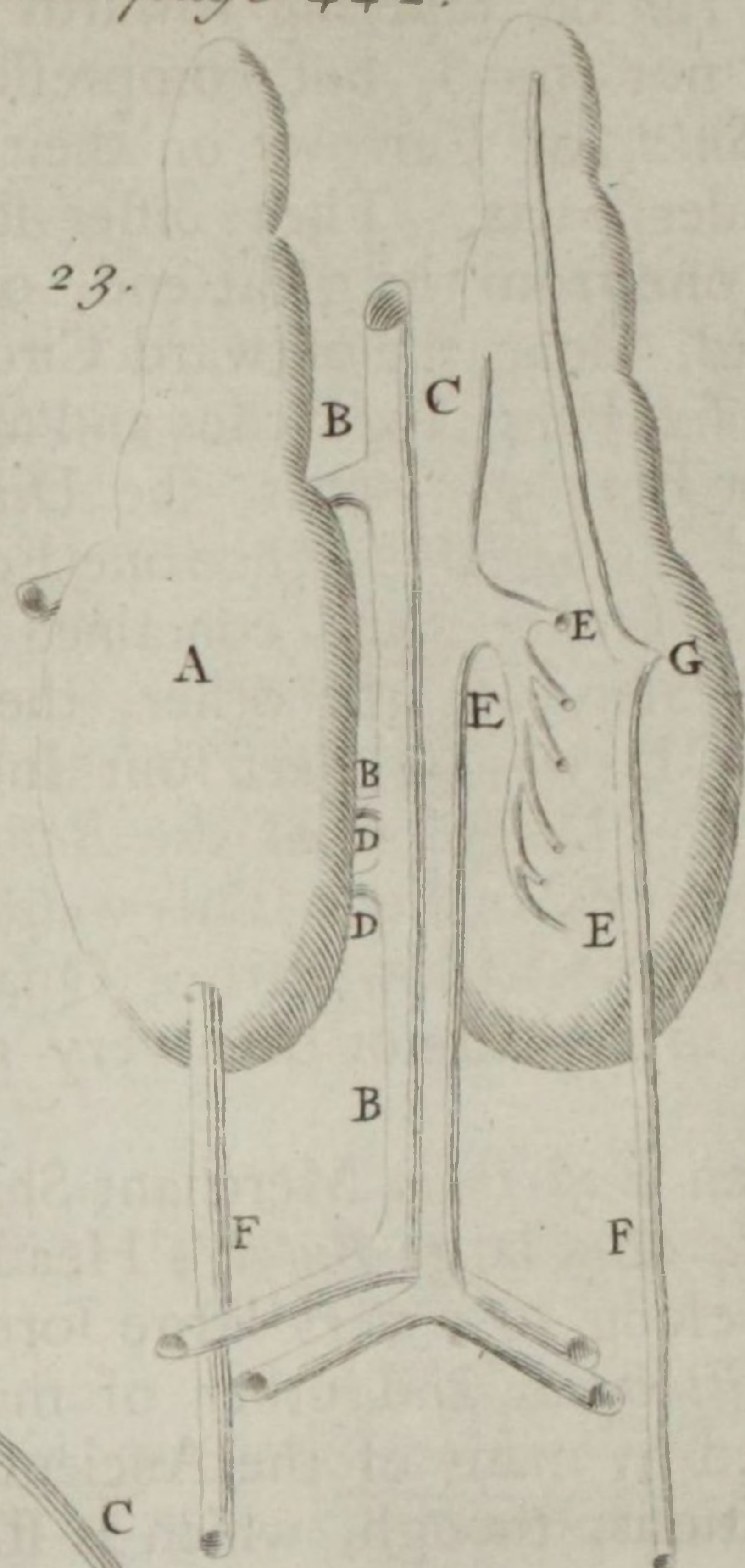


Fig. 24.

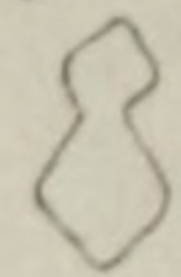


Fig. 25.

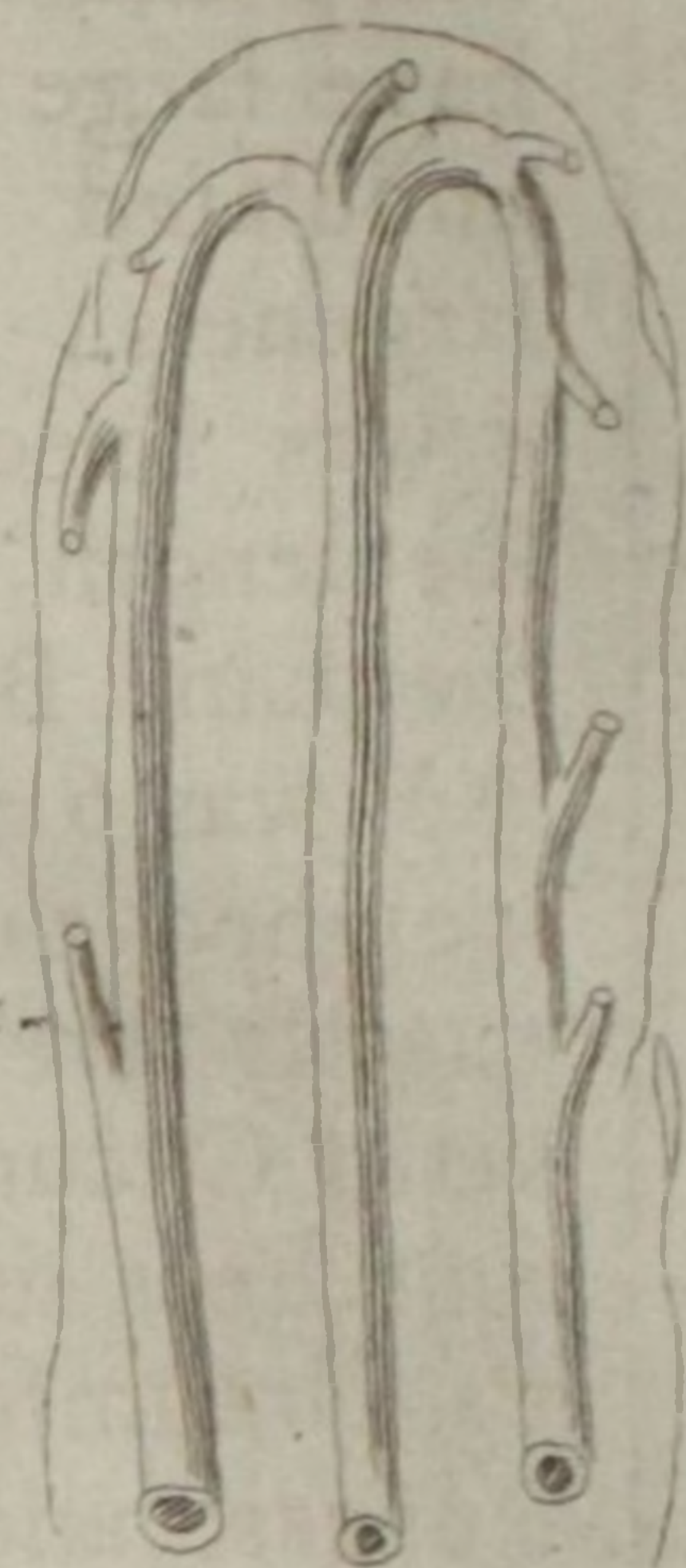


Fig. 26.

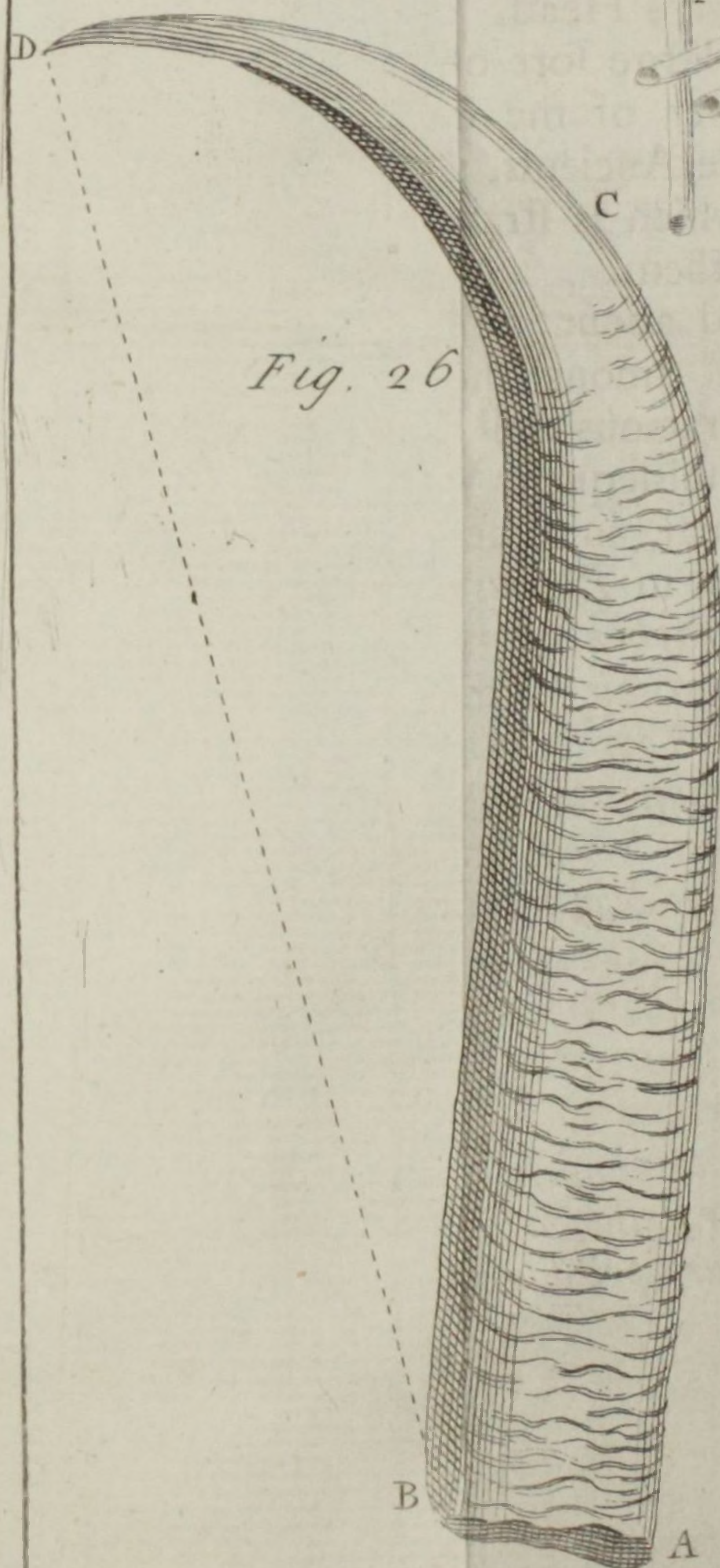
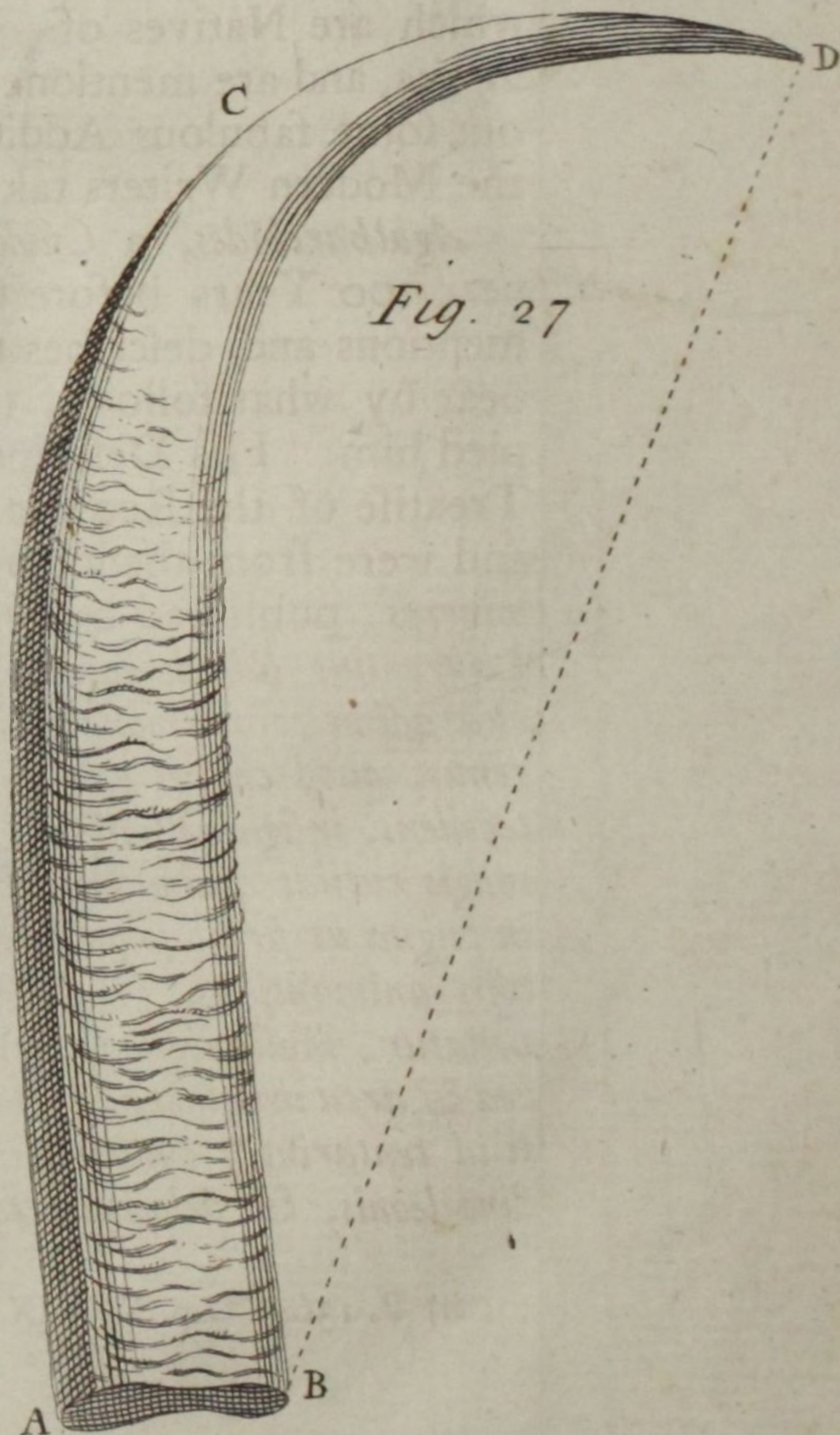


Fig. 27.



nescium. Diodorus Siculus (*Biblioth. Lib. III.*) hath barely, and almost Word for Word, transcribed *Agatharchides*, and hath added only the following Particulars; that the Eyes of this Animal are shining at Night; that after it hath killed other Beasts, it devours them, and that, in it's Attacks upon Flocks of Cattle, it is not to be terrified, either by the Strength of the Shepherds, or the great Number of Dogs. The following short Passage relating to this same Animal is taken out of *Strabo* (*c*). *Sunt & ibidem* (in Arabia) *tauri feri, ac qui carnem edant, nostros & magnitudine & celeritate longè exsuperantes, colore ruffo.* Pliny, *Histor. Nat. Lib. VIII. Ch. XXI.* seems likewise to have copied *Agatharchides*: His Words are, *Sed atrocissimos habet* (*Æthiopia*) *Tauros Silvestres, majores agrestibus, velocitate ante omnes, colore fulvos, oculis cœruleis, pilo in contrarium verso, rictu ad aires debiscente juxta cornua mobilia, tergori duritia silicis, omne respuens vulnus. Feras omnes venantur: Ipsi non aliter, quam foveis capti, feritate semper intereunt.* In the XLVth Chapter of the said 8th Book of *Pliny's* Natural History, he mentions a sort of *Indian Oxen.* *Boves Indici, quibus Camelorum altitudo traditur, cornua in latitudinem quaternorum pedum.* It is not unlikely, but that these *Indian Oxen* are the same with the *Æthiopian* ones above described; especially if we suppose that the Transcribers of *Pliny* have, by Mistake, written *latitudinem* instead of *altitudinem.* *Solinus* (*d*) hath barely copied *Pliny*, with this Difference only, that he calls them *Indicos Tauros*, whereas *Pliny* himself hath described them amongst the *Æthiopian* Beasts, which might very well happen, *Æthiopia* being reckoned, by some of the Antients, as part of *India.* The Description of *Ælian* (*e*) agrees perfectly with that of *Agatharchides*, of whom, it seems, he also borrowed it; only he fixes the Size of these extraordinary Oxen to twice the Bigness of the common *Grecian* Ox. There is another Passage in *Ælian* (*f*) which seems to relate, both to this large kind of *Æthiopian* Oxen, and the Horns, now in my Possession. His Words are, *Ptolomæo secundo ex India cornu allatum ferunt, quod tres amphoras caperet: Unde conjicere possumus bovem illum, à quo ejusmodi tantum cornu extitisset, maximum fuisse.* *Ludolfus*, in his *Historia Æthiopica* (*g*), speaking of the large *Æthiopian* Oxen, conjectures, that they are the *Taurelephantes*, which *Philostorgius*, a *Cappadocian*, says (*h*), were brought to *Constantinople* in his Time, where he saw them. The Words of *Philostorgius*, as transcribed by *Ludolf*, in his *Commentarius ad Historiam suam Æthiopicam* (*i*), are, *Habet & Terra illa maximos & vastissimos Elephantas;*

(c) *Geogr. Lib. XVI. p. 775. Edit. Casaubon.*

(d) *Polyhistoris Cap. LII. p. 58. Edit. Salm.*

(e) *Hist. Animal Lib. XVII. c. 4.*

(f) *Hist. Animal Lib. III. c. 34.*

(g) *Lib. I. c. 10.*

(h) *Lib. III. c. 11.*

(i) *Pag. 145.*

An Account of a Pair of very extraordinary large Horns.

imo & Taurelephantes, ut vocantur, quorum genus quoad cætera omnia bos maximus est, corio verò coloreque elephas, & fermè etiam magnitudine.

From all these several Writers it appears, that there is in *Æthiopia* (and probably the midland Parts of *Africa*, where Travellers seldom come) a very large Animal of the *bovinum* genus, at least twice as big as our Bulls or Oxen, with Horns proportionably large, but otherwise differing from them in many respects. And it is confirmed by modern Writers, that there is such an Animal in those Countries, though there is none, I know of, that hath given a Description of it in the least satisfactory. *Ludolf*, in his *Historia Æthiopica* (*k*), says, that there are in *Ethiopia*, Bulls of an uncommon Size, twice as large as those in *Hungary* and *Russia*; and that having shewn some of the largest Oxen in *Germany* to *Gregory*, an *Abyssinian* (from whose Writings, and Informations, he collected the Materials for that Work) he said, they were but of a middling Size. The Letters of the *Jesuits* frequently mention the largeness of these Oxen, and the said *Ludolf* cites the following Passage out of a Letter of *Alphonfus Mendezius*, Patriarch of *Ethiopia*, dated *June 1, 1626*. *Buoi grandissimi, di corna smisuratamente grosse è lunghe, talmente, che nella corna di ciascuno di esse potea capire un otre piccolo di vino*: That is, *Very large Oxen, with vastly thick and long Horns, one of which would contain a large Uter of Wine*. *F. Bernier*, in his Account of the *Great Mogul's Country* (*m*), says, that among many Presents, which two *Ethiopian* Embassadors should have presented to *Aurengzeb*, there was a prodigious large Horn of a Bull, full of *Civet*, which having been measured by him, he found the *Basis*, or large End, to be half a Foot in Diameter. This Horn, as *Bernier* farther observes, was brought by the Ambassadors to *Debli*, the place of Residence of the *Great Mogul*; but it was not presented to him, because, being distressed for Money, they had sold the *Civet* out of it, long before they came thither.

Upon the whole, it seems to me, that these Horns, and likewise that mentioned by *Bernier*, are the Horns of a large sort of Bulls or Cows, in *Ethiopia*, and the inward Parts of *Africa*, which, in all likelihood, is the same with that described by *Agatharchides*, *Pliny*, and those other ancient Writers mentioned above. But I cannot as yet, for want of a more accurate Description, be certain, whether it is the same with the *Sukotorio*, or *Sukotyro*, of *Nieubof* (*n*), though there is a good deal of reason to think, that it is. *Gesner* (*o*) speaks of a very large Horn, which was hung by a Chain to a Pillar in the *Minster*, or Cathedral, of *Strasburgh*, and which is not unlikely to be of the same sort with these. He says, that being measured

(*k*) Lib. I. cap. 10.

(*l*) Comment. in Hist. Æthiop. pag. 145.

(*m*) Tom. II. pag. 43.

(*n*) Loc. supra citato.

(*o*) Icones Animal. Quadrup. Edit. 2d. Tigur. 1560. pag. 34.

along the outward Circumference, it was found to be four *Roman* Yards long, and he conjectures it to have been the Horn of a large old *Urus*, which was hung up there, for it's monstrous Size, perhaps Two or Three hundred Years before his Time. As to these, it is very likely, that when the *English* had a great Commerce at *Ormus*, they were brought thither from some neighbouring Country, and afterwards carried over into *England*, by some curious Person.

XVII. An Ewe, which within two Years time had twice lambed, happened to be covered by a young Ram, about twenty Weeks old. About five Days after this, the Butcher killed the Ewe, and observing, that the *Uterus* was four times bigger than ordinary, he brought it, with the *Ovaria*, to me, assuring me, that it was not yet quite five Days since the young Ram had covered the Sheep, and that there was no other Ram thereabouts.

I endeavoured first to penetrate into the Womb from the *Vagina*, with the Point of a small pair of Scissars, but I found it so close, that I could not enter it, therefore I cut a piece off from the Womb, out of which ran a clear Water, and within it lay the *Fœtus*, with all it's Coverings. I spread this upon the backside of a *China* Tea-Dish, and finding it still contained more Water, I made a small Incision to drain it, and let it dry, that I might observe it the better. I could plainly see the *Vertebræ* of the Neck and Back, as also the Joints of it's short Tail; I thought likewise that I saw the Eyes. But when it was quite dry, I could not observe it's Back-bone so well as before, when it was moist, though the Painter, who made the Draught, and had sharper and younger Eyes than mine, saw the Bones of the Back very distinctly. My Design in drying it was to cut it in small Slices, that I might the better observe the inner Parts, for it was so extremely soft and tender when moist, that with the least touch it's Parts would be disordered and confounded. Therefore I cut this *Fœtus* into fifteen Slices and observed them with a Microscope, but could not be very certain what I saw. I thought I saw the Intestines, as also the Bladder; and coming to the Breast, I fancied that I saw the Heart; but I observed, with a great deal of Pleasure, that two Blood-Vessels lay near together in the Brain, and how they were spread into Branches. I had this *Fœtus* drawn as it lay in it's Teguments. A B is the *Fœtus*, and A C D E I K and A F G H L K, the Membranes, wherewith it was involved, in the manner I had spread and dried them, wherein the Blood-Vessels, as much as possible, are delineated. Now some Persons might expect, that I should have looked for the Extremities of the Blood-Vessels; but they have no end, as I have frequently said. Besides, they become gradually so exquisitely fine, that the Blood, which passed through them, can exhibit no red Colour to our Eyes; so that there is no tracing them when entering into the Vessels that return the Blood back to the Heart, except in living Animals, where one may see the Blood enter into the returning Vessels.

Observations upon a Foetus, and the Parts of Generation of a Sheep. By Mr Leeuwenhoek, F. R. S. Translated from the Dutch, by Dr Sprengell, F. R. S. No. 373, pag. 151.

Fig. 28.

Before the Butcher gave me this *Uterus*, he squeezed it betwixt his Fingers, and told me that he could feel nothing in it, and this I believe he had done several times, by which means he tore off the Vessels by which the *Fœtus* was fastened to the *Uterus*; which, I suppose, was the Occasion that, upon opening the *Uterus*, the *Fœtus*, with it's Coverings, came so easily forth.

Fig. 29.

I also took a Draught of the *Tuba Fallopiana*. At P, is the maginary Orifice, which is thought to suck the Egg from the *Ovarium*, according to the old absurd Notion; at M is shewn where the *Tube* increases in Bigness, and at QR the fleshy Substance, which I cut away from the *Uterus*. I then had also cut off the so called *Ovaria*, and the pretended *Ova*, which latter were much too big to pass upon Conception through the *Tubæ Fallopiæ*. I therefore took the length of the *Fœtus* with a pair of Compasses, and measured it upon a divided Brass Rule, and this I did also as to it's breadth; I then took the middle Number between these, and multiplied it twice by itself, to bring it to a Cube Number. I next took the length of the *Axis* of an *Ovum*, as it lay in the *Ovarium* inclosed in it's Membranes, and taking the Cube of that length, and dividing one Cube Number by the other, I found that such an *Ovum* was about seven times bigger than the *Fœtus*, notwithstanding it had near five Days growth. I shewed this *Fœtus*, with it's Covertures, to two Physicians, and one Surgeon, and I gave them the pretended *Ovaria* in their Hands, and they agreed, that not one *Ovum* was missing out of the *Ovaria*. Then I asked them what they thought? how it was possible that such an *Ovum* could pass through the Fallopian Tube? Whereupon the one said, that the *Ovarium* was quite out of doors, and that it was nothing but some fleshy Substance. But the other said, that notwithstanding this, all Animals came from an Egg, and the last told me, that he believed that Tube to be neither of a Sheep nor a Lamb; but I shewed them that it was from an Ewe which at least had lambed twice, and yet that the Tube was neither thicker nor wider, than the Tube of a Lamb.

Fig. 30.

After having kept these *Ovaria* some Days, by which means they were pretty much shrunk in the drying, I ordered them to be drawn, that the bigness of the Eggs might be observed. A B C D E is the *Ovarium*, on that side of the *Uterus*, in which the *Fœtus* had lain. You must observe, that the *Uterus* of a Sheep is divided by a Membrane, so that the young ones cannot touch one another. D E A is the part where it was fastened. In this *Ovarium* you may observe a round Protuberance, which is beset with several others; this great Protuberance is what is called an *Ovum*. This *Ovarium* is not here represented so large, as it was, when I cut it off from the Parts that it grew to. There was besides, at one Side of that *Ovarium*, a large round Body, grown to the *Ovarium*, which seemed also to be an *Ovum*, F G, on which there appeared several other little round Bodies

Fig. 31.

protuberant from it. Now on the other side of the *Uterus*, there was a large fleshy prominent *Ovum* (as it is called) which might plainly be observed without a Microscope, whose Bigness is likewise drawn, at H I, upon which you may likewise observe a smaller round Body, and out of that again other still smaller round Bodies, appear protuberant. After I had quite dried these Eggs, represented in *Fig. 30*, *31*, and *32*, I still observed more and more of the prominent round Bodies upon them, insomuch that upon one of them, I told sixteen round little Bodies, whereof some, by losing all their Moisture, were sunk in, and had a Dent in the middle. I cut these Eggs, with a very fine sharp Knife, into thin Slices, and then observing them with a Microscope, I saw Blood-Vessels in them, and also other sorts of Vessels, which I did not take for Blood-Vessels, and among the rest one so big, that a Hair of one's Head might enter it, besides abundance of others exceeding small. After many Observations, I could think no otherwise, but that the so called Eggs consisted of nothing but Vessels, and that the superfluous Moisture, which was sent to these Eggs, did not circulate (except only what was in the Blood-Vessels) and by overcharging the Vessels, elevated them into these small Protuberances, and sometimes bursting them, did thereby leave a Dent in the middle; which Dent having been served by some Persons, they firmly believed to be the Place where the *Ovum* was sucked out, from whence sprung the *Fætus*. I was very sorry that I did not get this *Uterus* without it's having been squeezed, for I do not question, but that I might otherwise have plainly discovered all the Members of this *Fætus*, since I could plainly observe it's Back-bones, even with the naked Eye, and that in a *Fætus* not of quite five Days growth. I hope after this, no Body will pretend to say, that the Animal *in Utero* at the Beginning, is nothing but an unformed Mass. These Observations I made in *September*, 1718.

XVIII. The Moose is thought peculiar to North America, and is one of the noblest Creatures of the Forest; the *Aborigines* have given him the Name of *Moose*, *Moosuk* in the Plural.

There are two sorts, the *Common light grey Moose*, by the *Indians* called *Wampoose*; these are more like the ordinary Deer, spring like them, and herd sometimes to thirty in a Company. And then there are the *large, or black, Moose*, of which I shall now give you the following Account.

He is the Head of the Deer-kind, has many things in common with other Deer, in many things differs, but in all very superior. The Moose is made much like a Deer, parts the Hoof, chews the Cud, has no Gall, his Ears large and erect. The Hair of the black Moose is a dark grey, and upon the Ridge of his Back to ten and twelve Inches long, of which the *Indians* make good Belts. He has a very short bob Tail. Mr *Neal*, in his late History of this Country,

A Description of the Moose-Deer in America. By the Hon. Paul Dudley, Esq; F. R. S. No. 368, pag. 165.

speaking

A Description of the Moose-Deer.

speaking of the Moose, says they have a long Tail ; but that Gentleman was imposed on, as to the other things besides the Moose.

Our Hunters have found a Buck, or Stag-Moose, of fourteen Spans in height from the Withers, reckoning nine Inches to a Span ; a Quarter of his Venison weighed more than Two hundred Pounds. A few Years since, a Gentleman surprized one of these black Moose, in his Grounds, within two Miles of *Boston* ; it proved a Doe or Hind of the fourth Year : After she was dead, they measured her upon the Ground, from the Nose to the Tail, between ten and eleven Feet, she wanted an Inch of seven Foot in height.

The Horns of the Moose, when full grown, are between four and five Feet from the Head to the Tip, and have seven Shoots or Branches to each Horn, and generally spread about six Feet. When the Horns come out of the Head, they are round, like the Horns of an Ox ; about a Foot from the Head, they begin to grow a palm broad, and further up still wider, of which the *Indians* make good Ladles, that will hold a Pint. When a Moose goes through a Thicket, or under the Boughs of Trees, he lays his Horns back on his Neck, not only that he may make his way the easier, but to cover his Body from the Bruise, or Scratch, of the Wood. These mighty Horns are shed every Year. The Doe-Moose has none of these Horns.

A Moose does not spring, or rise in going, as an ordinary Deer, but shoves along side-ways, throwing out the Feet much like a Horse in a racking pace. One of these large black Moose, in his common Walk, has been seen to step over a Gate, or Fence, five Feet high. After you unharbour a Moose, he will run a Course of twenty or thirty Miles, before he turns about, or comes to a Bay ; when they are chased, they generally take to the Water ; the common Deer, for a short Space, are swifter than a Moose, but then a Moose soon outwinds a Deer.

The Meat of a Moose is excellent Food, and though it be not so delicate as the common Venison, yet it is more substantial, and will bear salting : The Nose is looked upon as a great Dainty ; I have eat several of them myself ; they are perfect Marrow. The *Indians* have told me, that they can travel three times as far after a Meal of Moose, as after any other Flesh of the Forest.

The black Moose are not very gregarious, being rarely found above four or five together ; the young ones keep with the Dam a full Year.

A Moose calves every Year, and generally brings two. The Moose bring forth their young ones standing, and the young fall from the Dam upon their Feet. The time of their bringing forth is generally in the Month of *April*.

The Moose being very tall, and having short Necks, do not graze on the Ground as the common Deer, Neat Cattle, &c. do, and if at
any

any time they eat Grass, it is the top of that which grows very high, or on steep rising Ground. In the Summer they feed upon Plants, Herbs, and young Shrubs, that grow upon the Land, but mostly, and with greatest Delight, on Water-Plants, especially a sort of wild Colts-foot and Lilly, that abound in our Ponds, and by the sides of the Rivers, and for which the Moose will wade far and deep, and by the Noise they make in the Water, our Hunters often discover them. In the Winter they live upon Browse, or the tops of Bushes and young Trees, and being very tall and strong, they will bend down a tree as big as a Man's Leg, and where the Browse fails them, they will eat off the Bark of some sorts of Trees, as high as they can reach. They generally feed in the Night, and lie still in the Day.

The Skin of the Moose, when well dressed, makes excellent Buff; the *Indians* make their Snow-shoes of them: Their way of dressing it, which is reckoned very good, is thus: After they have haired and grained the Hide, they make a Lather of the Moose's Brains in warm Water, and after they have soaked the Hide for some time, they stretch and supple it.

XIX. The Dimensions are exactly set down, as I took them myself, by laying a String along the Surface.

a e the Length of thirty Inches.

b b the Circumference above the third Branch, seven Inches.

c c the Circumference above the second Branch, eight Inches.

d d the Circumference between the Brow and second Antler, eleven Inches.

e e the Circumference of ten Inches.

d e the Circumference of the Brow-Antler, $6\frac{1}{4}$ Inches.

e f the Length of the Antler, $16\frac{1}{4}$ Inches.

This Horn was drawn out of *Raven's Barrow Hole*, adjoining to *Holker Old Park*, by the Net of a Fisherman, on the twentieth of *June*, 1727. The Tide flows constantly where it was found, and the Land is very high near it.

It is now in the Possession of *Sir Thomas Lowther, Bart. of Holker*, in *Cartmell in Lancashire*.

XX. Though the *Coati Mondi* of *Brazil* is seldom brought alive into *Europe*; yet there were two of them found in *Captain Green's* Ship, one of which died in my Custody, of a Wound it had received in the Thigh, which I caused to be dissected, and have sent you the Account of it, compared with that of the *Parisian Academists* published of one of them; and which differs from theirs in several Particulars, most of which, as I believe, may proceed from the Difference of Sex, theirs being a Male, and ours a Female.

Theirs was six Inches and one half from the end of the Snout to the hinder part of the Head, ours was only four; theirs was sixteen Inches from the *Occiput* to the beginning of the Tail, ours was ten; theirs

An extraordinary large left Horn of the Stag Kind, taken out of the Sea on the Coast of Lancashire. By Mr J. Hopkins. No. 422. pag. 257.

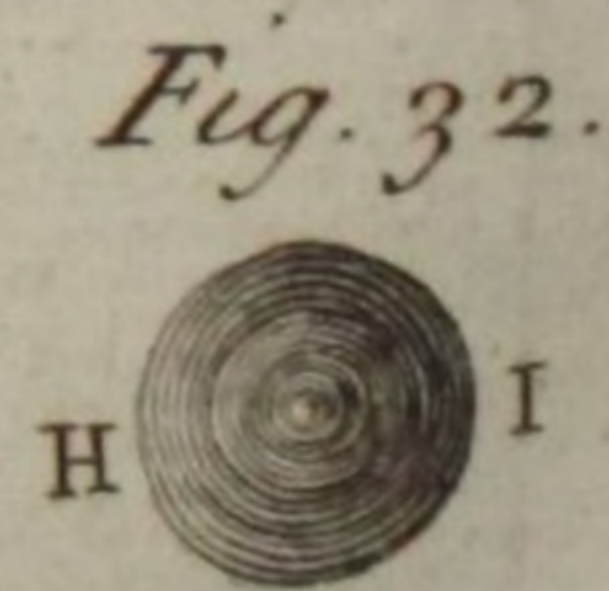
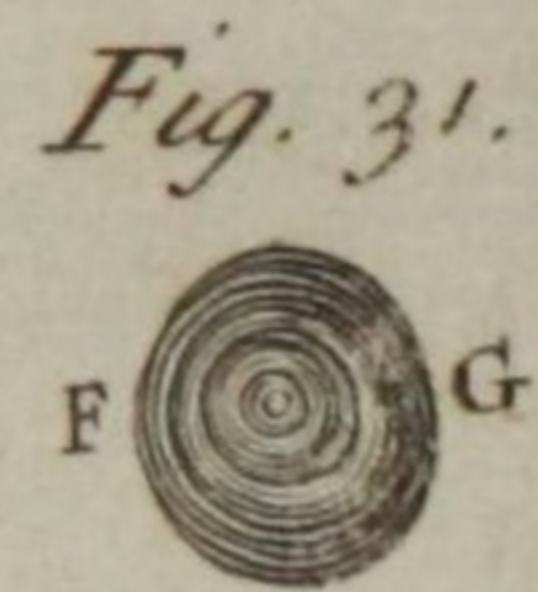
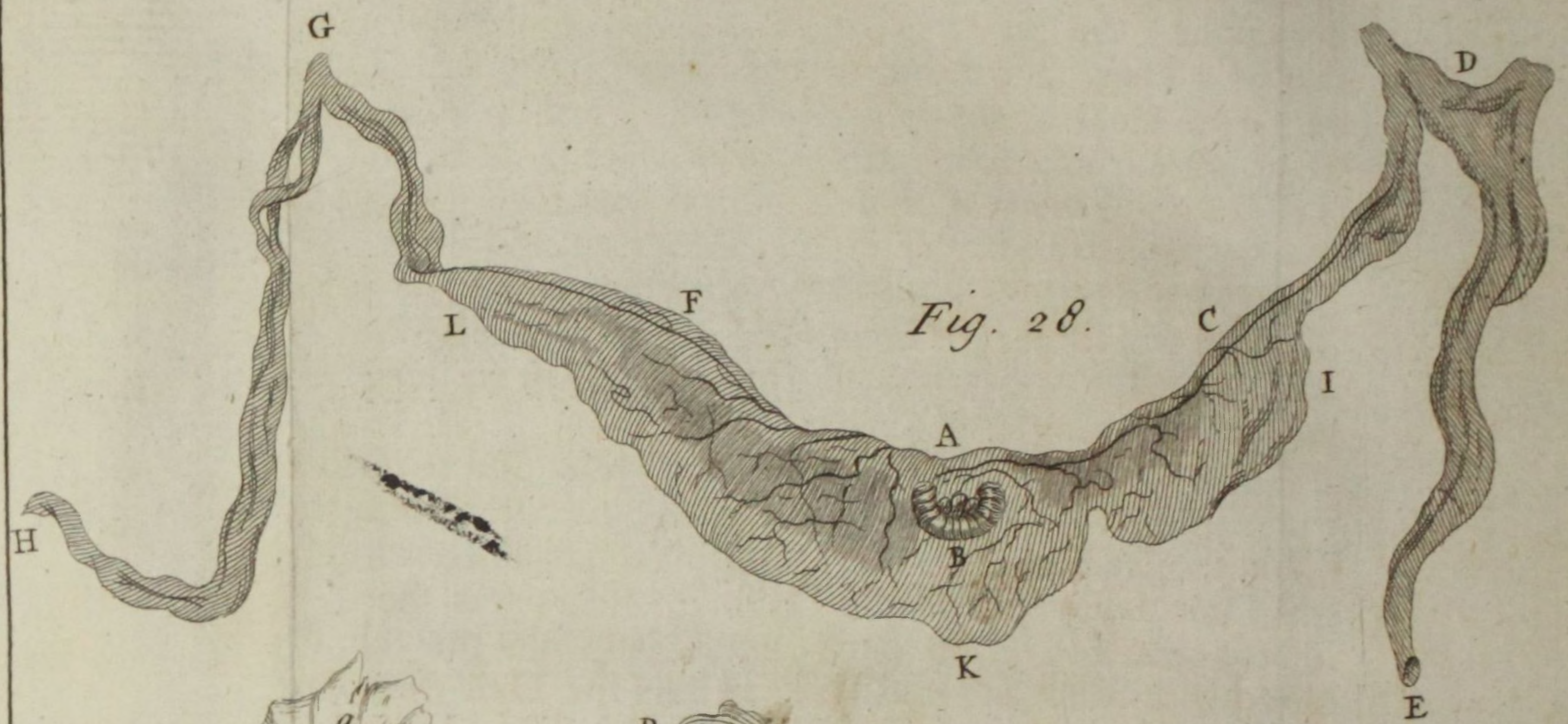
Fig. 33.

Of the Coati Mondi of Brazil. By Dr George Mackenzie. No. 377, pag. 317.

theirs from the Insertion of the Tail to the end, was thirteen Inches, ours twelve; theirs from the Top of the Back, to the Extremity of the fore Feet, was ten Inches, ours was seven; theirs from the Top of the Back, to the Extremity of the hinder Feet, was twelve Inches, ours eight; the Snout of theirs was very long and moveable, like that of a Hog, but streighter and longer in proportion, but ours was only two Inches; the fore Paws had each five Toes, the Claws of which were black, long, and hollow, like those of the Castor; the Toes of the Fore-paws were a little longer than those of the Hind-paws; the Soles without Hair; the Palms and Soles of these Fore-paws were covered with a soft and tender Skin; the Sole of the hinder Paw was long, having a Heel, at the Extremity of which there were several Scales a Line broad, and five or six long, in all which they perfectly agreed.

The Ears were round, like those of Rats, and covered at the Top with very short Hairs, and in this they likewise both agreed, as they did in the Eyes, which were extreamly small and beautiful, but there was some Difference in the Hair, for theirs was short, rough, and knotty, blackish on the Back and Head; and the rest of the Body mixed with black and red; but in ours the Hair was long, in proportion to the Animal, especially on the Tail, and the whole was beautified with white and black Circles, which made it have a most lovely Aspect: But from the Snout, down all the Throat and Belly, to the top of the Tail, and the inside of the Legs, was of a reddish Colour. The Tongue of both theirs and ours was chopt with several Fissures or Strokes, which made it rough to the Touch. The *Incisores* were six in each Jaw: The *Canini* were very large, especially those of the lower Jaw; but they did not turn up like Tusks as theirs did; their Figure was not round, blunt, or white, like those of a Dog, Wolf, or Lion, but sharp by the means of three Angles, which, at the Extremity, formed a Point sharp like an Awl: As to their Colour, they were greyish, and somewhat transparent: The *Gula* was large, and cleft like a Hog's; and the lower Jaw, as in a Hog, very much shorter than the upper.

We shall now proceed to the internal Parts. By the Dissection we found in ours, as the *Parisian* Academists did in theirs, that under the Skin, and between the Muscles, there was a great deal of Fat, white and hard, like Tallow. Theirs being a Male had a *Penis*, provided with a Bone, whose Length did in proportion exceedingly surpass that of the Bones which are found in the *Penis* of other Animals; so we in ours, being a Female, observed, that it had an exceeding large *Matrix*, and that the Insertion of the *Urethra* was upon the right Side of the *Vagina*. The *Epiploon* in ours, as in theirs, was very small; it had little Fat, and was a Complication of Fibres and Fillets, rather than a Membrane; it was not laid upon the Intestines, but touched upon the Ventricle. In theirs they observed a
very



...but in our we could discern none. We did not
...any Yellish in the external Membrane
...the Corn Model of Brain which appeared as in
...and then disappeared. It being
...the latter in color like theirs, was somewhat
...appearance, without any Appearance
...two were ones on the left side and
...on the right side. The latter in color as in
...the latter, looking more towards the
...and were very small in their
...The latter in color as in theirs, and
...which looked very small, concealed their
...in their external color, and all
...and nothing, although they are in their
...and they were very small, and
...of the latter, the latter was very
...as in theirs, and the latter in
...the latter, and the latter in
...the latter, and the latter in
...the latter, and the latter in
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very large Spleen, but in ours we could discern none. We did not observe, more than they, any Vessels in the external Membrane of the Ventricle, but the *Coronaria Stomachica*, which appeared as in theirs towards the upper Orifice, and soon disappeared, shooting forth a few Branches. The Liver in ours, like theirs, was somewhat blackish, and of a Substance very homogeneous, without any Appearance of Glands: It had seven Lobes, two great ones on the left Side, and five other small ones on the right Side. The *Pancreas* in ours, as in theirs, was fastened along the *Duodenum*, inclining more towards the right Kidney than the left; but whereas it was very small in theirs, it was very large in ours. The *Mesentery* in ours, as in theirs, was filled with a very hard Fat, which inclosed, and almost concealed all its Vessels. The *Intestines* in theirs were seven Foot long, and all of one Thickness, having nothing to distinguish them; but in ours they were only 42 Inches and a half. Theirs had no *Cæcum*, but we found it in ours at the upper end of the *Rectum*. The Bladder was very large; the right Kidney in ours, as in theirs, was a great deal higher than the left, and covered with the Lobes of the Liver. The Lungs in theirs had five Lobes, two on the right Side, and two on the left, and the fifth in the *Mediaſtinum*, which was as thin as a Spider's Web; but in ours there was seven Lobes, three on the right, and three on the left, and the seventh in the middle. The Heart in ours, as in theirs, resembled that of a Dog, having the right Auricle extremely great, and as they found a great deal of slimy Matter hardened in the right Ventricle, so we found in ours a *Polypus*. The *Musculus Crotaphites*, passing under the *Zygoma* was in ours, as in theirs, fastened there, being extraordinary fleshy, even to its Insertion, made by a very large Tendon, which was inclosed between two Pieces of Flesh, much thicker than those which are generally found in this Place, and which are thought to be put there to defend and strengthen the Tendon of the Muscle of the Temples.

The Tendons in the Articulations of the fore Feet, were very big and strong. In ours, we observed two Glands on each Side of the *Anus*, with a Passage to each of them, full of a greyish foetid Matter. The *Orbita* in ours, like theirs, was not bony throughout, but it was supplied in the upper Part by a cartilaginous Ligament, which joined the *Apophysis* of the *Os Frontis* to that of the first Bone in the upper Jaw. The Bone, which separates the *Cerebrum* from the *Cerebellum*, was as in Dogs. The *Dura Mater* in ours did not adhere to the *Cranium*, as in theirs. The *Sinus's* of the *Os Frontis* in ours, as in theirs, were full of Matter, like a friable Fat. The *Mammillares Processus* in ours, as in theirs, were very large. In the Eye both of them agreed exactly, the Globe not exceeding four Lines and a half in Diameter, the Aperture of the Lids being much larger, and the *Pupilla* being as large as the whole Globe of the Eye; the *Cryſtalline* contained three Lines in Breadth, and two and an half in Thickness, and

was more convex inwards than outwards: This Thickness of the Crystalline made the two other Humours to be less in Quantity. The *Choroides* was all over of the same Colour, viz. of a very brown red, without any *Tapetum*. which is hardly ever wanting in the Eyes of other Animals.

These are all the remarkable Differences, that we could discover, betwixt ours and that of the *Parisian* Academists; only I must inform you of some Things, as to the Manner of it's Living and Diet, which they had not the Opportunity to observe in theirs.

I believe they are misinformed in saying, that they carry their Tails erected, at least the Tail of this was always trailing on the Ground; neither can I be induced to believe that they eat their Tails, for there was no Part of her that she could endure less to be handled than her Tail, the least touching of which would make her cry, or rather hiss like a Snake; she could endure no manner of Cold; for in the Intervals, betwixt the Times of eating, she was either beneath the Bedcloaths, or on a Cushion before a Fire, with the Heat of which she seemed to be extremely well pleased.

Her ordinary Meat was buttered Eggs, Milk, and Bread, all manner of roasted Flesh, but no Fish: I once tried her with a new killed Partridge, which she eat of most voraciously, and for several Days after, she was very wild and ungovernable, which made me never afterwards try her with raw Flesh. I am apt likewise to believe, their ordinary Dens or Habitations are under Ground in sandy Banks, like our Rabbits; for when she was brought to the Fields, she would dig up the Sands with her Paws, with an incredible Swiftness, so that had she not been chained, there had been no Possibility of recovering her.

*The Anatomy
of the Mus
Alpinus, or
Marmot, by
John James
Scheuchzer,
M. D. F. R. S.
No. 397.
P. 237.*

XXI. Relictis abdominalibus musculis, aperto abdomine, in conspectum venit illico omentum pingue admodum, cujus tractus pinguedinosi vasis sanguiferis epiploicis intertexti pulcherrimum formant rete; sed est hæc omenti pinguedo concreta magis & compactior ea, quæ mox describenda venit, ac veluti emaciata ut omninò judicare liceat, resorptas esse per hyemem durante somno fluidiores oleosi hujus liquidi partes per venam portæ, ut inservirent tum secretioni bilis, quâ vesica biliaria fuit admodum turgida, tum nutrimento ipsius corporis.

Ex utroque hypogastrii latere copiosissima conspicitur & laxioris, quàm illa omenti, consistentiæ pinguedo, quæ inde à renibus sese protendit ad inguen, formans veluti alterum, imò duplex omentum, quæ pinguedo, uti & illa mesenterii, quæ ductum intestinorum omnium comitatur, adest tum ad lubricanda viscera abdominalia, tum in succi nutritii amplum penurarium.

Ad duodeni latus pro more, imò ultra ejus curvaturam, sese protendit pancreas, idque valde extenuatum, in quo macilentiaæ statu vidimus omnes alias corporis glandulas, speciatim eas, quæ musculis interjacent; in his animantibus tardissima est sanguinis circulatio, tardissimæ omnes corporis secretiones, nulla interim seri vel lymphæ, quæ
tardam

tardam quidem, sed tamen successivam habet secretionem, revectorio, ut tandem sanguis omni penè sero orbetur; hinc non mirum, quod deficiente lymphâ secernenda, glandula pancreatis, & sic quoque alia debeant emaciari.

Aperto duodeno in conspectum prodit bilis spumosa, quæ ipsa indicat feri defectum.

In scœmella hac uteri cornua sese protendunt ad duos pollices Parisinos, tubæ pertenuis filo vix crassiores ad $\frac{1}{2}$ pollicis, ovaria 2 lineas circiter longa, unam lata, alba, sub microscopio pellucida, cum prominentibus ovulis distinctæ diaphaneitatis.

Hepatis fatis magni lobi sunt sex, & aliqui horum in duos veluti subdivisi per incisuram: Lobo infimo mediante membrana connectitur cum rene dextro.

Renes pinguedine toti sunt obfiti.

Renes succenturiati ad latus venæ cavæ supra emulgentes corpuscula sunt flavicantia tres circiter lineas longa vix dimidiam lata, hepar inter & renes conspicua; sed uti aliæ glandulæ, macilentæ.

Ventriculi structura est, uti in animalibus aliis prohibitis & carnivoris, simplex membranosa, licet hoc animal sit herbivorum.

Singularis structuræ est fistula intestinalis in confinio intestinorum tenuium & crassorum.

Ingressus ilei in colon in diametro habet duntaxat tres lineas; colon è regione ilei 2 lineas. Sed quod incurvatur ibidem cœcum, est ex amplissimis, 2 pollicum in diametro. Memorabilis est valvula coli dicta, annuli ad instar rotunda, singularis prorsus structuræ. Exilis quippe admodum est.

Ingressus ilei veluti inter duas tunicas conniventes, ita ut nullus prorsus concedi possit excrementis ad intestina tenuia regressus. Et membranæ duæ, quæ mutuo occursum valvulam illam formant, rhomboidalis sunt figuræ. Adsunt præterea aliæ valvulæ conniventes annulares, & veluti in ramos protensæ tres quatuorve principales versus intestinum cœcum. Illustrat hæc observatio egregie usum intestini cœci, quod in infantibus recens natis ordinariè est capacius. Inservit nempe id diverticuli loco excrementis per novem mensium decursum in intestinis colligi, nec per ea excerni solitis. Par hic est ratio animantium, quæ per hyemem integram in montium cavernis dormiunt. Nulla per illud tempus fit excrementorum egestio, & tamen non obstante hæc tardissimâ circulatione atque secretionem, nullâve ciborum assumptione, collectio fit eorundem, quæ ne intestina utriusque generis infarciant nimium, amandantur ad cœcum, ibique ad usque vernum tempus manent; regressus autem ex eodem ad colon impeditur imprimis per valvulas ante descriptas. Ex myographia ea imprimis contemplanda duximus, quæ actiones hujus animalis distinguunt ab aliis aliorum. Immediatè sub cute crassus est & fortis musculus platysma myoides dictus, qui colli partem anteriorem & lateralem, imò & totum musculum masseterem fasciæ instar involvit. Ad ipsam usque articulationem

nem humeri cum cubito se protendens labio tum inferiori, tum superiori inferitur, & motum frequentem pedum anteriorum flexorium simul & labiorum insigniter adjuvat. Hæc quippe Animalia cibos pedum anteriorum beneficio, veluti manibus apprehendentia, ori admovent, & terram illorum ope suffodiunt.

Glandulæ thyroideæ ad laryngis latera magnæ, haud dubiè ad irrigationem muscutorum vicinorum, quorum usus admodum est frequens, quem ipsum in finem passim aliis musculis interjacent alia corpora glandulosa passim memoranda.

Sternohyoideus & sternothyroideus in ordinario sunt situ.

Fortissimus & tendinosus valde est masseter, maximi in his animalibus usus.

Fortissimus item depressor maxillæ inferioris digastricus, qui basi ossis hyoidis & ejus cornibus forti item tendine à processu styloide ortus in maxillam inferiorem ad mentum ferè usque inferitur, cujus venter anterior imprimis est crassus & posteriori quadruplo fortior.

Loco geniohyoidei externi adest statim sub mento massa carnea musculosa crassa, triangularis inde à maxillæ inferioris concursu, sive angulo, sese in quinque lineas lateraliter protendens, quæ maxillam inferiorem imprimis connectere videtur. Post hunc basi linguæ inferitur musculus latus transversis fibris carnosus à maxillæ inferioris parietibus internis ortus, qui tum in mediam linguæ basin, tum in os hyoides inferitur; qui etiam supplere videtur geniohyoideum externum. Tenuis ille est & à substrato geniohyoideo interno, sive genioglossò vix separandus.

Styloglossus fortis quoque est musculus, carnosoque principio à processu styloide ortus in fortem desinens tendinem.

Conspicui valde sunt musculi cricothyroidei item thyrohyoidei.

Ad latera gulæ & asperæ arteriæ glandulæ sunt utrinque ad digiti ferè longitudinem protensæ, quæ nonnisi elevata aspera arteria & gula in conspectum veniunt, & lubricandis his partibus inservire videntur.

Fortis est musculus rectus anticus major ejusdem planè structuræ uti in homine.

Ceratohyoides triangularis musculus à cornibus ossis hyoidis ortus in basin ejus inferitur.

Thyroarytænoideus sub sphinctere gulæ conspicuus ad id speciatim inservit, ut clangorem his animalibus proprium efficiat constringendo fortiter Arytænoideas cartilagineas.

Musculi pterygoidei sunt admodum fortes.

Ad supra jam descriptum platysma myodes adnotandum porro, portionem crassam satis inferi spinæ scapulæ, sed quoque eidem musculo transversim implantari alium tenuem trapezio instratum, qui proin integer ex variis partibus coadunatus musculus inservit motui labiorum, flectendo cubito, levandæ scapulæ & antrorsum ducendis brachiis, quorum opera hæc animalia terram suffodiunt, aliasque res suas peragunt.

Trapezius

Trapezius eodem prorsus modo se habet ut in homine.

Rhomboidis loco adest musculus fortis sub trapezio in conspectum veniens, qui oritur non solum à superioribus spinis vertebrarum dorsi, & inferioribus colli, sed omnibus omninò spinosis transcessibus vertebrarum colli, & insuper ab occipite, ita ut scapulam non solum retrorsum moveat, sed etiam elevet, sicque patientiæ musculum in actione sua adjuvet.

Insertio haec rhomboidis in occiput observatur quoque in quadrupedibus aliis, & haud dubiè eum in finem adest, ut caput pronum pendens tanto melius sustineatur.

Patientiæ musculus tenui principio oritur ab apophysi transversa primæ vertebrae, & in principium spinæ scapulae inseritur.

Hujus actionem adjuvat alius eodem principio ortus, qui ad finem spinæ dictæ inseritur, qui duo proin junctim sumpti totam scapulam attollunt.

Serratum inter anticum majorem, qui eodem modo se habet uti in homine, & subscapularem adest glandulosa caro magna & lata fortibus his musculis lubricandis inserviens.

Serratus anticus major non solum dentatas habet origines à costis, sed etiam fortes & crassas propagines arcessit à processibus transversis vertebrarum colli.

Aniscalptor adest duplex unus alteri instratus, inferior & latior atque fortior dentatis veluti processibus ab ipsis costis, imprimis inferioribus oritur, & inferiori scapulae costae in transitu firmiter annexus lata satis basi humero uti in homine inseritur, & praeterea propaginem mittit tenuem ad ipsum olecranon, ita ut non solum humerum retro deorsum trahat, sed etiam cubiti extensioni inserviat.

Musculi humeri infraspinatus, subscapularis, & rotundus uterque eodem modo se habent uti in homine.

Deltoides duplex est. Ea pars, quae oritur à clavícula, & acromio in flexuram cubiti inseritur, adeoque non tam ad humeri, quam ad cubiti musculos pertinet; altera verò portio, quae ab acromio & spina scapulae oritur, exteriorum humeri situm obtinet in medium circiter humerum inserta; hunc proin non solum sursum movet, sed & extrorsum abducit.

Coracobrachiaeus tenuis est musculus ejusdem situs & usus ut in homine.

Inter extensores cubiti primus est tenuis, reliquis fasciae ad instar instratus, à costa scapulae ortus; sequuntur duo alii fortes, quorum unus etiam à costa scapulae oritur, alter à superiore parte humeri, qui aliquandiu progressi sese uniunt & forti tendine in olecranon inferuntur.

Sub his alius latet itidem fortis, qui à summa humeri parte ortus cum anconaeo sese unit.

Hic ipse autem fortior & crassior est, quam in homine, & exterius atque inferius humeri latus occupat.

Inter

Inter flexores cubiti biceps ejusdem est structurae uti in homine.

Brachialis verò interni origo sese protendit ad capitulum usque humeri, & in suo progressu hic musculus totam humeri externam partem veluti fasciatim ambit, & eodem loco uti in homine inseritur.

Flexores carpi adfunt tres; Extensores carpi tales sunt, quales in homine.

Extensores digitorum sunt primò communis, qui in tres digitos priores inseritur ab humero ortus. Secundus cubito descendens, in ultimum & penultimum inseritur.

Adest & indicator s. extensor indicis.

Pronatores se habent uti in homine.

Ex supinatoribus longus brevior est brevi, caeterum ejusdem situs uti in homine.

Aliorum musculorum descriptiones reservamus in aliud tempus.

Figurarum Explicatio.

Fig. 34.

Fig. 35.

Fig. 36.

Fig. 37.

Fig. 34. *AB* Gula. *CD* Duodenum. *E* Ventriculus. Fig. 35. *E H* Ilei portio *G. H.* Coli portio *H F I.* Cæcum omnia magnitudine naturali. Fig. 36. *a a* Coli valvula, prorsus fere uti depingitur in homine, nisi quod fermè sit rhomboidalis; *b c* Apertura Ilei in Colon. Fig. 37. *K* Portio Cæci, cujus ima pars est aperta versus Colon, ut Valvulae conniventes ramosae *o o o* in conspectum veniant.

An Anatomical Description of Worms found in the Kidnies of Wolves, by James Theodor Klein, Sec. of the City of Dantzick, F. R. S. No. 413. pag. 269.

Fig. 38.

Fig. 39.

Fig. 40.

XXII. They were sent to me from *Sewaldia*, in *Eastern Prussia*.

Fig. 38. exhibits a female Worm found in the Kidney of a she Wolf.

Fig. 39. The Kidney of a Wolf, resembling a Bag, on Account of the almost entire Consumption of its *Parenchyma*. It contained eight Worms, some of a yellowish, others of a Blood Colour; two of which were Females, six Males.

The Females were more than twice longer and thicker than the Males. They were furnished with three very visible Holes; the first of which performed the Function of the Mouth; the second of the *Anus*; the third of the *Vulva*. This last Hole is seen under the Belly, about $1\frac{1}{2}$ Inch from the Mouth, *a, b, c*, Fig. 40.

The membranous Skin was marked with annular Fibres, and 7 or 8 Chesnut-coloured Lines, *d*, running the whole Length of the Worm. The Skin being cut, a limpid Humour issued forth, and then appeared the transversal Fibres interlaid on every Side with the *Viscera*, and are all round about, inserted into the Skin in the Interstices of the *Vesicles* (of which hereafter) and at the same Time the *Viscera* appeared, which the sole Parts destined for Nutrition and Generation seem to make up.

Fig. 41.

The alimentary Passage, is composed of two Canals, one whereof *b, b*, which begins at the Mouth, and is about 2 Inches long, smooth, fleshy, whitish, and endowed with thick Coats, serves for receiving Nourish-

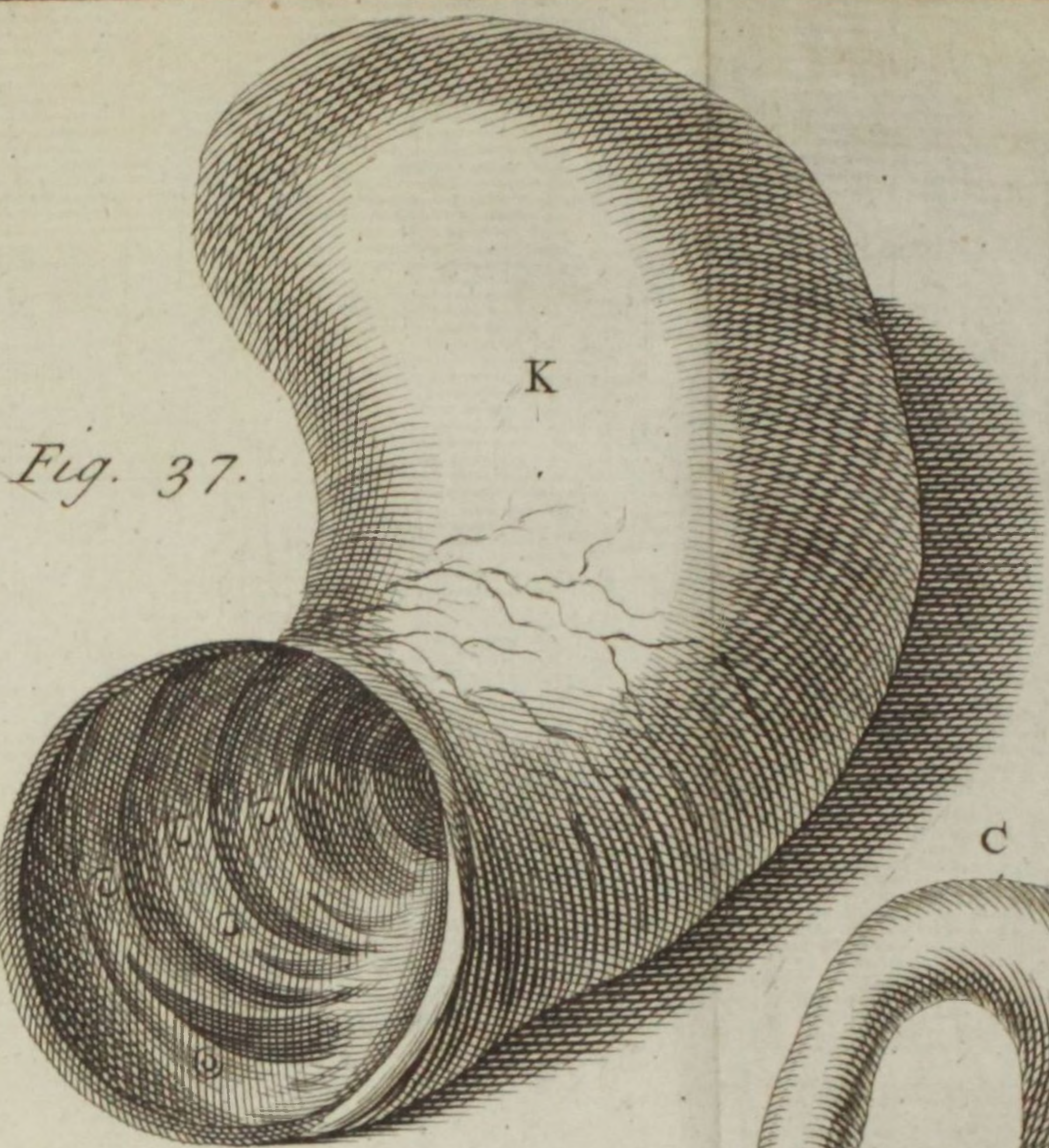


Fig. 37.

K

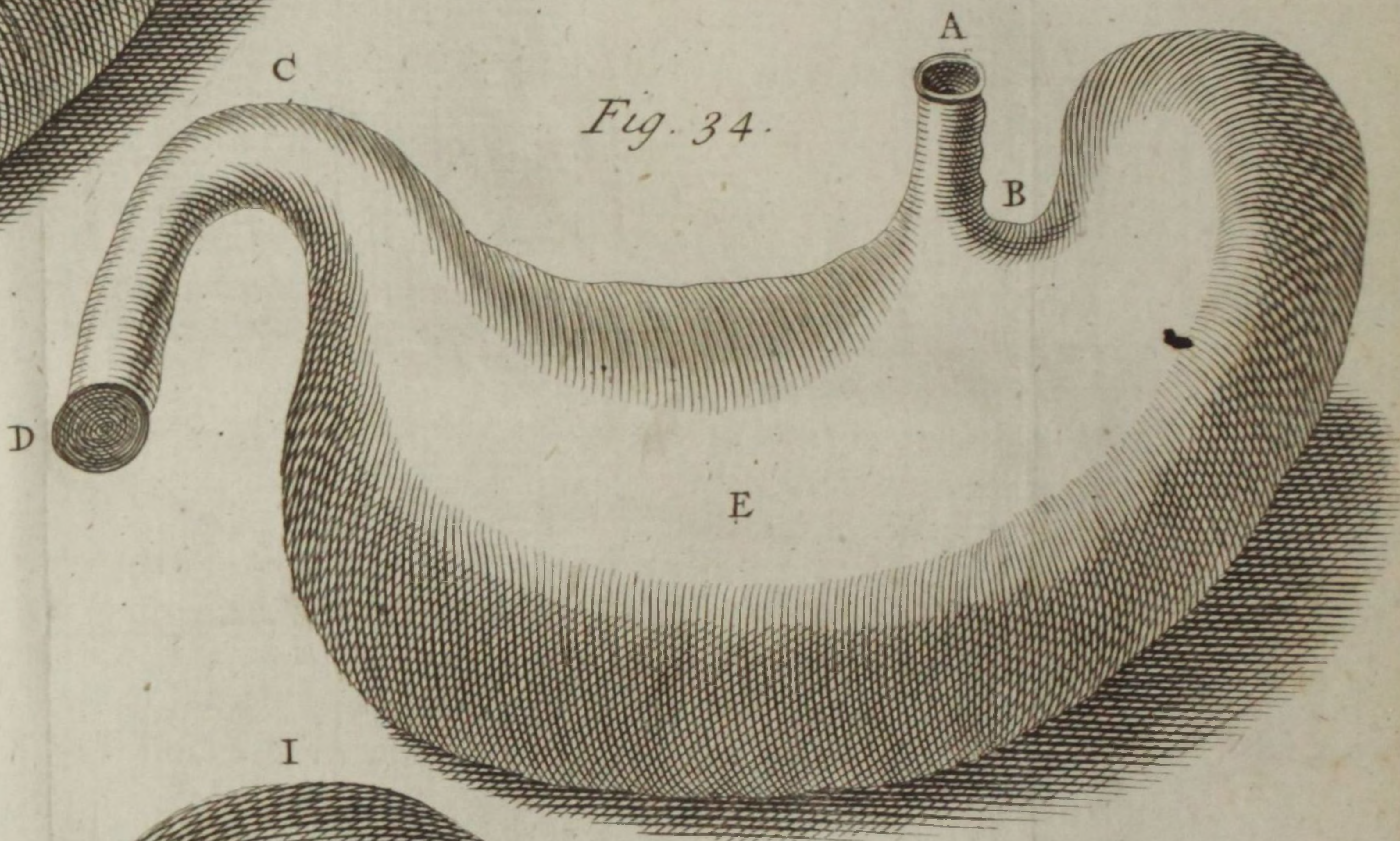


Fig. 34.

A

B

D

C

E

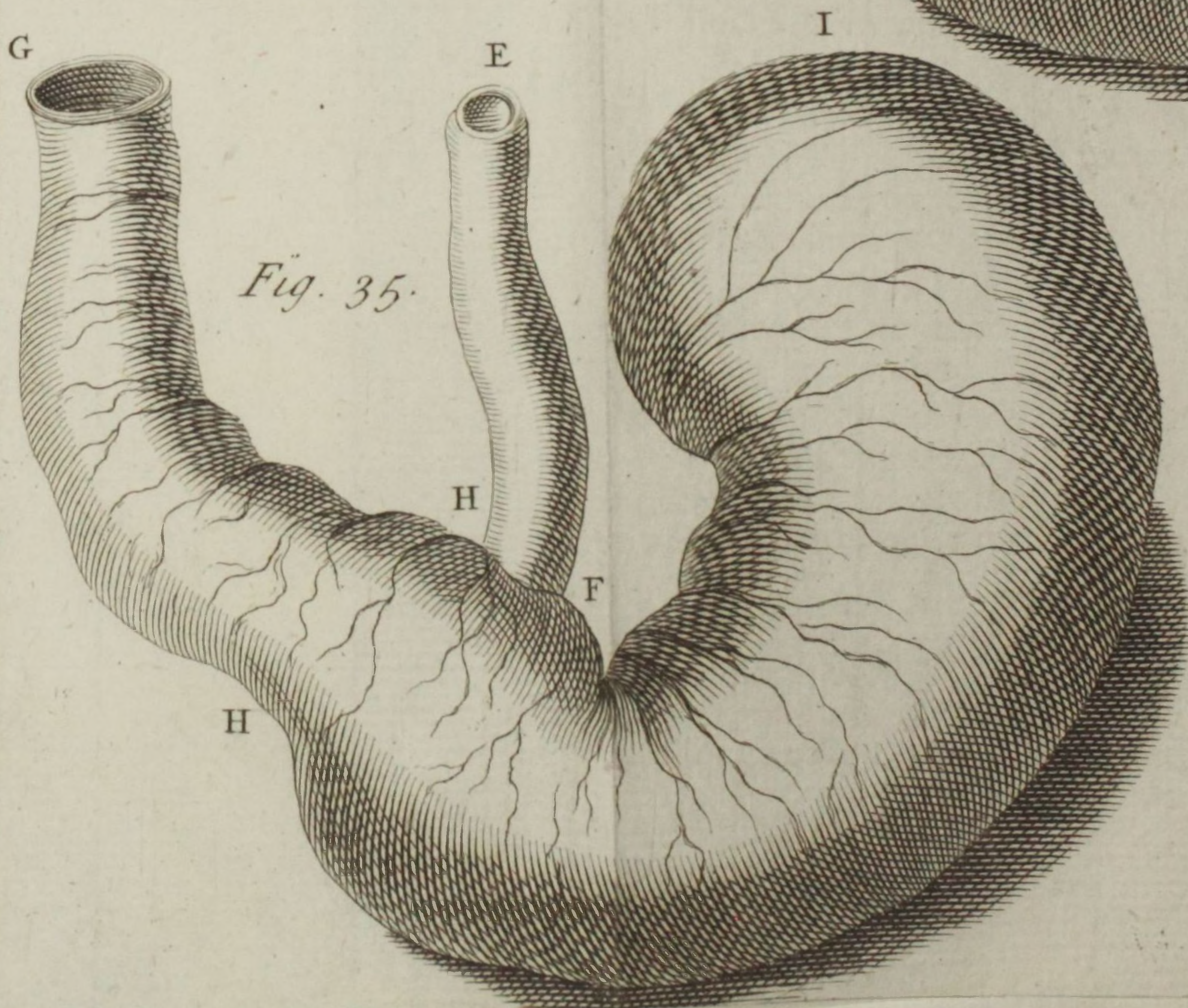


Fig. 35.

G

E

I

H

F

H

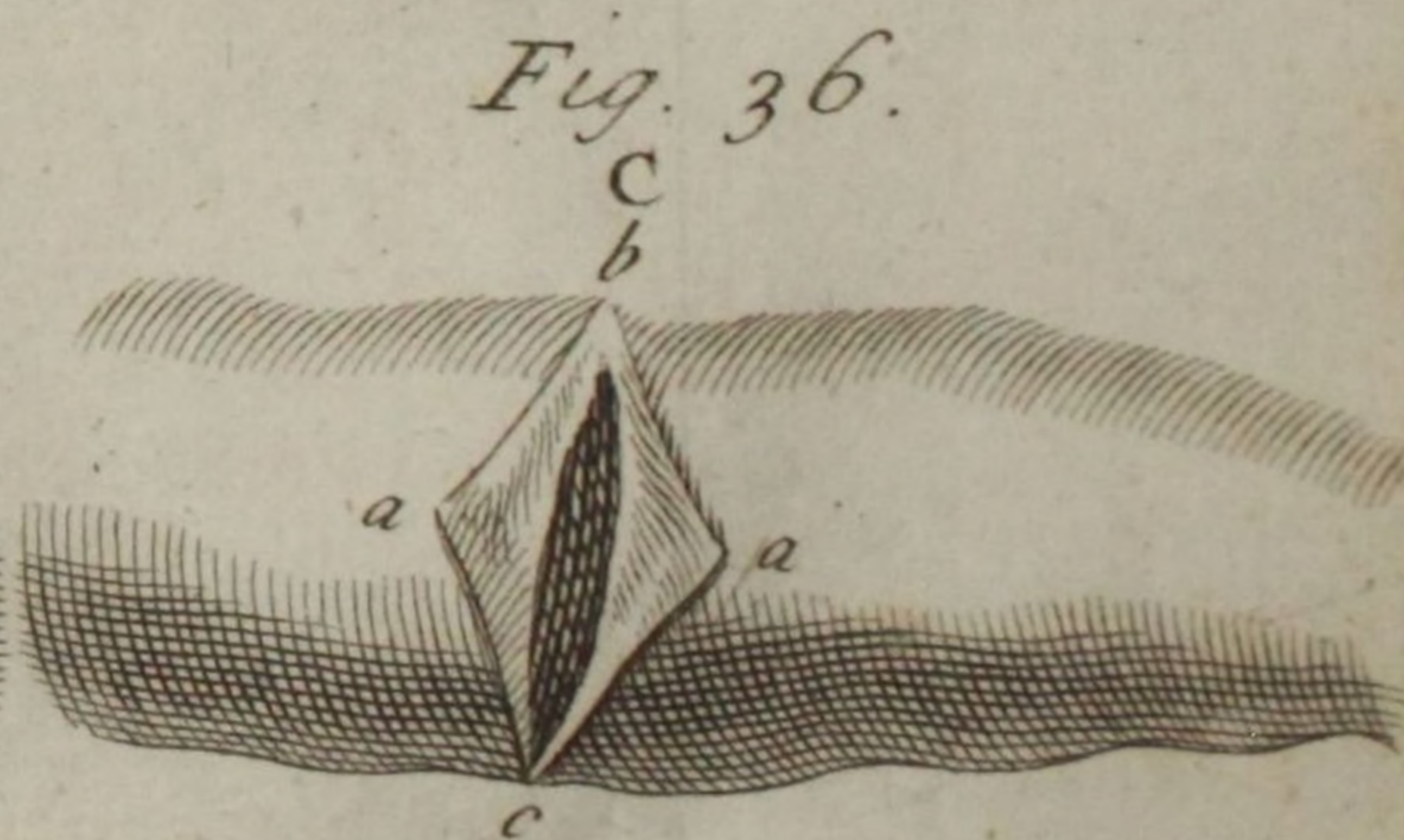


Fig. 36.

c

b

a

a

c

Nourishment. As this Duct proceeds with equal Thickness, it is once reflected and retorted before it enters the other, *c, c, c, d.* which is of a dark brown Colour, much broader and tenderer than the first, flatted, membranous, covered with very fine Coats, wrinkled like a Swathing Cloth, then runs into transversal and winding Sinews, and extends in a strait Line to the *Anus*. The inner Coat of this Canal seemed somewhat rough, and as it were strewed with Dust. The contained Liquor was perfectly fluid, and of a faint, footy Colour.

Near the *Anus*, was fixed to the Skin, the End of a whitish, tender Vessel, which thence proceeded strait to the beginning of the alimentary Canal, where reflecting towards it's Origin, and again resuming it's first Way, after being contorted and implicated in many and various Windings and Curves, widens and straitens here and there, until at length becoming more and more capacious, it forms a little Bag, for which a whitish, fine, smooth, Canal, about an Inch long, covered with pretty thick Coats, piercing through the Skin, $1\frac{1}{2}$ Inch from the Mouth, prepares an Outlet, marked under the Belly with a Caruncle, *Fig. 40. c. Fig. 42. & 43, b.* This little Canal may be, not improperly, called the *Oviduct* or *Vagina*. Fig. 42, 43.

The Colour of these Parts is not every where the same; for of whitish at the Beginning, in the Progress it insensibly becomes darker: And at length, where the Vessel acquires a greater Volume, and especially where it stretches forth into the Bag, it is of a Chesnut Colour. And as far as this Chesnut Colour continues, the Vessel is thick stuffed with *Myriads* of Eggs, and therefore is to be called the *Ovary*.

The Eggs, whose Number is incredible, seen with the naked Eye, resemble a *Magma* of a brown Colour; but viewed through those Microscopes, which in the *English Apparatus* bear the second and third Number, they are of the Figure marked *a* and *b*. Fig. 44.

The Surface of the inner Skin, which inclosed the abdominal Contents, was all beset with small whitish Bladders, of different Figures and Bulks, pouring out a Lymph upon tearing them. These were in the Females.

Though the Integument of the Male be marked with annular Fibres, and as many Chesnut-coloured Lines as that of the Female, throughout it's whole Length, yet his external Shape differs from that of the Female. *First*, Because, as I have already said, he is much less. *Secondly*, Because, the third Hole, *viz.* that under the Belly, is wanting in the Male. *Thirdly*, Because the *Anus* of the Male is surrounded with a thick cartilaginous Membrane, of near an orbicular Figure, about a Line broad, externally convex, internally concave; on the Middle of which appears a Tubercle, divided by a fine Slit, which lets out the Excrements, and a very small capillar Process *k*.

The Cavity of the Belly contained a limpid Humour, the transversal Fibres, the alimentary Canals, and spermatic Vessels. Fig. 45.

The

The alimentary Passages had the same Situation and Structure as in the Female; the anterior Canal was of a whitish Colour, the posterior, or wrinkled one, of a pale brown.

The spermatic Vessels were very white, and slender, yielding, when wounded, a milky Humour. They are divided into two small Branches, hanging out of a vermicular Process (scarce an Inch long) which lies in the Belly, in that Place where the alimentary Canals are joined together, and leans on the Side of the wrinkled Canal, by the Help of the transversal Fibres. These Branches, in their Progress hence, creeping above and below the Canal of the Aliments, are very often reflected, intorted and folded; one at length freed from it's Windings, stretches away strait towards the *Anus*, into which it is inserted in the Shape of a pretty stiff Vessel; but the other, at the Side of the wrinkled Canal, being pressed, collected, and equally inflected, almost through it's whole Extent, by the transversal Fibres, ends in the opposite Side, by an Extremity pendulous in the Belly, not far from the *Anus*.

The inner Coat of the Skin, just as in the Females, is all covered with small whitish Bladders, turgid with Lymph, but less in Proportion to the lesser Bulk of the Worm.

Fig. 46.

We found under the wrinkled Canal a certain whitish Duct, marked with the Letters *b, b, b*, firmly connected to the aforesaid Intestine by it's finest Part; but whose Outlet, or Origin, the Tenderness of the Intestine, and Fineness of the Duct hindred us from tracing with Exactness.

The Figures of the Worms, drawn according to their natural Bigness.

Fig. 40. The Shape of a Female Worm; *a*, the Mouth of the Worm; *b*, the *Anus*; *c*, the *Vulva*; *d*, the Chesnut-coloured Lines, running along the Worm's Length.

Fig. 41. *a*, the Worm's Mouth; *b*, the alimentary Canal, which is white, carnous, &c. *c*, the alimentary Canal, which is brown and flattened, and whose Extremity is in the *Anus*; *d*, the Place where the Canals join; *e, e, e*, the transversal Fibres; *f*, the *Anus*.

Fig. 42. and 43. *a*, the Worm's Mouth; *b, b*, the first alimentary Canal; *c, c*, the latter alimentary Canal; *d*, the Place where these two Canals cohere; *e, e, e*, the transversal Fibres; *f, f, f*, the white Vesicles turgid with Lymph, with which all the inner Skin is thick beset; *g*, the *Anus*; *h*, the *Vagina*, *s*, the *Oviduct*; *i*, the Outlet of the *Vagina*, or the *Vulva*; *k, k*, the Ovary filled with innumerable Eggs; *l, l*, the preparing Vessels.

Fig. 44. The Eggs viewed through a Microscope; *a*, through the Microscope, N^o. 3; *b*, through the Microscope, No. 2.

Fig. 45. A Male Worm; *a*, the Mouth of the Worm; *b, b*, the whitish alimentary Canal; *c, c*, the wrinkled Canal of the Aliments; *d*, the vermicular Process of the spermatic Vessels; *e, e*,
Fig.

a Branch of the spermatic Vessels along the Side of the Intestine, compressed by the transversal Fibres, and inflected through it's whole Extent in an uniform Manner; *f, f, f*, the Windings and Turnings of the spermatic Vessels; *g, g*, the transversal Fibres; *b*, the cartilaginous Membrane surrounding the *Anus*; *i*, the small Slit in it's Middle; *k*, the very fine capillary Process; *m, m*, the small Bladders covering the Skin.

Fig. 46. A Male Worm inverted and dissected about the *Anus*; in Order to see with Ease the Duct lying under the alimentary Canal; *a*, the wrinkled alimentary Canal; *b*, the whitish Duct under the wrinkled Canal; *c*, the spermatic Vessels.

Fig. 47. *a*, vermicular Process of the spermatic Vessels; *b, b*, the Branches of the spermatic Vessels, freed from their Windings; *c, c*, the same Branches dissected.

XXIII. The external Maxillar Glands in Brutes are of the Conglomerate kind. They lie externally laterally (lengthways) on the lower Jaw, partly under the *Depressor Labiorum*, and partly under the *Buccinator*. A strong Membrane intervenes between these Glands and the Jaw on one side, and between them and the Buccal Glands on the other side. They are more or less red (like the *Pancreas*) according to the quantity of Blood that remains in them, otherwise their Substance is white.

Of the external Maxillar, and other Salivary Glands: And of the Insertions of the Lymphatics into the Veins; By Richard Hale, M. D. F. R. S. No. 364. p. 5.

These Glands receive Arteries from the external Carotids, Veins from the external Jugulars, and Nerves from the third Branch of the *Par Quintum*.

The Number of excretory Ducts from these Glands, is not always the same, in the same species of Animals. In Cows generally fourteen are discovered by the Probe. Their Orifices are valvular, about four times less than their Ducts. Every Duct is about half an Inch from the next. Those in the middle of the Glands are largest, because the Glands are there broadest and thickest. The Ducts do not communicate with one another, nor with the Buccal. Every Duct is made of lesser Ducts united, which rise from the Lobules (thro' the whole substance of the Glands) which constitute each distinct Lobe and has the same Structure as the Pancreatic Duct. Each Lobe is depressed on it's sides, where it is joined to other Lobes; and between the Lobes many Buccal Glands are interspersed.

In Calves seldom more than six or seven Ducts admit any Probe; when the Animal grows older, the Ducts appear more plain and open.

In Sheep six excretory Ducts are always found in each external Maxillar Gland.

In Dogs and Cats, &c. these Ducts are fewer, in proportion to the smallness of the Glands. 'Tis observable that these Ducts in Dogs open obliquely towards the Mouth, whereby the *Saliva* may be better mixt with the Food in Mastication; which might be swallowed



lowed unmixt from another Structure of Ducts, in these Animals that swallow greedily.

Dr *Wharton* * first mentions the external Maxillar Glands. What he says of them, is applicable only to their appearance in Men, in which Subjects they are of the Conglobate kind, and very small, unless in Scrophulous and Venereal Cases. 'Tis plain that he had not seen them in Brutes; for in his Figures (which were drawn from Brutes) no notice is taken of these Glands. He describes them as very small and calls them Emunctories of the Nerves, which was the Notion (in his time) concerning the use of the Conglobate Glands; and the Saliva was said † *è Nervoso Genere profundi*.

‖ *Steno* justly blames *Blasius* for ascribing to the external Maxillars an Excretory Duct opening into the Mouth, like the common one from the Parotid Gland. Yet *Steno* (otherwise very accurate) does not truly describe these Glands, nor distinguish them from the Buccal, tho' they are as distinct from the Buccal, as the Sublinguals are from the internal Maxillars. *Steno* divides his Buccal into 3 Parts. The large Ducts in a Line rise from the external Maxillars; and how distinct these Glands are from the Buccal appears plainly in *Fig. 54, &c.* *Steno's* 2d part of the Buccal, † *intra quæ, & in mediâ parte*, are marked *e e*, in *Fig. 51. quæ alias, &c.* higher are the same *e e*, among the *Papillæ*. The third Part *quæ à superiore descendunt*, are *a b c d*.

The external Maxillars differ from the Buccal, in bigness, figure, structure, particular number of Ducts, colour, &c. The Buccal, Labial, internal Maxillar, and sublingual Glands, are of a yellow Colour; besides the Buccal are separated from the external Maxillars by a strong Membrane. Indeed many of the Excretory Ducts of the Buccal Glands open near the Ducts of the Maxillars (from whence *Steno* confounded these Glands) but they do so likewise round his own Ducts from the Parotids, and some Ducts from like Glands open near the Sublinguals, as also about *Nuck's* Ducts, in which places the Buccal Ducts are most numerous.

In short, there is a very great Number of Excretory Ducts dispersed all over the Membrane, that invests the Mouth, *Fauces, &c.* which rise from Glands that lie under this internal Membrane. These Glands are more numerous in some Parts than others, and receive different Names, according to the Part they belong to; as Labial, Buccal, Palatine, &c. But these are small Glandules with one Excretory Duct, and tho' they separate Saliva like the large Conglomerate Glands, Parotids, Maxillars, &c. yet they differ from these in Constructure, one common Excretory Duct, &c. Whereas the external Maxillars differ from all the other Glands of the Mouth, *viz.* by many ways from the Buccal, besides their Colour; in which particu-

* *Cap. 21.*† *Cap. 21. pag. 134.*‖ *Obs. Anat. p. 14.*‡ *Pag. 18. lar,*

Fig. 38.

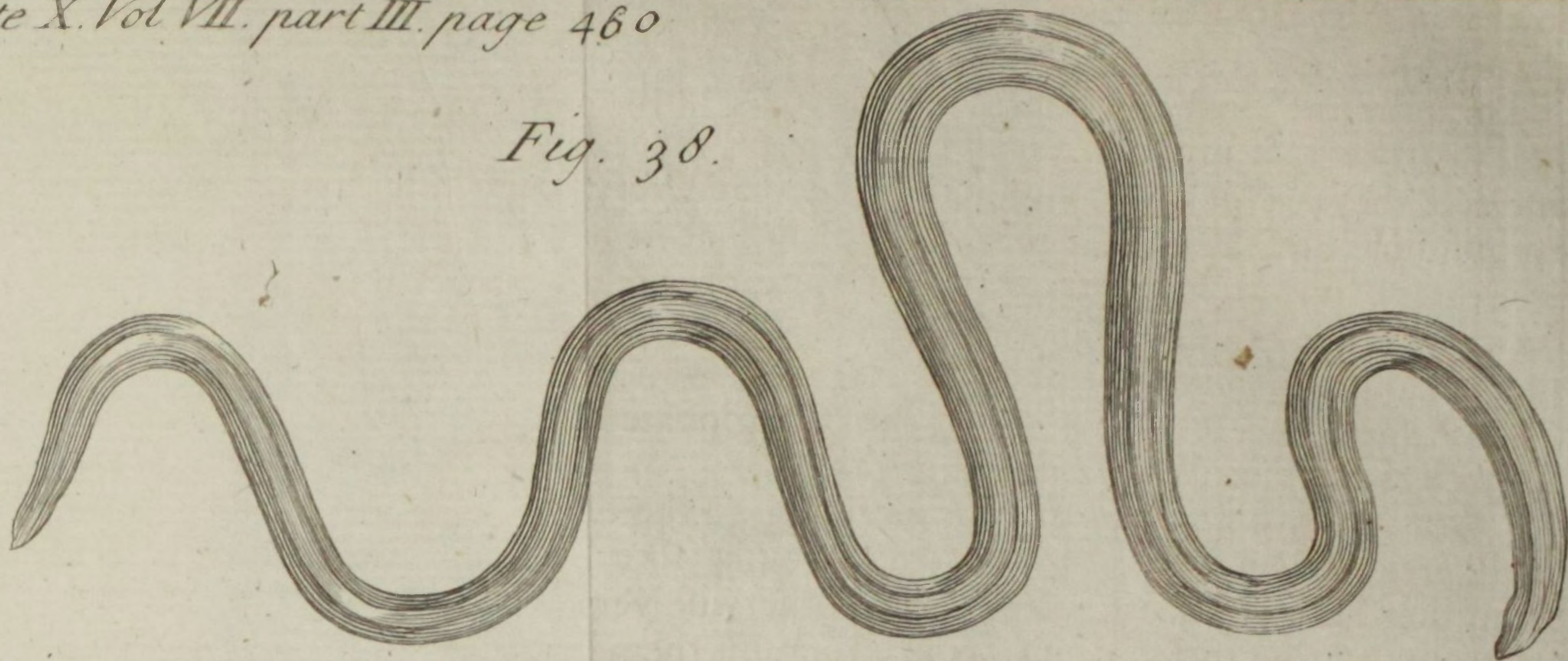


Fig. 39.

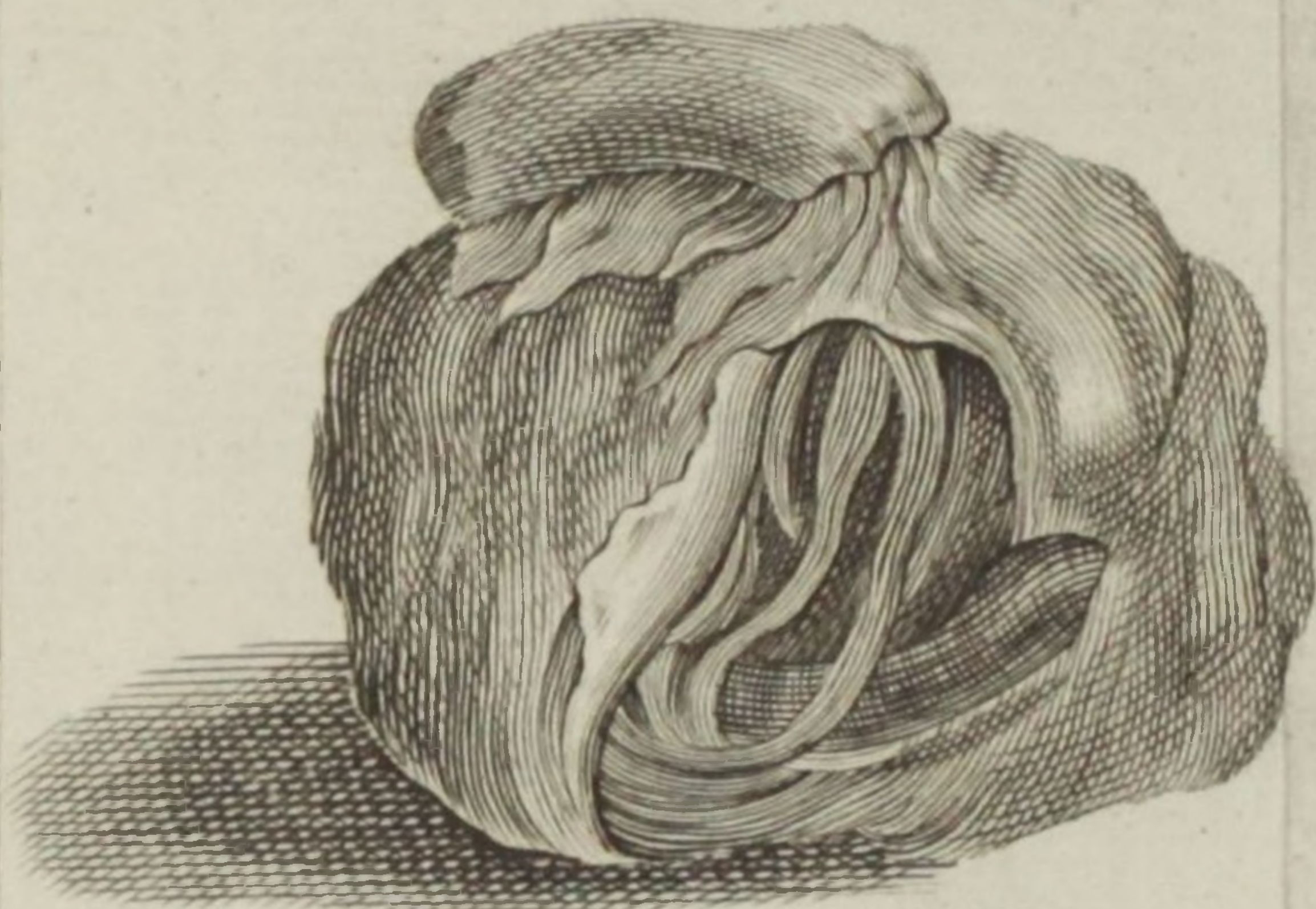


Fig. 47.

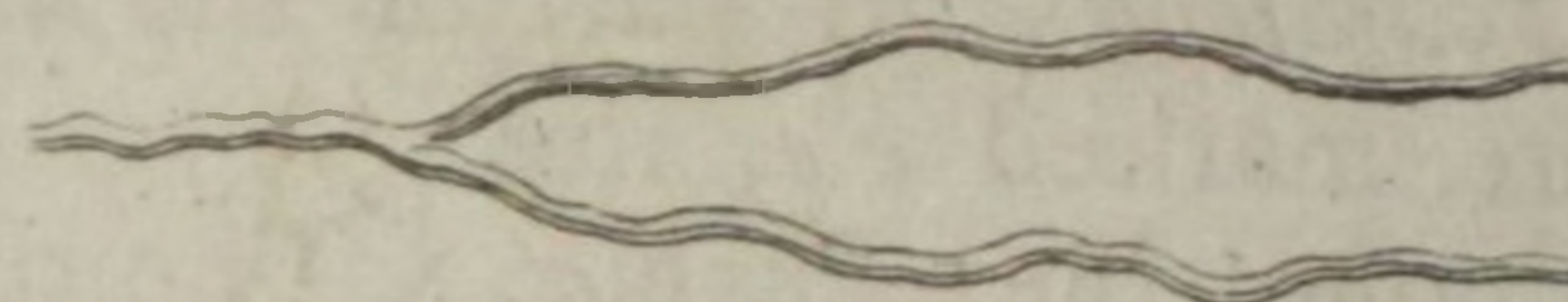


Fig. 40.



Fig. 41.



Fig. 42.



Fig. 43.



Fig. 44.

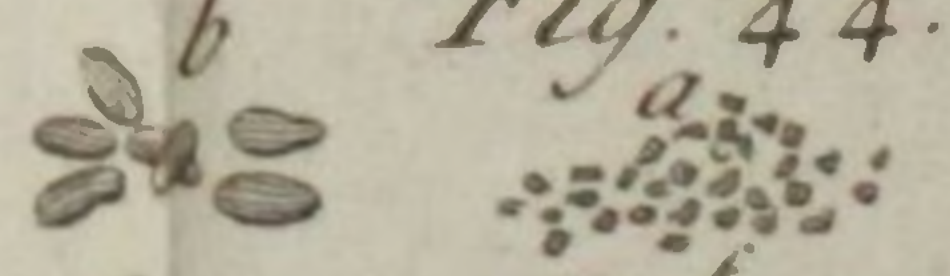
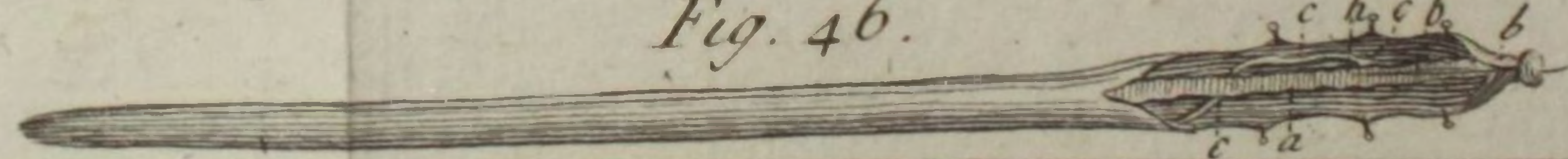


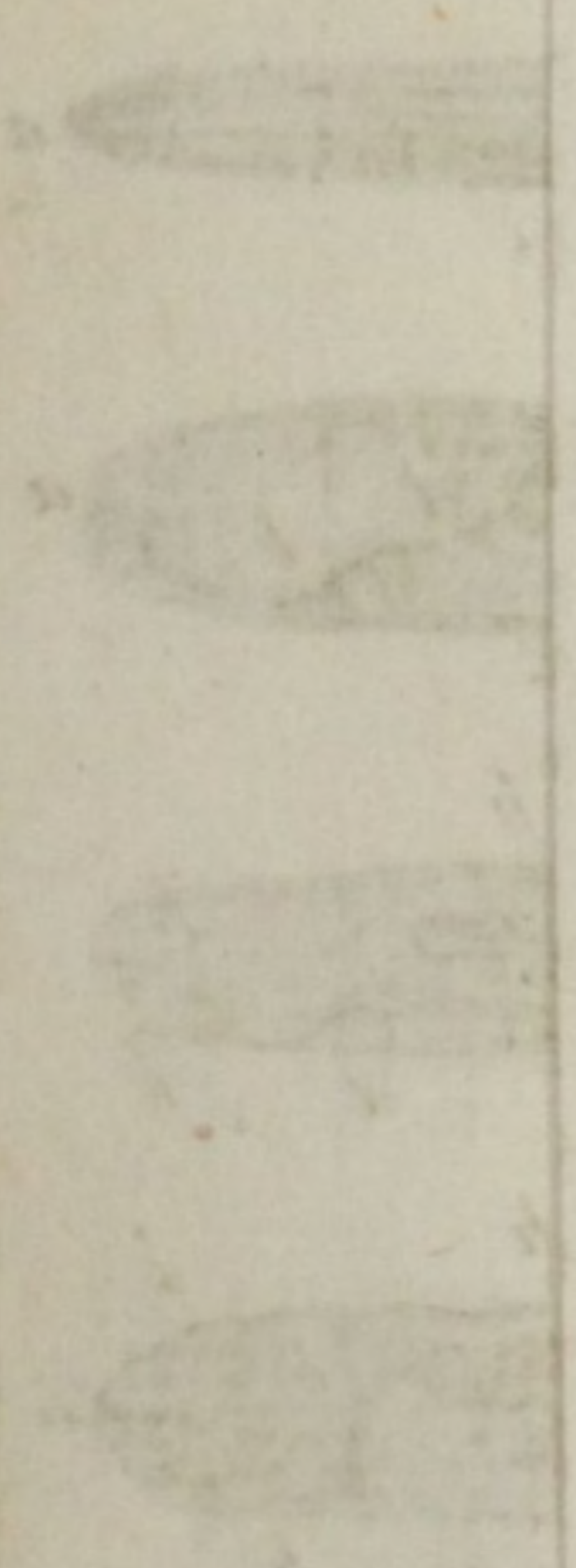
Fig. 45.



Fig. 46.



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lar, they are also distinguished from the internal Maxillars and Sublingual Glands; they differ also from these as well as from the Parotids, in having a great number of common Excretory Ducts. This number of Excretory Ducts was not observed by *Steno*, nor did he know that these Ducts in the same Line, were the Excretory Ducts of large Conglomerate Glands (like the Parotids) distinct from the Buccal.

Bartholine * mentions the external Maxillar Glands, but does not describe them. *Nuck* † only gives them a Place in his Catalogue of Glands, but takes no farther Notice of them, though he writes a || Book chiefly about a new Salival Duct rising from a Gland, that is found in no Animal besides a Dog.

Mr *Cooper* had never seen these external Maxillar Glands, as appears by a Letter of his (now by me) written above twenty Years ago, in answer to one I sent him upon the first discovery of these Glands. The external Maxillars in Men (of the Conglobate kind) are marked *g* in the first Figure of his *Myotomia Reformata*.

The Ducts of the external Maxillar Glands are opposite to the Orifices of *Steno's* Ducts; from which Glands and Ducts, as also from the Buccal, Labial, and Gingival Glands, the Saliva flows from all parts of the Mouth without the Teeth. From *Wharton's* and the Sublingual Ducts, from the Tonsils, *Fauces*, *Fretum Stenonis*, Gingival, Lingual, and Palatine Glands, the Saliva is derived, from the upper and lower, former and hinder parts of the Mouth within the Teeth.

What has been said of these Salivary Glands, &c. will be best understood by the following Figures which were drawn for me in October, 1697, by Mr *Burghers*, and have been lately compared with the Parts themselves in Cows, Calves, &c. These Figures are part of many more taken from Preparations at the same time, which were figured in the same Order as drawn. This is the Reason that the Cuts are marked in this manner, and it cannot be of use to alter these Marks and Numbers.

The Insertions of all the Lymphatic Vessels into the Veins can be discovered but in few Subjects, and no Figure as yet been given of them.

These Figures shew the Course of the *Lympha* both below and above the Subclavians in Men, and Axillars in Dogs. The *Lympha* below the *Receptaculum Chyli* is conveyed from all the inferior Parts by a great Number of small Lymphatic Vessels, which uniting with others obliquely above the Valves, become bigger in proportion, till at length they constitute two large Trunks near the Emulgents, which are the *Pedunculi* or Beginnings of the *Receptaculum Chyli*. The *Lympha* from the Parts above the Subclavians, is derived in like manner from lesser Lymphatics, to the common Ducts that are here delineated.

* Pag. 542.

† Adenol. p. 5. n. 11.

|| Sialog. p. 15. 158.

I know *Pecquet* has given a Cut of the Thoracic Duct in a Dog; which Duct is double from the Receptacle, and is inserted by four Branches into each Axillar. I believe with * *Bartholine*, (who has borrowed this Figure from *Pecquet*) that such an Insertion is a *Lusus Naturæ*. For though the Thoracic Duct may be double, and is sometimes divided into two Parts near the Subclavians, yet generally it is single, the *Lympha* from all Parts on both sides the Body being carried by proper Lymphæducts into one common Thoracic Duct, that conveys this Liquor, together with the Chyle from the Lacteals, into the left Subclavian Vein, by one, three, or more Branches. For there is as great a variety in the number of these Branches, as in the places of their Insertion.

Mr *Cowper* injected the Thoracic Duct in a Human Subject, and has given a Figure of that Preparation in his Book of Anatomy. But this Figure is imperfect, and the Insertion of the Thoracic Duct so ill drawn, that little can be learnt by it. However, no Anatomist has given any Cut, that demonstrates the Insertion of the Lymphatics from both Arms and both sides of the Head, &c. above the Subclavian Veins, which appear so plain in these Figures, that no Description can make them plainer.

Explanation of the Figures.

Fig. 48.

Fig. 48, 49, and 50. Demonstrate the Passages, or Vessels, by which the Chyle and *Lympha* pass into the Veins of a Dog.

12. 12 Those Lymphatics that bring *Lympha* from the Thighs and lower Parts. 13. 13 Are lateral Lymphatics arising from the Groin, Testicles, and neighbouring Parts. 14 The Receptacle of the Chyle. 15 An Indenture in the Receptacle, through which passes one Tendon of the Diaphragm. 16 Lymphatics from a neighbouring Gland. 17 Some Lymphatics from the Diaphragm. 18 An Artery that serves the Loins, and runs through a Division of the Receptacle. 19 The *Pancreas Asellii*. 20 The *Vasa Lactea 2di Generis*. 21 The beginning of the *Ductus Thoracicus*. 22 Some Divarications of the *Ductus*. 23 The Continuation of the *Ductus*, and its progress. 24 The *Aorta Descendens*. N. B. 18, 24. by their Pulsation (and the Tendon at 15) much promote the Ascent of the Chyle and *Lympha*.

Fig. 49.

25 A common Divarication of the Duct. 26 A Lymphatic from some neighbouring Gland. 27 A double Lymphatic from the secondary Gland 42, in Fig. 50. 28 That part of the *Ductus Thoracicus* where both its Branches, and the Lymphatics from the left side of the Head and left Fore-Leg meet. 29 The Lymphatics from

* Barth. p. 616, and 620.

the left side of the Head and left Fore-Leg united; they lie on the inside of the Vein. 30 A Lymphatic with a Pin in it from a neighbouring Gland, perhaps the *Thymus*. 31 A Lymphatic from the Neck, &c. it is divided and enters the Jugular by two distinct Branches under the *Sacculus* 43. 32 The Lymphatic from the right side of the Head. 33 The Lymphatic from the right Fore-Leg. 34 The large *Sacculus*, or Receptacle of the *Lympha*, on the right side, that receives all the *Lympha* on that side, and conveys it into the Jugular. 35 The *Cava Descendens*, 36 The *Vena Mammaria*, which is sometimes single. 37 The *Venæ Subclaviæ*. 38 The *Vena Vertebralis*. 39 The Axillars. 40 The Jugulars. 41 The right internal Jugular not injected.

Fig. 50, is *Fig. 49* reversed, the Duct, &c. being turned up, that the Insertion, both *Sacculi*, &c. may be better discovered. This is to be explained by the preceeding, and has only from 42 to 44 more Figures than the upper part of *Fig. 49*. has; all which are already taken notice of.

N. B. In this Subject the Chyle and *Lympha* are emptied into the Jugulars, and not into the Axillars; they are sometimes emptied partly into the Jugular, and partly into the Axillar, or Subclavian. In Men generally into the Subclavian.

42 A small secondary Lymphatic Gland on the back part of the top of the *Thorax*. 43 The *Sacculus*, that receives all the Chyle and *Lympha* from the whole Body (except 30, 31, 32, 33, 34.) and discharges it into the Vein at least we know of no other Lymphatics that any where else enter into the Veins. 44 A Lymphatic, (or Membrane, for it was not injected) that joins 29 to the largest Branch of the *Ductus Thoracicus*.

Fig. 51, represents part of the left Cheek of an Ox, separated from the lower Jaw-bone, with the external Maxillar Glands, it's Ducts, &c.

1, 2, 3, &c. to 14. Bristles inserted into the Ducts of the external Maxillary Gland *lll*. These Ducts open sloping into the Mouth, for the better mixture of the *Saliva* with the Food. 15 The Duct 3 injected with Wax, to discover it's Division and Bigness, in respect of the Orifice. 16 A Lobulus of the Maxillar Gland. It's excretory Duct is filled with Wax, and ends at 15. 17 The Duct 1 laid bare and opened, to shew it's large Cavity, &c. *AA*, Part of the Muscles and Fat, &c. belonging to the lower Jaw. *BB*, Part of the internal Membrane that invests the Mouth. *abcd*, Bristles in those Ducts of the Buccal Glands, *nn*, that I could pass any into. *eee*, Those Orifices of the Buccal Glandules, that were too little to admit Bristles. *kkk*, The *Papillæ* on the inside of the Mouth. *lll*, The Lobes that constitute the external Maxillar Gland. *mmm*, The Orifices of the Labial Glandules *pp*, that were too small for passing Bristles. *nnn*, Buccal Glandules interspersed between the Lobules

of the Maxillar Gland. *n n n* near *r r r*, Part of the Buccal Glandules, where they appear thickest, and are raised to discover the Ducts *r r r* running under them. *p p p*, The Labial Glandules like the Buccal. Mr Cowper in *Fig. 4.* letters them *H H.* *r r r*, the Ducts marked 6, to 14. as they appear under the Glandules *n n.* *N. B.* The same Numbers and Letters express the same Things in the following Figures.

Fig. 52.

Fig. 52 Exhibits part of the left Jaw-bone and Cheek of a Sheep, where the Bristles 1, 2, 3, &c. shew the constant number of excretory Ducts from the external Maxillary Gland in these Animals.

Fig. 53.

Fig. 53 Shews part of the right Cheek of a large Dog, taken from the lower Jaw-bone.

f, The Orifice of *Steno's* Salival Duct. *g*, The Orifice of *Nuck's* Duct, which rises as a *Papilla* on the Membrane *B B.* *b*, *Nuck's* new Duct, not found in Men, Oxen, or Sheep, but in Dogs, their Orbit not being entirely bony. *i*, *Nuck's* Gland. *o o o*, The Orifices of some excretory Duct, belonging to the external Maxillar Gland, that were too strait for the admission of Bristles. *q q*, The Teeth. In this Subject they are the Teeth of the upper Jaw; near the second of which, the Orifice of *Nuck's* Duct appears.

Fig. 54.

Fig. 54 Demonstrates the back part (next the Cutis) of the external Maxillar Gland of the same Dog, as it is beset with the Buccal Glandules.

Fig. 55.

Fig. 55 Explains the external Maxillar Gland in the right Cheek of a Cat. In this Subject I could only probe two Ducts, 3, &c. would not admit Bristles.

Of the Membranes enclosing the Fasciculi of Fibres, into which a Muscle is divided.

By Mr. Leeuwenhoek, F. R. S. Translated by Dr Sprengell. No. 367. p. 129.

XXIV. In cutting off several thin slices from a piece of Beef; whenever I cut the fleshy Fibres through transversly, I could plainly discover the Membrane, as it is commonly called, which envelopes the fleshy Fibres, and especially the larger *Fasciculi* of them, as they run lengthways along the Muscle. Between these *Fasciculi* the Membrane is of a considerable thickness, but spreads out every way into Ramifications exceeding small, I had observed some Weeks before, that this Membrane was composed of an inconceivable number of very small Vessels, which were plainly to be discerned not only where the Membrane appeared of some considerable breadth, but even where it was not so broad as a single Muscular Fibre; but how far this held, I could not determine, forasmuch as these small Ramifications of the Membrane, did again spread themselves into other Ramifications so exceeding fine, especially where they enclosed the single Muscular Fibres, that they were in a manner invisible even through my best Microscopes.

The very small Vessels, which compose this Membrane, (as it is called) are doubtless framed to convey some nutritious Juices, yet they are so small, that the Globules of Blood cannot pass through them.

That

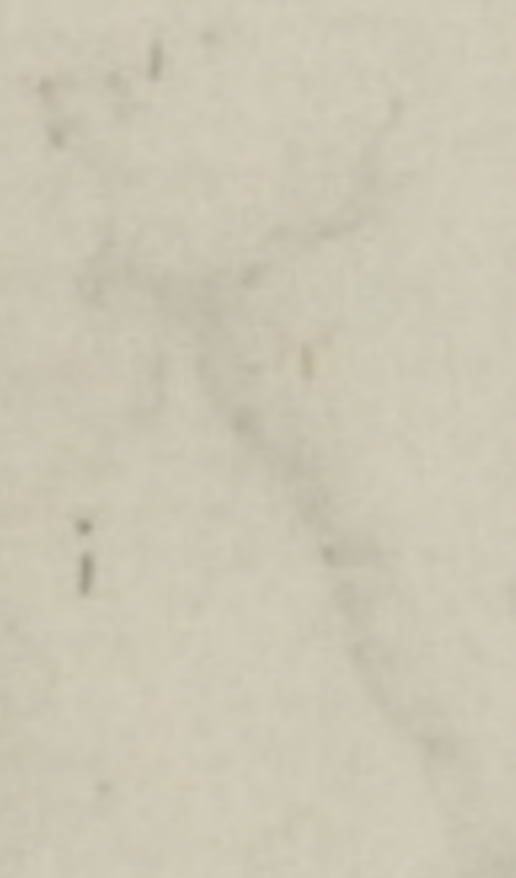


Fig. 48.

Fig. 49.

Fig. 50.

1771



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That this might be the better understood, I caused a small piece of the Membrane to be designed, *A, B, C, D*, which, with the adjoining fleshy Parts, is cut through transversly, and since it was impossible for the Designer to draw the extraordinary number of Vessels, which composed it, on Account of their being so exceeding small, he has represented them only by Points. Fig. 56.

Although in my former Letters I gave some Draughts of the Carnous Fibres cut through cross-way along with the Membranes, yet for the Satisfaction of those who have not seen my other Letters, I have given them here another Draught of the same, between *E, F, G*, and *H, I*.

These carnous Fibres, when wet, lay so close to each other, that the space between *EFG* and *HI* was quite filled up; but when dried, the Fibres were so shrunk, that one might see such Spaces between them as are here delineated.

Now as we see, upon the drying of the Membranes *AFG*, and *D, E, G*, with the Muscular Fibres between them, what a number of small Ramifications proceed from the Membranes, as is here represented between the Muscular Fibres; we must not imagine, that these Ramifications proceed only from the Points here represented, but that they are continued the whole length of the Fibres, and subdividing themselves into still finer Ramifications, they enclose every single Fibre in the whole Muscle.

Amongst several pieces of Flesh, where the carnous Fibres were cut transversly, I happened on one piece with it's Branches so plain, that the Membranes and Fibres looked like so many Boughs of Trees, with the Leaves on them, *K, L, M, N*, where *M* shews the so called Membrane torn off from another, as also how many Branches it runs into, and the many Fibres it covers. Fig. 57.

All these carnous Fibres, with the so called Membranes, lay very compact together, when I cut them off from the piece of Flesh, as likewise when I laid them on the Grass, and moistened them; but as the moisture dried away, they shrunk again, in the manner here represented, and although the Designer could plainly distinguish the small Vessels which were cut thro', the largest of which appeared at *M*, yet he was obliged to mark them only with Points. Here you may observe, that all the carnous Fibres, having been closely tied together by the said Membranes, by which they were enveloped, which are nothing but a congeries of Vessels, could not be separated from each other upon drying, but by tearing asunder those Membranes.

The carnous Fibres along with the so called Membrane, *K, L, M, N*, do not take up so much room, but that a grain of Sand may cover it, and yet one might very distinctly observe, in some of those carnous Fibres, the parts of which they were composed.

This Observation I was resolved to pursue in the Flesh of a Whale, of which I had kept two pieces by me, for about 7 or 8 Years, of
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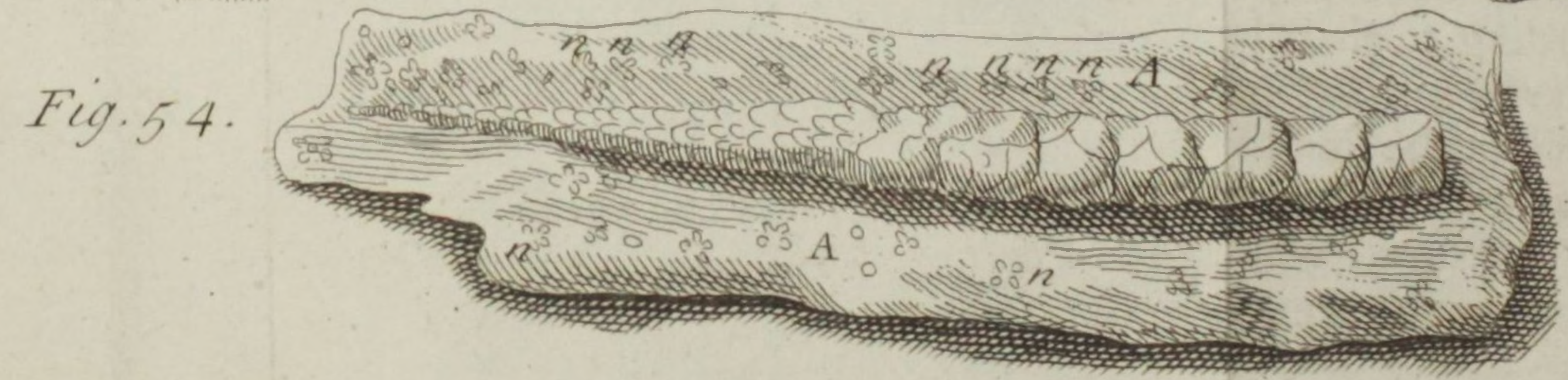
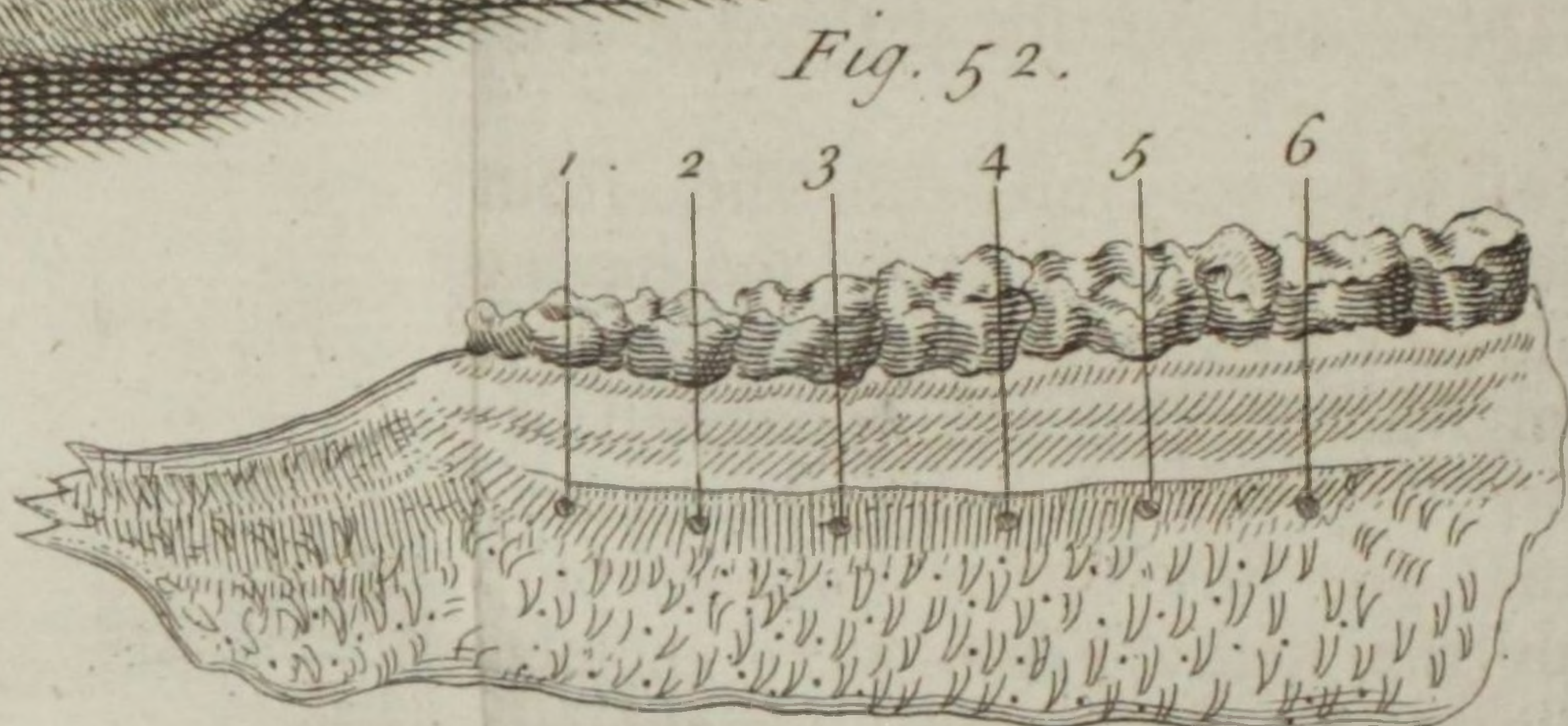
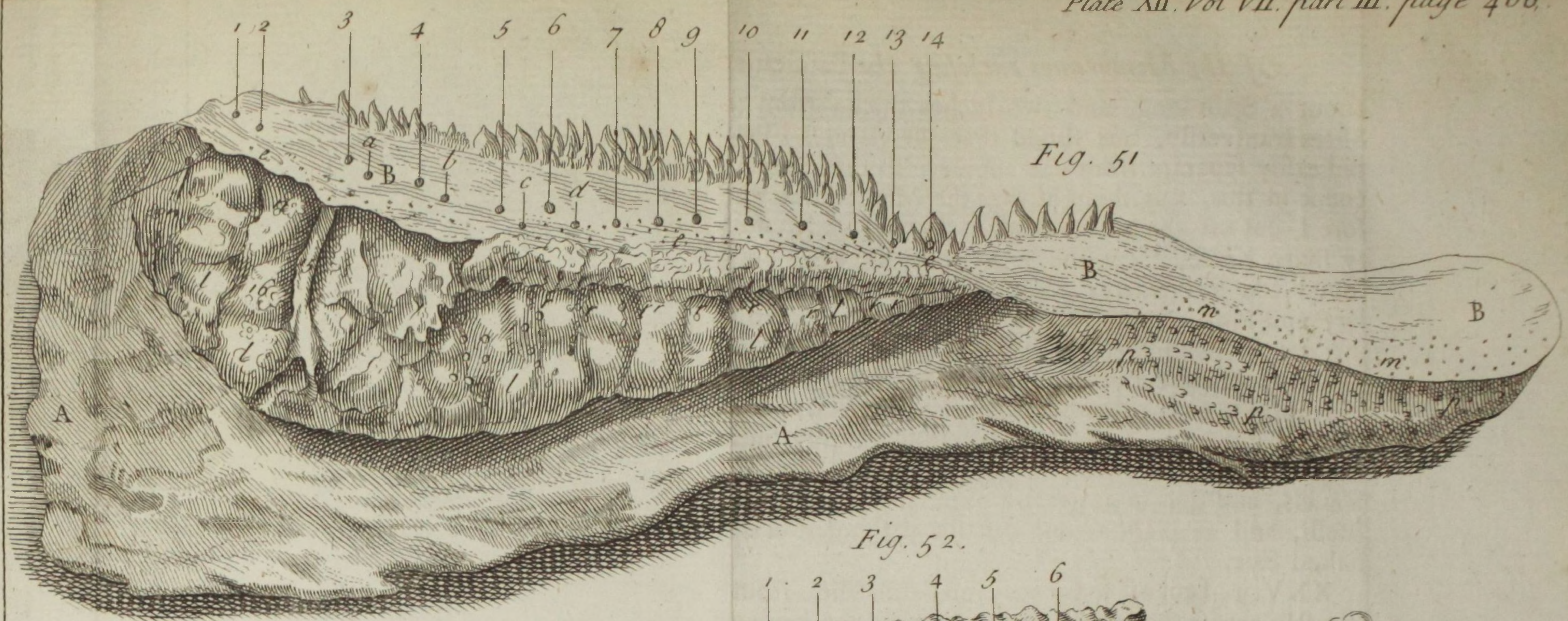
about a Span long, and two Inches thick; from these I cut several Slices transversly, but found that the carnous Fibres so cut through did easily separate from one another, so that I could not find my Account in this, but thought that the Membranes were rotten. Therefore I cut off the outside with a Table Knife, and then with a very sharp Knife, I cut the inner part into very fine Slices, and there I found the Excrements of Mites, which were very small, but globular, and some of them as small as I had ever seen before, and so going on, I found these Excrements every where, especially where the Membranes were thickest; then looking into such places where the Membranes were thinnest, insomuch that I was satisfied, that a Mite, though just come from the Egg, could hardly find room there, there it was that I discovered in the so named Membranes, the aforesaid Vessels, and that in as great a number as I had seen them in the Ox's Flesh, and as plain as one can see the holes in a Thimble with the naked Eye.

Of the Muscular Fibres of different Animals, by the same. N^o 367. p. 137.

XXV. 1. I cut off some very small thin Slices from the Flesh of an Ox, directly across the length of the Fibres, and having placed them upon Glasses, and moistened them with clean Rain-water, I observed them with a very good Microscope, and continued viewing them so long, that the fleshy Fibres began to grow dry. I then saw, that in some Places the exceeding small and fine Vessels, which compounded the Membranes, wherewith the fleshy Fibres were enclosed, were broken off from the fleshy Fibres, by the unequal shrinking of the thin slice of Flesh upon the Plate of the Microscope. I saw at the same time some other of these small Vessels, which were something stronger than the former, and were not broken off from the fleshy Fibres, but yet were stretched and drawn from them to the distance of the Diameter of a Blood Globule. I saw likewise some fleshy Fibres, which adhered so close to other Fibres, that the small Vessels of Communication were not broken off or stretched, so that nothing was to be seen there, but only the Membrane encompassing the Fibres.

I likewise placed before the same Microscope several other carnous Fibres, which I had separated according to their length from the Flesh of an Ox. In each of these I observed a great number of extremely small Apertures, by which I judged that the small Vessels of the Membranes had entered the Fibres; which Vessels having been moistened with Water, as soon as the little moisture, which had been left in those Apertures, was evaporated, I could see them very plain and distinct.

Now since of late two Persons of Note, have maintained, that the Blood circulated through the carnous Fibres; in order to examine into the Truth of this Hypothesis, I pricked my Thumb with a fine Needle, and placed a little Blood upon the Glass, where the carnous Fibres lay with design to observe with my Microscope, what was the proportion



portion between the Diameters of a Globule of Blood, and of the abovesaid Apertures, which I had seen in a Fibre.

While I was employed in these Observations, in came my Painter, who for these many Years has drawn all my Discoveries, and not being willing to trust too much to my own Eyes, he being much younger and better sighted than I, I placed before him the small Apertures in the Fibres, which he said was plain enough to be seen, and when he had viewed them to his Satisfaction, I placed before him likewise the Globules of Blood, which lay together in great numbers, and yet so distinct and separate one from another, as one shall seldom see them. I then asked him, what he thought to be the proportion between the Diameter of a Globule of Blood, and the Diameter of one those Apertures in the fleshy Fibre. After a little pause, he gave me for answer, that the Diameter of a Blood-Globule, was four times as large as the Diameter of one of those Apertures. If so, then according to the known Rule, a Globule of Blood must be divided into 64 parts, before it can enter through one of these Apertures into a fleshy Fibre.

This Discovery appeared to me very wonderful; and I am apt to think, that it will be very difficult to penetrate any deeper into the hidden Structure of the Muscular Fibres, and the manner by which they receive their Nourishment.

Having committed these Things to Paper, my Thoughts ran again upon the Muscular Fibres; and considering what I had said formerly concerning them, that they were composed of long, small Filaments, now I was not satisfied therewith, and therefore endeavoured to discover, whether these small Filaments, which compose a carnosus Fibre, might not really be so many small Vessels. With this design, I took part of the Flesh of a Whale, which I had kept some Years by me, and cut it into very thin Slices directly across the Fibres, and having moistened these thin Slices with fair Water, I placed them upon several Glasses, and before several Microscopes, when I observed that what I had formerly taken for small Threads or Filaments, were in reality exceeding small Vessels. I then cut part of the Whale's Flesh lengthwise, in order to discover the Vessels, which convey the nutritious Juice out of the Membranes into the Muscular Fibres, which Vessels then appeared to me in great Plenty and very distinct.

I afterwards took another piece of the Flesh of a very fat Ox, which I cut through transversely, and looking upon it with some of my best Microscopes, I could plainly see, that how small soever these Fibres were, they were still vascular, for I could see the Light through the Apertures of these Vessels, as I had done before in those of a Whale; but if I happened to cut the Fibres never so little obliquely, instead of cutting them directly across their length, the Light was not to be seen through them.

Of the Muscular Fibres of different Animals.

I had in a Drawer the hind Quarter of a Mouse, which had lain there some Years; from the largest Muscle of which I cut off transversely some small Slices, as thin as possible I could. Then placing these before my Microscope, I not only saw, that the carnous Fibres were of the same thickness with those of an Ox, but besides I could see the Apertures of the Vessels composing the carnous Fibres, as plainly as in the Flesh of a Whale. The Vessels in the Muscular Fibres of a Whale, are indeed six times more in number, than in those of an Ox, or a Mouse, but then the Fibre of a Whale is also sixtimes as thick as the other.

Hereupon I considered after what manner the Vessels, of which the Muscular Fibres mostly consist, received their Nourishment from the Vessels of the Membranes; since the Muscular Fibres, when they are at rest, have many alternate corrugations, by which I judged, that the Vessels in the Fibres must have their Sides pressed together, and their Cavities closed up. But if we call to mind, that in walking a Man may move both his Feet above 3600 times in an Hour, (for he may make two Steps in the time of one Pulsation of the Artery,) and that in that space of an Hour the Muscular Fibres must be so many times extended and contracted, and will therefore require great Supplies; we shall likewise find that this is sufficiently provided for, since upon every Extension of the Muscle, the Apertures of those small Vessels are free and open for the Carriage of Nourishment into the Fibres. This wonderful Structure of the Membranes, and the vast number of Vessels they consist of, as likewise the small Vessels of which the Muscular Fibres are composed, has never yet to my Knowledge, entered into the Thoughts of any Man, and with many will hardly find Credit.

*Continued by
the same. No.
371. P. 73.*

2. The Muscular Fibres of a Cod-Fish, and of a Pearch, being cut transversely, I could see in them very distinctly the great number of small Vessels, that ran along the length of each Fibre. And I have seen the same in the Muscular Fibres taken from the hinder Leg of a Mouse, and cut through transversely.

In speaking formerly of the small *Fibrillæ*, that help to suspend the Testicles of a Ram, I forgot to mention, that each of these consists of exceeding small Vessels, which run parallel to it's Length.

I have at this time standing before a Microscope, a small Portion of the Bone of an Ox, in which may evidently be seen the Vessels which proceed from the Bone, and compose what is called the *Periosteum*, as likewise the Openings of these Vessels; the reason of whose appearing so clearly is, as I imagine, that they are filled with the Medullary Oil.

*Of the Parti-
cles of Fat, by
the same. No.
367. P. 132.*

XXVI. 1. After the Discoveries that I had made concerning the Circulation of the Blood, particularly that the Blood-Vessels had no Endings, I began to consider how the Fat Particles could be formed, since I did not think that they were separated from the Blood, and came out of the Blood-Vessels. But having now plainly discovered, that the so called Membranes were nothing but very small Vessels, and believing

believing that they were created for no other end but to transport Nutriment, as also that there was no Circulation in these Vessels, I imagined that the Matter which we call Fat, was brought into them, which, when there was too great a supply of Nutriment, so that it could not be forced farther on, must be driven out of these Vessels; for all the Particles of Fat, that I have as yet observed, are inclosed in small Films.

This Original of the Fat is to me much more credible, than that it should be forced out of the Blood-Vessels; and yet how these fatty Particles, which consist of small Globules, and those of still smaller Globules (as it appears to me) are made and formed, I cannot as yet determine: As also where these Vessels, which constitute what we call Membranes, have their beginning, and how this Fat is brought into them.

I had in my Drawer a piece of Ox's Flesh, that I believe had lain there about four Years, wrapped up in a Paper, which Piece I found in some Places to be covered with a Membrane; from this I cut off several small Slices along with the Membrane, and I found that near the Membrane, there lay about 16 or 18 Nervous Fibrils, which, in the drying of the Flesh, were so squeezed together, that they were almost twice as long as they were broad. In some of which I saw very distinctly those Vessels, which are in the Nerves.

These Nervous *Fibrillæ* were enclosed by a sort of half round, separating them from the Muscular Fibres, which half round consisted of a row of small Tendinous *Fibrillæ*, each of which was about twice as thick as a Hair of a Man's Beard. Without these Tendinous *Fibrillæ* lay the Muscular Fibres, that had been cut through transversly, and in this part of the half round there were several Apertures, which seemed in the Microscope to be big enough for Hemp-seed to pass through them, which might well be taken for Vessels, but that there lay so many of them together. But considering that the Nerves are commonly covered with fatty Particles, I concluded that these Apertures were no Vessels, but meer fatty Particles, which I found to be true when I had cut through them, and discovered that the inward Fat was eaten out by the Mites, which had left only the Husks, or *Cortices*, of the Fat Globules behind: Which *Cortices* I never had as yet been able to discover, because the *Cortices* of the Fat Globules would, upon any heat, melt away as fast as the inward Fat.

2. I have formerly said, that the Matter which we call Meal, or Flower, in Wheat, Rye, Barley, Oats, and in all sorts of Beans, is shut up as it were, in little Cells, or Chambers, and that those little Cells are separated from each other by thin Membranes, which are thinnest in Wheat, And as in the Enquiry into what is called the *Periosteum* of an Ox or Sheep, I have often broke in Pieces the fat Particles thereof, and as often viewed them through a Microscope; so have I likewise placed a few of the fat Globules upon a clean Glass Plate, and held it over a

Of the Particles of Fat; by the same.
Translated from the Dutch by John Chamberlayne; Esq; N^o. 372. p. 93.

Coal Fire, or the Flame of a Candle, till they were all melted and reduced into a liquid Matter; so that not only the Fat, which was shut up in the Skin of the fat Globules, but likewise the Skin itself was reduced to a fluid Matter: and thereupon I immediately brought it before my Sight; and viewing it with Attention, perceived, when the melted Fat was cold, that there were different Matters inclosed in the said fat Globules; for there appeared an inconceivable great number of exceeding small coagulated Particles, and the rest of the Parts, of which the Fat was composed, lay in one smooth and even Substance, and I have been considering whether there might not be inclosed in such a Globule of Fat, so many little Cells and Partitions as we see in a little Grain or Seed, but if it be so, it will remain concealed from our Eyes.

But having now again carefully contemplated these coagulated Globules of Fat, many of which go to the making of one little Bubble, I did often fancy, that I saw, that each of the said small Particles was provided with such a transparent Dent, as I have before said, that the Meal Globules of Wheat, &c. are furnished with.

Nay, I have fancied to myself, though it did not appear to my Sight, that each fat Particle is furnished with little Cells within, like the Seeds or Fruits of Plants.

Since I wrote this, I was informed my Butcher had killed a Sheep of an uncommon Bigness, and that it weighed 140 Pounds, without the Fat that they took out of it, after it was killed, which weighed 51 Pounds, so that the whole Sheep weighed above 190 Pounds.

I caused a Piece of the Fat, that grew about the Kidnies to be brought to me, imagining that it's fat Particles would be of a coarser Grain than those of ordinary Sheep; for I have observed several times, that the bigger an Ox was, the larger were the fat Particles thereof; and since not one Man in a thousand has any Knowledge of the Contexture of these fat Particles, for we find that there are not any two of one and the same Figure, they being compressed by other Particles with which they are surrounded, I have caused some few of these fat Particles to be drawn, as between A B C D.

Fig. 58.

Now when we meet with one of these little Bundles of fat Particles, as has frequently occurred to us, in which the fat Particles were four times this Thickness; I imagine, that such fat Particles cannot be produced out of one single adipose Vessel, but that out of such a Vessel several small Sprigs issue forth, and out of each of those small Sprigs proceed others still smaller, and that out of these Particles one larger fat Particle is formed like a Bunch of Grapes.

Now I cut off with a Razor the Fat in several Places of a greater Piece, as thin as I could, laying the thin Pieces upon several Glass Plates, and put them upon a Coal Fire, so as to cause them to melt; and being melted, immediately viewed them with a Magnifying glass, when I observed the Skins, or membranous Coats of the fat Globules
lying

lying among the melted Particles, and in the said melted Particles there was nothing to be perceived but a limpid Matter surrounded with small Air Bubbles; but when the Fat was congealed, we could observe but very little of the Membranes, because they were covered with the Particles of Fat, with which these Membranes or Skins had before been filled.

I caused a few of these Skins of the fat Globules to be drawn, between E F G H. During the said Observation, I fixed my Eye with Attention upon the fat Particles of the Sheep which had been melted, and were again coagulated; and I could not but judge, that these fat Particles, which were exceeding small, were analogous to that internal Matter, wherewith some of the smallest little Seeds are furnished, and in a great many of these exceeding small Particles, I could in clear Weather discover some Transparency. Fig. 53.

Moreover, I cut as thin Slices as it was possible of the Fat, yea so thin, that five or six of them did not weigh a Grain, and put them into a little Water, in order to try whether I could make any farther Discoveries thereby, with respect to the small Particles of Fat; but it was in vain: only I saw floating upon the Water very small Particles of Fat, which were coagulated in a spherical Figure, and the very biggest of those fat Particles was no bigger than a grain of Sand. I placed these Particles upon a Glass Plate; and viewing them with a Microscope, I observed the Figure, which I mentioned above, as plain as before; and other fat Particles seemed to be of a different Figure, I put one of these into the Hands of my Painter, or Designer, bidding him to draw what he had observed, it being the Figure of one of the said fat Particles, which was coagulated on the Water, as it is represented between I, K, L, M, which was not very conformable with the other melted fat Particles; for in the doing it, all the Particles did not melt, for the fat Particles are not all extracted by the Water, and coagulate upon the Water in smaller and greater globular Particles; and when we take out of it the Remainder of the thin Slices of Fat, which float upon the Water, and view them with a Microscope, we find that many of the fat Particles appear intire to the Eye; and whereas they were before very smooth and even in their Sides, they were now changed into rough and uneven Particles; so that one should be apt to think, that there were two different sorts of Particles in the Fat, and that one sort melted more easily than the other. Fig. 60.

Now in order to get these melted Particles of Fat out of the Water, without altering them, I made use of a round Glass, and with it skimmed the Superficies of the Water; by which means some of the coagulated Particles stuck to the Glass. Moreover, I did again melt some of the fat Particles, which had been coagulated upon the Water, over a Coal Fire, as they lay in the Water; and when they were again coagulated.

gulated, viewing them with a Microscope, I found the small fat Particles to be yet smaller than those that were melted out of the Water.

In this last Observation I observed, with Astonishment, the inconceivable number of Veins and Membranes, which were diffused thro' the Fat, and the multitude of separated fat Particles, that were involved in their several Membranes.

After this there was laid before me the Hind-Quarter of a sucking Lamb, over which was spread what we call the Net, or Caul; and having cut off some Pieces of the said Net, or Caul, upon which there was little or no Fat, with a Pair of Scissars, and placing them before a Microscope, I observed again, that the fat Particles, where there were very few of them included between the Membranes, were of a more globular Figure than in other Parts, where a good many lay together, and that in other Places they were pressed or bruised, which I fancy was occasioned by the Butcher's squeezing the Caul in that place with his Fingers; and in another Place the fat Particles had been so torn in pieces, that I could see nothing remaining but the Skins of the fat Globules.

Moreover, I saw that the fat Particles had such a Pinch, or Dent, in them, as I have shewn, that there were in the Globules of Flower of Wheat; from which Spectacle, I am confirmed, more than before, in my Opinion, that the fat Globules might be separated intirely, or in part, from the Skin with which they are surrounded, by opening the Dents, without breaking the Skin.

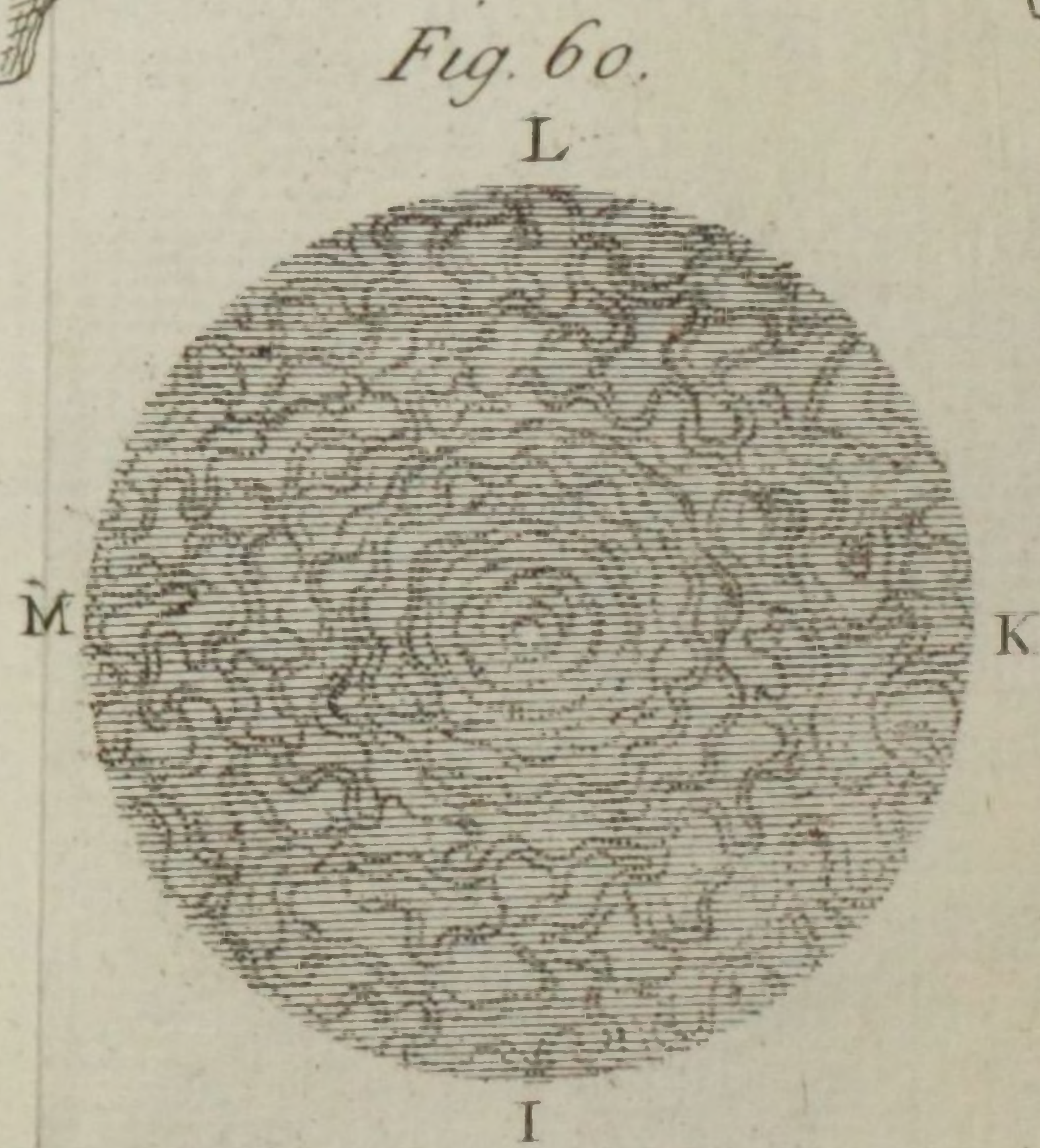
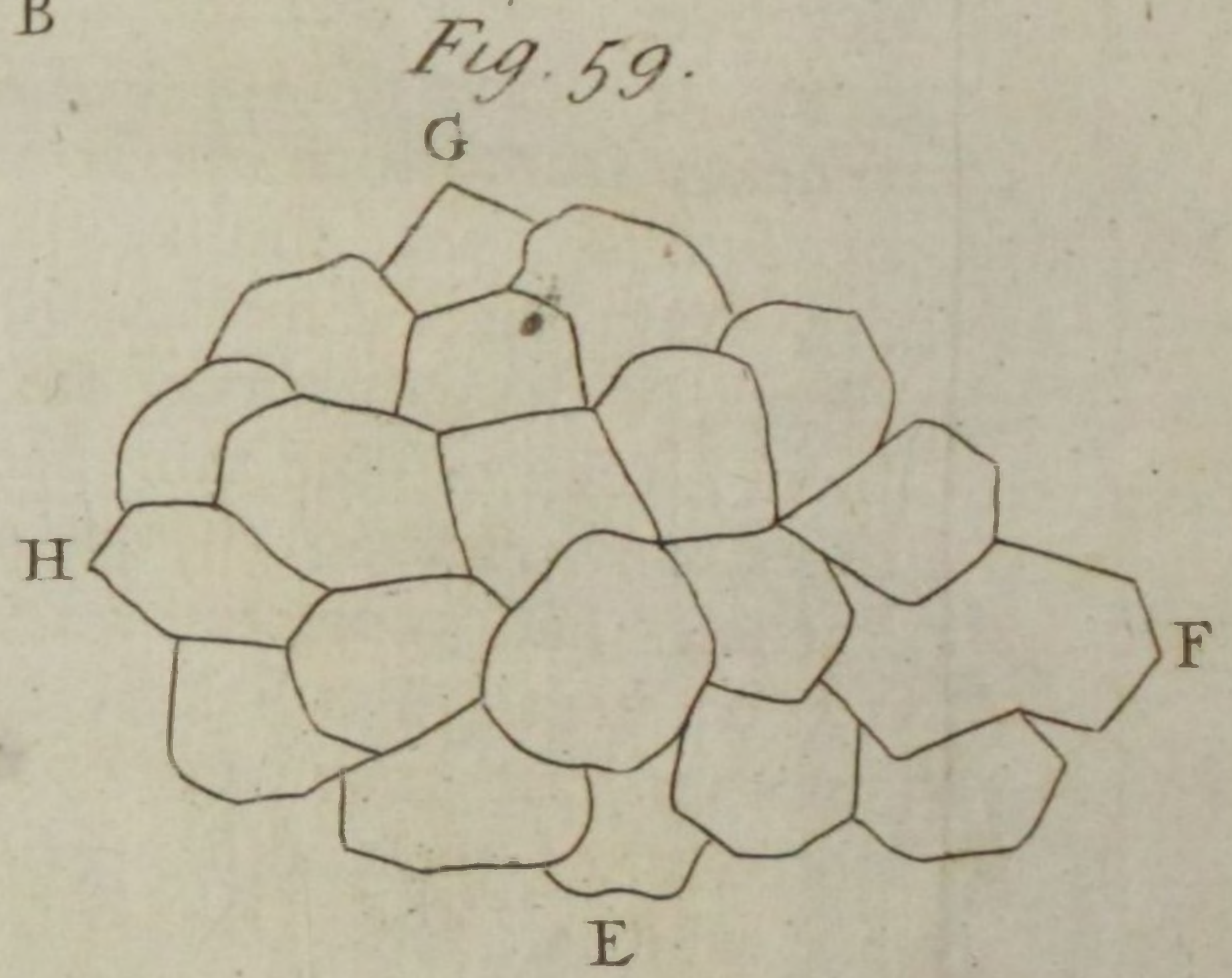
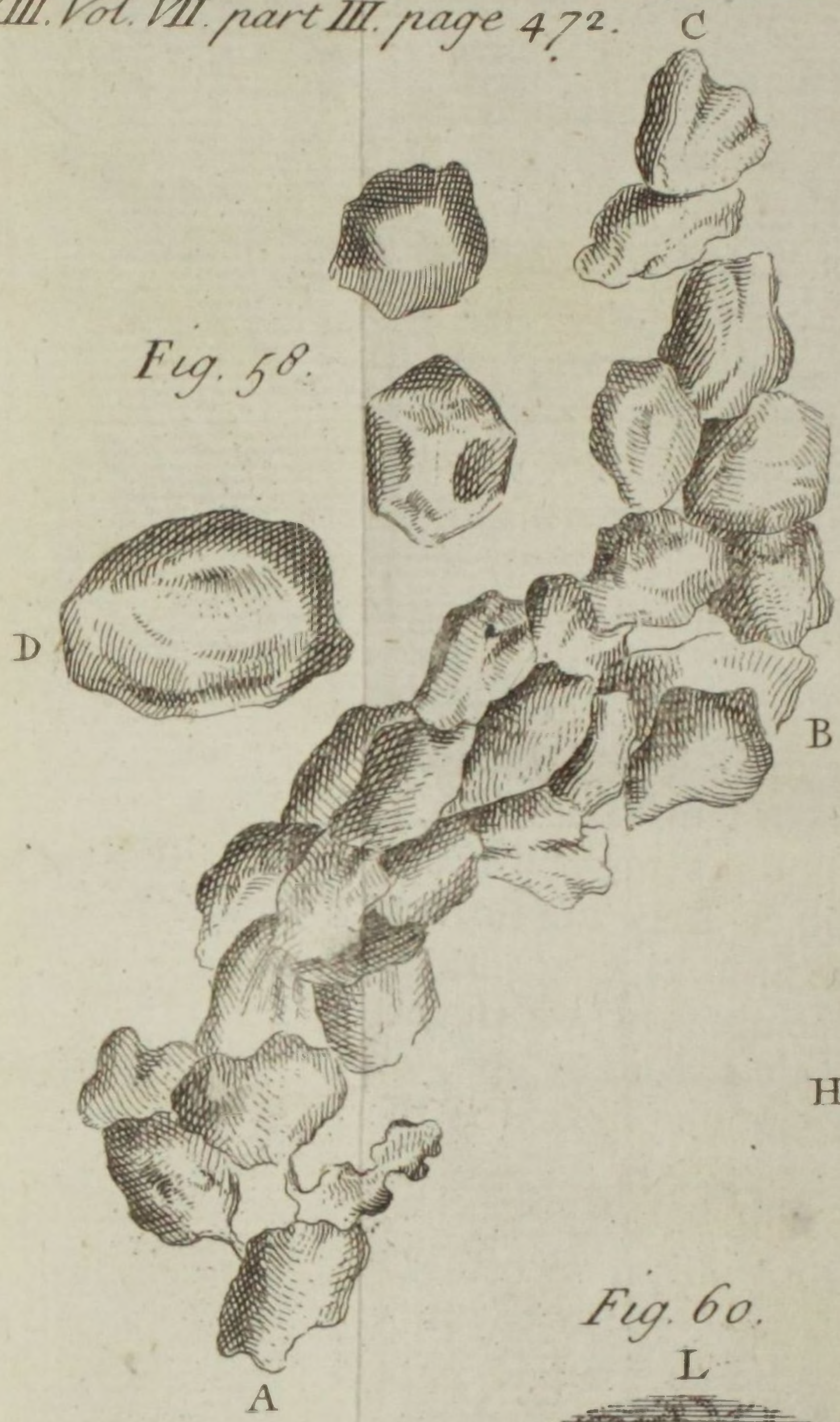
Then I took off the thin Membranes, which encompassed the fat Particles, and viewing them with a Microscope, observed, that the fat Particles had imprinted a roundish Figure on the Membranes inclining to a hexangular Shape, that it was a Pleasure to look on them; but in other Parts they were of an oval Figure.

Moreover, I took a flat Fish, which we call *Plaife*, and took off the Fat which adhered to the Vessels, or Bones, and viewed it with a Microscope, and observed, that the fat Particles were of several Sizes; and some were so small, that I judged that fifty of the least were no bigger than one great fat Globule; and moreover, I saw that many of the fat Globules had such a Pinch in them, as we find in the Meal, or Flower, of those little white Beans, which we call *French* or *Kidney-Beans*.

Afterwards my Servant brought to me the Fat of a *Pearcb*, which was nine or ten Inches long, and taking a little of it, I viewed it with a Microscope, but could not discover any small Particles in it, nor any internal Dent, as I had observed in the Fat of a small *Plaife*.

After that the Fat of the *Pearcb* had lain an Hour or two upon the Glass, I viewed it again, and observed that the Particles were become smaller, and that the Skin of the fat Particles, which as yet was beset with some fat Particles, was, as it were, shrunk, or wrinkled, and the Fat that was burst out, lay about the fat Particles, and was

was



was so fluid and transparent, that we could not discover any Parts in it.

From this Observation I began to think, whether each of these fat Particles was not provided with an Orifice, or Hole, out of which the Fat might be protruded at all times, as often as the Parts of the Fish stood in need of Nourishment, without an entire laying open the Skin of the fat Globules; for we constantly find, that when the Eggs of the *Pearcb*, which we call the Roe, increase in Bigness, it's Fat decreases; yea in such a manner, that when the said Eggs, or Roe, are arrived at their utmost Bigness, there is seldom or never any Fat to be seen upon the Intestines of the Fish.

XXVII. Mihi non incognitum est, quosdam Anatomicos supra mea fundamenta novum struere Systema ausos esse, affirmantes ovum esse proprium nidum, in quo animalculum feminis masculini hospitatur, & quod idem ovum ex eo imprægnatum, postea per tubam *Fallo-pianam* deducitur ab ovario ad uterum. Sed percipere non possum quomodo positiones adeo vanas statuere, easque in lucem edere audeant, adeo omni fundamento carent ut ulteriori contradictione indignæ sint. Quamvis etiam contradictiones quamplurimas passus sim, & adhuc patiar, permanebo in Systemate meo, quoniam animalcula in omnigenis feminibus inveni, si saltem animalia rite tractare possem, ne exceptis quidem variis avium ac piscium speciebus.

Of the Generation of Animals, by the same. No. 380. p. 438.

Porro comperimus in omnibus arborum & plantarum feminibus, etiam si parvissimis, si modo tractari possint, plantam esse formatam, quam plantam antea comparavi cum animalculis feminis masculini. Et farinosa materia in feminibus plantarum plantis nutrimento esse debet tamdiu, quam planta suos ejecerit radices, & ex terra alia possit.

XXVIII. 1. Almost all the sick Cattle refused every sort of Food and Drink; they hung their Heads, had shiverings in their Skin, and in their Limbs; they breathed with Difficulty, and their Expiration in particular was attended with a sort of rattling Noise; they were so feeble that they could scarcely go or stand upon their Legs. Some few of them eat a little, and drank very much; others had Fluxes of Excrements variously coloured, of a very offensive Smell, and frequently tinged with Blood: Many of them had their Heads, and their Bellies swelled in such a manner, that, upon clapping them with the Hand on their Paunches, or along the *Vertebræ* of the Loins, they sounded like a dry Bladder when full blown. In some the Urine was very turbid, in others of a bright flame Colour. In comparing the Pulses of the sound Cattle with those of the diseased, he found the latter to be quicker and weaker. There was but little Heat perceivable by the touching any of them; their Tongues were soft and moist, but their Breath was exceeding offensive. Besides these Particulars, he was inform'd by those who attended sick Cattle, and by other Persons worthy of Credit, that in some of these Beasts they had observed crude Tumours in several parts of the Body, as likewise

An Account of a Book, intitled, Conghi-etture del Dottor Pietre Anton. Michelotti, Filosofo, è Medico d' Arco, sopra la Natura, Cagione è Rimedi dell' infermità regnanti ne' Animali Bovini di molte Città, &c. Nell' Autunno del' Anno cadente 1711, in Venezia, 1712. No. 365. p. 83.

watery

watery Pustules and disorderly Motions of the Head, with dry, black, and fissured Tongues; that in others of them they met with Tumours, that came to maturation, putrid Matter issuing from the Mouth and Nostrils, Worms in the *Fæces*, and in the Eyes, bloody Sweats, and the falling off of the Hair.

In comparing the Flesh of the Cattle dead of this Distemper, with that of others killed for the Market, he found the Muscles in the former lying immediately under the Skin to be something livid. Having opened the three Cavities of the Body, he applied himself with the utmost Diligence to examine the Braine with it's Membranes, the *Trachea*, *Oesophagus*, Lungs, Heart with it's Auricles, the *Vena cava*, *Aorta*, and Diaphragm; the Liver, Spleen, and other parts of the lower Belly. In all which there was no discernable difference, either as to Figure, Size, Contents, Situation, or Connexion, with the neighbouring Parts, from what was observed in sound Cattle killed by the Butcher, except the Particulars hereafter mentioned. The Blood found in the Ventricles of the Heart, in the Pulmonary Vessels, in the *Aorta* and *Cava*, though still warm, was considerably blackish, and near a Coagulation: In opening the upper and middle Cavity, the Scent was offensive, but tolerable enough, whereas the Stink, that proceeded from the lower Belly, was not to be endured without Prejudice. In some few Carcases the *viscera* differed from their natural State, with regard to their Size, their Consistence, their Contents, Colour, and Smell. In many of them the Paunch was found very much contracted and dried, with a hard Substance contained in it. In others the Lungs were swelled and livid, the Liver tumified, and the Brain watery and putrid.

Upon observing the abovesaid State of the Blood in the Cattle dead of this Distemper; he was desirous to see what Condition it was in, while the sick Beasts were yet living. With which Design having ordered several of them to be blooded, he found the Blood not to issue out of the Vessels in a continued Stream, as usual, but, with a broken and interrupted Flux, one part of the Blood not immediately succeeding another. Having caused the Blood to be received in proper Vessels, and suffered it to stand for some Time, he found it intirely coagulated, without any Separation of the *Serum*, and attached to the sides of the Vessels with a reticular Pellicle upon the Surface exposed to the Air. All the Cattle which were blooded, being eighteen in number, died in a few Days after the bleeding, one only excepted, in which the Vein was opened upon it's first being taken ill.

Having enumerated all the Symptoms of the Distemper, the Author concludes from the whole, that the Sickness among the Cattle was a malignant pestilential Fever, killing almost all those that were infected with it.

The immediate Cause of this he takes to be a præternatural thick-
ness of the Blood, occasioned by a beginning Coagulation of those
Parts of it, which constitute the *Crassamentum*, whereby the Globules
of the Blood, and the Particles of the *Serum* were imprisoned in a
sort of *Reticulum* formed by the Union of the Fibres of the
Blood.

The occasional Cause of this Sickness he deduces from the cold
and wetness of the Season, which rained all the preceeding Year,
from *October 1710* to *November 1711*, which Observation is worthy
of Remark, since the Season preceeding, the Mortality among
the Cattle here in *England* was remarkably dry, and yet the Symp-
toms of the Distemper agreed with those observed in *Italy*, as may
appear from the Account given by Mr *Bates* in *Philosophical Trans-*
actions, N^o 358.

2. The Author (after having briefly accounted for the two Kinds of
the *Cocci Tinctorij* now in Use, viz. that of *Pliny* collected from the *Ilex*,
and the *American Coccus*, or *Cochinil*) proceeds to give us the Na-
tural History of the *Coccus Polonicus*, which he calls *Radicum*, because
it is chiefly found adhering to the Roots of the *Polygonum Coccife-*
rum, * *Kosmaczek Polonis C. B.* This he takes to be the *Polygonum*
Germanicum, incanum, flore majore perenni Raij. Of which he has given
a Print with the *Cocci*, as they stick to the Roots.

The *Coccus*, he says, is found sometimes single, sometimes more,
even forty adhering to one Plant of different Sizes, from a Pop-
py-seed to that of a white Pepper-corn. It is roundish, smooth,
and of a Purple Violet-Colour, and in a thin Cuticle incloses a
Blood-red *Succus*: One half, or more of it is covered with a rough,
dark, brown, Crust, by which it adheres to the Roots.

The Countrymen gather it about *Midsummer*, and dry it with
a slow Fire in Earthen Platters.

Several of these *Cocci* he exposed to the Sun in open Glassess,
and found that by the 24th of *July* every one, according to it's
Size, had excluded a small Worm with six Feet. That Part which
seemed to be the Head, had two short carnosse *Antennæ*; for he
could not perceive with Glassess any thing like either Mouth or
Eyes. On the Back, Length-ways, were two *Sulci*, which were
more or less visible, according to the different Motions of the *Ani-*
malculum. It's Feet seemed armed with Claws, and the first Pair
stronger and darker than the rest. The whole Worm was of
an obsolete purple Colour, and had several Bristles of a brown
grey.

These, after ten or fourteen Days, lay in a State of Rest, and
soon became covered with an exceeding white fine lanuginose Sub-
stance; in which Condition they continued five or eight Days

* *Kosmaczek Pilosell.* Herbario Polon.



longer, and then laid their Eggs, fifty, one hundred, or more, a-piece; which to the naked Eye appeared but like so many red oblongish Points, but with Glasses looked like Ant's Eggs, almost transparent, with a diluted Blood-red Content.

These Eggs being again exposed in the Sun about *Bartholomew-Tide*, were hatched a Month after, when some *Vermiculi* were excluded, which in the Microscope appeared to be Hexapods of a purplish Hue, with two *Antennæ* at their Head, and two greyish Bristles at their Tails, scarce visible except upon black Paper.

He supposes these last excluded *Vermiculi*, after some Wanderings, at last fix themselves to the Roots, and some of the lowest contiguous Branches of the *Polygonum*, where being deprived of local Motion and Sense, by some Way or other they imbibe that *Succus* from the Plant, and at last become the *Cocci* so called, or Vesicles full of that Blood-red *Succus* so useful in Dying.

Corrections
and Amend-
ments by J. P.
Breynius, M.
D. F. R. S.
Translated
from the La-
tin by Mr.
Zollman,
F. R. S. N^o
426. p. 444.

3. In my Natural History of the *Coccus Radicum*, when after many repeated Observations and Experiments (especially those of Pag. 16 and 17) I gave an Account of the Generation and Metamorphosis of that Insect, which uses to stick to the Extremities of the Roots like a spherical Grain, and is commonly called *Coccus Polonicus*, I conjectured, that those small Flies which are often found among the *Coccus*, did not belong to the *Coccus*, but owed their Rise to small Worms of their own Kind, and were accidentally found among the *Coccus*; and as I could not find any Difference of Sex among the Worms of the *Coccus*, and following chiefly the Opinion of Signor *Cestoni* concerning the *Coccus* of the *Ilex* (however, as I freely own, not without some Repugnancy, and a fluctuating Mind) I ventured to assert, that our *Coccus* also is an Insect of the Hermaphrodite Kind, which brings forth Eggs of itself, and from itself, and propagates it's Species without being impregnated by the Concurrence of a Male.

But the Summer following I began to be sensible that my Opinion was erroneous, and about the End of it was quite convinced of my being in the wrong.

Having repeated my Observations with the greatest Exactness, and examined them in the strictest Manner, at last I found that the Metamorphosis, or Evolution, thro' which our *Coccus* passes, is as follows.

A. Of the Male.

B. Of the Female.

I. The Egg.

I. The Egg.

The Eggs are laid about the End of *July*, or the beginning of *August*.

A. Of the Male.

B. Of the Female.

II. A Worm with six Feet, no Wings.

II. A Worm with six Feet, no Wings.

The Worms come out of the Eggs about the Middle of *August*, till the Beginning of *September*.

III. The less spherical Grain; that is, the *Coccus*, strictly so called, of the Bigness of a Grain of Poppy-Seed or Millet at farthest, gathered from the 9th of *June* till the Summer Solstice, with other bigger *Cocci*.

III. The larger spherical Grain; or the *Coccus* of the Bigness of a Vetch, or as large as that of white Pepper, which is gathered from the middle of *June* till about the middle of *July*.

IV. The less Worm with six Feet, no Wings. It comes out of the above-mentioned *Coccus*, from the Summer Solstice 'till the Middle of *July*.

IV. The larger Worm with six Feet, no Wings. That is to say, the Female coming out in the Beginning of *July*, but chiefly about the middle of the said Month; which being impregnated by the Fly, the Male, N^o VI, brings forth the Egg, N^o I.

V. The Nymph which appears about the Beginning of *July* and the following Days.

VI. The Fly, the Male, coming out from the middle of *July* till the 24th of the same Month, which impregnates the Worm the Female marked N^o IV.

This Insect, under what Shape soever it appears, *viz.* either of a Grain, a Male Worm, a Nymph, a Fly, a Female Worm, or a Worm coming out of an Egg, always when pressed and crushed, affords a Matter of a purple Colour, which however is observed to run most copious in the *Cocci* and the Worms, especially the Female ones.

4. A Dispute arising betwixt the Author (*Melchior de la Ruuscher*) and a Friend, concerning the Substance of *Cochineal*, the one maintaining it to be a small Animal, the other the Fruit or Grain of a Plant, the Author took the Pains to procure from *Antiquera* in *New Spain*, the Place where there is the greatest Traffick for it, the Attestations upon Oath of eight Persons who have been immediately employed in propagating and managing it for many Years;

An Account of a Book entitled, Histoire naturelle de la Cochinelle justifiée par des Documens authentiques Amsterdam, 1729.



By W. Ruddy,
M. D. R. S.
Secr. No 413.
p. 264.

from whence the whole Natural History of this Drug is collected. These shew, *First*, in Regard to Cochineal itself, That they are small living Animals with a Beak, Eyes, Feet and Claws; that they creep, climb, seek their Food, and bring forth Young, not changing their Species as Silk-Worms, but producing their Like; which are not larger than Nits, or small Mites, or the Point of a Needle; but when come to Maturity, resemble in Size and Figure, a Dog's Ticke. Thus far is certain, but their Manner of generating is doubtful, though it is commonly believed by those who cultivate them, that they are impregnated by a small Butter-fly, which is bred upon the *Nopal* (the Plant they live upon) which passes and repasses over them.

Secondly, As to the Manner of raising, nourishing, and managing, them, it appears, that at the proper Time, *viz.* after Winter (when these little Animals can bear the open Air) when the Cochineals which they have kept in their Houses are grown so large and big as soon to produce young ones, they put 12 or 14 together into a *Pastle*, or little Nest, made of fine soft Hay or Straw, or Moss of Trees, or the Down which immediately envelopes the Cocoa Nut. These *Pastles* are then placed upon the Plants of the *Nopal*, or prickly *Indian Fig* (which they take Care to cultivate well for this Purpose) and in 2, 3, or 4 Days, these Animals bring forth a great Number of young ones; soon after which the Mothers die. In the mean while the young ones, coming out of the Nests, climb up the *Nopal*, fix themselves to it, and suck it's Juice, which is their only Nourishment, but do not eat the Plant; and for this Reason, they always seek those Parts of it that are greenest, and fullest of Juice, taking Care at the same Time to place themselves on the Parts most sheltered from the Wind and Weather. During this Time, whilst they are growing up, and become pregnant, great Care is taken that no Vermin incommode or kill them, as also to keep them clean, and disengage them from certain Threads, like Cobwebs, that grow upon the *Nopal*: As likewise to defend them from too much Heat, or Cold; from the Rain and Winds; because the fine Cochineals are very tender: Nevertheless the wild Cochineals stand all these Inconveniencies; but then they are so gritty, of so ill a Smell, and of such little Value, that they ought not to be mixed with the fine.

Thirdly, In Regard to the gathering of the Cochineal: The first is of the Mothers, which having brought forth their young, have died in the Nests. Three or four Months after this, as the Season permits, when the first young ones are become sufficiently large and big, and are in a State to bring forth young in their Turn, and also have produced some few, the *Indians* carefully gather them off the *Nopals* with a little Stick, to which they fixed a little Hair in
the

the Nature of a Pencil. These Animals being collected in this Manner, and afterwards killed by hot Water or Fire, this is called the second Gathering, or rather the first of the young Ones that have been nourished and raised in the open Air. Three or four Months after this, they gather the second Brood of those that have been born upon the *Nopal*, which being become big, have brought forth already some young Ones. This they do much in the same Manner as before, only now they take off the Plant a great many young ones with their Mothers, which makes this Sort of Cochineal be called *Granilla*, from the number of small Ones found in it. In the mean Time they keep a Number of these young Ones alive, upon the *Nopals*, which they pluck up or cut, and lock up in their Houses, to nourish these Animalcules during the rainy Season. *Lastly*, these being grown large, they put them into the *Pastles*, and proceed in the Manner above expressed in the second Article. So that for the most part they make three Gatherings in a Year.

Fourthly, As to the Manner of killing the Cochineal: This is commonly done two Ways, either in hot Water, or in *Tamascales*, which are little Ovens made for that Purpose, though there are some People who kill them by roasting them upon *Comales*, which are flat Stoves with Fire under them, made use of by the *Indian* Women to bake their *Maiz* Bread. These three different Methods give the Cochineal three different Colours. The first renders them of a brown red; the hot Water making them lose the white Colour with which they are covered when alive. The second makes them of an Ash Colour and Marbled, or Jaspered; both upon Account of the natural White with which they are covered, and the red and transparent Colour of the Cochineal itself. The third Sort becomes black, as if it had been burnt. Of the old ones which died after dropping their young, four Pounds produce but one, when dried; or rather, one Pound is reduced to four Ounces: But three Pounds only of the living, which have been carefully taken off the *Nopals*, being killed and dried, produce as much.

This is the Substance of what I can collect from the Attestations, &c. which are printed and annexed at length, which the Collector says he has done, both as they contain many Circumstances unknown hitherto, both in his own Country (*Holland*) and elsewhere; and as the Curious may be now assured of a thing which has been very uncertain for so many Years, and indeed known but very superficially, even by those who have embraced the Opinion, that the Cochineals were really little Animals. And as there may be always a standing Evidence to evince the Truth of these Facts, he has thought fit to deposite the original Attestations, confirmed by the Certificates of three Magistrates, and three publick Notaries, among the other Registers of the
Royal