

IV. *An Extract of some Letters sent to Sir C. H. relating to some Microscopical Observations. Communicated by Sir C. H. to the Publisher.*

Aug. 11. 1702.

SINCE my return I have made proof of my new set of Microscopes, made by Mr *Wilson*, and have found the way of applying them very readily. The contrivance of the Ivory Box and hollow Screw for approach, with the illuminating Convex at the end of it is of great service both by Day and Candlelight, and the Sliders with the plain and concave Glass plates for Objects very convenient. But the Brass Tool I think capable of Improvement, and to want it, and when I come on your side I purpose to have one made with some new accommodations, *viz.* a fine threaded Steel Screw for a more steady approach, and some new turns and motions to the Arm which carries the Object, &c. and I propose also to have a brass Arm to slide up and down on the square Rod of my deep Microscope, to which I would with a Screw fix either the Ivory Box, or the handle of the brass Tool, to be set by that means in a settled posture, to any height or inclination required, which will be very necessary when an illuminating Glass is applied to either.

As for the Glasses themselves, I think them very good and well wrought, and (tho not so neatly set) to go far beyond any I have seen of *Mellins*. The greatest Magnifiers especially augment more, and yet shew an Object more distinct than his. My greatest shew an hair of my head to any Eye considerably above an Inch diameter, and some

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Eye

Eyes judge it at least two Inches, but supposing it a bare Inch, and that (as Mr *Hooke* affirms) 640 hairs breadth make one Inch, the length and breadth of an Object will by it be augmented 640 times, the surface 409600, and the solidity 262144000.

But the best of ours must needs fall short in power and goodness of Mr *Leeuwenhoek's* Glasses, whose skill both in making and using them I fear we shall not easily reach. I know many question the sincerity of his Relations, but I can do him that right to affirm that as far as I am able to follow him (and I have tried many of his Experiments) I find him always faithful in matter of fact, and therefore question not his veracity in other things. 'Tis not fair to say I have look'd on such Objects, and found no such thing as he mentions. There is more than an hasty cursory view required in observations of this kind, there must be patience and attendance, and some skill in managing the Glasses, Objects and Light to the best advantage, besides there are many lucky hints and coincidences, and all this to little purpose without a strong and good natural sight, and an Eye used to Glasses; for I scruple not to say that a discerning and critical Eye, as well as a nice and good Ear, is gained and improved by Experience.

'Tis a common and easie thing to ridicule all Microscopical Enquiries, and judge time trifled away in the examining Flies, Mites, &c. But certainly the works of God are not less beautiful and wonderful in the smallest than in the greatest of his Creatures, and many new and surprizing, (and 'tis our own fault if not instructing) instances of his Providence to be found in them. We should think a man very perverse, who would look into no Books but such as were published in the largest Volume and Characters; such an one would certainly lose the greatest part of useful learning, and I am confident would not be thought a jot the wiser for ridiculing such as read smaller Prints, tho with the assistance of Spectacles, which (let witty men say what they

they please) will ever be esteemed an useful Invention, and (as an old Author says) very much *per commodita dell'i poveri vekki*.

One of the first Objects I tryed my Glasses by was a living *Louse*, in which I could plainly see the motion of the Muscles (when he stirr'd his Legs) all which are joynd in a longish dark spot in the middle of his Breast, where the Tendons seem all united. The like motion of Muscles is also visible in the head when he stirs his horns, and in the several Articulations of his Legs. I saw also clearly a multitude of various branchings of Arteries and Veins, and the Pulse regularly beating in several Arteries. But the most entertaining sight is the *Peristaltick motion* of the Intestines, which is continued from the Stomach thro all the Guts to the *Anus*. I have observed the like *Peristaltick motion* in a Flea, and in several sorts of small transparent Maggots and Caterpillars. But a *Louse* is easiest to be had in all Seasons, and will bear rougher handling, and live confined between two concave plates, if not crushed, 4 or 5 days.

I thought a *Mite* would also prove a good subject for the like purpose, but found them not so transparent as I expected. However I discovered something in my observation of them, which may perhaps be new to you. For I plainly saw that all the bristles on the body of one of them (which to a common single Glas, and to the greatest Magnifier of my three glassed Microscope look like plain smooth hairs) were when viewed with a large Augmenter all spicated (if I may make a word) or bearded like the Ear on the Seed head of some Grasses. The appearance was like the annexed figure, which shews part of the bristle, but I cannot express the beauty and regularity of it, and every bristle on the whole Body and Legs, both long and short, had the same formation. But I must tell you withal, that all Mites are not so, for of 7 or 8 inclosed together, I found but one whose bristles were of this make, in the rest the horns only were spicated. Whether they were of different

Fig: 2.

A. a a a a a a a 2

kinds.

kinds, or rather only of different sexes, I shall not determine, they were all taken out of the same Cheese at the same time, and were in other parts very like. Their Mouths opens Horizontally (to the right and left) like that of a Wasp, and hard headed Maggot, and after their being some days shut up together I found some dead, and the Survivors preying on them, which gave me an opportunity of observing their manner of feeding, which was very remarkable, for they thrust one mandible forward, and bring the other backward at the same time, and this alternately, and by that means seems to grind their food.

If you should bring one of the greatest Magnifiers to observe a Mite or the like minute Animal, you must lay him on a thin Muscovy Plate in one of the Sliders, and cover him with a Concave, and take good care not to crush the Object between the Plates in your approach.

Aug. 25. 1702. Since my last I have been a few days at G—— and in my return (over the Sands) I pull'd off an Handful of *Muscles*, which stuck on a piece of a Rock that was covered by the Sea every Tide. These I brought with me, that I might observe the Organs by which they fix themselves so firmly to a Stone, that even a Storm will not wash them off. I found that these were threads which came from that part which is called the Beard of the Muscle, which had on their extremity, a flat spongy substance, that adhered only by imposition, like the wet pieces of Leather which Boys fasten to Stones, and they are describ'd, and well pictured by Mr *Lecuwenh.* But my principal end in gathering these Muscles was, that I might view and examine the Inhabitants of those little white Shells, which stick like Pustules on Muscle-shells (as they do likewise on Lobsters, Oysters, Stones, &c.) These are also mentioned by Mr *Lecuwenh.* who gives a picture of one of these little Creatures taken out of its Shell. His Draught is very accurate, only that in the 12 long Branches growing from the Head, the bristles are there pictured coming out quite round on each  
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joynt of every Branch, whereas they grow only on the inside, (all the hind part being perfectly bare) and look not unlike a ruffled Feather stript on one side. I cannot guess at the use of these curious ramifications, unless they serve to draw in food to the Creature, which cannot move out of its place. For keeping them alive in Sea-water, I saw them often put them out thro the slit of the *Operculum* which closes the top of the Shell, and draw them in again. This as I remember the Naturalists call a *Balanus* and class it with the *Concha Anatifera*. I never saw the latter, but that being much larger, if (as 'tis probable) it has the like Organs, we may easily account for the mistake of even some observing Men, who affirm they have seen them Feathered, and think them Birds *in fieri*. I have herewith sent you some Muscleshells with these *Balani* adhering to them, and because they are tender to manage, and great care is required to take them clean out, and display these curious parts, so as to ly fair and in good order, I have spread 2 or 3 of them on a piece of Glass, that you may see them your self. I have also sent you some *Cancelli* (a Lobster like Animal) in the Perewinkle Shells which they inhabit, and have broken off some of the Shell of one, that you may see how this Fish holds himself in by an hook on each side of his Tail. These *Cancelli* are excellent Meat.

Some of the Muscles which I brought were little above a quarter of an Inch long. I took one of these out of the Shell, and exposed it to the Microscope on a thin Plate of Muscovy Glass, and holding it to the light of a Candle, I saw in the thinner parts a vast number of Veins and Arteries, and the blood circulating in them more distinctly than I ever saw it in any other Animal. For I had this advantage in the Observation, that the Object lay always quiet, without changing Place, and my Plate was so thin, that I could bring to it what Magnifiers I pleased, and look without disturbance as long as I pleased, and I had moreover the Satisfaction of shewing it to 2 or 3 curious Persons, who  
had

had seen the circulation in other Creatures, for whereas other Animals will not easily be brought to lye still any considerable time, and will not live long when exposed to a Microscope, this lay always in the posture it was placed, and the motion of the Blood continued with little alteration 6 or 7 hours, only by keeping the Object moistened with Sea-water, and might have lasted much longer if I had not thrown it away. I repeated the same Experiment for 2 or 3 days with some of the remaining Muscles, with little difference in the Success.

The other day I spyed running among some Fruit, a small Worm which I could perceive to have a multitude of Legs; it was not half an Inch long, and the Body not thicker than an Hog's Bristle. This I put alive into a small Tube, and found it a perfect *Scolopendra*, whose Body was made up of 60 Incisures, at every one of which was a pair of Legs (one on each side) and each Leg had five Articulations. On his Head were 2 Horns, each of 16 Joynts, and under it a pair of terrible Forcipes, red, crooked, and pointed like the Talons of an Hawk, and I often saw him open and shut them, and wipe his Horns thro' them. These Forcipes are not unlike, and probably for the same Use as those on the Head of a Spider, but they are difficultly seen (because generally kept close) in a living Spider, but you may readily find them open'd, and in their perfect Shape, in the Spider's *Exuvie*, or cast Coats.

This Subject reminds me of a small black flat *Tick*, which (after walking in a Thicket) I found sticking on my Arm, and it had got its forepart so far into the Skin, that I had much ado to separate it with the point of a Needle, so as to preserve it intire and unhurt. I observed the Snout of this to be shaped not very unlike the jagged *Proboscis* of the *Serra Piscis*. The forepart of it *a* being like the end of a broad-pointed Sword, is clear and transparent, and has 3 Teeth on each edge, below which there comes out another serrated part *b b.* on each side almost at right Angles; but this

this is partly hid (when you look on the Back) by a thick Horn *c* on the side of the Head. I broke off one of the Horns at *d*, and then it appeared as in the annexed Figure, which represents the fore part of this *Tick*, and tho' rudely drawn, will give you a better Idea of it, than many words from an hasty Pen.

I afterward examin'd the Snouts or Proboscis of *Dog Ticks*, to see if they had the like Conformation, and found their Appearance as in Fig. B 2. the Snout *a* being so covered by the two clumsy thick Horns *bb* that the serrated Edges could not be perceived, but separating the Horns (with some difficulty) they appeared in the Posture of Fig. B 3. and I could then plainly see 8 Teeth or Jaggs on each side, as here expressed, but the Snout of a *Dog Tick* has not the additional serrated part, which is in the *Wood Tick*. I could also perceive a Pipe or Channel run through the Snout, and see some Bubbles move up and down in it, which I have also endeavoured to represent.

Sept. 8. 1703. My long Letters did not deserve such a Reception as should encourage the Continuance of them. I keep no Notes of what you call Observations, but sent you what came uppermost in the Order that occur'd to my Memory, and in no other Dress than what was hastily clapt on.

I have had a very entertaining Diversion with Pepper-water and some other Infusions, which I have kept by me ever since my return, tho' I have often formerly observed the like Waters, yet I never saw the *Animalcula* so much to my Satisfaction as in my new Glasses, which I have now increased to above double the number of my first set. I have found some of these *Animalcula* almost incredibly minute, which appear even to my greatest Magnifiers not so large as a Mite to a naked Eye, and in the bigger sort, I can plainly see the little Feet by which they perform so brisk Motions, which I never could find before. But I doubt not but your own Microscopes had shew'd you what

is discoverable in these Liquors, and therefore I shall say no more of them. Only I cannot omit mentioning one sort of Animal in them, which I never discover'd till within these 3 or 4 days, and by reason of their minuteness may possibly have escaped you also. These are very slender long Worms, of which my Pepper-water is prodigiously full. They are all of the same thickness, but their lengths are very different, some being twice, and some thrice as long as others, and at a Medium I judge the Proportion of their length to their breadth at least as 50 to 1. Even to the largest Magnifiers they look like Shreds of Horse-hair (to a naked Eye) from a quarter to 3 quarters of an Inch long. Upon a modest Estimate their thickness is not the 100th part of an hairs breadth, and consequently if you imagine an hair of your Head split into above 7800 equal Fibers, each Fiber would be as thick as one of these Creatures. Their Motion is equable and slow, and generally they wave their Bodies but little in their Progression, tho' sometimes they make greater Undulations. But what is more remarkable, they swim with the same Facility both backward and forward, so that I cannot distinguish at which end the Head is, and I have seen the same Worm go forward with one end, and back again with the other end foremost above 20 times together. And sometimes they will (like Leeches) fix one end on the glass plate (on which I lay the Water) and move the loose part of their Body round about very oddly. These I take leave to call *Capillary Eels*, and I have given you as well as I could a representation of their Appearance to a great Magnifier, in the several Postures I have seen them swim.

I find the Dust of the *Fungus Pulverulentus* or *Puff-Ball* to be the minutest Powder that I ever saw: To a naked Eye you know (when 'tis crush'd) it appears like a Smoke or Vapour, and with a common Microscope you cannot distinguish the Particles. But when 'tis viewed with the greatest magnifiers, each grain is visible and exactly alike,  
and



and appears a perfect Spherule of an Orange colour, something transparent, whose axis is not above the 50th part of the Diameter of an Hair. So that a Cubical Vessel of an Hairs breadth of a side, would hold 125000 of them. This was the dust of that *Fungus* which is bigger than your two Hands put together, and I observed since in another Puff Ball of the size of a small Crab ( which I take to be a different kind ) that all the Globules were darker, and that every one had a little Tail or Stalk affixed to it. I at first imagin'd that these (tho' so minute) might be Seeds, but was soon cured of that fancy when I found that the smut of Corn was composed of the like regular Globules, and about the same size. My way of observing these and the like dusts, is to breath gently on a thin Muscovy Plate, and then covering it highly with the Powder, to blow it off again, for enough will adhere, and they should not ly in confusion.

I have met with great variety of very beautiful minute Flies and Insects on Leaves and Flowers, (for at this time, of the year every thing is full of Animals) especially one very pretty Grub which I found plentifully adhering to Nettle-leaves, which is a wonderful thin Creature, has a sort of a covering all over his Back like a broad Shield, which he lies under like a Tortoise, and is all over beset and fringed round with Spikes. 'Tis almost imposible to describe such creatures tolerably, or give you an Idea of them, unless I could draw, but I have preserv'd some of these for your own view.

Sept. 29. 1702.

'Tis a double satisfaction to me that my own diversion contributes any thing to yours, and therefore without farther Apology for my hasty uncorrect way of Scribe, I shall continue, when I want other matter, to fill up my Letters as you command.

The end of last week a *Buck* which by mischance had his Leg broke, was kill'd tho' so late in the Season, and it being rutting time I thought I might with the greatest ad-

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wantage observe the *Semen Masculum*. Not to trouble you with some former attempts of this kind, as soon as he was killed I took out one of the *Testicles* with the adjoining *Seminal Vessels*, and found the *Vasa deferentia* very turgid, and full of a milky fluid. After various methods of viewing this Liquer, I saw the *Animalcula*, (in prodigious numbers) very perfectly in several postures moving very briskly, and shew'd them to others, who own'd they appear'd as plain as Tadpoles to a naked Eye. The greatest task was to lay them thin enough before the Microscope, for when the matter is too thick, you see nothing distinctly, but only a confus'd motion, and when thin spread it dries immediatly, so that you must be very quick with it, or you will lose your Labour. I diluted some of the *Semen* with warm Water, just so much as would a litte change the colour of the Water) and by that means could see them more distinct and separate, even with smaller Magnifiers, and they then kept their shapes long, even till next day when put in a small Tube, but were without motion. To  
 Fig. D. my best Glasses they appeared about the size, and in the postures here represented.

In my Observations of the *Animalcula in Waters* I have many of the same species in the several infusions, and even in Waters that have been exposed (especially at this time of the year) any time without any particular mixture, such as you find in the hollow of a Cabbage-leaf, or on the *Dipsacus*, &c. and I am confident that many of these are the same Creatures under different dresses. For I have noted such a regular process in them, and such a constant order of their appearance, that I am of opinion most of them are the product of the Spawn of some invisible *Volatile Parents*, and generated like Gnats, and many other sorts of Flies, which are bred, and undergo many changes in the Water, before they take wing. But I pretend not to sufficient observations to give you this for more than a conjecture. Some of them also may probably be originally *Water Insects*, or *Fish sui generis*,

*generis*, and are small enough to be raised in Substance or in Spawn, with the Vapours, and again to fall with the Rain, and may grow and breed again in the Water when kept, and this will seem less strange to you, when I assure you that I have seen, and when I am so happy as to wait on you next, will shew you Fishes, some as small as Cheesemites of different sorts, very wonderfully made, which are of the crustaceous kind, shell'd with many joynts, with very long Horns. fringed Tayls, and have many Legs like Shrimps, curiously made, and that some of these carry their Eggs or Spawn under their Tayls in one Bag, another sort in 2 distinct Bags, and some kinds on the fringes of their Legs like Lobsters. But to confine my self to the *Animalcula* I was speaking of, because you tell me your Pepper-water is come to a mischance, I have inclosed some Scetches in my rude way of Drawing, of some of the most remarkable which I have observed in mine. Those marked *E.* are very common, and described by Mr *Leeuwenb.* in some of the first Transactions, but I think neither these, or any of the rest are any where pictured. I have seen the Tayls of some of these 9 or 10 times as long as their Body, (which is about  $\frac{1}{2}$  of an Hairs breadth Diameter) but generally they are 4 or 5 times as long. As they move they will often twich up the Tayl in the posture as marked at *b*, and this Spring is so strong as when the Tayl is intangled, (as generally it is) by the end, they bring back their whole Body by the jerk, and convolution of the Tayl, which soon returns to its first straightness. To a good Glass the end of the Tayl seems to have a knob on it as in *a*, and the folding appears as in *b*, but examining it with one of the greatest Magnifiers, I found the knob to be only a close spiral revolution like the Worm of a Bottle Screw, and that the whole Tayl when twitched up was also a spiral. I have endeavour'd to represent this appearance (to the great Magnifier) in *c* and *d*. I have also seen them sometimes as in *e*. I have farther observed that when these ly still, they thrust out a fringed or

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bearded Mott, which they can draw in again, and that a rapid stream runs constantly toward their fore part, as if they drew in water, but I rather believe this current is made by a nimble tremulous motion of some minute Fins or Legs, which my Glasses will not discover.

Those *Animalcula* marked *F.* are also plentiful in all the Waters and are the largest of all, and I can see them in a good light and position (without any other assistance) with my bare Eye. Their length being about the breadth of a Hair. These have a very quick motion, and are perpetually beating about like a Spaniel in a Field, and by their frequent turns and returns, sudden stops, and casting off, seem to be always Hunting for Prey. Their Bodies are very thin, that which I take to be the Back being much darker than the other side, and you shall see them frequently turn sometimes one side and sometimes the other toward your Eye, and many times you may see part of each. Their edges are as it were fringed with a multitude of very minute Feet, which are most conspicuous about the Head and hinder parts, where are also some Bristles longer than the Feet, which shew like a Tayl, *a* shews one of these with the Back, and *b* one with the Belly toward you, and in *c* and *d* I have endeavoured to represent it as it often appears in other postures. I put some short shreds of my Hair into their Water to compare their magnitudes by, and saw that they could use their Feet in Running as well as Swimming, for they would often stand on an Hair, and go on it forward and backward from end to end, often stooping down, and bending themselves in several postures.

Among these are generally another sort (but not above  $\frac{1}{3}$  of their size (whose feet are also very visible, some of them are shaped almost like a Flounder, and others are rounder behind, for by their motions and actions I judge them the same Creatures. These also will stand and run on an Hair, or any filth in the Water, they are marked *a b* Fig. G. I have likewise seen them double as at *e*, and go forward  
so,

so, like Flies in Copulation. I was surpris'd at the first view of this, thinking it a single Animal of that shape, but have since often observ'd them both joyn and separate, and 2 of them following a 3d, sometimes the first, and sometimes the 2d laying hold of it, and driving off the other.

I forgot to tell you that the little Feet of these Animalcules are most distinguishable when the Water is just drying off, for they being then stranded cannot change their place, and if you watch that nick of time. You may see them move their Feet very nimbly, and distinguish them some little time after the Water is evaporated.

I have not time or room to explain the other Figures in the Paper, but you may expect more by my next.

*Octob. 6. 1702.*

I thought those which I call'd Capillary Eeles had been peculiar to Pepper-water, but have since observ'd the same (tho but few) in some standing water which drained from an Horse Dunghill. This Liquor was Mum-coloured, and the most pregnant of all that I had ever seen, and it would look incredible if I should tell you what a prodigious number of all sorts I estimated to be in a quantity of it of the magnitude of a Pepper Corn, for they appeared as thick as Bees in a Swarm, or Ants on an Hillock, so that I was obliged to dilute the Water to observe the particular sorts. I found in this not only almost all the Animalcula. I had seen in the other infusions, but many sorts which I never met with before. Among them were in great number plenty those which are represented in *H.* their extrem parts look bright, and the middle dark, and seems beset with Bristles, and their Tayl is pointed with a long sprig at its end, their motion is slow and wadling.

*Fig. H.*

But the prettiest object was a great number of a kind of Eeles, which appear most distinctly when the Water is almost dry, which make brisk shoots, and have a pretty wrigling motion, they are of different lengths, and are about the  
thick-

**Fig. K.** thickness of what I call Capillary Eeles. I have drawn some of them at *K*, with some of the Capillary Eeles among them, that you may better judge of their proportions.

**Fig. L.** I preserved some of this Dunghill-water by me 7 or 8 days, and found the number of these little Eeles decreasing every day, till I could hardly find one in it, tho they were as plentiful as before in the Water newly taken up. And on the contrary I observed great numbers in the kept Water, which are very scarce in the fresh. Among these is one sort very singular in its shape and motions. Its body is Spherical, only a little pointed like a Pear, and it seems very pliable like a Bladder fill'd with Water, in which are a vast number of dark particles in confused agitation. Their most remarkable motion is a revolving one, they will turn sometimes above an 100 times, sometimes not half so fast in a minute the same way, and then stop, and turn the contrary way, and all this without moving a Hairs breadth out of their place. They will also go forward, turn and return, and fetch a large compass with many Deviations, and in their progression they always (even in the shortest turns) keep their pointed end foremost, the revolving motion still continuing. And when the Water dries their Skin breaks, and the enclosed Liquid diffuses. I have given their shapes at *L*. These are of different magnitudes.

**Fig. M.** There is another sort, represented at *M*, in great numbers, which are near as long as the biggest kind formerly mentioned. These have brisk motions, and are very active, and have many feet before very visible. They will often contract, and again lengthen themselves as they Swim, but especially when the Water dries, they will shrink themselves up into a Globular figure, and the feet then stand out, which you may see move very nimbly a considerable time after. These also are of different sizes *aa* shews them at their length, and *bb* represents them contracted.

I have also given you the figure of another odly made  
Animal

Animal not uncommon among the rest, which is as large *Fig. N.* as the former, and in its motion (which is very nimble) keeps always the sharp end foremost. I have observed some variety in these (tho I take them to be of the same species) some of them being clear, and curiously striated from the point to the thick end, others only having a fore part clear, and the Bottle dark, as is shew'd at *a* and *b*, but I cannot by any Glass find the Organs by which they move

These I have mentioned are the most remarkable for their size and motions, there are great variety of others which I pretend not to describe and cannot draw, your own Waters are doubtless as fertile in these productions as ours, and your own view of them will be infinitely more satisfactory than any thing I can write.

I have preserved such of the Objects mentioned, as are capable of it, with many others to shew you when I come to *Aston*, (which I hope quickly to do) and particularly some of those Mites with spicated Bristles formerly mentioned, of which I have since found several.

I had forgot to tell you that I found a curious Mechanism in a small *diving Insect* which Inhabits standing Waters. 'Tis like a small fly, with an Head like an House Cricket, but in the place of Wings it has 2 paddles on the Shoulders, and on the end of the hinder Legs, (which are longer than the other 4) instead of Feet and Claws are perfect Oars. I have also taken notice in 2 or 3 sorts of Flies, that behind the Eyes, on the top of the Head, are placed three Protuberances (in Equilateral Triangle with the point foremost) with a black shining Globe in each, like a Ball in a Socket, and are so disposed as if made to look directly backwards. They are perfectly smooth, and without those Hemispherical divisions, visible in the Cornea of the Eyes of the Fly and Beetle kind, but appear more like those of a Spider. I have preserved a very fair one of these to shew you.

Having

Having some room left, I shall here add that I have tried several ways of killing the *Animalcula* before mentioned, by mixing Salts, Spirits and Acids, &c. with their Water, the least touch of which will immediately deprive them of motion and life. But I never yet succeeded in any tryal of recovering or reviving them after the Water was evaporated, by the addition of fresh Water, tho some have affirmed they may be revived by that means even an hour after, nay somebody in one of the Transactions says they will recover after the Water is boiled. Many of those I have mentioned burst when the Water dries, and tho some keep their shapes a little while, yet they too alter in a few minutes, and I cannot imagine them recoverable.

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Fig. A.



Fig. E.

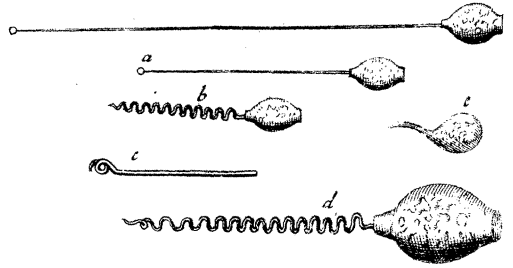


Fig. B.

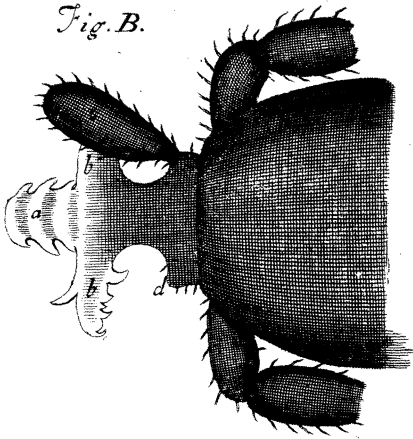


Fig. F.

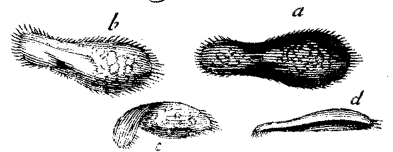


Fig. H.

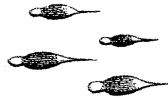


Fig. G.

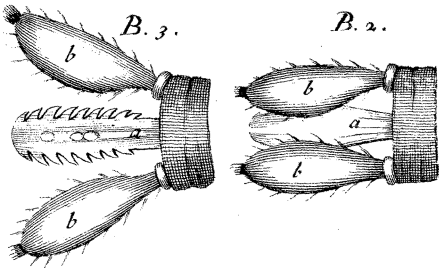
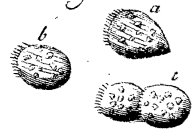


Fig. L.



Fig. K.



Fig. C.

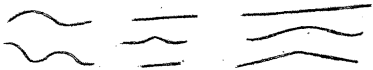


Fig. D.



Fig. M.

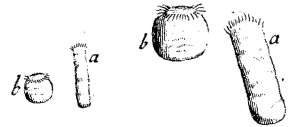


Fig. N.

