

III. *Several Observations and Experiments on the Animalcula, in Pepper-Water, &c.* By Sir Edm. King, M. D. and S. R. S.

S I R,

UPON reading some Abstracts of Mr. *Leeuwenhoek's* Letters in the late Philosophical Transactions, I called to mind some Microscopical Experiments that I made too, concerning *Animalcula*, which I do not remember, have been publickly taken notice of; therefore in Obedience to your Commands, I have faithfully transcrib'd them, such as they are, being certainly true, as to matter of fact.

1. First, having steep't Oates in Rain-water, some days (perhaps 9. or 10.) and looking upon it with my bare Eye, I saw a Substance, that seem'd to me like that usually call'd a Mother (on other Liquors) and laying as much of it as a small Pin's head upon the Object Plate of my best Microscope, I could very easily and plainly discern 7 or 8 sorts of *Animalcula*, of different sizes and shapes (or more) swimming in this Substance, which was Liquid enough, for them to perform very nimble and brisk Motions in, which was very pleasant to observe: Their shapes and sizes were after this manner, as near as I could guess.

Vide  
Fig. 1.

They were all very nimble in their Motions, by computation, several Thousand times magnifi'd.

2. The thin Scum upon Pepper-water, that did resemble Flakes of Salt, upon some sorts of Human Urine, apply'd in the same manner to the Object Plate of the Microscope, was only Clusters of *Animalcula*, that had Liquid Matter enough to Swim in, and I was in admiration at their Numbers, Motions, Variety and Minuteness.

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3. In a Decoction of Herbs, that was strain'd, and set by for a particular Use : In a little of the settling of that (as much as a Pin's-head) I saw Creatures like little Eels, about thus long \*, and seem'd to be as thick, but much sharper at both ends, with a wriggling Motion, like Eels.

4. I observe these small Creatures above-mentioned (if I may so call them) resemble the Nature of Fish, in several respects.

First, They'll flock together, and lye close together, as if they were in shoals, like Carps in a Pond, that has been so shallow, as I have often seen, sometimes in one place, and sometimes in another, but when disturb'd, they are, as to your sight, all dispers'd and lost in a trice ; and so are these little Creatures in their Original Liquor, if you shake the Liquor before you look to find them in shoals, or after: At least I am sure I did, and could never find any in that parcel of Liquor, till next day, or till they did associate again.

Secondly, They will follow their Liquor, to act in, to the last Particle of it, till they have no more to swim in, and then will seem to struggle for want on't, till their Strength fails them, and then after a minute, or less, they will seem dead upon the Object Plate, (when the watry Parts are dry'd away).

Thirdly, They will lye as if they were dead, near half an Hour, or more, then put a little Water to them, in half a minute they will begin to move themselves again, and by degrees, begin to swim faintly and feebly at first (as Fish will do,) and then recovering their strength again, will perform their brisk Motions as vigorous as ever.

Fourthly, Those that are almost dead will look flat, as if prest thin, but when they move, turn themselves over and over, without any regular Motion ; so that you might see them as thin, as the thinnest Spangle  
you

you ever saw, and like it in shapes; and they will continue so, so long as they are faint and sick; but within about an hours time, they will grow plump and well again, if you add fresh Liquor to them in time.

These *Animalcula* choose, for the most part, the top of the Liquor; I suppose for the sake of the Air.

If you perceive them lye dead upon the Object Plate, as I did, and do not remember to add Water to revive them, within an hour, they will be dead indeed: But you may see them in the posture you left them, many days after, as I did; and shewed others the same sight.

Now to give a farther Testimony, That they are *Animalcula*, which some doubt; I have noted the following Observations, for the sake of those that disbelieve Microscopical Experiments: But they may as well deny the use of Spectacles so well known.

If you take a fine Needle, and put the point into Spirit of *Vitriol*, (tho' you can see none of the Spirit with your bare Eye upon its Point, when you take it out, yet if you prick the same point of that Needle into the middle of that drop no bigger than a small Pin's-head, when some Hundreds of these *Animalcula* are swimming, very nimbly frisking about, you shall immediately see (as I did) these minute Creatures (if I may so call them) presently affected from the Acid Particles, so as to spread themselves, and tumble down seemingly dead\*.

\* Vide  
Fig. 3.

If you dissolve Salt, and with the point of the same Needle, repeat the Experiment (in the same manner) in some of the same Liquor that contains some of the same parcel of *Animalcula*, you shall see the Creatures afore-mentioned, be affected too, stop in their Motion, but in another manner quite; not spread flat, as those with Spirit of *Vitriol* did, but shrink long and round, in Form and Figure of that we call (whole Oatmeal, or) an Excorticated Oat.

And whereas the first with the Spirit fell down flat without turning; these, as soon as affected, turn round and round, when they begin to be sick, and wobble, as we say, before they fall down to the bottom and die; unless you quickly recover them with fresh Water, and then you will perceive them get a new Life by degrees.

*Tincture of Salt of Tartar* put into them in the same manner, kills them more immediately; but yet they will be first so sick, or so affected, call it what you please, as you may see by a surprising Convulsive Motion, they will grow Faint and Languid apace; as you may see them fall to the bottom of the Drop upon your Object Plate dead, but in their own Shape, (which I wondred at) that they were in before you apply'd your Needle, and will neither be flat as with Spirit of *Vitriol*; nor cylindrical, as with common Salt Liquor; but lie dead in the same Shape, as before you put in your Needle with the *Salt of Tartar*.

*Inks* kill them as soon as Spirit of *Vitriol*, but makes them seem to shrink divers ways; I suppose by the Solution of Copper which is in its Composition.

*Blood* (newly prest from a Prick purposely made in your Finger) kills them almost as soon as Spirit of *Vitriol*; by reason, (I suppose) of the Salt therein: But it's a fine and surprising sight, to observe them swimming and bustling, first amongst the Globbules of the Blood justling one another, like Fish that are suddenly depriv'd of Water, and bustle together amongst Mud; for so they appear'd to me: And I could think of no better a Comparison then, and I thought my Glasses as good as any Bodies, except some I have heard of Mr. *Leeuwenhoek*, that I never saw.

*Urine* kills them too, in a little time, tho' not so soon.

*Sugar*

*Sugar* dissolved like Salt kills them also, if used in the same manner, and with that some dye flat, and some dye round.

*Sack* will kill them, but not so speedily as the other Liquors. If I had had time, I might have set down many more Observations of this kind, to shew the Sensibility of these, and such like *Animalcula*.

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IV. *The manner of making Steel, and its Temper; with a Guess at the way the Ancients used to Steel their Picks, for the cutting or hewing of Porphyry. Communicated by Martin Lister, M. D. and S. R. S.*

IN the Philosophical Transactions, Numb. 93. p. 6015. amongst other Desiderata's and Queries, are these: *To endeavour to retrieve the Art of Hardning and Tempering of Steel, for cutting of Porphyry, &c.* We know not which way to rough-hew Stones of that untractable hardness.

Those famous and stupendious Monuments of Antiquity, the *Ægyptian* Obelisks are of *Porphyry*, and most of them curiously Carved with a vast number of Figures, one way of Writing of the Ancient *Ægyptians*:. These Witness the Facility that Nation had of graving in *Porphyry*; a Stone which no Tool will now touch, nor nothing less affect, than Emery or Diamant Powder.

Mr. Ray assures us, That all the Obelisks of *Rome*, that are Graven with Hieroglyphicks, are of one and the same kind of Stone, viz. a Marble of a mingled Colour, Red and White, very hard, and hath not in so many Ages suffered the least by the Weather.

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Fig. 2.

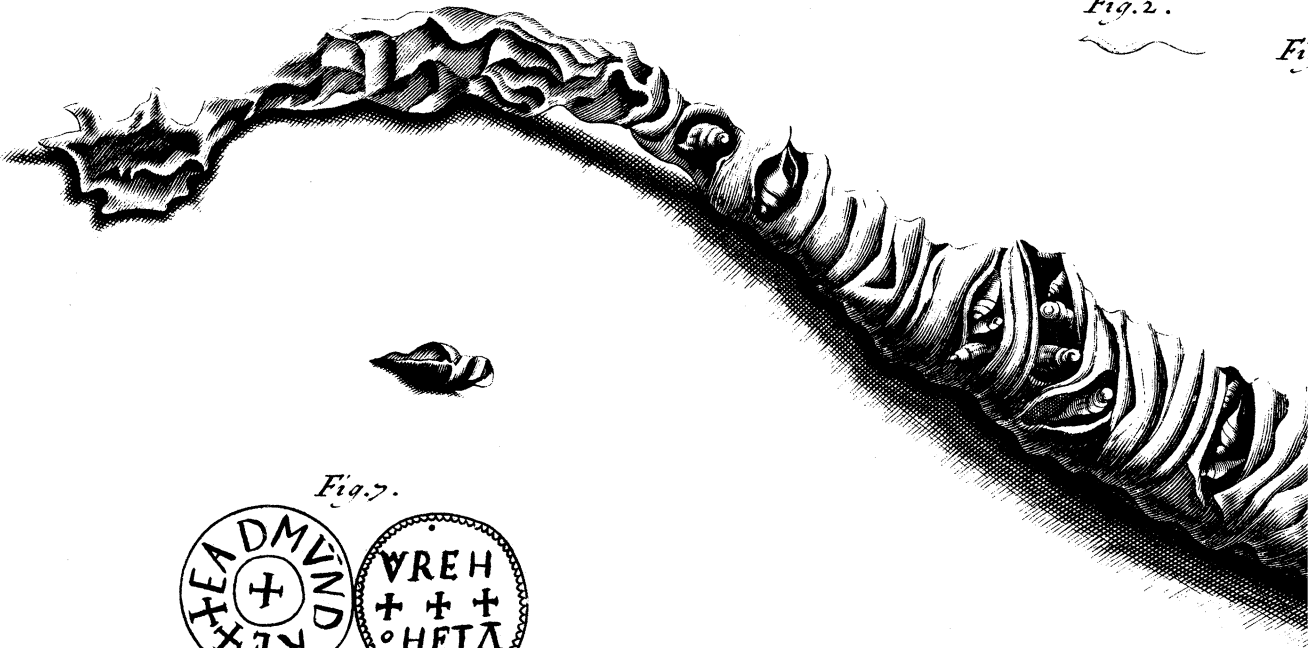


Fig. 7.

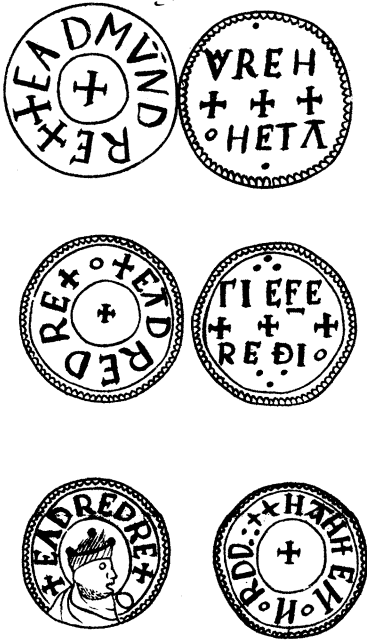
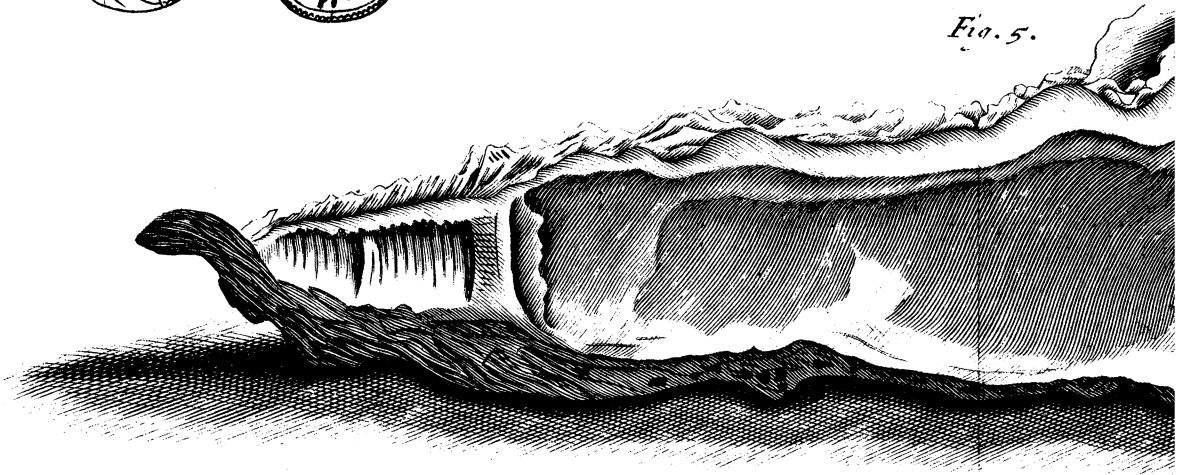


Fig. 6.

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Fig. 5.



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Fig. 1.



Fig. 3.

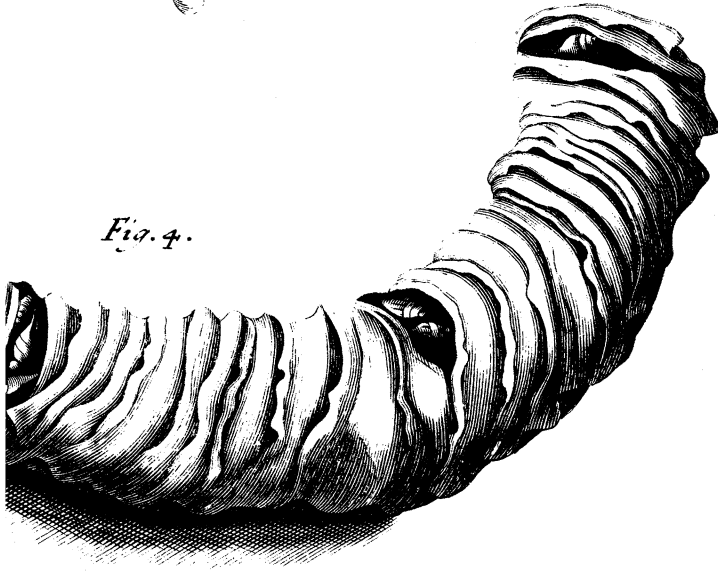


Fig. 4.

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