

1. Microscopical Observations on Red Coral: In a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.

THIS brings you (pursuant to your own Request) some Observations which I made about two Years ago, concerning Red Coral, which are these that follow.

In a Letter of mine of the 29th of *December* 1705, I acquainted you how I had found some small Parts of Blood-Corral upon a little Scollop Shell, and upon a piece of a little *Horn*, or small Fish so called, and that I was of Opinion, that that Corral did not grow, but was only coagulated upon the said Shells.

I had formerly several times slit both in length and thickness Pieces of Blood-Corral, that were very fair and of a shining Redness, and cut off as thin Scaley Particles as 'twas possible for me to do, to the end that I might discover the Vessels in the same; in doing which, I fancy'd to my self, that now and then I cou'd perceive some very small Orifices of the said Vessels, but they were so exceeding small, that I cou'd make no perfect Remarks of them, tho' I could easily observe, that in those Parts that I had cut thro' across, there ran such Fibres from the Centre to the Circumference, as are found in the Roots of underground Fruits; and notwithstanding all my Endeavours, I con'd not find any Pores in them, at least so as to say any thing certain of them; but it seem'd to me, as if most Parts of the Corral were made up of roundish Particles, such as some
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certain Fruits are compos'd of, but their roundness was such, that each of them were in a manner of a different Figure, such as might best suit with all the rest, and so as to leave no Vacuity in them; and thus the Saps which are not in the Vessels, are convey'd from one of those round Parts to the other, and so serve for Channels.

I could never have thought, that the Parts of Red Corral were so closely united to another, as I have since discover'd; I know indeed, that there are Pieces of Blood-Corral preserv'd as Rarities in a great many Closets, that are like little Trees with their Branches, fasten'd to Stones or other Substances, and pretend'd to be miraculously growing out of the same; but one is not oblig'd to believe it, unless it cou'd be prov'd, that such Corrals had Roots and little Fibres proceeding from them, which if they did not penetrate into the Stone, must at least be so spread over the Surface of it, as to be obvious to the Sight.

I will rather suppose, that Corral whilst it is growing at the Bottom of the Sea, is very soft; and that those Plants of Corral, or the Branches thereof being broken off by the Corral Fishers, the thick Ends of them may accidentally fall upon a Stone, or some other Substance; and by reason of the aforesaid Softness, and of a Glutinous Matter with which it is endued, might very easily be fasten'd to the Stone, and afterwards People made to believe, that it is a Wonderful Excrecence from such Stones or other Substances.

I have two Pieces of Corral by me, that were no bigger than a Hen's Quill; I broke one of them into several Parts, and found in three places Cavities that took up more than half the space of the Corral it self; between these Cavities the Parts of the Corral were solid and close: In each of those Cavities there was a thin Membrane that one wou'd judge to be a bit of a dry'd

dry'd Leaf, because the long Parts that appeared in them in great Numbers, seem'd to be Canals or Vessels ; but upon a strict Examination into the same, I judg'd them to be coagulated Salt Particles, and the rather, because they were sharp at both Ends.

Now I must confess, it is unconceivable to me, how such Particles shou'd be found in the middle of the Corral, especially if we allow that Substance to receive its Nourishment and Increase, after the same manner as other Plants.

For my further Satisfaction I took a little Piece of very fine Red shining Corral, and put it into the Fire, and observed that a little heat caus'd the fine Redness to vanish, and turn'd it into an Ash-colour.

The Corral being in this condition, the Superficies of it still retains the same Smoothness, but under it the Particles seem'd like Ribs extended lengthways in the Corral ; and viewing the same more narrowly, I observed, that the said Rib-like Particles compos'd a Circle of round Scales, and that several Roundnesses were made by those Rib-like Particles, till the middle Point of the Corral, in which there was no opening, became a long single Particle.

Now having observed, that the Corral, by being heated, did not burst in Pieces, but was only split or rent in one place, I imagin'd, that the Matter which was driven out of the Corral by the heat of the Fire, evaporated thro' that rent that was made in the Corral ; or else that the Parts of the Corral being open'd by the Heat, the Moisture that was in the Internal Parts might be drawn up towards the External.

After this I took a little Piece of Corral, and put it into a Glass, and put that into the Fire, encreasing the Degrees of Heat so fast till the Glass was melted, but I preserv'd the Matter that was drawn off as well as I could, and viewing it thro' a Microscope, I discover'd

a waterish Moisture, which to the naked Eye seem'd yellowish, and which was mingled with an exceeding number of small Particles, which made the Liquor thick and troubled, and 'twas also mingled with a yellowish Oyl, which, where it lay thickest, was of a Reddish Colour.

I took, moreover, some other Pieces of Corral, and laid them upon glowing Wood-coals, and put them into so great a heat, that the Colour turn'd from Red to a fine Whiteness; and in that condition I threw it into some clear Rain Water, and observed, that the Parts thereof were immediately separated, and the most part of it in appearance turn'd into a White and Chalky Substance; and the reason why all the rest of the Corral was not dissolved, was, in my Opinion, because a sufficient heat cou'd not reach the Parts of it; for when I took the Remainder, and heated it as I had done before, the same Effect was produced in that likewise.

The Water in which the Corral was quenched, had not stood a Minute, but that I cou'd perceive a Scum or Membrane of Salt Particles, with which it had been impregnated, upon the Surface of it, and which consisted of such an unspeakable Number of small Salts joyn'd to one another, that it was impossible to discover the Figure of them.

After the Water had stood some Hours, I discover'd abundance of Salt Particles, and of so many several Figures, that it was impossible to describe them; some of them were as clear as Chrystal, and it was a very pleasing Spectacle to see so many several Figures of such different Shapes and Sizes, lying together in such a narrow compass; and as fine and shining as they were when surrounded with Water, no less Dark were they almost all of them when the Water was evaporated, and then it appear'd as if they were dissolved into a great many small Particles, seeming to be of a Whitish Substance;

at another time, I fancy'd that I saw the Watery part, which lay upon or about those Salt Particles, impregnated with abundance of others much more small than the former, which in the evaporating of the Water, were coagulated upon the first mention'd clear Salts, and so eclipsed the shining or glaziness of those Salts.

After some Days, having decanted the Water off the Whitish Matter, and poured fresh upon it, I observed, that there were Salt Particles still coagulating upon the Superficies of the Water; and those Salt Particles were extracted from the Corral in so unspeakable a Number, that no Body wou'd believe it unless he had the Experience of it.

From hence we may conclude, that the hardness of the Corral proceeds from no other Cause but the great number of its fix'd Salts.

Now forasmuch as the Heat of the Fire was sufficient to take away the Redness of the Corral as soon as it was put into it, I laid three little Pieces of Corral on *Aqua fortis*, to try whether that wou'd have the same Effect; and I had no sooner poured the *Aqua fortis* upon the Corral, but the Air Bubbles, which came out of the said Corral, took up four times the space the *Aqua fortis* had filled before; and the Corral, moreover, by Reason of the great Multitude of Air Bubbles, that continually came out of it (some of which also stuck upon it) was raised from the Bottom to the Superficies of the Water, but the said Water was not in the least tinged with the Red Corral, but it became Whitish which was occasion'd by all those Parts separated from the Corral; and when the *Aqua fortis* had no more power to dissolve the Corral, by reason that I had poured but a very little upon it, the aforementioned dissolved Parts subsided to the Bottom, and the Superficies of the *Aqua fortis* resumed its first clearness.

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After the *Aqua fortis* had stood about two Hours upon the Red Corral, I took a little of that Whitish Matter that had sunk to the Bottom of the Glass, and putting it upon a clean Glass Plate, I discover'd an unspeakable Number of long Particles, that seem'd just like the very fine Hair of one's Beard after it had been shaved off two or three Days.

I took also some of the upper part of the *Aqua fortis* that was clear, and pouring it upon a clean Glass, I likewise discover'd therein a great many long Particles, such as are mention'd before; and when I examined more strictly into that White Matter that had subsided to the bottom of the Glass, I found that 'twas nothing else than the slender Particles abovementioned, some of which were longer than the rest.

The *Aqua fortis* having not been sufficient to dissolve all the Corral, I added a little more to it, and then observed, that in a short time the remaining part of the Corral was not dissolved, saving that a very few Parts, which were composed of much smaller, (or rather those smaller were again coagulated) floated upon the top of the Water, but 'twas impossible to discover of what Figure they were; and then the *Aqua fortis* which had been impregnated with the Red Corral was very clear, but when I came to view it thro' a Microscope, I discover'd, that there were still an unspeakable Number of the aforesaid long Particles floating therein.

I placed the said very small Particles before a Glass, which magnified much more than that I had already used, and then I discovered such exceeding slender Particles, as did almost escape my sight, and which, I suppose, were altogether invisible before.

With this Glass I discover'd long Particles, which did not only exceed the rest in length, but in thickness too, and the Ends of which were blunt; and having discover'd in some few of them three distinct sides, I con-

cluded that they were of an Hexangular Figure, and consequently that they were Salt-peter Particles.

From these Observations, I consider'd with my self, whether all those Salt Particles, in which, I said before, I had discover'd so many different Figures, were not originally of the same Shape with those very slender Salt Particles that I discover'd when I dissolved the Corral in the *Aqua fortis*, notwithstanding they were a thousand times smaller than they appeared thro' the Microscope; and the difference of their Figures may perhaps be only occasion'd by the Accession or Coagulation of other Particles, which in one place may be greater or less than in another; and accordingly the Figure and Size of them are determined by their nearness or distance from one another.

After this I broke off two little Pieces of Red Corral from a small Shell I had lying by me, and which is described in a preceding Letter, by *Fig. 4. Letter A*; and placed that likewise upon a piece of Wood-coal, which I made red hot by blowing on it the Flame of a Wax-Candle; and in that condition threw it into a little clean Rain-water, and presently observed the Corral to be dissolved into a fine White Matter, and soon after the Matter overspread with a Scum, which from time to time increased in thickness; and about two hours after, amongst the infinite Number of exceeding small Salt Particles, I saw some of a larger size coagulated, agreeing with the aforementioned Salt Particles; in short, one wou'd imagine, that the Salt Particles that were separated from that little piece of Corral, and which were coagulated in and upon the Water, did altogether make a greater Body than even all the Parts of the Corral itself would amount to.

Now having been informed, that a certain Physician or Surgeon (esteemed by some Persons, but of small Repute with others who have Skill in Physick) did make
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use of Corral in his Medicines ; and being my self of Opinion, that Corral can be of no manner of Service to the Bodies of Men, I took some of the finest Red Corral that one shall see, and put it into Post Paper, and beat it with a Hammer upon an Anvil to Powder ; after that I put the same Powder into a clean Glass, and poured upon it fair Rain-water, till the Particles of the Corral were cover'd with Water ; then I heated the said Water so much, that I caus'd it to boil about a Minute, and put a little of this Water, after it had stood some time and was grown cold, upon four several places, and upon the cleanest Glasses I cou'd get, to the end that the Water might for the most part, or rather altogether evaporate, and that I might by this means discover, whether any of the Salt Particles were gone over to the Water ; for in case none of the Salt Particles shou'd go over to the Water, how can any one suppose that Corral has any influence upon our Bodies, in respect to our Health.

After that this Water was intirely evaporated I view'd it carefully, but cou'd discover nothing remarkable in it ; and when I had also caus'd the clean Rain-water to evaporate, I cou'd not but think that there was no other difference between that and the other Water in which the powder'd Corral was boiled, than that there were more Particles in the Rain-water, than in that which was boiled.

I also-view'd the Water, in the bottom of which the boiled Corral lay, several times with my naked Eye, so long till the Water was in a manner evaporated, but I cou'd not in the least discover any Salt Particles in it ; and the Water, moreover, remained very clear : In short, I conclude, that 'tis impossible that those fix'd Salts, of which Corral is for the most part compos'd, can possibly be dissolv'd in the Body, but only by sharp Salts or by Fire, and consequently, that it is altogether

gether an unprofitable thing in Physick ; and who knows whether they that cry up Corral so much, did ever make any use of it, unless it were to amuse common People with uncommon Medicines, and thereby get themselves a Name; whilst they are in the mean time only cheating the World ; of which we have so many Examples.

I have likewise examined into two other sorts of White Corral, and noted some few Remarks upon them ; but I shall not trouble you with more at present, but conclude, and remain

Tours, &c.

II. *Part of a Letter from Mr. Ralph Thoresby, F. R. S. to Dr. Hans Sloane, R. S. Secr. concerning some Roman Coins found in Yorkshire.*

ON Saturday last Mr. *Arthington* obliged me with the perusal of some *Roman Coins*, which a few days ago were Plowed up at *Cookridge*, in some Grounds he purchased of Mr. *Kirk Junior*, and are a confirmation of the Conjecture of his Ingenious Father (the late *Thomas Kirk Esq;*) that the *Roman Via Vicinalis* (which comes from the great Military Road upon *Bramham-Moor*) passed from that Station at *Adellocum* (of which there is an Account No. 282. of the *Philosoph. Transact.*) thro' these Grounds to *Ilkley*.

There are but few of them, (not above Twenty that the Servants confess to) but those mostly very fair: The eldest he has is of *Domitian, An. Urb. Cond. 846.* which you know falls in with the Year of our Lord 95 ; his
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