

I. *Microscopical Observations on the Cortex Peruvianus*: By Mr. Anthony Van Leeuwenhoek, F. R. S.

I Have been many Years acquainted with the Heer *Angelus Van Wikhnyfen*, a Doctor of Physick at *Midd'elburgh* in *Zealand*, and I have a much greater esteem for him, because he has owned to me several times, (and so indeed have divers other Learned Gentlemen,) that he knew very little of the Art of Healing, and that most of his Operations were performed by simple Medicines.

When this Gentleman came to visit me last, our Discourse fell again upon the Skin or Bark of that Tree, which is called *China China*, and which is made use of with success in the most Obstinate Fevers.

Our Discourse amongst other things rolled upon this Topick, That between one Bark and another there is a great deal of difference; for in all Woods that are known to me, the Bark proceeds out of the Wood, and every Year there is produced a new Bark between the Wood and the old one of the former Year, by which means the Barks of Trees grow every Year thicker and thicker; so that at length the extreamest Bark that lies farthest from the Tree does not only receive no nourishment, but also dies, so that that which before had a taste in it becomes altogether tasteless, as I have shewn upon other Occasions; and consequently those Barks, which we call *China China*, are best when separated from the youngest Trees.

Hereupon the Doctor frankly Communicated to me, how he made use of the *China China*; adding, that he thereby

thereby infallibly cured all Fevers that were going off, and gave me leave to Publish what he told me.

He beats the *China China* to a fine Powder, and passing it through a very fine Sieve, takes two Drams of it, and infuses it into half a Pint of *French Wine*, and so gives it mingled with the said Wine to his Patient to drink; or else he takes about an Ounce or 16th part of a Pound of the said fine Powder, and puts it into a Glass Bottle, and pours upon it a Quart of *French Wine*, and so lets it stand for use: His Directions are, that about an Hour before the Fever comes upon you, you should take the Bottle and shake it well, to the end that the Powder that had subsided, may be well mingled with the Wine, which is to be divided into four Doses, and taken upon every Access of the Fever, in case it should return; and by this means, he says, hardly one in an hundred have failed of being cured.

About a Year ago, I took three or four little pieces of the Bark of the Tree called *China China*, and examined it as well as I could, but was not satisfied in my Observations; wherefore I took again a little handful of the said Bark, both of the thickest and thinnest sort, in order to examine it anew, and try whether I could have any better luck, than in my former Observations, which I laid aside, as if I had never made them.

I observed then, that the Bark called *China China* does for the most part consist of long Particles, both ends of which run into a Point, some of which, at first view, one would judge to be twice or thrice as long as the rest; but examining them more nicely, I found that they were several Particles sheathed, as it were, within one another, in such a manner, that without looking very close upon them, one would take them to be one continued Particle.

These Particles are somewhat Transparent, enclining to a yellowish Colour, and almost round.

I chose out a long Particle, which lay the length of the Wood in an Oblique Position, from among some of those that were near the Extremity or Superficies of the Bark, and caused it to be drawn as you see *Tab. 1. Fig. 1.* A B C D E.

At B is represented a small Crookedness occasioned by the Vessels that proceed from the Wood, and by which the Bark receives its increase.

By C D is represented that part upon which another of the long Particles lay, and so made a Dent or Impression therein, and the same also happened to the other end of it, described by A E, occasioned by another Particle that lay under it; but I never observed any thing like this in other Barks of Trees that I have examined, save only in that which is called Cinnamon.

I placed moreover before the Eyes of the Painter some of the said long Particles, after I had cut them asunder Horizontally, and caused him to draw a small Number of them, that you may judge how close the said Particles lay by one another in the Bark; yea, I have seen six of them lie so near one another, that you could but just distinguish the Number of them; and that which divides these long Particles from each other, is only the Vessels that compose part of the Bark, and proceed from the Wood, as I often said before, and from whence also I conclude, that the above mentioned Particles receive their increase.

Fig. 2. F G H I, represents an exceeding small part of the abovementioned Particles, so as they are cut across, whereby they appear in an Oval Figure; and if we view them very nicely we may discover, that they are composed of Screw-like Parts, as you may see in four of them between I and H.

From this Observation I supposed, that they were not at first made in an instant of time, but that they gradually receive their Increase.

I have several times cut the Bark *China China* through perpendicularly, or length-ways, in order to discover the Vessels that receive the said long Particles, and by which they are nourished ; but I could never succeed, by reason of the vast Number of the long Particles, which caused the small Vessels to break in pieces.

I steep'd some of the said Bark of *China China* in Rain Water, in order to soften it, for the outside of it is so hard that it could not be cut otherwise ; however it remained still so hard, that I could not make use of it to my Satisfaction ; but I have nevertheless observed several times, that the extream part of the Bark had no such long Particles as are described by *Fig. 1.* from whence I judged, that the said Parts were dead or perished, as is usual in several other Barks.

When I had separated the outmost part of the Bark from the rest, I discovered, that the Vessels, which mostly compose the said Bark, did not run length-ways, but Horizontally in the Bark ; and whereas in the Barks of many Trees I could discover the Yearly encrease and growing thickness, I could never but once discover the same in the *China China* ; at which time I observed, that the Vessels that lie Horizontally therein, (and are no bigger than the Hairs of ones Head,) were so close to one another, that there was not one of these long Particles described by *Fig. 1.* lying between them.

Now as the extream part of the *China China* is almost always rough and very hard, I took one of the little Barks, whose outside was smooth like others, tho' it was not of a thicker Wood, and after I had steeped it about 24 hours in Brandy, I found it much softer in the Cutting, than all the others I had dealt with before ; by this Bark I judged that it had been increasing six Years in thickness, before the long Particles represented by *Fig. 1.* were made ; and thus with much less labour I could clearly discover, that the accession or increase of six Years

thickness in the Bark, consisted in nothing else than of Vessels which were disposed Horizontally in the said Bark ; and entering a little further into the Bark, I found but very few of the above mentioned long Particles, but the further I came, the thicker they lay, till at last I found 'em as numerous as in other Barks : And whereas all other Barks of the *China China* are so heavy that they sink in Water or Brandy, this Bark which was smooth, swam, and tho' I thrust it under the Brandy yet it would emerge frequently.

Whether the *China China* be of two sorts of Trees is not now the Subject of my Enquiry, but in the mean time I judge by those pieces of Bark which I had, that they are for the most part taken from the extrem part of the Bark, which is in a manner perisht, for want of enjoying any longer its nourishment from the Tree; and since as I told you before, that smooth Bark which I had steeped some days in Brandy, would not subside, but floated therein almost equal with the Superficies, one would be apt to conclude, that the heaviness of the Bark depended on the Multiplicity of those long Particles described by *Fig. 1.*

Now that you may have a true Idea of the above mentioned Vessels, I caused a small part of them to be drawn, as in *Fig. 3.* K L O P, which Vessels so described, lay very near the Extremity or outside of the Bark, and in which the Painter could discover but three long Particles K M, P N and P O.

Several Persons seeing these kind of Figures would be inclin'd to think that they were not Vessels, being unable to conceive how the Saps can be carried thro' such Oval Particles which seem to be shut up quite round ; but if they considered, that in divers Plants, and in some Woods, there are found a sort of Covers to their Vessels, which are as *Valvulae*, and serve to hinder the protruded

truded Sap from returning the same way, they would not think it so strange an Appearance.

The Microscope, which I made use of to represent this last Figure, does not magnify near so much as that I made use of for the former.

In all my Dissections of the Vessels I could not once discover that any of the before mentioned Particles were joyned to those Vessels, and therefore I imagined, or rather considered, whether those long Particles might not be Coagulated Salts.

After that I had steeped a little piece of *China China* about 24 hours in Brandy, I observed several small Particles thereof floating, but I could not discover, that any of the long Particles were lessened or gone over to the Brandy.

I did several times lay a drop of the Brandy (wherein the *China China* had been steeped) upon the cleanest Glass I could get, in order, if possible, to discover whether any of the Salts of the *China China* might be gone over to the Brandy; and every time I discovered with great Amazement, that within the space of 12 Pulses, the fluid matter, (which was otherwise very clear, saving that it inclined to a Russet Colour) where it lay thinnest, was turned into a white Substance, and soon after the same happened to other drops that were thicker: And when I viewed this white Matter with my Microscope, I discovered an unconceivably vast Number of small Particles, insomuch that no Man would believe it unless he saw them, and where these Particles lay thickest together, they appeared to be of a Russet Colour.

I several times laid as much of it upon a clean Glass, as would make the Quantity of a Grain of Sand, to see if it were possible the Figure of those Coagulating Particles, but they were so unconceivably small, that they escaped my sight; and as soon as I had set this fluid Matter in the

Air, and placed it before my sight, I perceived the Particles moving amongst each other; they were also in vast Numbers, and the Moisture being dryed up, they assumed a White Colour.

Afterwards I infused some of this Bark in a well tasted *Florence Wine*, in which after it had lain about 24 Hours, I took a drop of the said Wine, and put it upon a clean Glass, and observed therein likewise abundance of Coagulated small Particles, but nothing near so numerous as these that appeared in the Brandy; I could also perceive some Salt Particles in the said Wine, but when I put in some more of the *China China*, the Coagulating Particles increased, but none of the Salts which are peculiar to the Wine did then Coagulate.

I infused again a little of the Bark in Rain Water, and after a little time poured some of it upon a clean Glass, in order to its evaporating, and then observed, that a great part of it was turn'd into a Scum, but there was nothing more remarkable in it.

Moreover I took a strong Pickle, and put some of it into a Glass Tube of the thicknes of a small Birds Quill, and conveyed into the Middle of that Pickle, in three distinct places, a little of the Brandy in which the *China China* had lain three or four days; and I observed, that the Brandy would not mingle with the Pickle, but immediately coagulated like Clouds, which Cloudy Matter, as being lighter than the Pickle, rise up to the upper parts of the Glass; and tho' this Coagulated Brandy, in which the *China China* was infused, had been ten days in the Pickle, yet was it not dissolved; and whereas the Coagulated parts, by reason of their lightness, had at first emerged, they did afterwards sink down gradually to the bottom, and tho' by shaking I moved them upwards, yet when the Glass stood still they would presently subside.

Afterwards

Afterwards I took some Pickle and mixt it with Brandy in which the Bark had lain about eight days, and poured some of it upon two distinct Glasses, and then observed that as soon as the said Brandy was mix'd with the Pickle, the mingled Stuff assumed a whitish Colour; and when I viewed it with my Microscope, I discovered therein so many Coagulated Particles, even where the Liquid Matter had run off of the Glass, that it was hardly to be conceived how there could proceed, out of two transparent mixed Liquors, so many Particles, which through the Microscope appeared of the Colour of the Bark *China Chine*, besides an unspeakable number of such exceeding small Particles, that they almost escaped my sight, tho' viewed through one of the best Microscopes; and about the space of a Minute after, in the place where the Liquid Matter had lain thinnest, I saw a great many Coagulated Salts of Quadrilateral Figures, the sides of which run obliquely into a Point, in appearance like a Quadrilateral pointed Diamond; others were Coagulated without any Shape or Order, and all encompassed with small Particles mentioned before: I saw moreover, a great many very transparent irregular Particles coagulated, of which, in all my Observations upon the Pickles and Brandy, I had never seen so many and so large; in viewing those Particles more narrowly, I found they were Salts that had not been able to Coagulate.

After this I took a little Brandy (about the Quantity of three or four Grains of Sand) in which some of the *China Chine* had been infused, but not in whole Pieces; and I mixed the same with about a like Quantity of my Blood, which by the prick of a Needle I had drawn out of my Finger, and as quick as ever I cou'd placed it before my Microscope; and then with great Amazement observed the Operation of this mingled Stuff, in which there was such a fermenting and running about of the Parts, that it is impossible for me to express it to you; and

and in these Commotions I observed, that most of the Globules of the Blood (which are the occasion of its redness) were dissolved, and I judged that this fermentation lasted about a quarter of a Minute; and because it was very diverting, I repeated the Experiment several times.

Moreover I mixed my Blood with some *French Wine*, in which the Bark had been infused, but discover'd no such fermentation as I had observed before, but I could perceive in some few places the Globules of Blood Coagulated after such a manner, that it appeared like a very thin Membrane torn to pieces, and several very thin Fibres or Threads thereof lay about, such as I had never seen before; and I think I never saw so little Coagulation of the Globules of Blood when mingled with any Liquid as I perceived with this mixture, but when the Blood was dry, and where it had lain pretty thick, there it was so much Coagulated, that there could be no Globules any longer observed therein.

Now if we consider that our Stomachs deliver out such Juices as Coagulate the Common Salts which are in our Meat and Drink, and discharge them with the Excrements, 'tis possible that many more parts of the *China China* are dissolved in the Stomach, and such a Coagulation caused in the Chyle, that the Juices which go into our Bodies, have such an Affinity with the Serum of the Blood, as to hinder its Separation, and so keeps the Blood in such a Fluid state, that the Distemper which we call a Fever is thereby prevented.

You will pardon me for trespassing so far beyond the Bounds of my foregoing Observations, but we cannot but stand amazed when we see that a Codfish should have two, three, or four Haddocks in its Stomach, which according to the manner of all Fishes, they swallow down with the Head foremost, and which serve for their Food and Nourishment; and that not only the Flesh of those
 Fishes,

Fishes, but also all the Bones of the Heads and Bodies, are so broken and dissolved, as to be turned all into Chyle, excepting those Parts that are discharged with the Excrements.

Now one cannot conceive, that the Bones of these Fishes should be dissolved by the Motion which the Stomach receives from the *Ledens gemysse* Parts, which are on the Head, and which we call Cheeks; but one must imagine, that there is a Juice in the Stomach of Fishes, that causes the Dissolution of the Bones; and if it be so in Fishes, why not likewise in Four-footed Beasts, and also in Birds.

Whilst I was writing this, my People were preparing two Turbots for my Dinner, the biggest of which was above a Foot long, and had in his Stomach a young Whiting (not yet consumed,) and which being longer than the Stomach it self, part of the Tail was turned up to the Head, the most part of which was Dissolved and Consumed, but the Body was as fresh and good as any that are brought into the Market.

Having made these Remarks, and entred them into my Book, I writ the following to the *Heer Van Wikbuysen*:

I think I have heard speak some Years ago of the China Chinæ, and been informed that this Medicine is not to be used but with the utmost Caution, for that otherwise it may be so prejudicial to the Body, that tho' the Fever should be removed, the subsequent Inconveniencies may be worse than the Disease it self; Wherefore you having had so much Experience of the China Chinæ, you cannot but know whether that Medicine does leave any Distemper behind it; of the truth of which I would gladly be informed.

Whereupon the said Gentleman answered me from Middleburg, July 15, as follows.

I know that many are of that Opinion, but what Grounds they have for it I can't tell; I must declare, that nothing of that has occurred in my Practice, and I have used as much of the Bark as any Body.

Fig: 1:

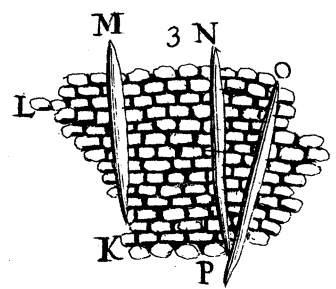
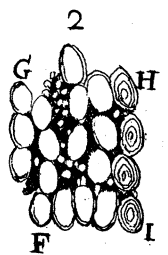
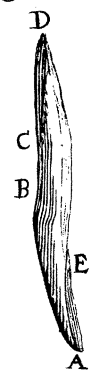
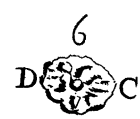
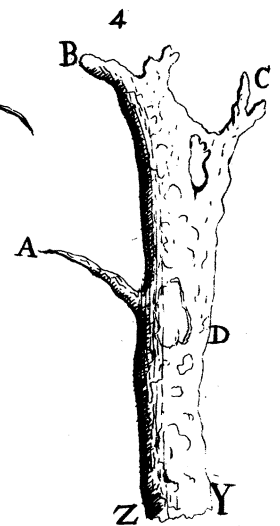
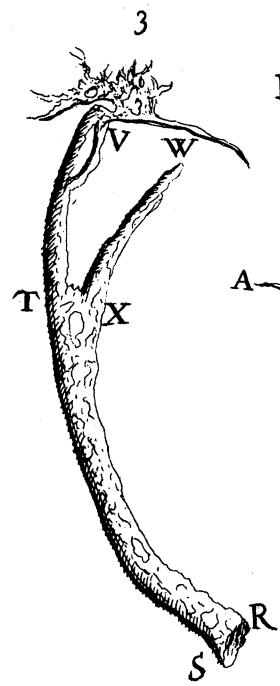
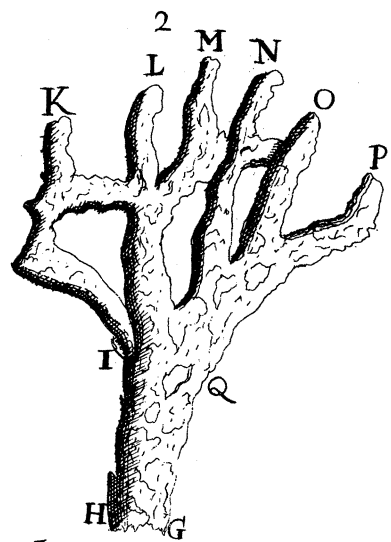
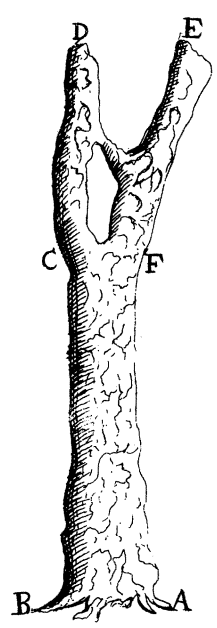


Fig: i:

Tab: 2:



Tab: 3.

Fig: 1:

