

II. *Microscopical Observations on the Blood Vessels and Membranes of the Intestines. In a Letter to the Royal Society from Mr. Anthony Van Leeuwenhoek, F. R. S.*

Delft in Holland, April 20. 1706.

I Take the Liberty to acquaint your Honours, that Professor *Bidloo* came to my House *March 7.* desiring me that he might view thro' a Microscope a little piece of Gut, which, he said, was part of the Bowels of a Woman; whereupon I having separated a small Particle thereof from the rest, we discovered in one of the thin Membranes, of which, for the most part, the Gut is composed, a great number of little Fibres and Vessels, which lay in great Multitudes over and across each other, as also some Particles of Fat, which lay like Bunches of Grapes upon the said Fibres.

After that the said Professor *Bidloo* was gone, I was desired, that in case I had discovered any thing remarkable in that little piece of Gut, I would give a brief Account of it.

Whereupon the same Evening I writ to the Persons who desired that of me, that I was considering whither or no those Particles of Fat, which we had discovered, might not be supposed by many People to be Glands or Kernels, and that the same were to be found likewise in the Skin; and the rather, because that I have discovered in the Skin and Guts of Animals none of those Glands, of which People talk so much, but Particles of Fat in great number.

Mr. *Bidloo* having acquainted me how this Woman died, I writ to him thereupon, as follows,

When I observed that little piece of Gut, that was unprepared, nicely thro' my Microscope, I could perceive a great Quantity of Blood lying without the Vessels, which I never did discover in the Guts of other Animals before; from whence I concluded, that as a great many Animals lose their Lives by the spilling of their Blood, that same Blood, notwithstanding the quicker Motion of the Heart in the Pangs of Death, continues its Circulation: Whereas in those that are Hanged or Strangled, as this Woman was, the Circulation of the Blood is in a great measure interrupted by the Rope: To which, if you add the dismal Thoughts of approaching Death, upon Account of the deserved Punishment they undergo, (which Thing does not occur in Beasts) and the great Concern at that time, there will be a much greater protrusion of the Blood of a Rational Creature, than that of a Beast.

Now the Blood being protruded out of the Heart in great Quantities at once, and not being able to circulate with the same quickness thro' the small Vessels, I suppose that the Tunica's or Coats of the exceeding small Vessels are so extended, that the Blood filtrating thro' them, is found in great Quantities without the Guts, where it is dried upon the extream Membrane or Skin, and is found in little Lumps here and there without any Order.

Soon after this, having acquainted Professor *Bidloo* with these my Thoughts, he had the Goodness to send me, on the 12th of *March*, two Dissertations subscribed with the Name of *Peter Evertse*, in *Latin*; from whence a day or two after it was explained to me, that the Woman to whom that Gut belonged had been Hanged, and that in her Life-time she was troubled with a Falling-Sickness.

In the said Dissertations I observed three distinct Draughts of the Figure and Form of the said Gut, and taken by the help of a Microscope; and forasmuch as these Figures did not agree with my Observations, I have taken the Liberty to delineate some small Particles of the said Gut, just as they appeared to me thro' several Microscopes, hoping that it will not be taken ill of me.

I then placed a small Particle of the said Gut with the Outside thereof before a Microscope. to shew how the Blood lay coagulated upon the extream Membrane of the said Gut which was unspeakably thin.

Fig. 1. A, B, C, D, E, F, shews the Blood as it lay spread within a small Compass upon the outmost Membrane of the Gut.

By G, G, G, G, we represented the Oblong sort of Drops, where the Blood had been protruded in an extraordinary thickness, and was coagulated like that Blood that lay upon those Parts which are described by B, C, D, E, and F.

Now as we see how this Blood was protruded thro' the Vessels of the Gut, we may very well suppose that the same happens in other Parts of the Body.

After this I separated the Membranes of the Gut, so carefully from one another, that I imagined I was come to the innermost Membrane; but after that I had observed it with greater Curiosity, I discovered that that Membrane which is here described by *Fig. 2*, H, I, K, L, M, N, O, P, Q, which is the Circumference of it as it appeared to the Painter, was a double Membrane.

In this small Particle, which was drawn thro' a larger Microscope than that of *Fig. 1*. there were such a vast number of small Vessels and Fibres, that it is almost inconceivable, as it was impossible for the Painter to describe all those that he saw of them, especially by reason of those two thin Membranes lying one upon the other; for how thin a Membrane soever one places before

fore the Microscope, if it be not broken, one can discover not the least Hole or Passage in it ; and when one of these small Fibres or Vessels appear to the Eye, they disappear as soon and escape the Sight ; partly because they are cover'd by other Particles that lie by or near them, and partly because they are torn from the Membrane that lies upon them, to which they had been before united.

By L, M, N, O, are represented the little Vessels or Fibres, which by being separated are standing out of the Membrane.

Now as for those Vessels which are discovered in the aforesaid Membranes, it is impossible for me to judge whether they are Arteries, Veins, Lacteal, or Lymphatick Vessels ; for altho' there are divers Arteries and Veins in such a thin Membrane as is here represented, and tho' there were Blood in them, yet cannot that Blood be discovered, because in such fine Vessels it loses its Colour ; besides the Globules of Blood in such exceeding small Veins and Arteries, if they are not dissolved of themselves, yet by the Expansion of the Gut to bring it into a flat posture, they must necessarily be dispersed and dissolved.

In the said Figure by R, R, R, R, R, and upon more other Places are represented the little Globules of Fat.

I placed before another Microscope a little Particle of the said Gut, in which, to the best of my Power, I had separated the Membranes that lay upon one another, and that compose the thickness of the Gut, in order to see them the better.

In *Fig. 4.* By A, B, C, D, E, M, P, W, *a, b, c, d,* X, Y, R, O, L, is represented a small Particle of the Gut (because it should it should not take up too much Paper) wherein none of the Parts are described, because it is only to shew how the Membranes are separated from each other ; the Circumference of the extreamest Membrane, of which, together with the Coagulation of the Blood
upon

upon it after it had been protruded thro' the small Vessels, is represented by A, B, C, D, E, F, G, H.

The uppermost Membrane is of an exceeding thinness, and very near of such a Form, as in *Fig. 2*.

In the abovementioned *Fig. 4*. A, G, F, I, K, L, is represented the third Membrane; L, K, I, M, N, O, the fourth; O, N, P, Q, R, the fifth; P, T, V, the sixth; P, W, X, Y, the seventh; and by W, *a, b, c, d*, the eighth Membrane.

So that the abovementioned Gut, as far as we have been able to represent it here, consists in Substance or Thickness of eight Skins or Membranes lying upon one another.

Between two of the said Membranes I observed, that there lay some Fibres without any Branches or Sprigs proceeding from them; and pursuing my Observations, there occur'd to my sight some other small Fibres lying close to the rest, which seem'd to me to be torn from other Parts; and a little on one side there lay one of those Particles, which I caus'd the Painter to view thro' the Microscope, and to draw it as it appears here in *Fig. 5*. A, B, C, D, E.

But pushing on the said Observations farther, and meeting with very few of the same Appearances, I considered whether this Figure might not be purely accidental by its shrinking:

I did also observe, that about the Blood-Vessels which I have already told you, I discovered, as it were shut up under the outmost Membrane, a great many Fat Particles lying; from whence I concluded, that the Woman, who was the Owner thereof, had been very Fat.

I caus'd some few of those Particles of Fat to be drawn by my Painter, only to show you how those said Particles lie near a Blood-Vessel; they are described by *Fig. 6*. F, G, H, I.

When we consider the great Protrusion of Blood without the Vessels, as it appeared to our Eyes by the help of a Microscope, we may suppose that such Protrusion or Expulsion of the Blood was occasion'd by a great and sudden Fright or Sorrow, or any other Passion ; from whence we may conclude, that in any such Accidents Bleeding is highly necessary, in order to give the Blood room enough in the Vessels for a free Circulation.

Now if the All-Wise Creator had not covered those Blood-Vessels that lie upon our Bowels, which to our Natural Sight seem, as it were, to lie naked, with a very thin, but a very strong Membrane ; that Blood, which, as is said before, is forced thro' the Veins, would run into the Cavity of the Belly, and there stagnating in great Quantities would rot and putrify, and consequently Death must follow : Whereas now, as it is found to lie in small Parcels on the Bowels and other Places, it may be easily dissolved again ; which, if it were not, it would be the Cause of one's Death, or at least of Sickness : But pardon me, that I have gone thus far beyond my Last.

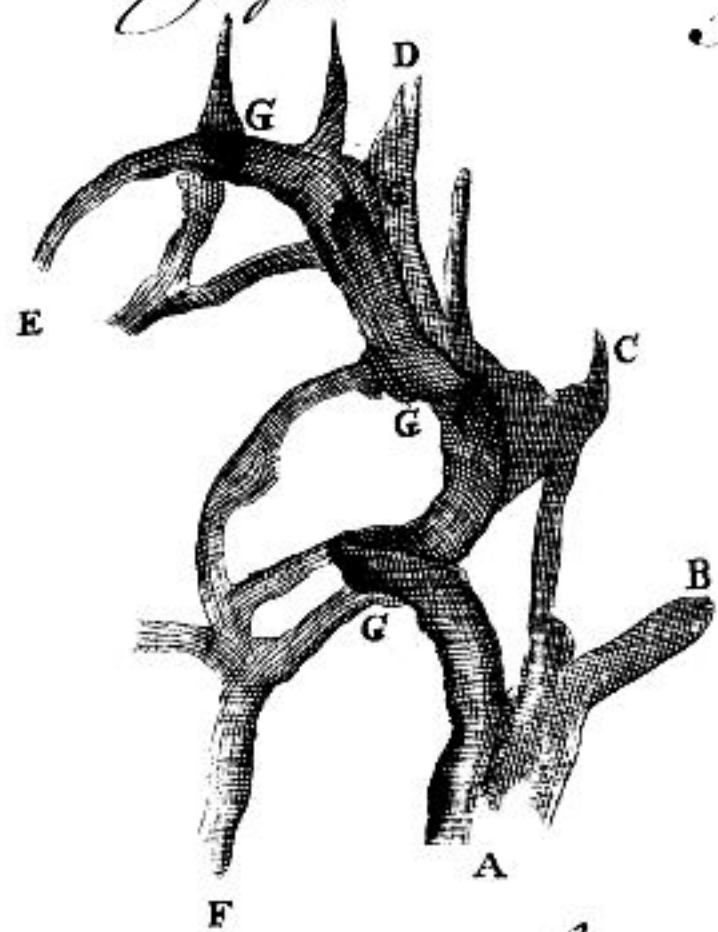


Fig: 3.



Fig: 4

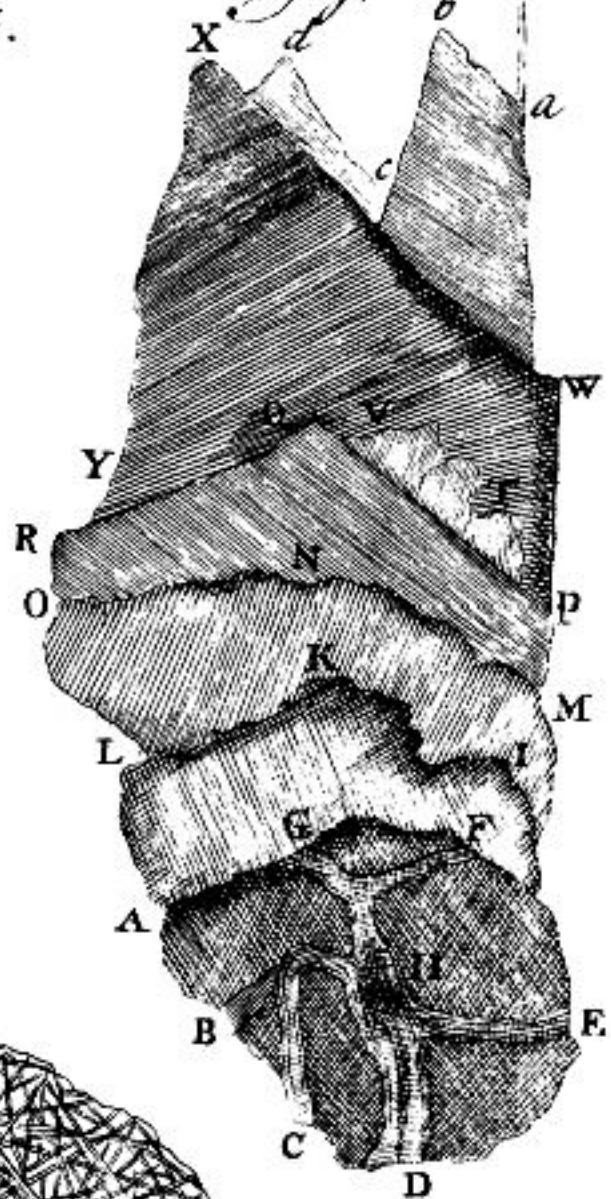


Fig: 2.

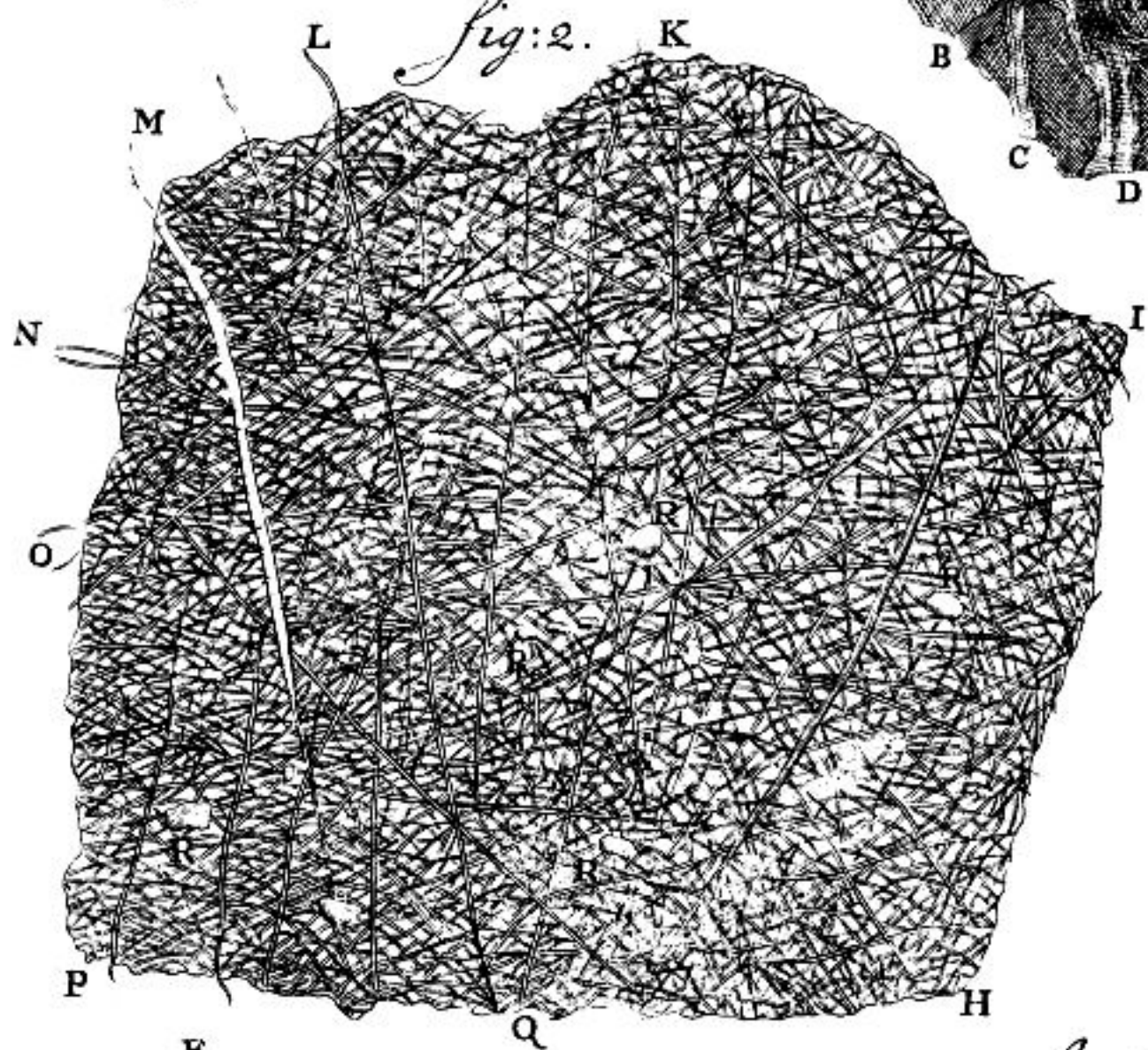


Fig: 6.

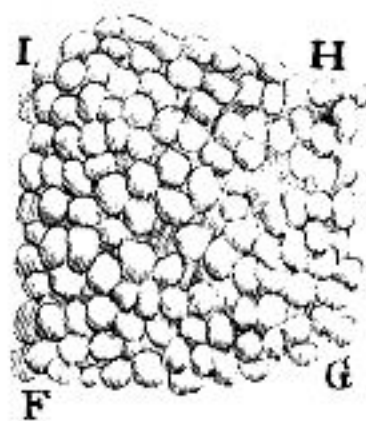


Fig: 5.

