

13
MICROGRAPHIA:

OR SOME

Physiological Descriptions

OF

MINUTE BODIES

MADE BY

MAGNIFYING GLASSES.

WITH

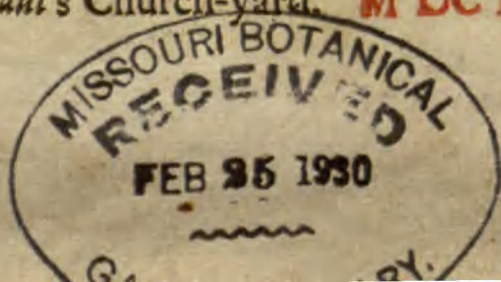
OBSERVATIONS and INQUIRIES thereupon.

By *R. HOOKE*, Fellow of the ROYAL SOCIETY.

*Non possis oculo quantum contendere Linceus,
Non tamen idcirco contempnas Lippus inungi.* Horat. Ep. lib. i.



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TO THE
KING.

SIR,

I Do here most humbly lay
this *small* Present at *Your*
Majesties Royal feet. And
though it comes accompa-
ny'd with two *disadvantages*, the *meanness*
of the *Author*, and of the *Subject*; yet
in both I am *incouraged* by the *greatness*
of your *Mercy* and your *Knowledge*.
By the *one* I am taught, that you can
A *forgive*

THE EPISTLE

forgive the most presumptuous Offendors:
And by the *other*, that you will not e-
steem the least work of *Nature*, or *Art*,
unworthy your *Observation*. Amidst the
many *felicities* that have accompani'd
your *Majesties* happy *Restauration* and
Government, it is none of the least confi-
derable, that *Philosophy* and *Experimental*
Learning have prosper'd under your *Royal*
Patronage. And as the calm prosperity
of your *Reign* has given us the *leisure*
to follow these *Studies* of *quiet* and *re-*
tirement, so it is just, that the *Fruits* of
them should, by way of *acknowledge-*
ment, be return'd to your *Majesty*.
There are, Sir, several other of your
Subjects, of your *Royal Society*, now
busie about *Nobler* matters: The *Im-*
provement of *Manufactures* and *Agricul-*
ture, the *Increase* of *Commerce*, the *Ad-*
vantage of *Navigation*: In all which
they are *assisted* by your *Majesties* *Incou-*
agement and *Example*. Amidst all those
greater

DEDICATORY.

greater Designs, I here presume to bring in that which is more proportionable to the smalness of my Abilities, and to offer some of the least of all visible things, to that *Mighty King*, that has established an Empire over the best of all Invisible things of this World, the Minds of Men.

Your Majesties most humble

and most obedient

Subject and Servant,

ROBERT HOOKE.

YOUR most humble and
most faithful Servant

ROBERT HOOKE.



TO THE
ROYAL SOCIETY.



After my *Address* to our *Great Founder* and *Patron*, I could not but think my self oblig'd, in consideration of those *many Ingagements* you have laid upon me, to offer these my *poor Labours* to this MOST ILLUSTRIOUS ASSEMBLY. YOU have been pleas'd formerly to accept of these rude *Draughts*. I have since added to them some *Descriptions*, and some *Conjectures* of my own. And therefore, together with YOUR *Acceptance*, I must also beg YOUR *pardon*. The Rules YOU have prescrib'd YOUR selves in YOUR *Philosophical Progress* do seem the best that have ever yet been practis'd. And particularly that of avoiding *Dogmatizing*, and the *espousal* of any *Hypothesis* not sufficiently grounded and confirm'd by *Experiments*. This way seems the most excellent, and may preserve both *Philosophy* and *Natural History* from its former *Corruptions*. In saying which, I may seem to condemn my own Course in this Treatise; in which there may perhaps be some *Expressions*, which may seem more *positive* then YOUR *Prescriptions* will permit: And though I desire to have them understood only as *Conjectures* and *Queries* (which YOUR *Method* does not altogether disallow) yet if even in those I have exceeded, 'tis fit that I should declare, that it was not done by YOUR *Directions*. For it is most unreasonable, that YOU should undergo the *imputation* of the *faults* of my *Conjectures*, seeing YOU can receive so *small advantage* of reputation by the *sleight Observations* of

YOUR most humble and
most faithful Servant

ROBERT HOOKE.



MICROGRAPHIA,
 OR SOME
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 OF
 MINUTE BODIES,
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 MAGNIFYING GLASSES,
 WITH
 OBSERVATIONS and INQUIRIES thereupon.

Observ. I. *Of the Point of a sharp small Needle.*



AS in Geometry, the most natural way of beginning is from a Mathematical point; so is the same method in Observations and *Natural history* the most genuine, simple, and instructive. We must first endeavour to make letters, and draw single strokes true, before we venture to write whole Sentences, or to draw large Pictures. And in *Physical Enquiries*, we must endeavour to follow Nature in the more plain and easie ways she treads in the most simple and uncompounded bodies, to trace her steps, and be acquainted with her manner of walking there, before we venture our selves into the multitude of meanders she has in bodies of a more complicated nature; lest, being unable to distinguish and judge of our way, we quickly lose both Nature our Guide, and our selves too, and are left to wander in the labyrinth of groundless opinions; wanting both judgment, that light, and experience, that clew, which should direct our proceedings.

Schem. 2.
Fig. 1.

We will begin these our Inquiries therefore with the Observations of Bodies of the most simple nature first, and so gradually proceed to those of a more compounded one. In prosecution of which method, we shall begin with a *Physical point*; of which kind the *Point of a Needle* is commonly reckon'd for one; and is indeed, for the most part, made so sharp, that the naked eye cannot distinguish any parts of it: It very easily pierces, and makes its way through all kind of bodies softer then it self: But if view'd with a very good *Microscope*, we may find that the top of a Needle (though as to the

some other caverns in another, and others in a third, or a fourth, or a fifth place, for so many differing substances have I found in one of these *petrify'd* Shells, and perhaps all these differing from the encompassing earth or stone; the means how all which varieties may be caus'd, I think, will not be difficult to conceive, to any one that has taken notice of those Shells, which are commonly found on the Sea shore: And he that shall thoroughly examine several kinds of such curiously form'd stones, will (I am very apt to think) find reason to suppose their generation or formation to be ascribable to some such accidents as I have mention'd, and not to any *Plastick* virtue: For it seems to me quite contrary to the infinite prudence of Nature, which is observable in all its works and productions, to design every thing to a determinate end, and for the attaining of that end, makes use of such ways as are (as farr as the knowledge of man has yet been able to reach) altogether consonant, and most agreeable to man's reason, and of no way or means that does contradict, or is contrary to humane Ratiocination; whence it has a long time been a general observation and *maxime*, that *Nature does nothing in vain*; It seems, I say, contrary to that great Wisdom of Nature, that these prettily shap'd bodies should have all those curious Figures and contrivances (which many of them are adorn'd and contriv'd with) generated or wrought by a *Plastick* virtue, for no higher end then onely to exhibite such a form; which he that shall thoroughly consider all the circumstances of such kind of Figur'd bodies, will, I think, have great reason to believe, though, I confess, one cannot presently be able to find out what Nature's designs are. It were therefore very desirable, that a good collection of such kind of figur'd stones were collected; and as many particulars, circumstances, and informations collected with them as could be obtained, that from such a History of Observations well rang'd, examin'd and digested, the true original or production of all those kinds of stones might be perfectly and surely known; such as are *Thunderstones*, *Lapides Stellares*, *Lapides Judaici*, and multitudes of other, whereof mention is made in *Aldrovandus Wormius*, and other Writers of Minerals.

Observ. XVIII. *Of the Schematisme or Texture of Cork, and of the Cells and Pores of some other such frothy Bodies.*

I Took a good clear piece of Cork, and with a Pen-knife sharpen'd as keen as a Razor, I cut a piece of it off, and thereby left the surface of it exceeding smooth, then examining it very diligently with a *Microscope*, me thought I could perceive it to appear a little porous; but I could not so plainly distinguish them, as to be sure that they were pores, much less what Figure they were of: But judging from the lightness and yielding quality of the Cork, that certainly the texture could not be so
curious,

curious, but that possibly, if I could use some further diligence, I might find it to be discernable with a *Microscope*, I with the same sharp Pen-knife, cut off from the former smooth surface an exceeding thin piece of it, and placing it on a black object Plate, because it was it self a white body, and casting the light on it with a deep *plano-convex Glass*, I could exceeding plainly perceive it to be all perforated and porous, much like a Honey-comb, but that the pores of it were not regular; yet it was not unlike a Honey-comb in these particulars.

First, in that it had a very little solid substance, in comparison of the empty cavity that was contain'd between, as does more manifestly appear by the Figure A and B of the XI. *Scheme*, for the *Interstitia*, or walls (as I may so call them) or partitions of those pores were neer as thin in proportion to their pores, as those thin films of Wax in a Honey-comb (which enclose and constitute the *sexangular cells*) are to theirs.

Next, in that these pores, or cells, were not very deep, but consisted of a great many little Boxes, separated out of one continued long pore; by certain *Diaphragms*, as is visible by the Figure B, which represents a sight of those pores split the long-ways.

I no sooner discern'd these (which were indeed the first *microscopical* pores I ever saw, and perhaps, that were ever seen, for I had not met with any Writer or Person, that had made any mention of them before this) but me thought I had with the discovery of them, presently hinted to me the true and intelligible reason of all the *Phænomena* of Cork; As,

First, if I enquir'd why it was so exceeding light a body? my *Microscope* could presently inform me that here was the same reason evident that there is found for the lightness of froth, an empty Honey-comb, Wool, a Sponge, a Pumice-stone, or the like; namely, a very small quantity of a solid body, extended into exceeding large dimensions.

Next, it seem'd nothing more difficult to give an intelligible reason, why Cork is a body so very unapt to suck and drink in Water, and consequently preserves it self, floating on the top of Water, though left on it never so long: and why it is able to stop and hold air in a Bottle, though it be there very much condens'd and consequently presses very strongly to get a passage out, without suffering the least bubble to pass through its substance. For, as to the first, since our *Microscope* informs us that the substance of Cork is altogether fill'd with Air, and that that Air is perfectly enclosed in little Boxes or Cells distinct from one another. It seems very plain, why neither the Water, nor any other Air can easily insinuate it self into them, since there is already within them an *intus existens*, and consequently, why the pieces of Cork become so good floats for Nets, and stopples for Viols, or other close Vessels.

And thirdly, if we enquire why Cork has such a springiness and swelling nature when compris'd? and how it comes to suffer so great a compression, or seeming penetration of dimensions, so as to be made a substance as heavie again and more, bulk for bulk, as it was before compression, and yet suffer'd to return, is found to extend it self again into the same space? Our *Microscope* will easily inform us, that the whole mass

consists of an infinite company of small Boxes or Bladders of Air, which is a substance of a springy nature, and that will suffer a considerable condensation (as I have several times found by divers trials, by which I have most evidently condens'd it into less then a twentieth part of its usual dimensions neer the Earth, and that with no other strength then that of my hands without any kind of forcing Engine, such as Racks, Leavers, Wheels, Pullies, or the like, but this onely by and by) and besides, it seems very probable that those very films or sides of the pores, have in them a springing quality, as almost all other kind of Vegetable substances have, so as to help to restore themselves to their former position.

And could we so easily and certainly discover the *Schematisme* and *Texture* even of these films, and of several other bodies, as we can these of Cork; there seems no probable reason to the contrary, but that we might as readily render the true reason of all their *Phænomena*; as namely, what were the cause of the springiness, and toughness of some, both as to their flexibility and restitution. What, of the friability or brittleness of some others, and the like; but till such time as our *Microscope*, or some other means, enable us to discover the true *Schematism* and *Texture* of all kinds of bodies, we must grope, as it were, in the dark, and onely ghes at the true reasons of things by similitudes and comparisons.

But, to return to our Observation. I told several lines of these pores, and found that there were usually about threescore of these small Cells placed end-ways in the eighteenth part of an Inch in length, whence I concluded there must be neer eleven hundred of them, or somewhat more then a thousand in the length of an Inch, and therefore in a square Inch above a Million, or 1166400. and in a Cubick Inch, above twelve hundred Millions, or 1259712000. a thing almost incredible, did not our *Microscope* assure us of it by ocular demonstration; nay, did it not discover to us the pores of a body, which were they *diaphragm'd*, like those of Cork, would afford us in one Cubick Inch, more then ten times as many little Cells, as is evident in several charr'd Vegetables; so prodigiously curious are the works of Nature, that even these conspicuous pores of bodies, which seem to be the channels or pipes through which the *Succus nutritius*, or natural juices of Vegetables are convey'd, and seem to correspond to the veins, arteries and other Vessels in sensible creatures, that these pores I say, which seem to be the Vessels of nutrition to the vastest body in the World, are yet so exceeding small, that the *Atoms* which *Epicurus* fancy'd would go neer to prove too bigg to enter them, much more to constitute a fluid body in them. And how infinitely smaller then must be the Vessels of a Mite, or the pores of one of those little Vegetables I have discovered to grow on the back-side of a Rose-leaf, and shall anon more fully describe, whose bulk is many millions of times less then the bulk of the small shrub it grows on; and even that shrub, many millions of times less in bulk then several trees (that have heretofore grown in *England*, and are this day flourishing in other hotter Climates, as we are very credibly inform'd) if at least the pores of this small Vegetable should keep any such proportion to the body of it, as we have found these pores

of

Fig: I.

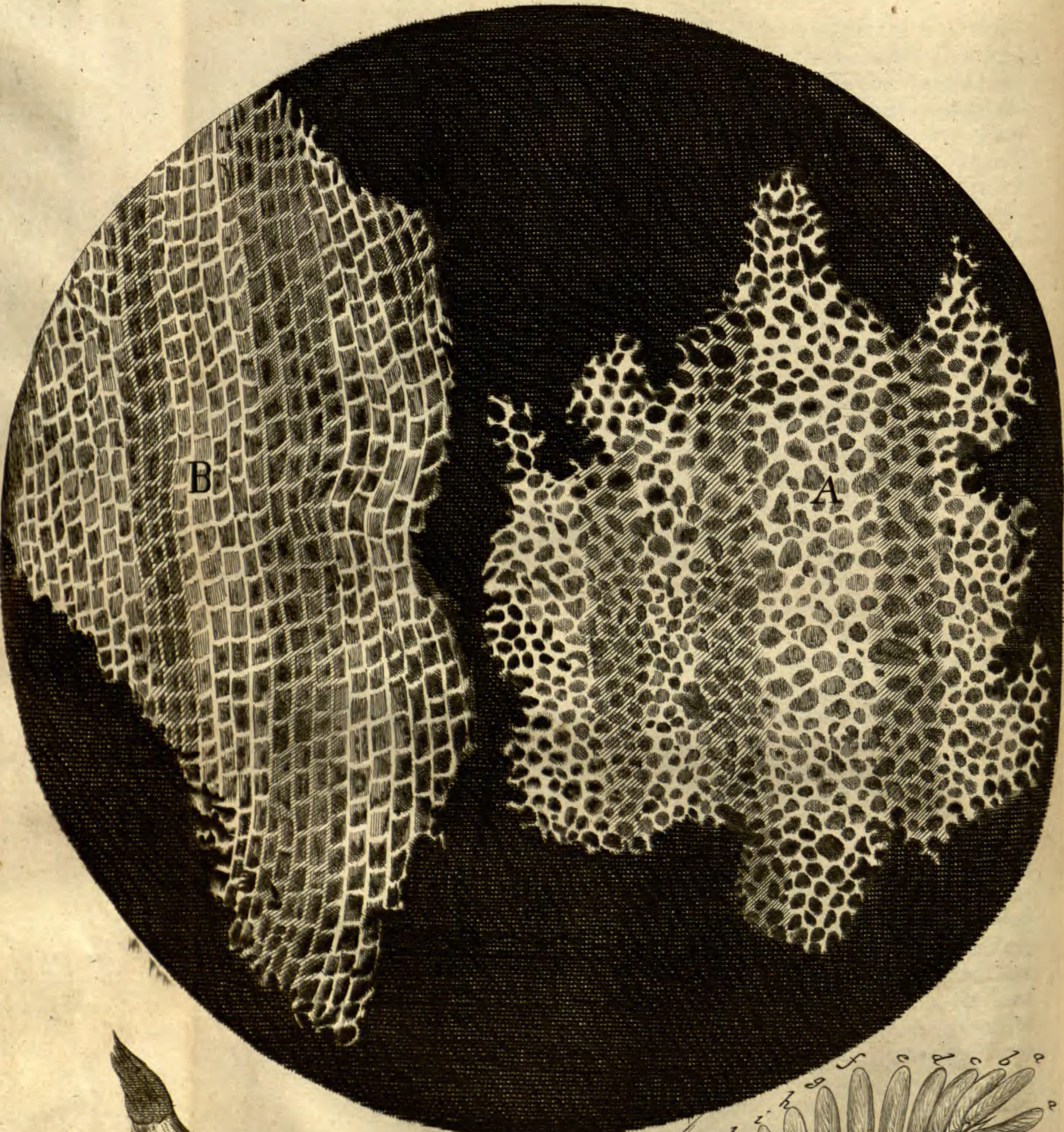
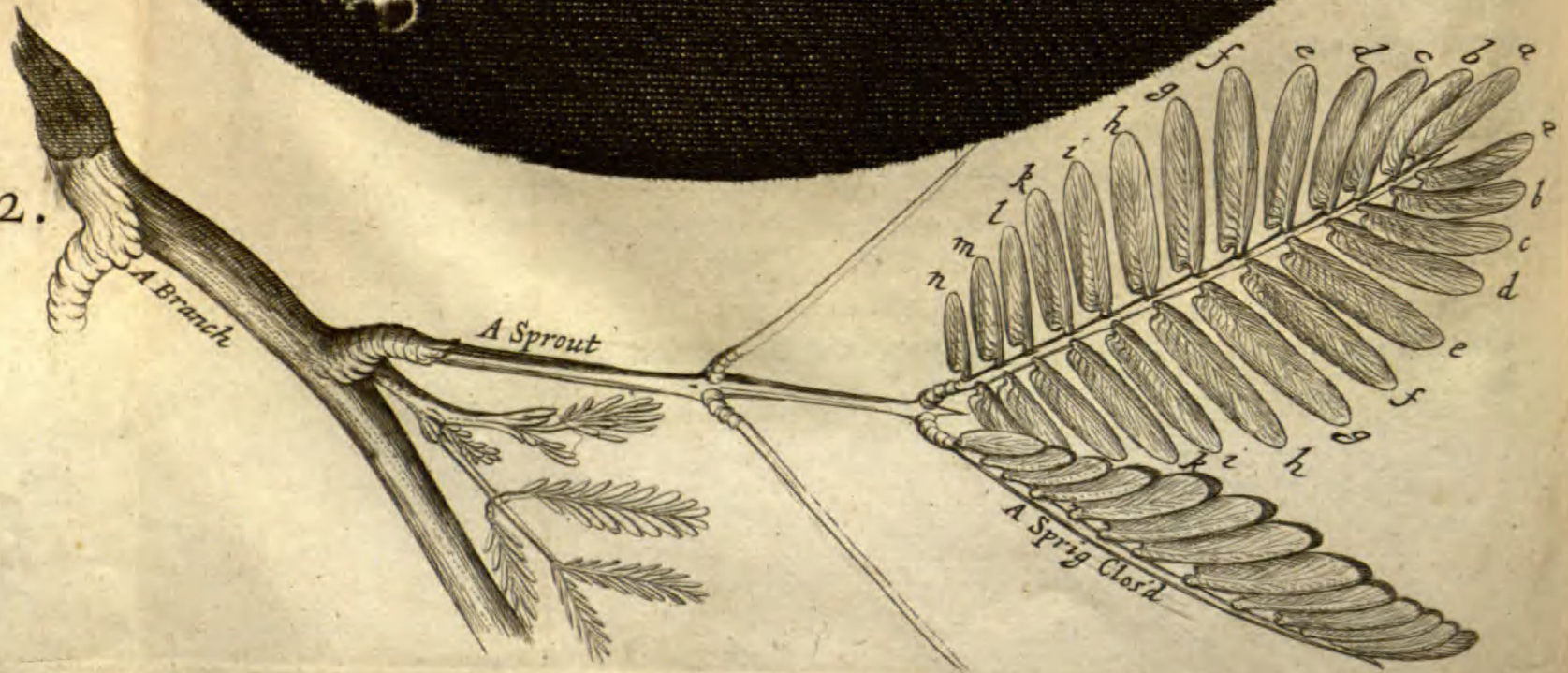


Fig: 2.



of other Vegetables to do to their bulk. But of these pores I have said more elsewhere.

To proceed then, Cork seems to be by the transverse constitution of the pores, a kind of *Fungus* or Mushrome, for the pores lie like so many Rays tending from the center, or pith of the tree, outwards; so that if you cut off a piece from a board of Cork transversly, to the flat of it, you will, as it were, split the pores, and they will appear just as they are express'd in the Figure B of the XI. *Scheme*. But if you shave off a very thin piece from this board, parallel to the plain of it, you will cut all the pores transversly, and they will appear almost as they are express'd in the Figure A, save onely the solid *Interstitia* will not appear so thick as they are there represented.

So that Cork seems to suck its nourishment from the subjacent bark of the Tree immediately, and to be a kind of excrescence, or a substance distinct from the substances of the entire Tree, something *analogus* to the Mushrome, or Moss on other Trees, or to the hairs on Animals. And having enquir'd into the History of Cork, I find it reckoned as an excrescency of the bark of a certain Tree, which is distinct from the two barks that lie within it, which are common also to other trees; That 'tis some time before the Cork that covers the young and tender sprouts comes to be discernable; That it cracks, flaws, and cleaves into many great chaps, the bark underneath remaining entire; That it may be separated and remov'd from the Tree, and yet the two under-barks (such as are also common to that with other Trees) not at all injur'd, but rather helped and freed from an external injury. Thus *Jonstonus* in *Dendrologia*, speaking *de Subere*, says, *Arbor est procerâ, Lignum est robustum, dempto cortice in aquis non fluitat, Cortice in orbem detracto juvatur, crascescens enim præstringit & strangulat, intra triennium iterum repletur: Candex ubi adolescit crassus, cortex superior densus carnosus, duos digitos crassus, scaber, rimosus, & qui nisi detrahatur debiscit, alioque subnascente expellitur, interior qui subest novellus ita rubet ut arbor minio picta videatur.* Which Histories, if well consider'd, and the tree, substance, and manner of growing, if well examin'd, would, I am very apt to believe, much confirm this my conjecture about the origination of Cork.

Nor is this kind of Texture peculiar to Cork onely; for upon examination with my *Microscope*, I have found that the pith of an Elder, or almost any other Tree, the inner pulp or pith of the Cane hollow stalks of several other Vegetables: as of Fennel, Carrets, Daucus, Bur-docks, Teasels, Fearn, some kinds of Reeds, &c. have much such a kind of *Schematisme*, as I have lately shewn that of Cork, save onely that here the pores are rang'd the long-ways, or the same ways with the length of the Cane, whereas in Cork they are transverse.

The pith also that fills that part of the stalk of a Feather that is above the Quil, has much such a kind of texture, save onely that which way soever I set this light substance, the pores seem'd to be cut transversly; so that I ghes this pith which fills the Feather, not to consist of abundance of long pores separated with Diaphragms, as Cork does, but to be a kind

of solid or hardned froth, or a *congeries* of very small bubbles consolidated in that form, into a pretty stiff as well as tough concrete, and that each Cavern, Bubble, or Cell, is distinctly separate from any of the rest, without any kind of hole in the encompassing films, so that I could no more blow through a piece of this kinde of substance, then I could through a piece of Cork, or the sound pith of an Elder.

But though I could not with my *Microscope*, nor with my breath, nor any other way I have yet try'd, discover a passage out of one of those cavities into another, yet I cannot thence conclude, that therefore there are none such, by which the *Succus nutritius*, or appropriate juices of Vegetables, may pass through them; for, in several of those Vegetables, whilst green, I have with my *Microscope*, plainly enough discover'd these Cells or Pores fill'd with juices, and by degrees sweating them out: as I have also observed in green Wood all those long *Microscopical* pores which appear in Charcoal perfectly empty of any thing but Air.

Now, though I have with great diligence endeavoured to find whether there be any such thing in those *Microscopical* pores of Wood or Piths, as the *Valves* in the heart, veins, and other passages of Animals, that open and give passage to the contain'd fluid juices one way, and shut themselves, and impede the passage of such liquors back again, yet have I not hitherto been able to say any thing positive in it; though, me thinks, it seems very probable, that Nature has in these passages, as well as in those of Animal bodies, very many appropriated Instruments and contrivances, whereby to bring her designs and end to pass, which 'tis not improbable, but that some diligent Observer, if help'd with better *Microscopes*, may in time detect.

And that this may be so, seems with great probability to be argued from the strange *Phænomena* of sensitive Plants, wherein Nature seems to perform several Animal actions with the same *Schematism* or *Organization* that is common to all Vegetables, as may appear by some no less instructive then curious Observations that were made by divers Eminent Members of the *Royal Society* on some of these kind of Plants, whereof an account was delivered in to them by the most Ingenious and Excellent *Physician*, Doctor *Clark*, which, having that liberty granted me by that most Illustrious Society, I have hereunto adjoyn'd.

Observations on the Humble and Sensible Plants in M^r. Chiffin's Garden in Saint James's Park, made August the 9th, 1661.

Present, the Lord Brouncker, Sr. Robert Moray, Dr. Wilkins, Mr. Evelin, Dr. Henshaw, and Dr. Clark.

There are four Plants, two of which are little shrub Plants, with a little short stock, about an Inch above the ground, from whence are spread several sticky branches, round, streight, and smooth,

smooth in the distances between the Sprouts, but just under the Sprouts there are two sharp thorny prickles, broad in the letting on, as in the Bramble, one just under the Sprout, the other on the opposite side of the branch.

The distances betwixt the Sprouts are usually something more than an Inch, and many upon a Branch, according to its length, and they grew so, that if the lower Sprout be on the left side of the Branch, the next above is on the right, and so to the end, not sprouting by pairs.

See
Schem. 11.
Fig. 2.

At the end of each Sprout are generally four sprigs, two at the Extremity, and one on each side, just under it. At the first sprouting of these from the Branch to the Sprig where the leaves grow, they are full of little short white hairs, which wear off as the leaves grow, and then they are smooth as the Branch.

Upon each of these sprigs, are, for the most part, eleven pair of leaves, neatly set into the uppermost part of the little sprig, exactly one against another, as it were in little *articulations*, such as Anatomists call *Enarthrosis*, where the round head of a Bone is received into another fitted for its motion; and standing very fitly to shut themselves and touch, the pairs just above them closing somewhat upon them, as in the shut sprig; so is the little round *Pedunculus* of this leaf fitted into a little cavity of the sprig, visible to the eye in a sprig new pluck'd, or in a sprig withered on the Branch, from which the leaves easily fall by touching.

The leaf being almost an oblong square, and set into the *Pedunculus*, at one of the lower corners, receiveth from that not onely a *Spine*, as I may call it, which, passing through the leaf, divides it so length-ways that the outer-side is broader then the inner next the sprig, but little *fibres* passing obliquely towards the opposite broader side, seem to make it here a little muscular, and fitted to move the whole leaf, which, together with the whole sprig, are set full with little short whitish hairs.

One of these Plants, whose branch seem'd to be older and more grown then the other, onely the tender Sprouts of it, after the leaves are shut, fall and hang down; of the other, the whole branches fall to the ground, if the Sun shine very warm, upon the first taking off the Glafs, which I therefore call the *humble Plant*.

The other two, which do never fall, nor do any of their branches flagg and hang down, shut not their leaves, but upon somewhat a hard stroke; the stalks seem to grow up from a root, and appear more *herbaceous*, they are round and smooth, without any prickle, the Sprouts from them have several pairs of sprigs, with much less leaves then the other on them, and have on each sprig generally seventeen pair.

Upon touching any of the sprigs with leaves on, all the leaves on that sprig contracting themselves by pairs, joynd their upper superficies close together.

Upon the dropping a drop of *Aqua fortis* on the sprig betwixt the leaves, *ff* all the leaves above shut presently, those below by pairs successively after, and by the lower leaves of the other branches, *ll*, *kk*, &c. and so every pair successively, with some little distance of time betwixt, to the top of each sprig, and so they continu'd shut all the time we were there. But I returning the next day, and several days since, found all the leaves dilated again on two of the sprigs; but from *ff*, where the *Aqua fortis* had dropped upwards, dead and withered; but those below on the same sprig, green, and closing upon the touch, and are so at this day, *August 14*.

With a pair of Scissers, as suddenly as it could be done, one of the leaves *bb* was clipped off in the middle, upon which that pair, and the pair above, closed presently, after a little interval, *dd*, then *ee*, and so the rest of the pairs, to the bottom of the sprig, and then the motion began in the lower pairs, *ll*, on the other sprigs, and so shut them by pairs upwards, though not with such distinct distances.

Under

Under a pretty large branch with its sprigs on, there lying a large Shell betwixt two and three Inches below it, there was rubbed on a strong fented oyl, after a little time all the leaves on that sprig were shut, and so they continued all the time of our stay there, but at my returne the next day, I found the position of the Shell alter'd, and the leaves expanded as before, and closing upon the touch.

Upon the application of the Sun-beams by a Burning-glass, the more *humble Plant* fell, the other shut their leaves.

We could not so apply the smoak of *Sulpher*, as to have any visible effect from that, at two or three times trial; but on another trial, the smoak touching the leaves, it succeeded.

The *humble Plant* fell upon taking off the Glass wherewith it was covered.

Cutting off one of the little Sprouts, two or three drops of liquor were thrust out of the part from whence that was cut, very cleer, and pellucid, of a bright greenish colour, tasting at first a little bitterish, but after leaving a licorish-like taste in my mouth.

Since, going two or three times when it was cold, I took the Glasses from the more *humble Plant*, and it did not fall as formerly, but shut its leaves onely. But coming afterwards, when the Sun shone very warm, as soon as it was taken off, it fell as before.

Since I pluck'd off another sprig, whose leaves were all shut, and had been so some time, thinking to observe the liquor should come from that I had broken off, but finding none, though with pressing, to come, I, as dexterously as I could, pull'd off one whose leaves were expanded, and then had upon the shutting of the leaves, a little of the mention'd liquor, from the end of the sprig I had broken from the Plant. And this twice successively, as often almost as I durst rob the Plant.

But my curiosity carrying me yet further, I cut off one of the harder branches of the stronger Plant, and there came of the liquor,

liquor, both from that I had cut, and that I had cut it from, without pressure.

Which made me think, that the motion of this Plant upon touching, might be from this, that there being a constant *intercourse* betwixt every part of this Plant and its root, either by a *circulation* of this liquor, or a constant pressing of the subtler parts of it to every extremity of the Plant. Upon every pressure, from whatsoever it proceeds, greater then that which keeps it up, the subtile parts of this liquor are thrust downwards, towards its *articulations* of the leaves, where, not having room presently to get into the sprig, the little round *pedunculus*, from whence the *Spine* and those oblique *Fibres* I mention'd rise, being dilated, the *Spine* and *Fibres* (being continued from it) must be contracted and shortned, and so draw the leaf upwards to joyn with its fellow in the same condition with it self, where, being closed, they are held together by the implications of the little whitish hair, as well as by the still retreating liquor, which distending the *Fibres* that are continued lower to the branch and root, shorten them above; and when the liquor is so much forced from the Sprout, whose *Fibres* are yet tender, and not able to support themselves, but by that tensness which the liquor filling their *interstices* gives them, the Sprout hangs and flags.

But, perhaps, he that had the ability and leisure to give you the exact *Anatomy* of this pretty Plant, to shew you its *Fibres*, and visible *Canales*, through which this fine liquor circulateth, or is moved, and had the faculty of better and more copiously expressing his Observations and conceptions, such a one would easily from the motion of this liquor, solve all the *Phænomena*, and would not fear to affirm, that it is no obscure sensation this Plant hath. But I have said too much, I humbly submit, and am ready to stand corrected.

I have not yet made so full and satisfactory Observations as I desire on this Plant, which seems to be a Subject that will afford abundance of information.

information. But as farr as I have had opportunity to examine it, I have discovered with my *Microscope* very curious structures and contrivances; but designing much more accurate examinations and trials, both with my *Microscope*, and otherwise, as soon as the season will permit, I shall not till then add any thing of what I have already taken notice of; but as farr as I have yet observ'd, I judge the motion of it to proceed from causes very differing from those by which Gut-strings, or Lute-strings, the beard of a wilde *Oat*, or the beard of the Seeds of *Geranium*, *Moscatum*, or *Musk-grass* and other of kinds of *Cranes-bill*, move themselves. Of which I shall add more in the subsequent Observations on those bodies.

Observ. XIX. *Of a Plant growing in the blighted or yellow specks of Damask-rose-leaves, Bramble-leaves, and some other kind of leaves.*

I Have for several years together, in the Moneths of *June*, *July*, *August*, and *September* (when any of the green leaves of *Roses* begin to dry and grow yellow) observ'd many of them, especially the leaves of the old shrubs of *Damask-Roses*, all bespecked with yellow stains, and the undersides just against them, to have little yellow hillocks of a gummy substance, and several of them to have small black spots in the midst of those yellow ones, which, to the naked eye, appear'd no bigger then the point of a Pin, or the smallest black spot or tittle of Ink one is able to make with a very sharp pointed Pen.

Examining these with a *Microscope*, I was able plainly to distinguish, up and down the surface, several small yellow knobs, of a kind of yellowish red gummy substance, out of which I perceiv'd there sprung multitudes of little cases or black bodies like Seed-cods, and those of them that were quite without the hillock of Gumm, disclos'd themselves to grow out of it with a small Straw-colour'd and transparent stem, the which seed and stem appear'd very like those of common *Moss* (which I elsewhere describe) but that they were abundantly less, many hundreds of them being not able to equalize one single seed Cod of *Moss*.

I have often doubted whether they were the seed Cods of some little Plant, or some kind of small Buds, or the Eggs of some very small Insect, they appear'd of a dark brownish red, some almost quite black, and of a Figure much resembling the seed-cod of *Moss*, but their stalks on which they grew were of a very fine transparent substance, almost like the stalk of mould, but that they seem'd somewhat more yellow.

That which makes me to suppose them to be Vegetables, is for that I perceiv'd many of those hillocks bare or destitute, as if those bodies lay yet conceal'd, as G. In others of them, they were just springing out of their gummy hillocks, which all seem'd to shoot directly outwards, as at A. In others, as at B, I found them just gotten out, with very little or no stalk,