

the South-East, and the weather broke up a pace. The Sycamores bled not all this while, but the 7th about Noon all Trees of that kind bled very freely, both at the Twigs and Body, and I struck above a dozen.

At this same Critical season I was willing to repeat the Experiment upon other Trees; and to this end I forthwith struck the *Hawthorn, Hazel, Wild Rose, Goose berry-bush, Apple-tree, Cherry-tree, Blather-nut, Apricock, Cherry-Lawrel, Vine, Walnut;* yet none bled but the last-named, and that faintly in comparison of the *Sycamore*. This is consonant to our former Experiments: And if it did happen (as I said in my former Letter,) that these Sycamores bled not all this Winter afore at the wounds made the first of *November*, I do now think, that if new wounds had been still made at every break of Frost, some signes, at least of our *Tork-shire* bleeding, might have been discover'd before now. But I affirm no more, than I have seen and tried.

In all the Monuments of the Antients, collected by the great industry of *Pliny*, I find but few instances of this nature. Amongst those few, there is one that is registred with two or three remarkable circumstances to our purpose. He tells us, that the Physicians of old, when they had a mind to draw the Juyce of the Mulberry-tree, were wont to strike it skin-deep only, and that about two hours after Sun-rise. This Experiment is twice mentioned by him, and in both places as a strange *phænomenon*. We might make our Comment upon the places, but for this time are content only to transcribe the Texts. *Lib. 16. c. 38. Mirum; hic ( cortex ) in Moro, Medicis succum quarentibus, ferè horâ diei secundâ, lapide incussus manat, altius fractus siccus videtur. Lib. 23. c. 7. Mora in Egypto & Cypro sui generis, ut diximus, largosucco abundant, summo cortice desquamato, altiore plagâ siccantur; mirabili naturâ.*

*Some Observations concerning the Variety of the Running of Sap in Trees, compared with a Weather glass; made in April, 1670. Together with some ways of ordering Birch-water: By Dr. Ez. Tonge.*

I Am this day very much confirmed in my apprehension, that Trees and other Plants, if we could contrive them, as I have  
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( but slenderly ) projected in my *Sap-wifer* to that purpose, would far better indicate the Alteration of Weather, as to heat, cold, moisture, drought, than any Weather-glasses, I have yet experimented. For my Weather-glass continuing at one and the same station, in a manner all this day (*April 13.*) my Trees have altered their temper so much, that 24 of them, that ran tolerably this fore-noon, yield not a pint of Sap this after-noon; and though one of them ran most part of the day, the rest ceased about one or two of the clock in a fair clear Sunshiny season, retarded (so far as I could observe) only with a Western wind; though that be reputed mild and cherishing.

These Trees ran above two quarts in the morning. The Weather-glass continues the same, *viz.* about 11 inches water, these two days. *Thursday* the 14th, it was 9 $\frac{1}{2}$  only. *Friday* the 15th, my Weather-glass at noon was advanced from 9 to 10 $\frac{1}{2}$ , yet the quantity of Birch-water this day exceeded my former from these Trees; for I had above 2 $\frac{1}{2}$  quarts before noon.

But for cold, I find, that the Air, when any whifling blast of cold wind stirs, stays my Birches. I want a Wind-fane.

I would desire by the by, that people would try with Mints and other hot, balsamick or aromatick herbs or roots, and especially with *Rosemary*, put into their Bottles filled with Birch-water from the tree, to preserve it, and to brew Ale with it. I had very fine and warming drink from a few sprigs of *Rosemary* steep'd in Spirit of Wine; I purpose to try *Elecampane*, and roots of the like kinde.

*Saturday*, the 16th, these 24 Birches began to run presently after Sun-rise, and ran about 3 quarts, and ceased about two a clock after noon, having till then continued to run. *Sunday*, the 17th, it rained, so that we could make no Observations what Sap these Trees might spend; neither did Rain and all amount to much above a Gallon and a half. *Munday* the 18th, they ran until Noon. *Tuesday* and *Wednesday* the 19th, and 20th, wherein was expected greater store of Sap, after the Rain, the Trees spent not a drop. *Quere*, Whether it be from their busie protruding of their leaves upon the rain? (of which yet there was then no appearance;) or the over-cooling and moistening of the Roots by plenteous Rain? *Saturday*, the 23th, my Weather-glass stood at 7 $\frac{1}{2}$ , it being a Rainy and boisterous morning, the Rain not allaying the Wind. At 9 a clock of that fore-noon, my

Birch water worked in the Barrel *per se* : Which seems to verify Mr. *Souton's* relation from his Brother, a *Swedish* Merchant, importing, that Birch-water in *Sweden* worketh alone; (perhaps collected in great quantity. ) Only *I* put a very few Cloves into my Sap. Boiled to a third or less, it keeps well, especially when boiled with the buds or sprigs of the same Tree, as I have been informed.

*April 16, 17, 18, in the year 1670.* Birch-sap mixed with Rain-water at the Tree, fermented, with *Rosemary*-sprigs steeped in Spirit of Wine : which warmed the stomach as strong Wine, and pleased the palate ; though the taste in the mouth was somewhat waterish.

*A Letter written by the same Dr. Tonge, to the Publisher ; about the Retarding the Ascent of Sap, together with some other Queries relating to that Subject.*

SIR, last night Sir *R. Moray* did me the favour to acquaint me in discourse with some particulars about the Gathering of Sap in Fruit-trees, and the Retarding the Ascent thereof ; which he had received from an eminent Planter in *Glocestershire* : Concerning which, *I* thought it fit to communicate some Reflexions of mine ; which you may dispose of, as you think good.

It was propounded to me by way of *Quere* ; How to gather every drop of Sap that should rise in any Fruit-tree ? This, *I* said, *I* thought not feasible, by what *I* had experimented hitherto. My grounds were these ; *First*, in those Trees, whose Sap seems to be of a Gummy nature when condensed, as Plums, Cherries &c. *I* knew no Experiment, by which any drop of Sap could be collected. And *I* suspect, some other Fruit-trees to be of that nature, whose Sap *I* could not draw out at any season, of hot or cold weather, though they have not been observed to yield any Gum. Perhaps there may also be some Fruit- and other Trees, whose Saps are viscous, though not Gummy ; and these, *I* doubt, will not yield any Sap to be gather'd in any common or known way.

*Secondly*, it seem'd to me not feasible, to gather all the Sap of those Trees, whose Juice is fluid and plentiful, and condenseth into a gelly, because it seems at most seasons of the Year to ascend imperceptibly ; and that not only in the outward, but innermost parts and pores of the Tree ; not only betwixt Bark and

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and Wood, but betwixt every coat of the Wood, and even through the most solid parts of each Coat; as *Mr. Willoughby's* Observations have discover'd, \* unless I mistake.

The Experiment of the said *Glocester shire* Planter, by which he hoped to gather all the Rising Sap of Fruit-trees, was made, by binding the Trees round about very closely and strongly with cords, so as to intercept what riseth 'twixt Bark and Body; he being of opinion, that no considerable quantity riseth in any other part. To which I oppose, besides what was said just now, that some Trees will live though they be disbarked in some place quite round; especially if this be done in some season, when the blasting Winds stir not; which I have elsewhere discoursed of in my Letters to Sir R. M.

Mean time, though this Planter seem to me to mistake in the Rising of Sap, yet he maketh it up by discovering to us, that such Tying of Trees retards their Blossoming and Bearing; and so may in some years (as this present, in which the open weather hastening blossoms, is like to destroy the fruit) prevent a scarcity of forward fruit, usually nipped by the late Frosts.

Upon this discourse I shall take leave to suggest these following Inquiries:

1. Whether two Trees, running, when both are free and untied, equal quantities of Sap at like orifices of equal breadth and depth, will run unequally, when strongly tied; and if so, what will be the difference?

2. Whether the said Trees will run unequal quantities at equal orifices made in *Roots*?

3. Whether the delay of Sap, staying Fruit and Blossoms, as is suppos'd, by tying, will cure the *Phyllo-mania*, as Cross-hacking?

4. Whether a Tree kept wholly from bearing this year (its usual bearing year) will bear the next, and so to better advantage, when fruit is scarce?

5. Whether by this way, Trees may be brought to bear at other seasons, than yet hath been practis'd?

6. Whether tying of Trees, made before Mid summer, causeth the Bark to swell *under* the Ligature, and after Mid-summer, *above* it? and whether equally, or by what different proportion?

7. Whether it will direct Sap to inoculated Buds, if the contrary side only be stopp'd by strong binding ?

8. Whether in paring the Bark quite round, or in part, covering the bare place with Lome, the same or like effects will follow ?

9. Whether, in case the Bark above the Ligature swell most, it be to be attributed to the Sap descending, or to the permeableness of all parts of Plants by their Sap (as resembling Blood and other Humors in the Body,) which more readily descends than ascends to heal the wounded part, or to supply intercepted nourishment ?

*Some further Inquiries, made by the same Dr. Tonge, concerning the Running of Sap in Trees; the keeping of such Sap, and brewing with it; a way of colouring of Leaves, Fruit, &c. As also about multiplying\* Crab-stocks, and propagating Trees by Layers, &c.*

1. **W** Hether any Tree, that ran not at Noon in a clear and equally tempered day, ran the same day at night, or in any cooler part of the same day ?

2. Whether a Tree, which gave over running the former day before night, ran the very next day all day and all night, at any trial ?

3. Whether Trees beginning to run one day (suppose one hour) do at any time or season of their running, the weather still favouring them in their season, encrease the time of their running, and so proceed gradually and constantly to their longest term; and whether they go on to run all night at last ?

4. Whether Trees may then, and only then, be said to be in their best season of running, when they will run in the night or till the Sun set ? And when that season is ? and in what Trees ? And whether then, and at that, or what season, it be best to gather Sap for use ?

5. Whether Trees are not sometimes so full of Sap, that a greater quantity may by a large orifice, or many orifices, be drawn from them, than did rise in them the same day ? If so, then that case must be distinguished from another case at another time, wherein Sap rises as well as runs all day, or all day and night, though slowly : And consequently in all Experiments, the rising and running of Sap must carefully be distinguished, and it must be noted, when Sap runs of a stock of that liquor  
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formerly risen, and when it runs only as it rises?

6. If Sap do restagnate in any Trees at some seasons, more rising and remaining in them, than they digest? When that is? In what Trees? And how long it lasts? And how to be observed and found? Whether Sap so restagnating, be better digested, and fitter for use, being fermented, and insolated, as it were, by morose exposure to the Sun, or be thicker and clamier, and more near a gelly and unfitter for use?

7. What constant exposure to the Sun in Bottles, corked or open, of Glass or Stone, operates in Sap? [ I kept some in a large retort of 2 or 3 gallons, exposed night and day (without any other stop than the obliquation of the Retorts neck, and a little paper to keep out Insects,) many months, and it contracted a Coat on it's top, and the taste pleasing my palate; I adventured to brew with it at Cider-season, and made a great quantity of good cordial drink with 8 Bushels of chopt Apples, brewing them like Malt with hot water, and putting my Juices and Saps into my water-Cider at the latter end of their boiling: I filled a Stand with it, which contained half the quantity of the largest Rhenish-wine Vessel, viz. about 40 gallons, as I remember. I had not half Sap in this liquor (the greatest part of my Brewing being made with water) yet I got five bushels and more of warming Cordial and pleasant drink for every bushel of my Apples: if it had been all Sap, it would have been much more cordial and strong: There was in it a considerable quantity of juyce of Borrage-roots and herbs (at that season usually thrown out of Gardens,) which Borrage-liquor works and purges it self when tunned, and turns into an excellent clear brown colour; and it may be tried, whether it may be brought to be a potable, pleasant and wholsom drink alone, or with ease brewing with Ale, Cider or other liquors, apt to sower, if it prove so (as I submit to Inquirers,) that Borrage-liquor resists Acidity in drink, (as the herb in flower and in substance is supposed to do,) and swims above water, Cider, or, when it's mixt with them, in gentle boiling doth preserve them. I drank my drink the Easter following: So my Sap gathered at Spring, brewed about Michaelmas, continued good till Easter and after it. ]

8. Whether a Glass, fitted to both ends of a Root, so divided, that there remain a distance of half an inch from that part  
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left adhering to the Tree, and that growing in the Earth, (which Glass I call my Sap wiser;) will be and continue always full of Sap, or only whilest the Tree runs, or how long? And when? *Quere*, whether this Glass must be *cemented* on to both ends of the Root, before the Root runs; or whether it be better to put it on gently, and not too firm and close, so as to exclude the Air?

9. Whether Saffron infused in Sap, or other tinging moistning Bodies, put into such a Sap-wiser, will tinge the whole Tree, wood, leaves, fruit, &c. or any of them? Or by the like infusion in bored arms of any Trees have the same effect?

10. Whether by a Sap-wiser the motion of Sap in Apples, Peares, and such like other Trees, whose Sap is too subtil or too slow in motion to be otherwise discerned, may be observed, and be tinged?

11. If any Pear, or Apple, or Quince, may be made bloudered by grafting on a Mulberry-stock? And whether being after removed to another, suppose a Quince-stock, it will retain its colour, and all Grafts taken from it also?

12. Whether Sap may by a Sapwiser be transfused out of one Tree into another; and if so, what it will work?

13. Whether grafting, chamfering, indenting tong-wise, or inoculation well closed and waxed, will succeed in the Root, and whether in that part of a Root, which is cut off from the Body, and remains in the Earth? Whether grafting, inoculating, &c. in root and stock, be best, when the Sap is running, or before, or after running? Some affirm, that the dividing of Crab-stock Roots, from the stem left in the ground, is the best way of multiplying Crab-stocks, or a commendable one at least?

14. Whether Crab- and Apple-kernels sown in indifferent or barren ground, and weeded some years (after that the hopefulllest spare Roots of the largest of those are removed with the stocks for use,) the other Roots of lesser size separated from the stem being left in the ground, after 3 or 4 years growth or more (then come to be of half an inch diameter,) each Root thus carefully left in the ground with the top not bruised, but cut smooth, even, sloped, and waxed, raised to the day only, may grow into a new Plant, or be inoculated, packt and grafted? and how soon?

15. Whether the Nature of Saps ascending, or the Cause of it, be after this manner; *viz.* That in the moist night, the Roots being spongy and soft in the extreme parts, draw in moisture and ferment it; to which the Sun by his warmth gives farther fermentation in the Roots, and a pulsion upwards into the firmer parts of the Roots, and thence into the Body and Branches, and there digesteth it? And whether by the same manner, the Body and Branches warmed, and exhausted in the day by the Suns heat, digesting and expending into leaves, &c. according to the season, draw Sap out of the lower part to the extremities, so that when Digestion, or *suction* (if there be any such) exceeds *Pulsion*, Sap runs not, & *vice versa*?

16. If Spongy and soft wood imitates Roots in their manner of shooting fresh Roots, and in the growth, after the way above mentioned?

17. Whether more solid wood, as Bays, &c. in moist and seasonable weather laid, and fitted, or, as it were grafted in Willow roots or sticks, will shoot Roots in Layers, and grow as Mulberries do? [I have heard that a chip of soft wood, laid to the end of a *Bay* slip, promotes its rooting: And that *Mulberry* slips are easily propagated, set in the latter end of *January*, or beginning of *February*, in a moist season, not in dry *March*. Such slips root best, if they be Suckers, and taken off with part of the old bark; or if they be last years shoots, cut off from Arms, taken with some older bark from the place where they shot out. I have set many formerly, which all thrive. I affect to propagate them for Pear, and other stocks, namely Quinces, Medlars, Plums, to turn their pulp and juyce red, by taking grafts from such Trees, as have been grafted on Mulberries. *Quere*, if bloud-red Pears and red Redstrakes were thus raised at first, or may be propagated, and to what advantage?]

18. *Quere*, if Quince-stocks conduce to make firm the pulp of Apples, and alter the form of them from what the Graft naturally had before?

*An Account of two Books.*

I. MISCELLANEA Curiosa MEDICO-PHYSICA. Academiæ Naturæ Curiosorum. Lipsiæ 1670. in 4o.

**T**His is a work very lately begun in *Germany* by a Company of ingenious Philosphers, call'd *Academia Naturæ*