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 *York-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 Physitians 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 *phœnomenon*. 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 quærentibus, ferè horâ diei secundâ, lapide incussus manat, altius fractus siccus videtur.* Lib. 23. c. 7. *Mora in Ægypto & Cypro sui generis, ut diximus, largo succo 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 (but

(but ſlenderly) projected in my *Sap-wiſer* 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 Sun-ſhiny 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 9¼ only. *Friday* the 15th, my Weather-glaſs at noon was advanced from 9 to 10½, yet the quantity of Birch-water this day exceeded my former from theſe Trees; for I had above 2½ quarts before noon.

But for cold, I find, that the Air, when any whiſling 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. *Tueſd.* and *Wedneſ.* 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 7¼, 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 verifie 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 ſtomack 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 Juyce 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

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.*

* See *Numb.* 48. *p.* 964.

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 practiſed?

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 Bloud 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. WHether 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 an other 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 former

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 clammier, 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 Juyces 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 eaſie 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 Michaelmaſs, 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

left

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? *Quære*, 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 bloud-red 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 hopefulleſt 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, ſlope, and waxed, raiſed to the dy only, may grow into a new Plant, or be inoculated, packt and grafted? and how ſoon?

15. Whe-

15. Whether the Nature of Saps aſcending, or the Cauſe of of it, be after this manner; *viz.* That in the moiſt night, the Roots being ſpungy 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 verſâ?*

16. If Spungy 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 graſted 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 throve. 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 graſted on Mulberries. *Quære*, if bloud-red Pears and red Redſtrakes were thus raiſed at firſt, or may be propagated, and to what advantage?]

18. *Quære*, 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 Accompt of two Books.

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

THis is a work very lately begun in *Germany* by a Company of ingenious Philoſophers, call'd *Academia Naturæ*