Promiſcuous Inquiries, *chiefly about* Cold, *formerly ſent and recommended to Monſieur* Heuelius; *together with his Anſwer return'd to ſome of them.*

A conſiderable piece of the grand Deſign of the Modern *Experimental* Philoſophers being, to procure and accumulate Materials for a good Natural Hiſtory, whence to raiſe in progreſs of time a ſolid Structure of Philoſophy; all poſſible Endevours are uſed in *England*, to ſend abroad and recommend to as many of Forreign parts, as there is opportunity, *Directions* for ſearching into the Operations of Nature, and for obſerving what occurs therein, aſwell as in Mechanical operations and practiſes.

Several Heads of that kind have been already publiſh'd for this purpoſe in ſeveral of the former Tracts; to which, as we have added, in this, the *Quæries* about *Mines*, ſo we ſhall ſubjoyn thoſe, that were not long ſince committed to the care of that Excellent Promoter of Aſtronomy and Philoſophy, Monſieur *Heuelius*, Conſul of *Dantzick*; who demonſtrates ſo much zeal for the advancement of real knowledge, that he not only improves and promotes it by his own Studies, but labours alſo to incite others to do the like; having already warmed many of the Northern Climate, particularly *Poland*, *Pruſſe*, *Livonia*, *Sweden* and *Denmark*, into a diſpoſition to be ſtudious and active in inquiring after ſuch particulars concerning Philoſophy, as are recommended from hence, and rendred them, very willing to employ themſelves in things of that nature.

The Inquiries ſent to Dantzick, *are theſe*;

1. What Signior *Burattini* (an *Italian* Gentleman, Maſter of the Mint to the King of *Poland*, and reputed a great Maſter in the *Mechanicks*) hath perform'd in *Dioptricks*? Whether at preſent he employs himſelf, as is related, in grinding a *Teleſcope* of 120 foot long? And, if ſo, what way he means to make uſe of,

of, commodiouſly to handle a Tube of that length?

2. Whether the ſame have the Art (as has been written from *Paris*) to make ſuch Glaſs, as is not at all inferiour to *Venice*-glaſs, and exceeds any plate of Glaſs, hitherto made there, twice or thrice in bigneſs?

3. What is the way of making Pot-aſhes in *Poland*?

4. What is to be obſerved about *Succinum* or Amber? whether it be an Exſudation of the Sea? whether it be ſeen to float upon the ſurface of the Sea? whether it be ſoft, when 'tis firſt caſt on ſhore? At what ſeaſon of the year, and in what manner 'tis taken up, *&c*?

5. What is to be obſerv'd in the Digging of *Sal Gemmæ* in *Poland*? what is the Depth of the Mines, ſtored with this Salt? what their diſtance from the Sea, *&c*?

6. What truth there is in that Relation concerning Swallows being found in Winter under waters congealed, and reviving, if they be fiſh'd and held to the fire?

7. Whether there be in the *Bodnick Bay* a Whirl-pool, as is related to be in the Sea of *Norway*, which is commonly call'd the *Maal-ſtroom*? And whether there be any Signs, that ſpeak the communication of thoſe Gulphs by ſubterraneous paſſages; as the Jeſuit *Kircher* affirms in his *Mundus Subterraneus* T. 1. p. 146?

8. To what depth the Cold in thoſe parts peirces the Earth and Water?

9. Whether their Watches go ſlower by the intenſe cold?

10. Whether their Oyls in hard froſts are turn'd into true, that is, hard and britle, Ice?

11. Whether they can freeze there a ſtrong Brine of Bay-Salt; and a ſtrong Decoction of *Sal Gemmæ*, or Soot; or a ſtrong Solution of *Salt* of *Tartar*, or of *Sugar* of *Lead*?

12. Whether they can congeal meer *Blood*, all the ſerous part thereof being ſever'd? Item, *Canary* Wine; the *Lixiviums* of Soap-boylers, and ſuch as are prepared of other Salts; as alſo, the Spirits extracted out of Salts, as Spirit of *Vitriol*, *Nitre*, &c?

13. Whether an intenſe and laſting Froſt makes any alteration in *Quick-ſilver*, expoſed very ſhallow in a flat Veſſel.

14. Whether the Purgative virtue of *Cathartick*s be increaſed or leſſened, or even totally deſtroy'd by a ſtrong and continued Cold?

15. Whether Harts-horn thaw'd, and ſuch like ſubſtances, uſing the ſame method of Diſtilling, yield the ſame quantity of Liquor, which they uſe to yield, when not frozen?

16. What Cold operates in the Fermentation of Liquors?

17. Whether Birds and Wilde Beaſts grow white there in Winter, and recover their native colour in Summer?

18. Whether Colours may be concentred by a ſharp cold? *E. g.* A ſtrong Decoction of Cocheneel in a fit Glaſs?

19. Whether the *Electrical* virtue of *Amber*, and the *Attractive* and *Directive* force of the *Magnet*, be changed by a vehement Cold?

20. Whether pieces of Iron and Steel, even thick ones, be made britle by intenſe froſts; and therefore Smiths are obliged for prevention, to give their Iron and Steel-tools a ſofter temper?

21. Whether accurate Obſervations evince, that all Fiſhes dye in frozen Waters, if the Ice be not broken? Where it is to be diligently inquired into, whether the Cold it ſelf, or the want of changing or ventilating the water, or the privation of Air, be the cauſe of the death of Fiſhes?

22. Whether any Phyſicians or Anatomiſts have inquired, by freezing to death ſome Animals (as Rabits, Pullets, Dogs, Cats, *&c.*) after what manner it is, that Intenſe Cold kills men? whether they have found any Ice in the Inner parts; and if ſo, in which of them; Whether in the Ventricles of the Brain and Heart; and in the greater Veſſels?

Theſe were the Quæries recommended about a Twelve-month ago. Monſieur *Heuelius* in a late Letter of his, accompanied with ſeveral papers from others, returns this Accompt.

THe Inquiries you propoſed to me, I did impart to ſeveral of my Learned friends: But hitherto I have attained an Anſwer but to few particulars. Among the reſt you'l find a Letter of the Learned *Johannes Schefferus*, Profeſſor in the *Swediſh* Univerſity at *Upſall*, wherein he diſcourſes handſomly of ſeveral things, being ready to entertain a Literary Commerce with you about ſuch matters. Touching *Amber*, I am almoſt of the ſame mind with him, that it is a kind of *Foſſil Pitch* or *Bitumen*, ſeeing it is not only found on the Shore of the *Boruſſian* Sea, but alſo digg'd up in ſubterraneous places, ſome *German* miles diſtant from the Sea,

and that not only in Sandy, but alſo in other Hills of firmer Earth; of which I have ſeen my ſelf pretty big pieces. Concerning *Swallows*, I have frequently heard Fiſher-men affirm, that they have here often fiſh'd them out of the Lakes, in the Winter; but I never have ſeen it my ſelf. Whilſt I am writing this, I receive Letters out of *Denmark*, advertiſing me, that thoſe two Learned men, *Thomas* and *Eraſmus Bartholin*, do intend ſhortly to anſwer the ſame *Quæries*. Next Winter, if God vouchſafe me life and health, I purpoſe to make a Journey to *Konigs-berg*, where I hope to learn many things, eſpecially about *Amber*.

Thus far in anſwer to thoſe Inquiries for the preſent.

To this he ſubjoyns other things, no leſs fit to be communicated to the Curious, in theſe words;

The Books you have ſent me over ſea, I have not yet received: I wiſh, they were all tranſlated into Latin; for I have not *Engliſh* enough, to underſtand all particulars perfectly. For the reſt, you have obliged me, by communicating the Obſervations of the laſt *Eclipſe* of the *Sun*, aſwell thoſe made in *England*, as thoſe of *Paris* and *Madrid*. That I may requite you in ſome meaſure, I ſend you my Obſervations both of *that*, and the *Moons* laſt *Eclipſe*. In the *Sun's Eclipſe*, this is chiefly obſervable, That the *Semidiameter* of the *Moon* from the very beginning, to about 5. or 6. digits of the increaſing *Phaſis* was much leſs than the *Rudolphin* Account imports. For it was then almoſt equal to the *Semidiameter* of the *Sun*: but, after the greateſt Obſcuration, when I again contemplated the *Moons Semidiameter*, I found it 8″ or 9″ bigger than that of the *Sun*; ſo that the *Semidiameter* of the *Moon* was not always, during this Eclipſe, conſtant to it ſelf. It will therefore be worth while, to be hereafter more diligent and curious in this particular, and accurately to obſerve in the *Phaſis* of each *Digit* the *Proportion* of the *Semidiameters* of both Luminaries; to the end, that *firſt* it may be made manifeſt, Whether in all the *Eclipſes* of the *Sun*, or in ſome only, that variation happens; *next*, that the Cauſes of ſuch a *Phænomenon* may be diligently inquired into. Of this Variation, the Excellent *Iſmael Bullialdus* hath alſo obſerved ſomething at *Paris*. For he has written to me, That in the ſame Eclipſe the *Semidiam.* of the *Sun* to the *Semid.* of the *Moon* was, as 16′.9″.to 16′.22″; but that in another

Phaſis of *6 digits*, the Semidiameters appear'd equal. Theſe my Obſervations, if you think them worthy, you may communicate to other Mathematicians. The laſt year 1665. *July* 27. (*ſt. n.*) the *Tables* did alſo indicate an Eclipſe of the *Moon*: but though the Sky here was very cleer, yet the Moon was not at all obſcured by the *true ſhadow*, but entred only a little into the *Penumbra*, wherein it continued 50'. The beginning of its touching the *Penumbra* did then almoſt happen, when *Aquila* was elevated 36° 18'; which is an Example worthy to be noted. I have many Obſervations of the *Eclipſes* of former years by me, which I could not yet make publick, by reaſon of the multitude of my buſineſs, which do almoſt over-whelm me. The Eclipſe of the Moon of this Year 1666. *June* 16. (*ſt. n.*) was obſerved from a Hill neer my Garden, to the end, that we might ſee both together the *Suns ſetting*, and the *Moon riſing*. But I was diſappointed of my hopes. For very thick Exhalations, beſieging the *Horizon*, where the Moon was to riſe, unto 2°. 30', hindred me from ſeeing the *Moon riſe*, in the Article of the *ſetting* of the *Sun*. Wherefore the firſt *Phaſis* of 1. *dig.* 45'. did not appear but in the *Moons Altitude* of 2°. 30'; when the greateſt Obſcuration was already paſt. The *End* fell out hor. 9. 27'. about 128° from the *Zenith* Weſtward.

I am very glad to underſtand, that you have ſo good *Teleſcopes*, as to make ſuch conſiderable Obſervations in *Jupiter* and *Mars*, as you have lately done in *England*. I have no leaſure now, by reaſon of the Obſervations of the Fixt Stars, which I now almoſt conſtantly am employ'd about, to do any thing in the advancing of *Teleſcopes*. I am obliged to finiſh the *Catalogue* of the *Fixt Stars*; having mean while the contentment to find, that many excellent perſons labour about the Improvement of *Optick Glaſſes*. If I could get a good one of thoſe of 60. foot, you mention, at a reaſonable rate, you would oblige me in ſending me one; perhaps may I be ſo happy, as to make likewiſe ſome good diſcovery or other, by the help thereof. In the mean time, let me know, I pray, the Dimenſions of thoſe Glaſſes, and how they are to be managed. The ingenious *Burattini* has not yet finiſht his *Teleſcope*; as ſoon

as

as he hath, I ſhall acquaint you with it. * Before I conclude, I muſt give notice to the Lovers of *Aſtronomy*, that on the 24. of *September* (ſt. n.) of this year, I have obſerv'd that *New Star* in *Pectore Cygni* (which from the year 1662. untill this time hath been almoſt altogether hid) not only with my naked Eye, like a Star of the ſixth or ſeventh Magnitude, but alſo with a very great *Sextant*. It is ſtill in the very ſame place of the Heavens, where it was formerly from *A.* 1601. to almoſt 1662. For, its Diſtance from *Scheat Pegaſi* hath been by me found 35°. 51'. 20". and from *Marcab*, 43°. 10'. 50"; which Diſtances (as I have found in my *Journal*) are altogether equal to thoſe, which I obſerv'd *A.* 1658. the 1. of *November*. For the Diſtance from *Scheat* at that time was 35°. 51'. 20". and from *Marcab*, 43°. 10'. 25": where that former from *Scheat* exactly anſwers to the recent; and that from *Marcab*, 'tis true, differs in a very few *Seconds*, but that diſparity is of no moment, ſince it only proceeded from thence, that this *New Star* is not yet ſo diſtinctly to be ſeen, as at that time, when it was of the *third Magnitude*. It is therefore certain, that it is the ſelf ſame Star, which *Kepler* did firſt ſee *A.* 1601. and continued untill *A.* 1662. But whether in time it will grow bigger and bigger, or be loſt again, time will ſhew. He that will obſerve this Star, muſt take care, leſt he miſtake thoſe three more *Southern* ones, of the *Sixth Magnitude*, and now in a manner ſomewhat brighter (though not extant on the *Globe*) than the *New Star* in *Collo Cygni*. The higheſt of thoſe three, is diſtant from *Scheat Pegaſi* 36°. 25'. 45"; the middlemoſt from the ſame, 37°. 25'. 20". and the loweſt, 38°. 4'. 30". Farewell, and aſſure the Moſt Illuſtrious *Royal Society* of my humbleſt Services.

* A Letter, written ſince from *Paris*, advertiſes, that ſome of the Curious there have received ore of theſe Glaſſes of *Sr. Buratini*, and do eſteem it to be good without mentioning the Dimenſion of it: which yet is look'd for by the next.

So far Monſieur Heuelius, whoſe accurate Calcul. of the *Solar Eclipſes* Duration, Quantity, *&c.* is intended to be fully repreſented the next Month, ſince it could not be conveniently done this time. The *annexed* Papers follow.

One is from Monſieur *Joh. Schefferus*, to this purpoſe.

1. That he is confident, the *Royal Society* of *England* will do much good for the advancement of uſefull Knowledge. 2.

2. That he conceives *Amber* to be a kind of *Foſſil Pitch*, whoſe Veins lie at the bottom of the Sea; believing that it is hardned in tract of time, and by the motion of the Sea caſt on ſhore: *He adds*, that hitherto it hath been believed, not to be found but in *Boruſſia*; but he aſſures, that it is alſo found in *Sueden*, on the ſhores of the Iſle *Biorkóó*, in the Lake *Melero*, whoſe water is *ſweet*. Of this, *he ſaith*, he hath a fine piece by him, two inches large and thick, preſented him by one, that himſelf with his own hands had gathered it and ſeveral other pieces, on the ſhore of the ſaid Illand; affirming withall from the mouth of a Shepherd of that place, that it is thrown out by a ſtrong Wind, bearing upon the ſhore.

3. That it is moſt certain, that *Swallows* ſink themſelves towards Autumne into Lakes, no otherwiſe than *Frogs*; and that many have aſſured him of it, who had ſeen them drawn out with a Net together with Fiſhes, and put to the fire, and thereby revived.

4. That 'tis alſo very true, that many *Animals* there grow white in Winter, and recover their own Colour in Summer. That himſelf hath ſeen and had *Hares*, which about the beginning of Winter and Spring were half white, and half of their native colour: that in the midſt of winter he never ſaw any but all white. That *Foxes* alſo are white in Winter; and *Squirrels* grayiſh, mixt of dark and white colour.

5. That 'tis known there generally, that *Fiſhes* are killed, by reaſon of the Ice not being broken: but *firſt*, in ponds only or narrow Lakes; *next*, in ſuch Lakes only, where the Ice is pretty thick; for, where 'tis thin, they dye not ſo eaſily. *Laſtly*, that thoſe Fiſhes that lie in ſlimy or clayie ground, dye not ſo ſoon as others. But, *he adds*, that even in great Lakes, when 'tis a very bitter Froſt, Ice is wont to be broken, either by the force of the Waves, or of the Impriſoned Vapors, raiſed by the agitation of the Water, and then burſting out with an impetuoſity; witneſs the noiſe made by the rupture of the Ice through the whole length of ſuch Lakes, which *he affirms* to be not leſs terrible than if many guns went off together. Whereby it falls out, that Fiſhes are ſeldom found dead in great Lakes.

6. That neither Oyle, nor a ſtrong Brine of Bay-Salt, is truly con-

congeal'd into Ice, in thoſe parts, *Viz.* at *Upſall* in *Sueden.*

7. That the Froſt pierces into the Earth, two Cubits or *Swediſh* Ells; and what moiſture is found in it, is white, like Ice: That Waters, if ſtanding, freeze to a greater depth, even to three ſuch Ells or more; but thoſe that have a Current, leſs: That rapid Rivers freeze not at all; nor ever-bubling Springs; and that theſe latter ſeem even to be warmer in Winter, than Summer.

So far this Obſerver; who likewiſe offers his Services in giving an anſwer to the remaining *Queries*, and in entertaining a commerce in ſuch other Philoſophical matters, as he is converſant in.

Another Paper written by Monſieur *Febre*, chief Secretary to Prince *Ratzivil*, contains theſe particulars;

1. That the College of the Learned in *Boruſsia* finds it not ſo eaſie to reſolve all thoſe *Quæries* ſent from *England* to M. *Henelius*: but yet that they will try what may be done upon it.

2. That as for himſelf, he can aſſure from his own Experience concerning the Effects of Cold; *Firſt*, That in the War againſt the *Muſcovites* and *Coſacks*, *A.* 1655. in *January*, in *White Ruſsia*, at the Siege of *Bichow*, 30. Leagues from *Smolensko*, and three from *Mohilo*, near the River *Boriſthenes*, when they had Quarter in a Village call'd *Iskau*, they were ſeized on with ſuch a Froſt, that all their Proviſions of *Spaniſh* Wines or *Peterſimen*, and *Beere*, were in one Night frozen upon the Sleds, notwithſtanding they were cover'd with Straw; in ſo much, that when next morning they would have drawn of thoſe Liquors, they found all dry, and were conſtrain'd to carry them into a Stove, to thaw them; which they could not do in two whole days, and were obliged to break the Veſſels, and put pieces of the Icy Wine into Kettles to thaw them over the Fire, for Drink: That they asked not for a Draught, but a *Morſel* of Wine or Beer: That their Horſes had no better cheer than themſelves, as to matter of Drink; the Pool of the Village being ſo thoroughly frozen, that there was but very little Water left between the Ice and the bottom of the Pool; whereby the poor Beaſts were forced to drink with great reverence, kneeling on their fore-feet to thruſt their heads into the holes, made for them in the Ice, and to ſuck thence ſome drops of Water; and that, if they had not had Snow to eat, there would have dyed a far greater number

number of them, than there did. Moreover, that he obſerved, that the *Hungarian Wine*, of which they had a Tun, reſiſted the Cold better, than the *Peter Simen*; for it was not ſo much frozen; unleſs it be, that the Butler had more care of that, than the reſt, by tranſporting it ſooner into the Stove, when he found the exceſs of Cold. Again, that one preſenting him in the March with ſome *Aqua-vitæ*, the Scrue of the Flagon, put to his Mouth, ſtuck ſo cloſe to his Lips, that he could not draw it off, without drawing bloud,

In a *third* Paper, I find theſe particulars from the ſame M. *Febre*.

1. That a conſiderable perſon, one Dr. *Becker*, a great Lover of Curious Inquiries, has given him hopes to entertain this Philoſophical Commerce.

2. That he hath ſeen men dye in *Poland* and *Lithuania* both of *Heat* and *Cold*. And *firſt*, that *A.* 1653. in *July*, being with this preſent King of *Poland* in march from *Leopoli* to the Camp of *Glignani*, it was ſo furiouſly hot that day of their march, that it cauſed ſuch an alteration in that Regiment of Foot, which was the Kings Guard, marching moſt of them bare-foot upon Sands, that more than an hundred of them fell down altogether diſabled, whereof a dozen dyed out-right, without any other Sickneſs. *Secondly*, as to the Cold, that the froſt was ſo bitter, that 3 Souldiers dyed of it, *A.* 1665. the 2. of *January*, in paſſing a long Ditch: beſides, that divers perſons loſt ſome of their Lims.

The Succeſs of the Experiment of Transfuſing the Bloud of one Animal into another.

THis Experiment, hitherto look'd upon to be of an almoſt unſurmountable difficulty, hath been of late very ſucceſsfully perform'd not only at *Oxford*, by the directions of that expert Anatomiſt Dr. *Lower*, but alſo in *London*, by order of the *R. Society*, at their publick meeting in *Greſham Colledge*: the Deſcription of the particulars whereof, and the *Method* of Operation, is referred to the next Opportunity.

Errata to be corrected in Number 18.

Pag. 311. line 18. read *marked*. p. 312. l. 35. r. *Sines*. 16. l. penult. *Sines*. p. 113. l. 13. r. *Sines*. p. 316. l. 26. r. *that* for *if*.

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