

Promiscuous Inquiries, chiefly about Cold, formerly sent and recommended to Monsieur Hevelius ; 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 Endeavours 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 *Hevelius*, 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;

I. What Signior *Eurattini* (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 Exfudation 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. &c.

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

11. Whether they can freeze there a strong Brine of Bay-Salt ; and a strong Decoction of *Sal Gemmae*, 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 Catharticks 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 concentrated by a sharp cold? *E. g.* A strong Decoction of Cochineel 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 brittle 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 Rabbits, 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 Queries recommended about a Twelve-month ago. Monsieur *Henelius* in a late Letter of his, accompanied with several papers from others, returns this Account.

THE Inquiries you propos'd 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'll 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 Bartkolin*, do intend shortly to answer the same *Queries*. Next Winter, if God vouchsafe me life and health, I purpose to make a Journey to *Königs-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*, as well 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 *Semidiameter's* 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

Phases 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 clear, 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 $36^{\circ} 18'$; 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 busines, which do almost over-whelm me. The Eclipse of the *Moon* of this Year 1666. June 16. (*st. n.*) was observed from a Hill near 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 $2^{\circ} 30'$, hindred me from seeing the *Moon rise*, in the Article of the *setting* of the *Sun*. Wherefore the first *Phase* of 1. *dig.* $45'$ did not appear but in the *Moons Altitude* of $2^{\circ} 30'$; 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 finish'd his *Telescope*; as soon

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* (*ft. 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 $35^{\circ} 51' 20''$. and from *Marcab*, $43^{\circ} 10' 50''$; 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 $35^{\circ} 51' 20''$. and from *Marcab*, $43^{\circ} 10' 25''$: 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* $36^{\circ} 25' 45''$; the middlemost from the same, $37^{\circ} 25' 20''$. and the lowest, $38^{\circ} 4' 30''$. Farewell, and assure the Most Illustrious *Royal Society* of my humblest Services.

So far Monsieur Hevelius, 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.

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

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 Island; 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* tink themselves towards Autumn 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
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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-bubbling 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 *Monfieur Fehre*, chief Secretary to *Prince Ratsivil*, contains these particulars;

1. That the College of the Learned in *Borussia* finds it not so easie to resolve all those *Queries* sent from *England* to *M. Heuelius*: 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 *Moihilo*, near the River *Boristhenes*, when they had Quarter in a Village call'd *Iskan*, they were seized on with such a Frost, that all their Provisions of *Spanish* Wines or *Peterfmen*, 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 forefeet 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 blood,

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 Blood 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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