

Zenith, but declining to the S W; which I found to be a Centre, from which many luminous *Radii*, of which the red Band was much the most considerable, proceeded. This Crown, or Centre, seemed, at that time, as near as I could judge, about the Place of *Cancer*; for it effaced all the neighbouring Stars, and I could but just see two Stars, which I take to be those in the Heads of the *Twins*; when the Brightness was most faded: It would sometimes almost disappear for near a Minute, and then kindle again, and dart Rays on all Sides; but those to the W. and N. were short, pale, and soon disappeared. Those which shot Southward, were of a fiery Red; and the whole Southern Part of the Atmosphere was tinged with a red Brightness, which did not however reach quite down to the Horizon; for, to the S W, where my Prospect was least confined, I could see *Sirius*, then about 15° high beyond the red Light. The Houses opposite to mine hindered me from seeing, how far to the E. and N E the red and blue Rays extended. All this while, the N. and N W Parts of the Heavens seemed dark, by Reason of the great Brightness in the E. and S: It was very clear however, and the Stars visible. About 9, the red Band had covered the Tail of *Ursa Major*, having moved considerably towards the N, the Centre continuing in the same Place; and by degrees it faded so as not to be distinguishable from the common Redness which was spread over so considerable a Part of the Heavens. About 10 I went to the Riverside, where I had a large Prospect to the S E; and found all that Part covered with a dusky Red, quite down to the Horizon. There were afterwards some faint Rays darted, sometimes from the Centre of this Phænomenon, which has the Appearance of a common *Aurora Borealis*.

2. About $7^{\text{h}} 30'$ the Sky to the N. was very clear, and the Stars shone bright; to the S and S E, as I was in the Skirt of the Town on the N W Side, the Sky looked obscured, partly from a Mist, partly from the Smoak of the City. At the same Time there appeared a bright Column arising somewhat N. of the E, or about the E N E, which reached up with it's Point near to the *Zenith*, but going a little South of it. This Column seemed to be the Boundary of the clear and obscure Regions of the Sky above mentioned: It had an uniform steady Light, without any Dartings or Shiverings; but it sometimes vanished for a few Minutes, and then returned again all at once, not proceeding from the Bottom, but from the Side next the misty Part of the Sky, as if it were only the Border of the Mist illuminated. About 8 this Column was grown much wider, and all of a Breadth, extending in the same Direction beyond the *Zenith* to the W S W, as far as I could see for the Houses; the Addition to it's Breadth seemed to be all on the Southern Edge of it; this whole Band was of a most beautiful Pink-colour. At $8^{\text{h}} 15'$ the *Phænomena* remained the same; but to the N N W there appeared some whitish Clouds about 20° from the *Zenith*: Out of these arose three beautiful Pyramids of Light, which extended

---at London,
by Cromwell
Mortimer,
M. D. Secr. to
the Royal So-
ciety. *Ibid.* p.
839.

An Aurora Australis seen at Peterborough and Rome.

very near the *Zenith*; the middle of these Pyramids were of a beautiful Sea-green, which went off gradually in lighter Shades towards the Edges, which were of a bright White; the Colour of these very much resembled the Light of *Phosphorus*. I observed these Columns for some Minutes, and then, going in a-doors, saw no more of the *Phaenomenon*; and was told, half an Hour after, that it was all over; but have been informed since, that it returned again about ten; when the Redness spread, almost universally, over the Southern Parts of the Heavens.

— at Peterborough
by the Rev.
Mr Timothy
Neve, *Ibid.* p.
343.

3. About 7^h 30', till almost 9, it spread with Variety of Colours all over the Horizon, meeting in a Centre almost vertical, but somewhat inclining to the S. The original Colours were so mixed and blended in the common Centre, as by the vast Variety easily distinguished, made a beautiful Appearance. The fainter Colours came from the 2 opposite Points of the N W and S E: The Blood-red Crimson, &c. were seen chiefly in the N E and S W. The Wind, I think, full N, but very still. The 3 preceding Days were excessive cold; the Barometer fell 8 or 9 Degrees, and we had very great Quantities of Snow, Hail, and Rain, most of that Time; and, if I remember right, the Lights in the Air, of late Years, appear after such Storms, especially for 10 Years past, when our Winters have been unseasonably mild, and our Summers cold and rainy.

— at Rome
Jan. 27. 1740,
by the Abbot
Didacus de
Revillas F.R.S.
No. 460. p.
744. Apr.
&c. 1741.
Fig. 41.

L.V. The Sky being all over cloudy, and a strong S. Wind blowing, at 6^h p. *m.* a reddish Light appeared between 45 and 55° of S E Amplitude. The greatest Breadth of it above the Horizon was about 9°. But in a Part of the Sky nearest to the Horizon, darkened to about 1°, there was a Space of Light, almost of the Figure of a Parallelogram, about 10° broad, and 8° high; which shone more in the upper Part than in the lower. Among the thicker Clouds there was one extremely black, A B, almost parallel to the Horizon, extended above the Light toward the S.

In about ½ an Hour the Light became more vivid, and then sensibly diminished again; which it did several Times till 9^h. In the meantime a little thin Cloud, CD, parallel also to the Horizon, appeared intersecting the Light on the Southern Side. About 9^h other Clouds, proceeding from the E. toward the S. covered the Light, which was then fading, and about 9^h 30' extinguished it entirely. After 12 there fell a great Shower.

The Barometer all this time stood at the Height of 27.9½ *Paris* Inches. The mercurial Thermometer, which in boiling Water is at 0°, and in Snow mixed with ½ of common Salt is at 180, was then at 141 Degrees.

The same Light was observed more bright and distinct, at the same Time, by some who were coming from *Viterbo* to *Rome*, and by others in the *Via Valeria*, 25 Miles to the Eastward of the City.

Meteorological Diaries at Petersburg.

LVI. I. PART II. Containing Meteorological Observations made at

Petersburgh, } Lunden in }
Lunden in Sweden, } 1724, 1725. | Sweden, } 1724.

A Journal of Meteorological Observations made at Petersburg, By the Rev. Mr Tho. Consett, from Nov. 24, 1724, to June 23, 1725, abstracted for the Use of the Royal Society. By W. Derham, F. R. S.

555
An Abstract of the Meteorological Diaries, communicated to the Royal Society, with Remarks upon them. By W. Derham, D.D. Canon of Windsor, and F. R. S. No. 429. p. 101. July &c. 1733.

This Journal contains Observations, 3 times in the Day, of the Barometer, the Winds and their Strength, the Weather, and (after April 15) of the Thermometer. Which Observations (although very curious and useful) yet being too long, would be tedious to be read at the Societies Meetings; I therefore desire the following Extract may be acceptable.

Mr Consett, from the beginning noteth down the Barometrical Variations, but I know not his Divisions, and Degrees, 'till Dec. 18, at 3^h p. m. and then the Barometer was at 30.66 Wind N E¹ and fair.

From Nov. 24 to the End of the Month, the Weather was cloudy, with Snow, and a deep Snow on the last Day, and fair on the 28th. The Winds were E. and N E of 2 and 3 Degrees Strength, 'till the 29th and 30th, and then SE³ S⁴ and SW³.

In Dec. it was cloudy, with some Snow, 'till Dec. 8, and 9, which were fair Days. Then cloudy on the 10th and 11th, and Rain in the Evening. Afterwards some cloudy and moist Air; some fair, 'till Dec. 23, and then Hail; Wind S W³. The next Day Snow; and the rest of the Month some cloudy and dark, with Snow, and some fair. The Barometer, ever since the 18th, hath been above 30 Inches, and on Dec. 26, it was 30.84; on Dec. 30, 30.96, and 31.00; and lastly on Dec. 31, it was 31.12.

In Jan. 1724-5, on the 3d Day, the Barometer was at 30.65, on the 4th before Noon 31.32, after Noon 31.36, but on the 5th it was in the Afternoon 31.59, the Wind S W¹ and cloudy Weather, which is the highest Range of the Quick-silver in all the Observations, and if I mistake not, the highest I ever met with any where, and at any time. On the other Hand, the lowest Range was on February 25, at 28.28; Wind W⁴ and Snow. The Barometer was above 30 Inches all the Beginning of Jan. 'till the 13th, and then it gradually fell to 28.36. The Winds, for the most part, were in some Westerly Point 'till Jan. 11, and then S E² with fair, and an hard Frost for a Week; the Weather, before the 11th, being cloudy and moist, with some Snow now and then, and a little Rain on Jan. 1. All the rest of Jan. was, for the most part, cloudy with Snow, and but little fair, and that attended with Frost.

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In

In *Feb.* the Barometer continued high, until, by a gradual Descent, it came to 28.98, on *Feb.* 15, and 17; Wind Westerly 3. and 4. But on *Feb.* 25, it fell to 28.28; Wind W⁺, and is abovementioned. The greatest Part of this Month the Weather was cloudy, and sometimes with thick Darknes, frequent Snow, and now and then fair, with sharp Frost.

All *March* the Barometer was above 29 Inches, sometimes above 30. The greatest Part of the Month was cloudy, with frequent Snow, and some fair, with sharp Frosts; the Winds were variable, and their Strength about 1 and 2 Degrees all the Month, and feldom at 3 Degrees, nor calm at any time.

All *April* the Barometer was above 29 Inches, and under 30. In the Beginning of the Month Snow and cloudy, with some fair, and sharp Frosts, 'till *April* 13, when Mr *Confett* saith, the continual Winter-Frosts were thawed; and that on the 15th they left off their Fires in their Stoves. After this, some cloudy, some Rain, and some fair; the Winds were variable, commonly 1 and 2 Strength, now and then 3, and not any Day 0.

From *April* 16, he observed the Thermometer; which being one made by Mr *Hauksbee* stood at 51, which is between cold Air, and temperate; the freezing Point being at 65; it then rose for some Days to 46, and 40, 'till on the 22d it was at 36, and towards the End of the Month it fell again to 47.

All *May* the Range of the Barometer was between 28 and 29 Inches; and for the most part above 29.50. The Thermometer was on the 1st Day at 52.8, and continued rising to 50 on the 7th, where it stood to about the 14th, and then arose to 40 for the following Days, being at 40.25 on the 17th in the Morning, Wind S². and fair, when in the Evening of the same Day it arose to 30.34, Wind W². with Rain; it soon got down again to 40 for several Days; but from the 27th to the End it was about 30.50. This Month had much more fair than any of the preceding Months, together with some cloudy with Showers, and some heavier Rain.

In *June* the Range of the Barometer was (as in the last Month) between 28 and 29 Inches, but more frequently under 29.50 than it was in that Month. The Thermometer was all this Month between 40 and 41, only on the 1st, 2d, 3d, 8th, 11th, 13th, 23d Days, it was a little above 31, but never so high as 30, which is between warm Air, and Hot. On *June* 2, Rain fell with Hail. And (as I have observed in some of these Papers) that *Cold in Summer produces Rain*, so much Rain fell on *June* 5; after which, some cloudy, with frequent Showers, and many Days fair, to *June* 23, on which the Observations end.

Thus I have given an Abstract of the *Meteorological Observations at Petersburg*, and have taken what Care I could to note such Matters as may give the Society a just Notion of the State of every Month at that Place,

Fig. 38.

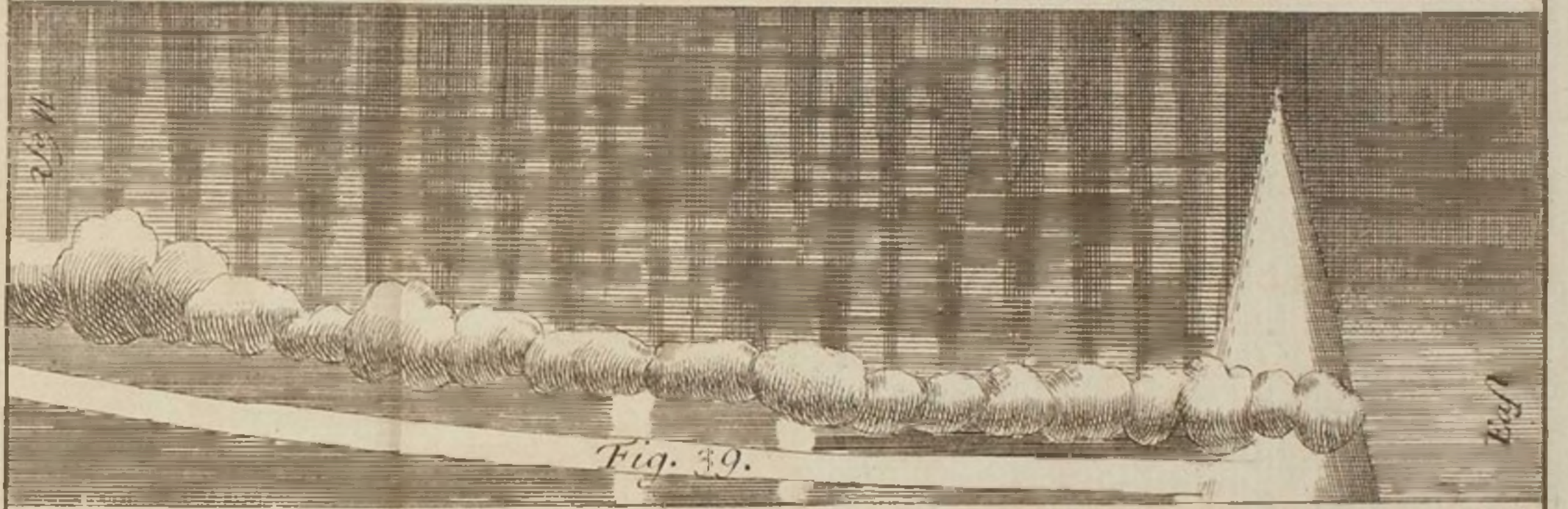
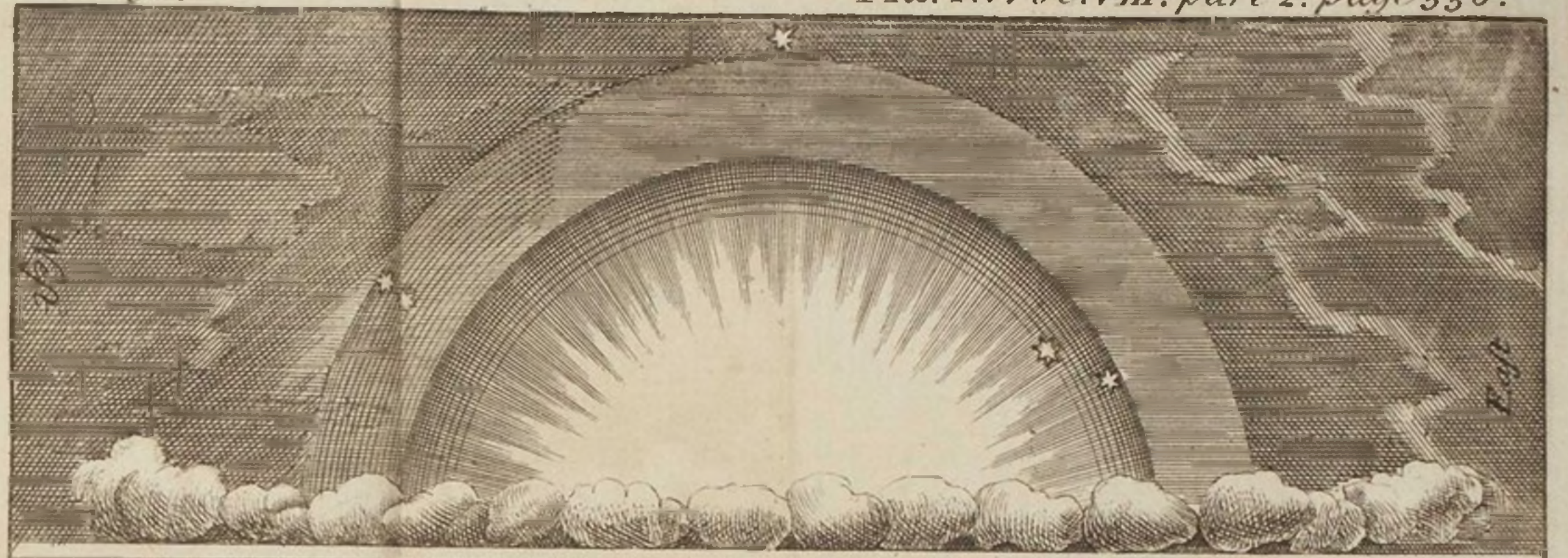
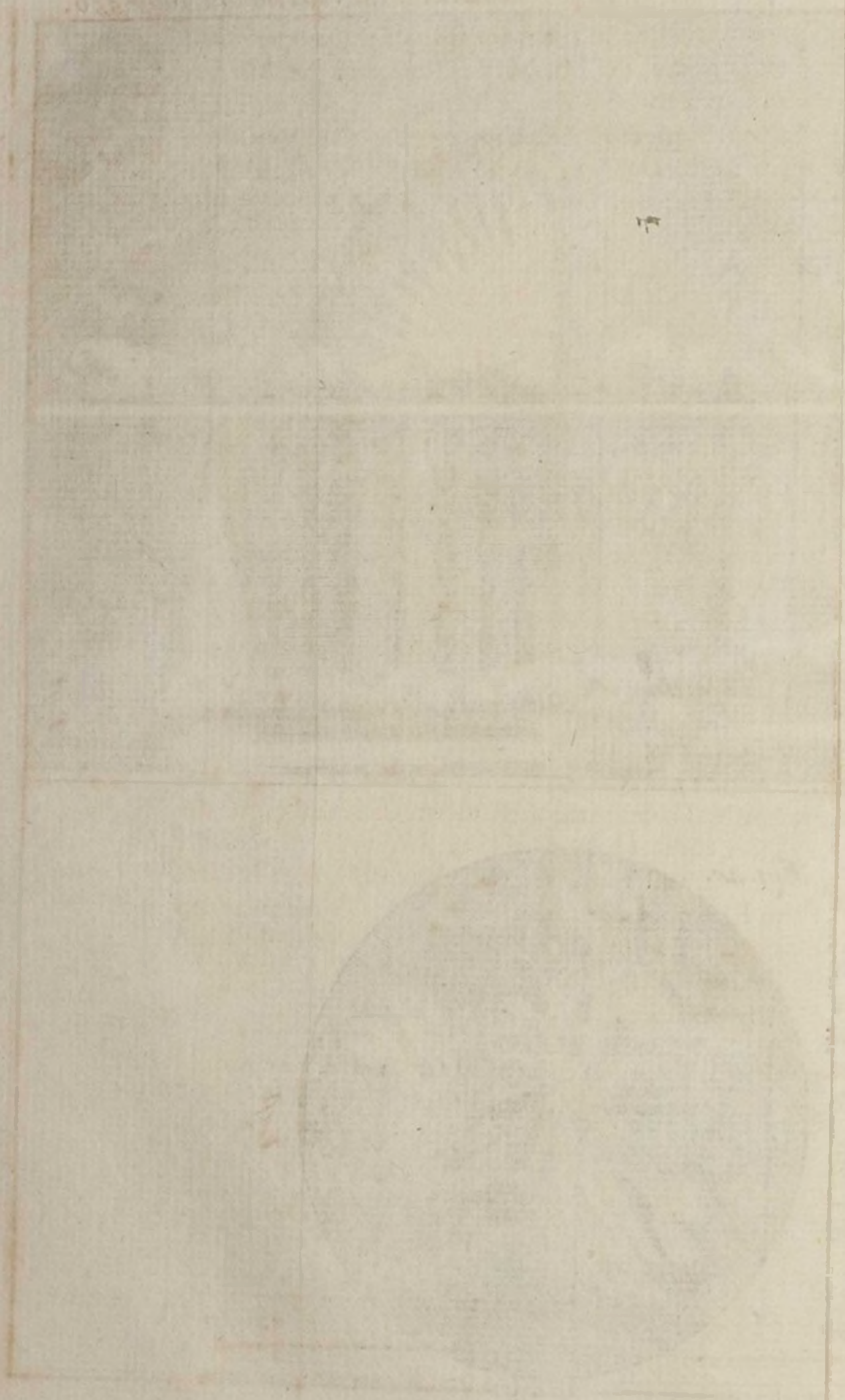


Fig. 39.

Fig. 40.





Place, and that which was most observable in it. I could wish, that either the Society, or I myself could have had some Observations in the more Southerly Parts, to have tallied with these.

These Observations not coming to Hand 'till I had finished those at *Petersburgh*, I am forced to subjoin them by way of Appendix; and the 1st Observation I shall make, shall be of the Range of the *Mercury* in the *Barometer*, which seems to be different in both Places, as far as I can judge of the Matter, by the few Observations that tally with one another, which is only from *Dec. 18*, to the End of that Month, Mr *Consett's* Barometrical Divisions before that time not being intelligible: And in all that Fortnight's time, the *Petersburgh* Barometer was above 30 Inches, and once above 31; whereas that at *Lunden* was but a little above 29, and but once at 29.6: And indeed, through the whole Year, the *Lunden* Barometer, I observe, was only now and then below 29 Inches, and much seldomer above 30. But I shall perhaps be better able to give an Account of these Matters when I come to the Observations of future Years.

2. As I have taken Notice in other Places, so I find in these Observations a great Conformity between the Winds, especially when strong for some time, and when they have been for some time in or near the same Quarter.

3. As for the *Weather*, no good Judgment could be made of it in the Space of five Weeks, which is all the time in which the Observations tally: Only I take Notice that Thunder was more frequent at *Lunden* than *Petersburgh* during that time.

Having taken Notice of the Observations in 1724, that tally, I proceed to the whole Year's Observations of *Lunden*.

I begin with the *Barometrical Ranges*, which will be best seen and compared by these two little Tables; the first of which is, in part, the curious Author's, viz. the mean Heights of the *Mercury*; to which I have added the highest and lowest Ranges in each Month. And because it will take up but little Room, I have added the Author's Mean of his Thermometrical Observations, although, I confess, I scarce understand the Divisions of his Thermometer.

Appendix to the foregoing Observations, being Meteorological Observations at Lunden in Sweden, in the Year 1724, which tally with Mr Consett's.

An Abstract of the Meteorological Observations of the whole Year 1724, made at Lunden in Sweden. By _____, Abridged for the Use of the Royal Society. By W. Derham, F. R. S.

The Highest and Lowest Ranges of the Barometer, and the Mean of the Barometer and Thermometer at *Lunden*, in the Year 1724.

| | Jan. | Feb. | March | April | May | June |
|--------|-------|-------|-------------------|---------------------|---------------------|-------|
| High | 29. 8 | 29. 9 | 30. $\frac{1}{2}$ | 30. $\frac{1}{2}$ | 29. 9 | 29. 9 |
| Mean | 29. 3 | 29. 2 | 29. 4 | 29. 6 | 29. 4 $\frac{1}{2}$ | 29. 4 |
| Low | 28. 8 | 28. 6 | 28. 8 | 29. 1 $\frac{1}{2}$ | 29. 0 | 28. 9 |
| Therm. | 24.1 | 37.1 | 21.1 | 6 $\frac{1}{2}$ | 13.8 | 45.8 |

July

Meteorological Diaries at Lunden in Sweden.

| | July | August | Septem. | October | Novem. | Decem. |
|--------|--------------------|--------------------|-----------------|-------------------|-------------------|--------------------|
| High | 29. 7 | 29. 9 | 29. 9 | 30. $\frac{1}{2}$ | 30. $\frac{1}{2}$ | 30.1 $\frac{1}{2}$ |
| Mean | 29.2 $\frac{1}{2}$ | 29.5 $\frac{1}{2}$ | 29. 3 | 29. 5 | 29. 5 | 29.2 $\frac{1}{2}$ |
| Low | 28. 8 | 29.2 $\frac{1}{2}$ | 28. 7 | 29. $\frac{1}{2}$ | 28. 9 | 28. 3 |
| Therm. | 34.s | 23.s | 1 $\frac{1}{2}$ | 15.i | 30.i | 43 i |

The Barometrical Heights at *Petersburgh*, A. D. 1724 and 1725.

| | Dec. | Jan. | Feb. | Mar. | Apr. | May | June |
|------|-------|-------|-------|-------|-------|-------|-------|
| High | 31.12 | 31.59 | 30.36 | 30.35 | 29.87 | 29.99 | 29.81 |
| Mean | 30.61 | 29.97 | 29.32 | 29.76 | 29.57 | 29.67 | 29.45 |
| Low | 30.11 | 28.36 | 28.28 | 29.18 | 29.28 | 29.35 | 29.10 |

The Heights of the Thermometer.

| | | | | | | | |
|------|---|---|---|---|------|-------|-------|
| High | — | — | — | — | 36.0 | 30.34 | 30.70 |
| Mean | — | — | — | — | 45.0 | 40.98 | 40.0 |
| Low | — | — | — | — | 54.7 | 52.8 | 40.63 |

By comparing these two Tables together, it is manifest that the *Mercurial Ascents* are much greater at *Petersburgh* than at *Lunden*, and that the *Descents* are nearly the same; so that the Range of the Barometer at *Petersburgh* is 3 Inches, 31 hundredth parts; but at *Lunden* only 1 Inch, and about 8 Tenths. And the greatest Height of the Thermometer at *Petersburgh*, was on *May 17*, 30.34.

Of the Winds
and Weather
at Lunden, in
1724.

In *Jan.* the Winds were, for the most part, about the W. and S Points, and frequently very boisterous. The Weather was some cloudy, some fair, frequent Rain, but no Cold taken notice of 'till *Jan. 30*.

In *Feb.* the Winds frequented the same Points as in *Jan.* but they lay more between the N. and E: than then; and they were very boisterous oftentimes. In this Month Snow was frequent, and now and then Thunder, and but little fair Weather.

In *March* the Winds were very variable, and sometimes strong. The Weather more serene than before, with sometimes Snow, and towards the latter End Rain, and now and then a Frost.

In *April* the Winds were more Northerly and Easterly than in *March*, and not very strong. The greatest Part of the Month was freezing, and fair, with some Days of Rain with Thunder.

The Beginning of *May* to the 16th the Mornings were frosty, with some Rain, some Snow, and some fair the rest of the Day; after the 16th some Rain and some Snow; and towards the End of the Month fairer. The Winds were variable, brisk, and about the 23d, 24th, and 25th, stormy.

In *June* the Winds variable, pretty brisk, and stormy on the 10th, 11th, and 12th; then the Weather for the most Part fair till the 15th; after that cloudy, and but little fair, with frequent and plentiful Rain.

July also was a cloudy, wet Month, with but little fair, and some Thunder, which was sometimes violent. The Winds, for the most Part, were between the W. and S. and moderate.

In *Aug.* the Winds were more Northerly and Easterly than in *July*, and sometimes between the W. and S, and moderate in all the Points. The first 9 or 10 Days were, for the most Part, fair; after that, 9 or 10 Days, more cloudy, Rain, Lightning in the Evening, loud Thunder and Rain in the Day, and some in the Night; and from the 20th to the Month's End fairer, with cloudy, Hail, and Rain.

In *Sept.* the Winds frequented the Northerly and Westerly Points, were brisk, and sometimes stormy; the Mornings, for the most Part, cloudy the 9 first Days, and fairer the rest of the Day. The greatest Part of the rest of the Month was rainy, with Plenty of Snow on the 25th; then Rain, which continued in the Month of

Oct. during the 9 first Days; the rest of the Month was cloudy, with now and then Hoar-Frosts, and some fair. The Winds varied often, but were the most frequent in some of the Southerly and Westerly Points, and not very high.

In *Nov.* the Winds were sometimes in the Westerly and Southerly Points, but more frequent in the Northerly and Easterly, for the most Part of a moderate Strength. The 9 first Days the Weather was cloudy, then Snow and Frost to the 17th; then to the End cloudy, Snow, Hoar-Frost, Rain, and but little fair, and that in the Morning.

In *Dec.* the Winds were moderate, and often in the Southerly and S W Points, seldom Northerly. The 5 first Days were cloudy and wet; then Snow and Frost the 6th, 7th, and 8th; then cloudy to the 13th; then Hoar-Frost, and fair on the 14th, 15th, and 16th; then cloudy, with Thunder, Rain, Snow, and Frost, at diverse Times, in the rest of the Month.

2. PART III. Containing Meteorological Observations made at

| | | |
|--------|---|-------|
| Berlin | } | 1726. |
| Sweden | | |
| Lunden | | |
| Bettna | | |
| Upsale | | |
| Bygdea | | |
| Pithea | | |

Continued by
the same, No.
433. P. 334.
July, &c.
1734.

An Abstract of Meteorological Observations made in the Year 1726, at Berlin, by the Society there, and communicated by Job. Theod. Jablonski; and in Sweden, at Lunden, by Conrad Quensel, Math. Prof.

Meteorological Diaries at Berlin, and in Sweden.

in the *Caroline Academy*; and at *Bettna* in *Sudermanland*, by *Andr. Geringius*, Pastor and Provost of the Place; and at *Upsale*, by *Eric Burman*, Astron. Prof. in the *Gustavian Academy*; and at *Bygdea*, in *Westrobothnia*, by the late *Jacobus Burman*, Pastor of the Place; and lastly, at *Pithea*, in the same Province, by *Olave Burman*, and *Israel Steckfennius*, Students.

These Observations have, with so great Judgment, Diligence, and Care, been made, some twice, and some thrice every Day, that I wish they could be published as they are; but by reason they are too numerous and bulky to be capable of that, therefore I have contracted them as well as I could, to make them useful to the Society; and that not without a great deal of Trouble, by Reason of the Difficulty to give a tolerable brief Account of so great a Variety and Number of Observations, as are those of the Winds, and their Strength, the Weather, the Barometer, Thermometer, &c. of so many Places, and so many Times every Day in the Year.

The most useful of the *Barometrical* Observations I have represented in the following Table; which shews, at an easy View, the highest, lowest, and mean Heights of the Quicksilver in every Month, at the several Places.

| | JANUARY. | | | | | FEBRUARY. | | | | |
|------------|---------------------|--------------------|---------------------|-------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|
| | Berlin | Lun. | Bett. | Upsa. | | Berlin | Lun. | Bett. | Upsa. | |
| High | 29.3 | 30.0 $\frac{1}{2}$ | 30.51 | 30.18 | | 29.6 | 29.8 $\frac{3}{4}$ | 30.40 | 30.2 | |
| Mean | 28.7 $\frac{1}{2}$ | 29.3 $\frac{1}{8}$ | 29.92 | 29.58 | | 28.6 $\frac{1}{4}$ | 29.1 $\frac{1}{2}$ | 29.74 | 29.53 | |
| Low | 28.0 $\frac{1}{4}$ | 28.5 $\frac{1}{4}$ | 29.26 | 28.98 | | 27.6 $\frac{1}{2}$ | 28.4 $\frac{1}{4}$ | 29.8 | 28.86 | |
| MARCH. | | | | | | APRIL. | | | | |
| | Berlin | Lun. | Bettna | Upsa. | Pithea | Berlin | Lun. | Bettna | Upsale | Pithea |
| High | 29.0 $\frac{1}{2}$ | 30.0 $\frac{1}{4}$ | 30.50 | 30.24 | 30.11 | 28.10 | 29.9 $\frac{1}{2}$ | 30.48 | 30.17 | 29.98 |
| Mean | 28.5 | 29.4 $\frac{1}{2}$ | 29.79 | 29.28 | 29.35 | 28.5 | 29.5 $\frac{7}{8}$ | 29.86 $\frac{1}{2}$ | 29.66 | 29.27 $\frac{1}{2}$ |
| Low | 27.10 $\frac{1}{2}$ | 28.8 $\frac{1}{2}$ | 29.8 | 28.32 | 28.50 | 28.0 $\frac{1}{2}$ | 29.2 $\frac{1}{2}$ | 29.25 | 29.15 | 28.57 |
| MAY. | | | | | | JUNE. | | | | |
| | Berlin | Lun. | Bettna | Upsa. | Pithea | Berlin | Lun. | Bettna | Upsale | Pithea |
| High | 28.9 $\frac{1}{4}$ | 30.0 $\frac{1}{2}$ | 30.40 | 30.16 | 30.11 | 28.7 $\frac{1}{2}$ | 29.9 $\frac{1}{2}$ | 30.20 | 30.00 | 29.98 |
| Mean | 28.4 $\frac{1}{2}$ | 29.7 $\frac{3}{8}$ | 30.77 $\frac{1}{2}$ | 29.84 | 29.74 $\frac{1}{2}$ | 27.9 $\frac{1}{4}$ | 29.4 $\frac{1}{2}$ | 29.67 $\frac{1}{2}$ | 29.62 $\frac{1}{2}$ | 29.56 $\frac{1}{2}$ |
| Low | 28.0 $\frac{1}{8}$ | 29.4 $\frac{1}{4}$ | 29.35 | 29.52 | 29.48 | 27.0 $\frac{1}{2}$ | 28.9 $\frac{1}{2}$ | 29.15 | 29.25 | 29.15 |
| JULY. | | | | | | AUGUST. | | | | |
| | Berlin | Lun. | Bettna | Upsa. | Pithea | Berlin | Lun. | Bettna | Upsale | Pithea |
| High | 28.5 $\frac{3}{4}$ | 29.6 | 30.5 | 29.88 | 29.56 | 28.8 | 29.8 $\frac{1}{2}$ | 30.30 | 29.98 | 29.86 |
| Mean | 28.2 $\frac{1}{4}$ | 29.2 $\frac{1}{4}$ | 29.70 | 29.54 | 29.37 $\frac{1}{2}$ | 28.3 $\frac{1}{4}$ | 29.3 $\frac{1}{8}$ | 29.65 $\frac{1}{2}$ | 29.48 | 29.28 $\frac{1}{2}$ |
| Low | 28.0 $\frac{1}{4}$ | 28.9 $\frac{1}{2}$ | 29.35 | 29.20 | 29.19 | 27.11 $\frac{3}{4}$ | 28.8 $\frac{1}{2}$ | 29.1 | 28.98 | 28.71 |
| SEPTEMBER. | | | | | | | | | | |

| SEPTEMBER. | | | | | | OCTOBER. | | | | |
|------------|--------|--------------------|--------------------|-------|--------|--------------------|--------------------|---------------------|---------------------|---------------------|
| | Berlin | Lun. | Bettna | Upsa. | Pithea | Berlin | Lun. | Bettna | Upsale | Pithea ^a |
| High | 28.6 | 29.7 $\frac{1}{4}$ | 30.28 | 30.00 | 29.80 | 28.10 | 30.1 $\frac{1}{2}$ | 30.55 | 30.25 | 29.90 |
| Mean | 28.1 | 29.1 $\frac{1}{2}$ | 29.57 ² | 29.29 | 29.20 | 28.3 $\frac{1}{2}$ | 29.1 $\frac{1}{8}$ | 29.57 $\frac{1}{2}$ | 29.28 $\frac{1}{2}$ | 29.05 |
| Low | 27.8 | 28.5 $\frac{1}{2}$ | 28.87 | 28.58 | 28.60 | 27.9 | 28.2 $\frac{1}{4}$ | 28.60 | 28.32 | 28.20 |

| NOVEMBER. | | | | | | DECEMBER. | | | | |
|-----------|--------------------|--------------------|--------|-------|--------|--------------------|--------------------|--------|--------|--------------------|
| | Berlin | Lun. | Bettna | Upsa. | Pithea | Berlin | Lun. | Bettna | Upsale | Pithea |
| High | 29.1 | 30.1 $\frac{1}{2}$ | 30.80 | 30.51 | 30.19 | 29.1 $\frac{1}{4}$ | 30.0 $\frac{1}{2}$ | 30.50 | 30.7 | 29.80 |
| Mean | 28.7 | 29.5 $\frac{1}{2}$ | 30.00 | 29.73 | 29.24 | 28.4 $\frac{1}{4}$ | 29.5 $\frac{1}{2}$ | 29.65 | 28.83 | 29.0 $\frac{1}{2}$ |
| Low | 28.1 $\frac{1}{4}$ | 28.9 $\frac{1}{2}$ | 29.20 | 28.90 | 28.29 | 27.8 $\frac{1}{4}$ | 28.4 $\frac{1}{2}$ | 28.80 | 28.60 | 28.21 |

Although this Table may give a good View of the *Barometrical Ranges* at the several Places in every Month of the Year 1726, yet I think it necessary to acquaint the Society with the great Agreement between the Ascents and Descents of the \varnothing , sometimes at the very same Time, and generally near it. If the \varnothing was remarkably high or low, it was so in all, or most of the Places: If stationary for 3 or 4 or more Days, it was the same in all. Only the Alteration would begin, or end, somewhat sooner, or later, perhaps, in one Place than another; and when any Deviation was from this Rule, it was commonly most remarkable in the *Pithea* Observations.

The *Thermometrical* Observations I can give no Account of, by reason I understand not the Thermometers there made use of, not the freezing, temperate, or other Points. Only the *Upsale* Thermometer (which was made by Mr *Hauksbee*) must serve for all: In which the Point of extreme Heat is marked 5 Degrees above 0; and so is graduated downwards to 45°, which is the Point of *temperate*; and 65°, which is the Point of *freezing*. The *Mean* of all the Degrees of every Month, at *Upsale*, the illustrious *Burman* hath noted according to Dr *Jurin's* Directions; which is, by adding the whole Month's Degrees, and dividing by the Number of Days. Which *Means* I have inserted, as well as my own; mine being the *Means* between the highest and lowest Degrees, as well of the *Thermometer* as *Barometer*. And because I forgot to insert the *Barometrical Means* of the illustrious *Lunden* and *Pithea* Observers (which are according to Dr *Jurin's* Way) but took only those between the highest and lowest Stations, therefore I have given this little Table of them.

| JANUARY. | | FEBRUARY. | | MARCH. | |
|------------------------------|--------|-----------------------------|--------|-----------------------------|-----------------------------|
| Upsale | Pithea | Upsale | Pithea | Upsale | Pithea |
| $\frac{29.76 \frac{10}{31}}$ | | $\frac{29.47 \frac{1}{14}}$ | | $\frac{29.51 \frac{2}{31}}$ | $\frac{29.28 \frac{1}{18}}$ |

A Table of the Mean Barometrical Stations, by Dr Jurin's Way.



Meteorological Diaries at Berlin, and in Sweden.

| APRIL. | | MAY. | | JUNE. | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|
| Upsale | Pithea | Upsale | Pithea | Upsale | Pithea |
| 29.76 $\frac{2}{3}$ | 29.49 $\frac{2}{3}$ | 29.91 $\frac{13}{31}$ | 29.82 $\frac{22}{31}$ | 29.59 $\frac{4}{13}$ | 29.49 $\frac{2}{3}$ |
| JULY. | | AUGUST. | | SEPTEMBER. | |
| 29.53 $\frac{11}{31}$ | 29.38 $\frac{3}{9}$ | 29.54 $\frac{17}{31}$ | 29.27 $\frac{10}{31}$ | 29.34 $\frac{9}{15}$ | 29.14 $\frac{1}{6}$ |
| OCTOBER. | | NOVEMBER. | | DECEMBER. | |
| 29.43 $\frac{13}{31}$ | 29.11 $\frac{17}{30}$ | 29.81 $\frac{1}{10}$ | 29.49 $\frac{23}{30}$ | 29.66 $\frac{23}{31}$ | 29.19 $\frac{9}{31}$ |

A Thermometrical Table of the highest, lowest, and mean Stations at Lunden and Upsale, with the Upsale Means, according to Dr Junin's Method.

| JANUARY. | | | FEBRUARY. | | | MARCH. | | | |
|----------|-------------------|--------|----------------------|-------------------|--------------------|----------------------|-------------------|-------|----------------------|
| | Lun. | Upsale | Upsale | Lun. | Upsale | Lun. | Upsale | | |
| High | 79 | 96. | | 85 | 83.7 | | 111 | 82.0 | |
| Mean | 58 $\frac{1}{3}$ | 74.8 | 81.2 $\frac{74}{31}$ | 65 $\frac{1}{2}$ | 74.3 $\frac{1}{2}$ | 74.1 $\frac{21}{28}$ | 84 $\frac{1}{2}$ | 67.5 | 69.1 $\frac{13}{31}$ |
| Low | 38 | 67.7 | | 56 | 65 | | 58 | 52.4 | |
| APRIL. | | | MAY. | | | JUNE. | | | |
| High | 149 | 60.9 | | 187 | 47.8 | | 188 | 46.7 | |
| Mean | 116 | 56.56 | 53.7 $\frac{77}{31}$ | 156 | 32.54 | 33.0 $\frac{2}{3}$ | 158 $\frac{1}{2}$ | 30.55 | 34.0 $\frac{7}{15}$ |
| Low | 83 | 43.3 | | 125 | 18.1 | | 129 | 15.4 | |
| JULY. | | | AUGUST. | | | SEPTEMBER. | | | |
| High | 173 | 42.4 | | 156 | 52.2 | | 168 | 62.7 | |
| Mean | 146 | 32.54 | 33.7 $\frac{75}{35}$ | 134 $\frac{1}{2}$ | 41.60 | 43.5 $\frac{13}{31}$ | 133 | 50.4 | 43.5 $\frac{13}{31}$ |
| Low | 119 | 23.4 | | 113 | 32.8 | | 98 | 38.1 | |
| OCTOBER. | | | NOVEMBER. | | | DECEMBER. | | | |
| High | 122 | 70.7 | | 90 | 84.3 | | 83 | 94.8 | |
| Mean | 102 $\frac{1}{2}$ | 61.7 | 61.8 $\frac{27}{34}$ | 71 | 73.0 | 72.1 $\frac{1}{28}$ | 61 | 80.57 | 79.8 $\frac{5}{31}$ |
| Low | 83 | 52.7 | | 52 | 62.3 | | 40 | 67.7 | |

By this Table, especially by the *Upsale* Observations, it appears, that the colder Months in this Year 1726, were not so excessive cold, as their Northerly Situation would incline one to imagine, *Upsale* itself being 60° N. But by the Table, some of the Days in *Jan.* *Feb.* and *March*, &c. at the Beginning of the Year; and of *Sept.* *Oct.* *Nov.* and *Dec.* at the latter End of it, may be observed to have had the Thermometer sometimes not so low, or very little below the *freezing Point*. In *Jan.* and *Dec.* for Instance, when it was at 67.7, which was lower than in the other Months, it was not 3 Degrees lower than the *freezing Point*, at 65°.

But by the best Judgment I could make of the *Berlin* Thermometrical Observations, they seem to have had no less, if not more severe Weather, than in the Northern Parts, particularly than at *Lunden*, *Upsale*, and

and *Pithea*, where the Weather seems to have been milder than at *Bettna* and *Bygdea*; at which two Places I find they had frequently Showers and Storms of Snow, and more hard Weather than at the other *Swedish* Places, or *Berlin*.

What the Cause of this different Warmth should be, I leave others to judge, whether the Proximity of the Sea, or the Warmth of mineral Vapours, and the Guard of their Woods screening off the cold Winds (which two latter I remember *Ol. Magnus* ascribes much unto).

But for the better judging of the State of every Month, be pleased to take this View, which the curious Author of the *Bettna* Observations hath given, together with some Remarks of my own, from the other Places.

In *Jan.* he says, the Winter cold (which was very intense from the 23d of *Dec.* to the 15th of *Jan.*) began to abate, to the Disadvantage of the Ways and Travelling.

In *Feb.* he says the Winter Weather continued all the Month, to the middle of *March*, with some Snow, and Frost enough to benefit the Ways and Travelling.

March he says began with Snow, and stormy and grievous Cold; but towards the latter End, the Weather was milder, and more feasonable to the Agriculture newly begun. On the 14th and 17th was an *Aurora Borealis*.

In this Month, on the 17th and 22d, at *Berlin* also there were Signs of *Auroræ Boreales*, as also on *Feb.* 23.

Also at *Upsale*, a *Lumen Boreale* was on *Feb.* 27, *March* 3, 15, and 16.

In *April*, *Bettna* is said to have had a seasonable Seed-time; and that the autumnal Corn, which had escaped the *Worm* (a Calamity I find common in those Parts as well as *England*) began now to flourish.

At *Lunden* they had *Parbelii* on the 28th and 29th. At *Upminster* we had the *Aurora Borealis*, or *Streaming*, in the Evening, *April* 12th.

In *May* the reverend and learned Observer at *Bettna* takes Notice, that by the continual and pernicious Heat of the Sun in this Month, the Corn was so burnt up, as to be a sad Prefage of an ensuing Scarcity, and Dearth of Provisions.

And at *Upsale* also, and *Berlin*, they mention great Drought, and excessive Heat of the Sun. But in some Parts of the Month, the Air at *Berlin* is said to have been coldish.

In *June* the violent Heats were abated, and the Season more moist and rainy. The Corn being too soon ripe, caused their Harvest to fall out at a very unusual Season.

At *Lunden* and *Berlin* it was cold several Days and irksome.

July I find was a rainy Month at *Berlin*, and most of the *Swedish* Places (*Pithea* the least). At *Bettna* it was very unwelcome to the Harvest-men. Much Thunder also and Lightning was in most of the Places, chiefly at *Upsale*.

In *Aug.* I find a greater Agreement between the Winds than in the other Months, they, in most of the Places, blowing from some of the Points between the West and South. At *Berlin* and *Upsale* was much Rain, at *Pithea* Thunder; and at *Bettna* the Beginning of the Month, being mild and fair, is said to be a good Seed-time; but it is remarked, that for want of Rain the Seed came not up well.

Sept. was a very rainy Month in all the *Swedish* Places, very cloudy, and some misty, and snowy at *Pithea*; but at *Berlin* better Weather. At *Lunden*, a *Parbelius* on *September* 11th.

In *October* the *Swedish* Places had many *Aurora Boreales*. At *Lunden*, on *Oct.* 8, 12, and 24. At *Bettna* on the 8th, 10th, 12th, 13th, 15th, 22d, 26th. At *Upsale*, on the 3d, 6th, and especially the 8th. And the same Evening of *Oct.* 8, at *Upminster*, we had a very remarkable whitish List, or Girdle went cross the Heavens, from W. by S, to E. by N, about half a Degree broad; which continued but a little while, and then the whole Hemisphere was covered with streaming Vapours, in all Parts emitting Lances that pointed towards the Zenith, where they formed a Canopy; sometimes reddish, sometimes darker, and sometimes blazing, as if set on Fire, and emitting Lances every Way, so as to make an Appearance of the Star which the Knights of the Garter wear. This Canopy moved sometimes some Degrees Eastward, and then would return back again near the Zenith. When the Vapours and Lances shone out most, I observed a strange Commotion and Working in them, as if some large Body was behind them, and disturbed them. This *Aurora Borealis* being different from those that usually appear, I was minded to take this Occasion of mentioning it with others that were seen at the same Time in *Sweden*.

The Weather in this Month was Rain, and hoar Frosts in the *Swedish* Places, with much Snow at *Bygdea* and *Pithea*; a *Parbelius* at *Lunden*, *Oct.* 14: And the illustrious *Bettna* Observer saith, the Plenty of Rain this Month caused the Corn to thrive much; and he reckons the 31st Day of this Month to be then the first Winter Day with them, it being frosty, and Abundance of Snow that Day. At *Berlin* it seems to have been a dark and cloudy Month, with irksome Cold towards the latter End.

In *Nov.* *Aurora Boreales* were at *Lunden* on the 2d, 7th, and 8th; at *Bettna* the 2d. At *Lunden* and *Upsale* it was cloudy, foggy, Frost, and Snow: At *Bygdea*, *Pithea*, and *Berlin*, fairer, with Frost and severe Cold. At *Bettna* the Cold was very intense; the Heavens very cloudy and misty.

In *December*, at *Lunden* *Aurora Boreales* were on the 5th, 6th, 7th, 8th, 9th, 10th, 14th, 15th, 16th, and 22d Days; and at *Upsale* on the 5th and 6th; and at *Berlin* on the 7th and 12th there were Signals of the *Aurora Boreales*. Frost and Snow, cloudy and Fogs were at *Lunden*; at *Upsale* some cloudy and foggy, and a pretty deal of fair sometimes: At *Berlin* much Frost, Cold, and a great Storm of Wind on
the

the 23d: At *Pitheia* frequent Snow, and some fair, some cloudy. *Bettna* is noted to have moderately Snow, but twice more intense Cold, to the great Benefit of the Ways and Travelling.

For the better understanding the foregoing Observations, and for a Conclusion of them, it is to be observed, that the *Lunden Barometrical* Observations were made with a *Barometer* graduated according to our *English* Measure, into Inches, and I suppose Decimals of Inches. But the *Thermometer* (as I said) I understand not.

The *Bettna* Barometer also is graduated, according to *English* Measure, into Inches and Centesms.

The *Upsale* Barometer and Thermometer were both made by Mr *Hauksbee*, and consequently are according to *English* Measure; the Barometer having Inches and centesimal Parts; the Thermometer as I have before described.

The *Bygdea* Observations the reverend Author did not live all the Year to finish, and there being none Barometrical, or Thermometrical, only a verbal Account of the Weather, and now and then of the Winds; therefore I have only, as Occasion served, taken Notice of those Remarks.

The *Pitheia* Observations had none Thermometrical; and those of the Barometer seem to be in Inches and centesimal Parts.

3. PART IV. *Containing Meteorological Observations made at*

Continued by the same.

Naples
Bengal } 1727.
Christiana }

An Abridgment of the *Meteorological Observations* made in the Year 1727, at *Naples*, by Dr *Nic. Cyrillus*, *Prim. Med. Prof.* and at *Bengal*, by the Rev. Mr *Bellamy*, Chaplain to the *English* Factory; and at *Christiana* in *Norway*, by ——— communicated by Mr *Pr. Kink*. Extracted, for the Use of the *Royal Society*, by *W. Derham*, *F. R. S.*

I shall begin (as in my former Abstracts) with a short and easy View of the *Barometrical* and *Thermometrical Observations*, in these little Tables of them, which will be the more valuable, on account of the Observations being made (as I suppose) with some of the *Societies* Glasses, of Mr *Hauksbee's* Preparation.

The *Barometrical Means* of *Naples* are, both as they are set down by the illustrious Observer himself, according to Dr *Jurin's* Directions; and also as they are between the highest and lowest Stations of every Month. Those of *Norway* are in the latter Way.

JANUARY,

Barometrical and Thermometrical Ranges at

A Table of the Barometrical Ranges at Naples, and in Christianiana at Norway, in the Year 1727.

| | JANUARY. | | FEB. | | MARCH. | | APRIL. | | MAY. | | | |
|------|----------|-------|--------|--------|--------|-------|---------|-------|--------|---------|-------|--|
| | Naples | | Naples | | Naples | | Naples | | Naples | | | |
| High | 29.80 | | 29.88 | | 30.6 | | 29.88 | | 29.88 | | | |
| Mean | 29.55 | 29.65 | 29.63 | 29.72 | 29.59 | 29.73 | 29.71 | 29.72 | 29.71 | 29.73 | | |
| Low | 29.30 | | 29.38 | | 29.12 | | 29.54 | | 29.54 | | | |
| | JUNE. | | | JULY. | | | AUGUST. | | | | | |
| | Naples | | Norw. | Naples | | Norw. | Naples | | Norw. | | | |
| High | 29.72 | | 29.3 | 29.80 | | 29.7 | 29.80 | | 29.7 | | | |
| Mean | 29.60 | 29.64 | 29.1½ | 29.67 | 29.70 | 29.3½ | 29.55 | 29.63 | 29.5 | | | |
| Low | 29.46 | | 29.0 | 29.54 | | 29.0 | 29.30 | | 29.3 | | | |
| | SEPTEMB. | | | OCTOB. | | | NOVEMB. | | | DECEMB. | | |
| | Naples | | | Naples | | | Naples | | | Naples | | |
| High | 29.88 | | | 29.88 | | | 30.06 | | | 29.88 | | |
| Mean | 29.59 | 29.72 | | 29.50 | 29.66 | | 29.59 | 29.75 | | 29.59 | 29.65 | |
| Low | 29.30 | | | 29.12 | | | 29.12 | | | 29.30 | | |

A Table of the Thermometrical Ranges at Naples, Bengal, and Christianiana, in the Year 1727.

| | JAN. | | FEB. | | MARCH. | | APRIL. | | MAY. | | JUNE. | | |
|------|-------|-------|---------|---------|--------|---------|--------|-------|------|-------|-------|-------|---------|
| | Nap. | Nap. | Nap. | Beng. | Nap. | Beng. | Nap. | Beng. | Nap. | Beng. | Nap. | Beng. | Christ. |
| High | 51.3 | 44.5 | 48.3 | 15.2 | 41.0 | 15.3 | 30.0 | 20.4 | 20.0 | 10.8 | | | 46 |
| Mean | 47.1 | 40.0 | 41.0 | 7.6 | 31.0 | 7.9 | 24.0 | 10.6 | 14.7 | 5.8 | | | 37 |
| Low | 43.0 | 35.0 | 34.5 | 0.1 | 21.0 | 0.6 | 18.0 | 0.7 | 9.5 | 0.8 | | | 29 |
| | JULY. | | | AUGUST. | | | SEPT. | | Oct. | Nov. | Dec. | | |
| | Nap. | Beng. | Christ. | Nap. | Beng. | Christ. | Nap. | Beng. | Nap. | Nap. | Nap. | | |
| High | 17.0 | 15.4 | 40 | 21.0 | 15.4 | 45 | 25.0 | 10.4 | 43.5 | 47.0 | 50.5 | | |
| Mean | 10.0 | 7.7 | 35 | 11.1 | 7.8 | 35 | 19.7 | 7.7 | 32.2 | 43.7 | 43.2 | | |
| Low | 3.0 | 0.1 | 30 | 7.3 | 0.2 | 25 | 14.5 | 5.0 | 21.0 | 40.5 | 36.0 | | |

These Tables give an easy View of the Barometer and Thermometer in the several distant Parts of the World specified: Which would have been very instructive, had they been observed throughout the Year, as they were at Naples.

By the Barometrical Observations it appears, that the Ascent and Descent of the Quicksilver is not so great at Naples as in the more Northerly Climes: For it was but twice in the whole Year above 30 Inches; and but thrice as low as 29.12 Inches. And so I observed, that at Zurich the Range is but about an Inch; but at Upminster I find the highest Ascent to have been 30.44 Inches; and the lowest Descent 27.44 Inches, which is a Range of 2½ Inches: And by my Account of the Petersburg Observations in 1724, it appears that the Mercurial Range there is 3.31 Inches. And as for Norway, the Observations are too few,

few, and all made only in the Summer Months, whereby no good Judgment could be made: And *Bengal* had no *Barometer*.

By the *Thermometrical Table* we may judge of the Heat and Cold of the several Places. For the right understanding of which, I must repeat what I said in a former Abridgment, viz. that in Mr *Hauksbee's* Thermometers, the Point of *Extream Heat* is 5° above 0; that 45° below 0, is the Point of *Temperate*; and 65° , the Point of *Freezing*. But Dr *Cyril* saith it freezes with them at *Naples* when the Spirits are only got to 55° .

And as at *Naples* it freezes at a warmer Degree of the Thermometer, so I observe that at *Christiana* the illustrious Observer complains of the *vehement Heat of the Sun* in *July*, when the Spirits were but at 36 and 34° ; in *Aug.* at 25, 27, and 28 Degrees, he says, the *Weather was exceeding hot*. I thus distinctly mention (as the Author doth) the *Heat of the Sun*, and the *Heat of the Weather*, because they may not mean the same Thing, I having been informed by the Whale-Fishers, that in *Greenland* the Heat of the Sun is scarce tolerable on one Side of the Ship, when on the other Side it freezes hard.

At *Bengal* the Heat at some Times seems to be very intense, by the Thermometer being, in some Months, more Degrees about the 0, than the Point of *extream Heat* is. As particularly in *April*, *May*, and *June*, it was 6, 7, and 8° above 0. But those excessive Heats are generally in the Afternoons, the Forenoons being more temperate, and the Temperature, or what they call Cold there, is at the same Time of the Day. And the Degree of the Thermometer, at which they reckon it coldish, is about 15° . And on *May 2d*, at 8 in the Morning, Mr *Bellamy* saith (the Glass being then at 20.4 Degrees) *The Morning was like Winter Weather in Europe*.

Whether this so different Judgment of great Cold at *Bengal*, when the Thermometer was about 20° ; and of excessive Heat at *Christiana*, when it was but a little below that, viz. at 25° , &c. Whether, I say, this Difference of Judgment arises from some Prejudice of the Senses, or from some extraordinary Quality in the Air, I leave (as Dr *Cyril* doth) to the Judgment of the learned Society.

As to the Weather, Winds, Rain, &c. of the several Places, it would be endless to meddle with Particulars, and therefore a transient View of every Month must suffice.

At *Naples*, *Jan.* was a cool Month, frequent Rain, with much Thunder and Storms of Wind. The Rain amounted to $111\frac{1}{2}$ Measures (23 of which make an *English Inch* in Depth) which is 4 Inches $19\frac{1}{2}$ Measures, or near 5 Inches Depth. *Vesuvius* was pretty quiet.

Feb. was a drier Month, the Rain amounting only to 14 Measures, which is but little above half an Inch deep. The Weather was for the most Part cloudy, with some Frosts. *Vesuvius* emitted a thick Smoak.

Barometrical and Thermometrical Rages at

At *Naples*, in *March* it was cold, with Hail, and Snow on the Mountains, the Rain amounted to 101 Measures, which makes 4 Inches, 9 Measures Depth. The Winds were in all the Points. *Vesuvius* discharged Rivulets of Fire.

At *Bengal* the five last Days (which were all observed in this Month) were fair, the Wind S².

In *April* the Winds at *Naples* were much in the northerly Points, cold, frequent Thunder, the Rain only 38 Measures, which make 1 Inch, 15 Measures. No Fire in *Vesuvius* the Beginning of the Month, but towards the latter End, divers Rivers of Fire and Smoak.

At *Bengal* the Wind was much among the southerly Points, cloudy, some Rain and Thunder. The Weather for the most part temperate, but great Heats in the Afternoons.

In *May*, at *Naples*, the Wind lay much in the westerly and southerly Points. Rain 103 $\frac{1}{2}$ Measures, which makes 4 Inches 11 $\frac{1}{2}$ Measures Depth, with frequent Thunder. *Vesuvius* cast out Rivers of Fire, which reached almost to the Bottom of the Mountain.

At *Bengal* the Winds varying, but for the most part southerly, with much cloudy, Rain and Thunder. The beginning of the Month colder than ordinary; afterwards exceeding hot.

In *June* at *Naples*, the Wind was much in the westerly and north-westerly Points, but little Rain, only 6 $\frac{1}{2}$ Measures, which is but about a quarter of an Inch depth.

At *Bengal*, much Rain with Thunder and Heat. On *June* 6th, it is noted, *we are now pretty certain the Rains are set in.*

At *Christiana*, the Observations begin on *June* 22d. The Weather temperate, and for the most part cloudy, with Thunder, Hail and Rain.

July, at *Naples*, was a very hot, dry Month, without any Rain, but frequent Mists. *Vesuvius* quiet.

At *Bengal* frequent and much Rain, with Thunder and Lightning; for the most part cloudy. Winds perpetually varying.

At *Christiana*, great Rains with Thunder, frequent Fogs, some fair, and Complaints of vehement Heat, although the Thermometer was but at 30 Degrees in that Month.

In *Aug.* at *Naples*, the Wind was in the westerly and north-westerly Points. Showers with Thunder were frequent, which amounted only to 49 $\frac{1}{2}$ Measures, which is but a little above 2 Inches Depth. And although, by the Table, the Weather seems to have been warm, yet there are frequent Complaints of the Air being cold. *Vesuvius* cast forth a large River of Fire.

At *Bengal* much Rain, with Thunder and Cloudy. Winds varying, but pretty much Easterly. Weather sometimes very hot, but for the most part more temperate than in some of the other Months.

At

At *Christiana* the Winds various; frequent Mists, with cloudy, and sometimes fair, and sometimes Rain. Great Complaints of Heat, although by the Thermometer no great Signs of it.

In *Sept.* at *Naples*, the Winds various, and very stormy towards the latter End of the Month, with horrible Thunder, Lightning, and heavy Rain, which amounted to 220 $\frac{1}{2}$ Measures, making 9 Inches 13 $\frac{1}{2}$ Measures in Depth; which was more than fell in any Month of this Year, and drowned the Marshes, and did a great deal of Damage to Houses, Trees, &c. *Vesuvius* was quiet at the Beginning, but fiery at the End.

Bengal, hath only the 7 first Days Observations where the Wind was mostly easterly, cloudy, and showery, with Thunder and Lightning.

The Observations of the remaining Months are all of *Naples*; where, in

Oct. the Wind was various, and sometimes stormy, with Thunder; frequent Mists, and sometimes heavy Rain, amounting to 107 Measures, which make 4 Inches 15 Measures, and in the Mountains Snow. *Vesuvius* turbulent in the beginning of the Month, and emitted a River of Fire.

Nov. was, for the most Part, a cloudy misting Month, with Thunder and Rain; but of no greater Quantity than 73 Measures, which are equal to 3 Inches 4 Measures Depth *English*. The Wind was more northerly than in any other Quarter. The Fire of *Vesuvius* less.

Dec. was a wet, unseasonable Month, the Rain being 179 Measures, which is 7 Inches 18 Measures in Depth; which following the Rains and unseasonable Weather of the preceding Months, so damaged the Fruits of the Earth, that publick Prayers were ordered for fair Weather.

The Rain of the whole Year the illustrious Observer computes at 3 *English* Feet 7 Inches and 14 $\frac{1}{2}$ Measures. And to shew how much wetter this Year was than the others, he gives these Quantities of the Year 1724, 2 *English* Feet 10 Inches, 14 Measures; of 1725, 2 Feet 10 Inches, 17 Measures; of 1726, 1 Foot, 11 Inches, 14 $\frac{1}{2}$ Measures.

Continued by
the same.

4. PART V. Containing Meteorological Observations made at
Hall in Saxony, 1729.

| | | |
|--------|-------------|---------|
| | Goslar | } 1728. |
| | Wittemberg | |
| | Naples | |
| | Southwick | |
| Sweden | Lunden | |
| | Swenæker | |
| | Rifinge | |
| | Bettna | |
| | Upsale | |
| | Hudiskswald | |
| | Hernœsand | |
| | Bygdea | |

An Abstract of *Meteorological Observations* made at *Hall* in *Saxony* in 1729, by *Job. Joach. Langen*, Math. P. P. O. and in the Year 1728, at *Goslar* in *Lower Saxony* in *Germany*, by *Job. Conrad. Trumphius*, M. D. & Pract. *Goslar* at *Wittemberg* in *Saxony*, by *Job. Fred. Weidler*, J. U. D. & Math. Super. Prof. in Acad. *Witteb.* at *Naples*, by *Nic. Cyrillus*, in *Urbe Neap.* Pr. Med. Prof. at *Southwick* in *Northamptonshire*, by *George Lynne*, Esq; and in *Sweden*, at *Lunden*, *Bettna*, *Upsale*, and *Bygdea* (mentioned in 1726,) to which the illustrious Observers have added Observations from *Swenæker*, in *Westro-Gothia*, Latitude $58^{\circ} 10'$, by *Torstanius Vassenius*, V. D. Minist. in *Wassenda*; at *Wifingsæ*, by *Magnus Oxelgren*, Lect. Gymnasii; at *Rifinge* in *Ostro-Goth*, by *Sueno Laurelius*, Past. and Provost, at *Stockholm*, Lat. $59^{\circ} 30'$, by *Job. Backman*, Citizen; at *Hudickswald Helfingorum*, by *Olave Broman*, Pastor there; at *Hernœsand* and *Angermann*, by *Jack. Renmarck*, Math. Lectore; at *Læfan-ger* and *Umea*, Lat $63^{\circ} 43'$, by *Bern. Ask*, Theol. Stud. and at *Torneao*, in *Westro-Goth*. Lat. $65^{\circ} 43'$, by *Abr. Fought*, Pastor there. Extracted for the Use of the *Royal Society*, by *William Derham*, D. D. F. R. S.

A Table of the
Highest, Mean,
and Lowest
Barometrical
Stations, in the
Year 1728.

| | JANUARY. | | | FEBRUARY. | | | MARCH. | | |
|------------|----------|-------|-------|-----------|-------|-------|--------|-------|-------|
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Hall | 29.4½ | 28.7½ | 28.1½ | 29 7 | 28.10 | 28. 2 | 29. 2 | 28.9½ | 28. 5 |
| Goslar | | | | | | | 31. 3 | 30.10 | 30. 6 |
| Wittemberg | 30.2½ | 29.5½ | 28. 9 | 30.2½ | 29. 9 | 29. 3 | 29.9½ | 29. 5 | 29.1½ |
| Naples | 29.88 | 29.50 | 29.12 | 29.88 | 29.71 | 29.54 | 29.88 | 29.63 | 29.38 |
| Southwick | 30.08 | 29.37 | 28.67 | 30.10 | 29.84 | 29.58 | 29.88 | 29.35 | 28.83 |
| Lunden | 30.20 | 29.46 | 28.72 | 30.22 | 29.52 | 28.82 | 29.81 | 29.16 | 28.51 |

JANUARY.

| | JANUARY. | | | FEBRUARY. | | | MARCH. | | |
|-------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Swenæker | 30.36 | 29.68 | 29. 0 | 30.35 | 29.32 | 28.29 | 29.73 | 29.05 | 28.37 |
| Rifinge | 30.20 | 29.55 | 28.90 | 30.20 | 29.52 | 28.85 | 29.67 | 29. 0 | 28.20 |
| Bettna | 30.80 | 30.10 | 29.40 | 30.80 | 30.12 | 29.45 | 30.21 | 29.55 | 28.90 |
| Upsale | 30.46 | 29.85 | 29.24 | 30.50 | 29.86 | 29.23 | 30.00 | 29.40 | 28.80 |
| Hudickswald | 30.50 | 29.75 | 29.01 | 30.56 | 29.89 | 29.22 | 30.24 | 29.52 | 28.80 |
| Hernœsand | 30.60 | 29.95 | 29.30 | 30.50 | 29.79 | 29. 8 | 30.25 | 29.47 | 28.70 |
| Bygdea. | 30.30 | 29.75 | 29.20 | 30.40 | 29.67 | 28.94 | 30.28 | 25.39 | 28.50 |
| | APRIL. | | | MAY. | | | JUNE. | | |
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Hall | 28.11 | 28. 8 | 28. 5 | 29.1 $\frac{1}{2}$ | 28. 8 | 28.3 $\frac{1}{2}$ | 29.0 $\frac{1}{4}$ | 28. 8 | 28. 3 |
| Goslar. | 31. 4 | 30.11 | 30. 6 | 31. 5 | 31.0 $\frac{1}{2}$ | 30. 8 | 31. 4 | 31.0 | 30. 9 |
| Wittemberg | 30. 0 | 29.4 $\frac{1}{2}$ | 28. 9 | 30. 1 | 29. 8 | 29.2 $\frac{1}{2}$ | 30. 0 | 29.8 | 29. 5 |
| Naples | 29.88 | 29.75 | 29.63 | 29.80 | 29.71 | 29.63 | 29.88 | 29.75 | 29.63 |
| Southwick | 29.94 | 29.48 | 29.03 | 29.96 | 29.51 | 29.07 | 29.93 | 29.70 | 29.27 |
| Lunden | 29.73 | 29.22 | 28.51 | 30.02 | 29.57 | 29.12 | 29.83 | 29.52 | 29.21 |
| Swenæker | 29.83 | 29.05 | 28.27 | 30.07 | 29.26 | 28.45 | 29.93 | 29.49 | 29.06 |
| Rifinge | 29.70 | 29.06 | 28.43 | 29.95 | 29.35 | 28.75 | 29.70 | 29.35 | 29.00 |
| Bettna | 30.22 | 29.63 | 29.05 | 30.50 | 29.90 | 29.30 | 30.20 | 29.89 | 29.58 |
| Upsale | 30.00 | 29.49 | 28.98 | 30.29 | 29.73 | 29.17 | 30.09 | 29.73 | 29.38 |
| Hudickswald | 30.10 | 29.60 | 29.10 | 30.38 | 29.79 | 29.20 | 30.96 | 30.09 | 29.22 |
| Hernœsand | 30. 7 | 29.50 | 29.07 | 30.20 | 29.72 | 29.24 | 30.10 | 29.71 | 29.32 |
| Bygdea | 29.80 | 29.40 | 29.00 | 30.10 | 29.62 | 29.14 | 29.96 | 29.42 | 28.88 |
| | JULY. | | | AUGUST. | | | SEPTEMBER. | | |
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Hall | 28.11 | 28. 8 | 28. 5 | 29. 0 | 28.8 $\frac{1}{2}$ | 28. 5 | 29. 1 | 21.10 | 28. 8 |
| Goslar | 31. 3 | 30.11 | 30. 7 | 31. 5 | 31. 0 | 30.9 $\frac{1}{2}$ | 31. 5 | 31.0 $\frac{1}{2}$ | 30. 8 |
| Wittemberg | 30. $\frac{3}{4}$ | 29. 7 | 29.3 $\frac{1}{2}$ | 30. $\frac{1}{2}$ | 29. 8 | 29.4 $\frac{1}{2}$ | 30. 0 | 29.7 $\frac{1}{2}$ | 29. 3 |
| Naples | 29.80 | 29.71 | 29.63 | 29.88 | 29.80 | 29.72 | 29.88 | 29.54 | 29.21 |
| Southwick | 29.95 | 29.57 | 29.20 | 30.04 | 29.51 | 28.98 | 30.02 | 29.53 | 29.04 |
| Lunden | 29.73 | 29.38 | 29.02 | 29.92 | 29.37 | 28.82 | 29.91 | 29.45 | 29.00 |
| Swenæker | 30.10 | 29.19 | 28.28 | 29.74 | 29.19 | 28.64 | 29.93 | 29.39 | 28.86 |
| Rifinge | 29.50 | 29.15 | 28.80 | 29.57 | 28.86 | 28.15 | 29.95 | 29.32 | 28.70 |
| Bettna | 30.12 | 29.66 | 29.20 | 30.10 | 29.56 | 29.02 | 30.38 | 20.83 | 29.28 |
| Upsale | 29.91 | 29.55 | 29.20 | 29.91 | 29.45 | 29.00 | 30.17 | 29.71 | 29.25 |

Meteorological Observations in Saxony and Sweden.

| | JULY. | | | AUGUST. | | | SEPTEMBER. | | |
|-------------|----------|-------|-------|-----------|-------|-------|------------|-------|-------|
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Hudickswald | 30.05 | 29.61 | 29.18 | 29.90 | 29.48 | 29.07 | 30.21 | 29.74 | 29.27 |
| Hernæsland | 29.97 | 29.53 | 29.10 | | | | | | |
| Bygdea | 29.85 | 29.42 | 29.00 | 29.96 | 29.58 | 29.20 | 30.2 | 29.53 | 29.05 |
| Torneao | | | | 29.85 | 29.56 | 29.27 | 29.92 | 29.56 | 29.20 |
| | OCTOBER. | | | NOVEMBER. | | | DECEMBER. | | |
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Goslar | 31.5 | 31.0 | 30.6 | 31.6 | 30.5 | 30.6 | 31.8 | 31.1 | 30.4 |
| Wittemberg | 30.5 | 29.6 | 29.2 | 30.5 | 29.0 | 28.9 | 30.2 | 29.6 | 29.1 |
| Naples | 29.80 | 29.71 | 29.52 | 29.96 | 29.67 | 29.38 | 29.80 | 29.51 | 29.21 |
| Southwick | 29.98 | 29.31 | 28.64 | 29.95 | 29.45 | 28.91 | 30.04 | 29.43 | 28.80 |
| Lunden | 30.12 | 29.51 | 28.90 | 29.90 | 29.26 | 28.62 | 29.92 | 29.32 | 28.73 |
| Swenæker | 30.26 | 29.55 | 28.84 | 29.95 | 29.14 | 28.34 | 30.16 | 29.53 | 28.91 |
| Rifinge | 30.16 | 29.43 | 28.70 | 29.80 | 29.05 | 28.30 | 30.05 | 29.42 | 28.80 |
| Bettna | 30.80 | 30.02 | 29.25 | 30.40 | 29.70 | 29.01 | 30.70 | 30.11 | 29.52 |
| Upsale | 30.49 | 29.83 | 29.16 | 30.10 | 29.44 | 28.79 | 30.49 | 29.87 | 29.25 |
| Hudickswald | 30.97 | 29.99 | 29.01 | 30.22 | 29.47 | 29.72 | 30.60 | 29.95 | 29.30 |
| Bygdea | 30.40 | 29.70 | 29.0 | 30.24 | 29.42 | 28.60 | 30.50 | 29.80 | 29.10 |
| Torneao | 29.90 | 29.58 | 29.25 | | | | | | |

A Thermometrical Table of the Highest, Lowest, and Middle Stations at Naples, Southwick, Lunden, and Upsale, in 1728.

| | JANUARY. | | | FEBRUARY. | | | MARCH. | | |
|-----------|----------|------|------|-----------|------|------|--------|------|------|
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Naples | 49.05 | 43.5 | 38.5 | 48.0 | 44.5 | 35.0 | 39.5 | 35.9 | 32.3 |
| Southwick | 79 | 67 | 55 | 80 | 67 | 54 | 69 | 57 | 45 |
| Lunden | 83 | 68 | 54 | 91 | 73 | 56 | 123 | 98 | 74 |
| Upsale | 91.5 | 80.9 | 68.3 | 89.2 | 77.9 | 66.6 | 72.1 | 63.0 | 53.9 |
| | APRIL. | | | MAY. | | | JUNE. | | |
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Naples | 42.5 | 33.2 | 24.0 | 26.0 | 18.5 | 11.0 | 16.0 | 9.7 | 4.5 |
| Southwick | 71.0 | 53 | 36 | 56 | 40 | 24 | 50 | 35 | 19 |
| Lunden | 148 | 118 | 85 | 172 | 145 | 118 | 176 | 153 | 130 |
| Upsale | 69.5 | 52.1 | 44.7 | 54.7 | 45.0 | 35.3 | 42.0 | 33.6 | 25.2 |

JULY.

| | JULY. | | | AUGUST. | | | SEPTEMBER. | | |
|-----------|----------|-------|-------|-----------|-------|-------|------------|-------|-------|
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Naples | 13. 5 | 8. 2 | 3. 0 | 16. 0 | 10. 0 | 4. 0 | 26. 5 | 17. 1 | 7. 7 |
| Southwick | 50 | 34 | 17 | 56 | 39 | 23 | 65 | 48 | 32 |
| Lunden | 172 | 152 | 132 | 153 | 133 | 113 | 150 | 122 | 94 |
| Upsale | 37. 2 | 31. 0 | 25. 5 | 40. 2 | 32. 8 | 25. 5 | 58. 4 | 46. 2 | 34. 6 |
| | OCTOBER. | | | NOVEMBER. | | | DECEMBER. | | |
| | High | Mean | Low | High | Mean | Low | High | Mean | Low |
| Naples | 40. 0 | 31. 3 | 22. 5 | 48. 0 | 42. 0 | 34. 0 | 54. 5 | 54. 5 | 44. 7 |
| Southwick | 71 | 56 | 41 | 84 | 64 | 43 | 87 | 72 | 58 |
| Lunden | 119 | 98 | 78 | 109 | 87 | 64 | 83 | 71 | 59 |
| Upsale | 68. 2 | 58 | 47. 7 | 98. 0 | 57. 0 | 56. 1 | 89. 6 | 76. 8 | 64. 0 |

| | Southwick | | Naples | | | Southwick | | Naples | |
|----------|-----------|-------|--------|----------|-------|-----------|-------|--------|----------|
| | Inch. | Cent. | Inch. | Measures | | Inch. | Cent. | Inch. | Measures |
| January | 4. | 00 | 4. | 15½ | July | 3. | 21 | 0. | 00 |
| February | 0. | 99 | 0. | 00 | Aug. | 0. | 96 | 0. | 00 |
| March | 3. | 27 | 0. | 5 | Sept. | 0. | 86 | 4. | 4 |
| April | 1. | 97 | 0. | 14 | Oct. | 2. | 79 | 6. | 17½ |
| May | 1. | 44 | 0. | 00 | Nov. | 1. | 52 | 2. | 7 |
| June | 2. | 82 | 1. | 2½ | Dec. | 2. | 43 | 6. | 8½ |

A Table of the Rain at Southwick and Naples in the Year 1728.

Rain in the whole Year,

At Southwick, is 26 Inches, and 26 Centesimals.

At Naples, is 19 Inches, and 14 Measures.

As the Observations of this Year, which the Royal Society hath received from many, and very distant Parts of the World, are too large and numerous to be printed in the *Philosophical Transactions*, or read at the Society's Meetings; so to make them as useful as possible, I have put as many of them as I could into Tables, to be seen and compared at an easy View, as I have done in former Years: But I am forced to omit such of them, where no Account is given of the Instruments they used, or where none were made use of at all, but only verbal Descriptions given, that Tables would not admit of. But the Places mentioned in the Tables, had the Society's Glasses of Mr Hauksbee's making.

Remarks on the Meteorological Observations of the Year 1728.

The *Barometrical* Observations I need not satiate the Society with Remarks upon, because I have made divers of that Kind, upon the preceding Years: only I shall repeat two Things that I formerly took notice of, and have had frequent Confirmations of this Year; viz.

1. The

1. The great Conformity of the Ascents, Descents, and Stations of the Mercury in the Barometer. 2. That the Range of the Mercury is much greater in the Northerly than Southerly Climes.

As for the *Thermometrical* Observations, I have inserted all that were made with the *Royal Society's* Glasses: But such as were made with other Thermometers, it would have been of little or no use to have taken Notice of them, unless I could have reduced them to some known Measure; which only two of the curious Observers enabled me to do; but I found that a Matter so perplext and difficult, as not to answer the great Trouble of it, especially considering that these Tables exhibit Observations made in different and distant Parts, *viz. Italy, Germany, England, and Sweden*, by which an Estimate may be, in some measure, made of the Temperature of those different Climates of the World. In order to which, I must repeat what I mentioned in some preceding Year; that in the *Royal Society's* Glasses, the Point of *Extream Heat* is 5° above 0, that *Temperature* is 45° below 0, and *Freezing* at 65° . And if we cast our Eye upon the several Months, particularly those of Winter, especially if we consider that which I have remarked in 1727, from Dr *Cyriel*, concerning the *Freezing-Point* at *Naples* to be at 55° , which is at *London* at 65° , and at *Christiana* and *Bengal* probably as different also. I say, considering these Things, it is surprizing that the Heat and Cold of those distant Places, is not as different as their Northerly and Southerly Situations. But at *Lunden*, I was surprized to find the Thermometer much lower in the warmer Months than at *Upsale*, or any other of the *Swedish* Places, 'till I found that in all those Months, they had continual Cold and Rain, when the other Places mention little but fair, or cloudy, and but little Rain or Cold. And this minds me of a former Observation, *That Cold is the Parent of Wet*, especially in Summer.

As to the *Winds* and *Weather*, so many are the Places of Observation, and so many and so various the Observations, that it is next to impossible to give a tolerable Abridgment of them: and therefore my Remarks on the foregoing Years, especially on the same Places and Parts of the World, must suffice here.

The Quantity of *Rain* and *Snow* were observed at *Naples, Risinge, Bettna, Upsale, Hudickswald, and Southwick*: But I find no Description of the Instruments wherewith they observed, nor of their Measures, except at *Southwick* and *Naples*, and therefore am forced to omit all but the two latter, in which the Depth is measured by *English* Measure, the *Southwick*, by Inches, and hundredth Parts of an Inch; and the *Naples*, by *English* Inches, and the Observer's Measures, 23 of which make an *English* Inch.

Lastly, That I may omit as little as may be of what the illustrious Observers take Notice of, I shall add the Meteors they mention, together with some of my own, that happened about the same Time.

The first was a *Lumen Boreale* at *Bettna*, in the Night after *March 20*; and at half an Hour after 8 on *March 22*, at *Windsor*, I saw an unusual sort of *Streaming*, in which the Columns were not (as usually) conical, or pointed, not rising towards the Zenith-Point; but were with parallel Sides, and rose perpendicularly to the Horizon. They were very bright, emitting a Light equal to that of the Moon in her Quarters. Also they rose from a Bank of Vapours, not curved at Top (as usually) but lacinated, or broken.

Also on *March 24*, the curious *Bettna* Observer saith, there was, the Night before, *Lumen Efflammans Boreale*; which was also seen at *Lafanger*.

On *Aug. 26*, at Night was a remarkable *Lumen Boreale* at *Bettna*. And the Night before at 10^h 20' *p. m.* a Gentleman going from my House, saw towards the E. about 30° high, a *Ball of Fire*, about 4 Inches Diameter, blazing, and standing still at first, and presently after, it ran towards the N. and in about 5, or more Minutes, he heard an Explosion like Thunder. It's Blaze emitted a Light equal to that of the Moon at Full.

At the same Time, the News-Papers say, a *Light* in the Sky, like a Comet, was seen at *Watford* in *Hertfordshire*, with Sparks of Fire issuing from it's Tail; that then it brake out with a prodigious Lustre, like the Sun, which lasted not long, and was followed with a terrible Clap of Thunder, the Stars twinkling all the while, and not a Cloud to be seen. Which Clap, I doubt not, was the same which my Friend heard, and which was 5 or more Minutes in it's Passage hither.

At *Bettna*, *Lumina Borealia* were seen on the Nights after *Sept. 18*, *19*, and *24*; the second of which covered half the Heavens. And on *Sept. 21*, about 10 Hours *p. m.* I observed, at *Upminster*, an unusual sort of Tan-coloured thick Vapours towards the N W b N but withal lightsome, and such as the Stars might be seen through. And after some Time, they sent forth, in divers Places, *Streaming Lances*, gently and gradually coming and going.

On *Oct. 13*, I saw that uncommon sort of *Streaming* at *Redbridge*, near *Southampton*, and the same Night at *Bettna* was *Lumen Boreale eruētans Flammam*, as the Observer expresses it. At *Lafanger* also those Streamings were on the same Night, and on the 15th, 18th, 19th, and 23d.

On *Oct. 19*, a *Parbelius* was at *Lunden*, and on the 22d a *Lumen Boreale* at *Wittemberge*.

On *Nov. 12*, at *Windsor*, we had considerable *Streaming*; and the same was at *Bettna* and *Umea*; and on the 29th at *Lafanger*; and again at *Umea* on *Dec. 24*.

After I had finished the foregoing Observations on the Year 1728, I received the curious Observations of the illustrious Marquis *Poleni*, made at *Padua*, for six Years; such of which as are conformable to mine, I shall subjoin by way of Appendix.

An Appendix
to the Remarks
on 1728, and
some of the
Years preceding

The it.

A Table of Rain at Padua.

The first thing he gives an Account of is, the *Quantity of Rain and Snow* (in *English Measure*. and according to the *Old Stile*) that fell before and after this Year 1728, in six Years Time, in the following Table.

A Table of the
Rain at Padua,
in the Years

1725, 1726,
1727, 1728,
1729, 1730.

| | 1725 | 1726 | 1727 | 1728 | 1729 | 1730 |
|-----------|------------|------------|------------|------------|------------|------------|
| | Inch. Dec. | Inch. Dec. | Inch. Dec. | Inch. Dec. | Inch. Dec. | Inch. Dec. |
| January | 0 .521 | 1 .355 | 5 .955 | 4 .278 | 1 .085 | 0 .112 |
| February | | 1 .460 | 1 .073 | 1 .050 | 1 .245 | 2 .906 |
| March | 0 .889 | 3 .168 | 1 .878 | 4 .832 | 2 .902 | 4 .592 |
| April | 4 .019 | 3 .998 | 0 .498 | 1 .419 | 2 .768 | 1 .638 |
| May | 3 .625 | 1 .368 | 3 .530 | 3 .403 | 2 .634 | 4 .467 |
| June | 0 .036 | 2 .608 | 2 .476 | 2 .103 | 3 .134 | 6 .205 |
| July | 2 .297 | 2 .357 | 2 .930 | 4 .016 | 4 .526 | 2 .339 |
| August | 5 .185 | 1 .268 | 5 .067 | 5 .186 | 0 .578 | 4 .269 |
| September | 2 .647 | 2 .900 | 4 .164 | 6 .948 | 3 .267 | 1 .090 |
| October | 7 .104 | 0 .179 | 6 .576 | 5 .163 | 6 .294 | 5 .254 |
| November | 3 .636 | 2 .277 | 5 .091 | 6 .836 | 4 .186 | 0 .534 |
| December | 0 .030 | 2 .390 | 7 .169 | 7 .599 | 2 .804 | 0 .894 |
| Year | 29.989 | 25.328 | 46.407 | 52.833 | 35.423 | 34.300 |

From this Table he observes, that the *Februaries* were the driest *Months*, and 1726, the driest *Year* in all the six, and that the *Octobers* were the wettest *Months*, and 1728 the *wettest* of all the six Years.

Further also he saith, that in the four *Seasons* of the Years (reckoning their beginning from the 10th Day of their respective Months, *viz.* of *Dec. March, June* and *Sept.* that I say) less wet falls in Winter and Spring, than in Summer and Autumn, and that the wet Weather increases, as the Seasons advance; that in Winter is the least wet; that it increaseth in Spring; is more in Summer; and most of all in Autumn.

For the Proof of this, he hath made a Table of the mean Quantities of the Rain in the four Seasons of each of the six Years; the Sums of which six Years Rain, are in Winter, 39,490 Inches; in Spring, 52,188 Inches; in Summer, 58,25 Inches; and in the Autumn, 74,558 Inches. But in the many Years that I observed the Weather at *Upminster*, I find it not so.

After these Observations of the Weather, the illustrious *Marquis* proceeds to the *Barometrical Indications* of it; and hath made Tables of the rising and falling of the Quicksilver, together with the Course of the Winds, both against Rain, and also against Snow, hoping to predict from thence the several sorts of Weather. But I omit the Tables, because I think little of general Use can be concluded from them but what is commonly known.

I omit

I omit also his Table of the Sum and Mean Altitudes of the Barometer, and Thermometer; but his following Table may be of Use.

| Year | Month | Day O. S. | Barometer highest | Barometer lowest | Winds | Weather at the same Time |
|------|--------|-----------|-------------------|------------------|-------|--------------------------|
| 1725 | Janu. | 19 | 30.28 | | W | Fair |
| | Dec. | 8 | | 28.56 | S W 4 | Cloudy |
| 1726 | Nov. | 28 | 30.18 | | N | Fair |
| | Feb. | 13 | | 28.92 | S W | Cloudy |
| 1727 | Nov. | 20 | 30.24 | | N W | Fair |
| | Octob. | 29 | | 28.80 | S 2 | Cloudy |
| 1728 | Dec. | 2 | 30.20 | | N | Thin Clouds |
| | Dec. | 12 | | 29.00 | N W | Small Rain |
| 1729 | Dec. | 20 | 30.30 | | W | Somewhat cloudy |
| | Nov. | 10 | | 28.90 | N | Rain |
| 1730 | Dec. | 20 | 30.40 | | N | Fair |
| | Feb. | 27 | | 28.98 | S E | Sunshine with cloudy |

A Table of the highest and lowest Stations of the Barometer, with the Winds and Weather.

From this Table it appears, from the highest and lowest Stations in the six Years, that the greatest Range of the Barometer is 1.84 Inches; but at *Naples* it is only 94 Centesimals of an Inch; and what it was at other Places, I have given some Account of in my Remarks on 1727.

The illustrious Observer hath also been very curious and sedulous in his Observations of the *Thermometer*; which I am sorry I can give no acceptable Account of, for want of so much Knowledge of his Thermometer, as may enable me to compare his Observations with mine.

He hath also compared with his own, the Quantities of *Rain*, and the *Barometrical Range* observed at *Paris*, by *M. de la Hire*; and finds that the *Paris Rain* is $16.4\frac{1}{12}$ Lines, and the *Barometrical Range* $2\frac{3}{12}$ Lines more than the *Padua*.

The last Thing which the illustrious *Marquis* takes Notice of, is the *Magnetical Declination*, which he saith is 13 Degrees *West*, and hath decreased in the six Years $\frac{10}{60}$ ths; that every Day there is a small Alteration in the Declination, so that it doth not continue the same a whole Day together; that the Declination of all Needles (especially if touched by different Magnets) is different a few Sexagesims. But these Niceties I recommend to the Enquiry of the Curious, because they disagree with the Observations of *Gilbert*, and most of the *Magnetical Writers*.

An Account and
Abstract of the
Meteorological
Diaries com-
municated to
the Royal So-
ciety, for the
Years 1729
and 1730. By
Geo. Hadley,
Esq; F. R. S.
No. 447. P.
154. Jan. &c.
1738.

LVII. 1. The Society having been pleased to refer to me, on the Death of Dr *Derham*, the Meteorological Diaries transmitted to them from the curious Observers both at Home and in foreign Parts; as soon as they were put into my Hands, I applied myself to make an Abstract of them in such Manner as I judged may be most useful, and have nearly pursued the Method of Dr *Derham*, beginning at the Year 1729, where he left off.

Before I proceed to the Tables, I think it proper to give some Account of each of the Diaries of these two Years, and their Contents, that any Member of the Society, that may have Occasion to make farther Inquiries into these Matters, may be acquainted with what is to be found therein, and what Pains have been bestowed by the curious Observers.

The Diary kept by Mr *Hauksbee*, by Order of the Society, at their House in *Crane-Court*, consists of Observations of the Barometrical Heights twice a Day, *i. e.* Morning and Evening, in Inches, Decimals, and Centesimals; the Thermometer likewise, in it's proper Graduations, which, I suppose, are already well known to the Curious, and the Weather, with the Hour of each Observation. The Winds are omitted. The Depth of Rain is set down several Times for the most Part in each Month, the Sum of which is to be divided by 10, the Funnel which catches the Rain being so much bigger in Surface, than that of the Vessel which receives the Rain from it.

That from *Southwick*, near *Oundle* in *Northamptonshire*, by *George Lynne*, Esq; contains the Height of the Barometer once a Day, and the Winds, the Steadiness and Strength of which is likewise marked with proper Marks and Figures. Observation is made of the upper and under Currents of the Air, when it so happened. The Thermometer is marked twice a Day; the Weather often, both by Day and Night; the Rain from Time to Time, and the Quantity of each particular Shower often set down by itself, with some other miscellaneous Observations, as Haloes, Thunder-storms, and sudden Changes of Wind, &c. He takes Notice of his Thermometer being placed in an Out-house exposed to the Air, but screened from the Sun, which is a proper Precaution in using that Instrument. The remarkable Rises and Falls of the *Mercury* are also marked with proper Marks; which Method would be useful in the other Columns also, for Comparison of Diaries, if some certain Rule were agreed on.

That from *Kent*, 16 Miles S E from *London*, gives an Account of the Barometer once a Day, sometimes twice or thrice, with the Hour of each Observation, and the Winds, Weather, and Rain, the Proportion of which for every Day is given at the End of each Month. There is also a separate Column for the Height of the Clouds, which he divides into 3 Orders; and where there are 2 Orders at a Time, they are both noted; as also when any of them move with different Velocities or Directions, which he supposes to be commonly a Sign of Change

Change

Change of the Wind: But he does not inform us by what Method he determined their Heights or Velocities. The reigning Wind, and general Strength of it, is noted at the End of each Month; the Eclipses also, and the Times of the New Moons; which he observes make it appear, that the Notion of the Change of Weather depending on the Age of the Moon, is without any Ground: With other Miscellaneous Observations; as the *Aurora Borealis*, Fruitfulness or Sterility of the Season. He had no Thermometer.

That from *Hudicksvall* in *Sweden*, by Mr *Olive Broman*, shews the Height of the Barometer sometimes once, sometimes twice or thrice a Day, O. S. in *English* Measure, with the Winds, and the Strength of them, and the Weather. There is also to the Diary 1729, annexed an Account of the Height of the Sea Water for every Day, which I observe varies in the whole about 2 Inches, and is sometimes interrupted by Floods from Rain. This, I suppose, may relate to the Tides in the Gulph of *Bothnia*. I have not inserted these in the Tables, not being of general Use. There is no Thermometer, nor the Quantity of Rain, set down.

That from *Risinge* in *Ostrogothia* in *Sweden*, by *Sueno Laurelius*, Pastor and Provost, gives the Height of the Barometer, for the most Part, 3 Times, sometimes 5 Times a Day, with the Hour of the Observations, O. S. in *English* Measure. He refers for the Descriptions of his Barometer and Thermometer to the Diary 1727. The Winds, with the Degree of their Strength, Weather, and Depth of Rain, are also set down.

In that from *Upsale* in *Sweden*, by Mr *Andrew Celsius*, *Astr. P. R.* and *F. R. S.* Observations are made 3 Times a Day of the Barometer and Thermometer, both which Instruments were made by Mr *Hauksbee*; the Winds, with their Strength, and the Weather, and Depth of Rain, from Time to Time.

That from *Svenaker* in *Sweden*, near *Trollhetta*, by *Torstanus Wassenius*, *V. D. M. &c.* contains the Height of the Barometer twice a Day, sometimes 3 Times, O. S. in *Swedish* Feet and Inches and Decimals, which being supposed to be in Proportion to *English*, as 974,375 to 1000, the mean Heights are reduced in the Tables following into that Measure. The Winds also, with their Strength, are noted, and the Weather. There is no Thermometer. Notice is taken of Thunder-Storms, and other Meteors*.

That from *Lunden* in *Sweden*, by Mr *Conrad Quensel*, Math. Prof. in *Acad. Carolina*, contains Observations of the Barometer twice a Day,

* Note, In the Account of the *Swedish* Diaries 1728, *Svenaker* is said to be 109 *London* Feet above the Surface of the Sea. The mean Height of the Barometer there in these two Years is but 29 Inches, 47, which would give the Height of the Place near 450 Feet, according to the Reckoning hereafter in this Paper: therefore I think there must be some Mistake. Perhaps some Air might have got into the Top of the Tube, or the Scale placed too high.

O. S. in *English* Inches and Decimals, and 4ths of them; the Winds, with their Strength, and their Weather. The Thermometer is *Florentine*, and therefore the Observations not inserted in the Table. The monthly Mean there given, is taken simply between the 2 Extrems: I have given it in the Tables taken the other Way, as all the rest are.

That from *Bygdea* in *Sweden*, by Mr *John Telinus*, Pastor there, has Observations of the Barometer twice a Day, Morning and Evening, O. S. in *English* Inches and Decimals; the Winds, with their Strength, and Weather. The 2 last Months are wanting. There is no Thermometer.

That from *Bettna* in *Sudermanland*, by Mr *And. Geringius*, Pastor and Provost, has Observations of the Barometer thrice a Day, except in the first Part of *Jan.* O. S. in *English* Inches and Decimals; the Winds, with their Strength, and Weather, with other Meteorological Observations, and upon the Seasons, as to Fruitfulness and Sterility, &c. The *Aurora Borealis* is frequently mentioned. The Thermometer is peculiarly graduated, and so could not be inserted. There is a Column for Rain, with Marks, which I understand not.

From *Wittemberg* in *Saxony*, there are two Diaries communicated, one from Mr *Mat. Hafius*, Math. Prof. the other from Mr *J. Fred. Weidler*, LL. B. and *Math. Prof. Primar.* That by Mr *Hafius* has the Height of the Barometer several Times a Day, sometimes four or five Times, O. S. in *English* Inches and Decimals, and the Parts of these in Vulgar Fractions, but are reduced to Decimals in the Tables. He used two Barometers and Thermometers. Those marked I, are Mr *Hauksbee's*, those marked II, *Florentine*. The coldest Day he ever observed, was *February* the 5th, 1726. It contains also the Winds, with their Strength, and Weather. Mr *Weidler* gives the Height of the Barometer three Times a Day, N. S. in *Paris* Inches and Lines, and the Parts of these in Vulgar Fractions; the Winds also, with their Strength, and the Weather, and Quantity of Rain, in Cubes and Lines, but at the End of each Quarter the Depth is given in *Paris* Inches and Lines. The Thermometer is Mr *Hauksbee's*. There are some Astronomical Observations of Eclipses, &c. He takes Notice, that an Occultation of *Venus* by the *Moon*, observed with a Telescope of 18 Feet, may serve to prove the *Moon* to have an Atmosphere; for being then in it's Quadrature with the *Sun*, it appeared to lose it's Cusps, and become oval, when it came near the *Moon*. I have in these two Years made use of Mr *Hafius's* Barometrical and Thermometrical Observations, being in the O. S. and *English* Measure, though the three last Months of 1730 are wanting. The Depth of Rain is taken from Mr *Weidler*, and reduced out of the *Paris* to *English* Measure, being supposed to be as 1068 to 1000, but is not reduced to the *Old Style*. Mr *Weidler* refers to his Dissertation upon Meteorological Observations sent to the Society. The Year 1730 he observes to have been more than had been known wet and cold, and the Sky very misty.

That

That from *Padua*, by the Marquis *Poleni*, shews the Height of the Barometer once a Day, O. S. in *English* Inches and Decimals; the Winds, and sometimes their Strength, and Weather. A particular Account of his Thermometer has been published formerly in the *Transactions*, and also his Observations upon his Diaries, containing in the whole six Years. The Depth of Rain is given both for the *Old* and *New Style*.

That from *Bengal*, by Mr *Bellamy*, Preacher to the Factory, has the Height of the Thermometer twice a Day, Morning and Evening; the Winds, with their Strength, and the Weather, for the Year 1730. The Medium of the Thermometer is taken from both the Evening and Morning Heights, the Difference there being very great in Proportion between Morning and Evening.

That from *Boston* in *New England*, by *Paul Dudley*, Esq; F. R. S. shews the Weather 3 Times a Day, and Wind once or twice. No Barometer or Thermometer.

There is one of the Year 1729, seems to be *Swedish*; but finding neither the Author's Name nor Place, I have not inserted it.

In the Year 1730, those from *Crane-Court*, *Southwick*, *Kent*, *Huddeswell*, *Ostrogotbia*, *Upsale*, *Svenaker*, *Lunden*, *Bettina*, *Wittemberg*, *Padua*, and *Boston*, and continued in the same Manner. There is none from *Bygdea*. The *Abo* Observations for the Year 1730, by Mr *D. Spring*, shew the Height of the Barometer twice a Day, in *Swedish* Inches and Decimals, but the mean Heights are reduced to *English* in the Tables. They shew also the Winds and Weather, and in the last Column the *Aurora Boreales*, which are frequent in most Months of the Year.

That from *Naples*, by *Cyrillus*, shews the Height of the Thermometer, which is Mr *Hauksbee's*, once a Day. The Winds, with their Strength, and Weather, and Depth of Rain in *Neapolitan* Measures, 23 of which make a *London* Inch, and are reduced thereto in the Tables. The Barometrical Heights he has not set down, because he found them not to agree with those of former Years, which made him suspect his Instrument to be out of Order; but as it appears he had removed his Habitation, it might be owing to it's being situated higher or lower than the former. An Eruption of *Vesuvius* happening, an Account is given of it, and of Damage done by Lightning, and also of the Seasons, as to Fruitfulness and Healthiness.

Note, In some of the Diaries, the Numbers shewing the decimal Parts of the Inches, are set down in single Figures, without any Rule or Cypher to distinguish them from the Centesimals, and in others the Centesimals in like Manner; but it is easy to make a Judgment of the Author's Method by Consideration of them.

Having given an Account of the Method and Contents of the several Diaries, I now proceed to the Tables extracted out of them. The Barometrical Table consists of two Parts: The upper shews the mean
Height

Height of the Barometer, taken in the Method proposed formerly by Dr *Jurin*, for every Month throughout the Year, for each Place; and in each Column the highest Month is marked with an *h*, the lowest with an *l*, to make them more observable to the Eye. At the Bottom, the Mean of the whole Year is set down for each Place. At the Foot of this Table is another, shewing the greatest Ascent and Descent of the *Mercury* in that Year, with the particular Day of each, the Difference of which is the Range: Which Circumstance Dr *Derham*, and other Observers, have used generally to take Notice of.

Next follow the Table of the monthly Thermometrical Heights, extracted in Dr *Jurin*'s Method also, in every Place where the Society's Instruments were used; and at the Bottom the Mean of the whole Year, and also the hottest and coldest Day in each Place. In the last Place, the Tables of the Depth of Rain, where it is contained in the Diaries.

I chose to put each of these Matters in separate Tables, that the Eye may be able to take a View of the whole, and compare the State of each Place with the others, as to each Particular, with less Confusion, as also because several of the Diaries have nothing upon one or more of these Heads.

Note, The mean Heights of both Barometer and Thermometer are extracted only from the Morning Observations, some of the Diaries containing no more; and judging it sufficient to the present Design of these Tables, except in the mean Heights of the Thermometer at *Bengal*, which are taken from both Morning and Evening Observations.

A Table

Barometrical Heights observed in 1729.

A Table of the monthly mean Barometrical Heights, and also of the greatest Ascents and Descents of the Mercury observed in several Places, in the Year 1729, in Inches and Decimals.

| 1729. | Crane-Court, London. | Southwick in Northampt. | In Kent. | Hudicksvall in Sweden. | Ostrogothia in Sweden. | Upsale in Sweden. | A. |
|-------------------------------|-------------------------|----------------------------|----------------|---------------------------|---------------------------|----------------------|----|
| | Lat. 51° 31 | Lat. 52 54 | Lat. 51 | Lat. 62 | Lat. 56 | Lat. 59 48 | |
| January | 30 08 | 29 70 | 29 41 h | 29 49 | 29 20 l | 29 43 l | |
| February | 02 | 66 | 37 | 30 02 | 576 | 92 | |
| March | 29 93 | 54 | 37 | 29 63 | 27 | 55 | |
| April | 93 | 60 | 26 | 30 04 h | 62 h | 30 16 h | |
| May | 95 | 57 | 29 | 29 82 | 38 | 29 71 | |
| June | 30 07 | 69 | 36 | 86 | 35 | 74 | |
| July | 29 97 | 64 | 28 | 69 | 20 l | 60 | |
| August | 30 09 h | 72 h | 38 | 78 | 35 | 65 | |
| September | 29 69 | 42 | 09 | 90 | 42 | 81 | |
| October | 83 | 52 | 09 | 55 | 32 | 54 | |
| November | 61 l | 32 l | 28 94 l | 45 l | 25 | 54 | |
| December | 83 | 52 | 29 25 | 75 | 52 | 79 | |
| Mean of the whole Year. | 29 91 | 29 575 | 29 ,257 | 29 ,748 | 29 371 | 29 73 | |
| ☿ Highest | 30 55 Feb. 26 | 30 11 Feb. 26. | 29 90 Feb. 26. | 30 60 Feb. 23. | 30 35 Feb. 27. | 30 59 Feb. 27. | |
| ♁ Lowest | 28 75 Nov. 25. | 28 48 Nov. 25. | 28 16 Nov. 25. | 28 43 Oct. 12. | 28 15 Jan. 20. | 28 70 Jan. 18. | |
| Differ. | 1 80 | 1 63 | 1 74 | 2 17 | 2 20 | 1 89 | C. |

| 1729. | Svenaker in Sweden. | Lunden in Sweden. | Bydea in Sweden. | Bettna in Sweden. | Wittemburg in Saxony, by Mr Hafsus. | Padua in Italy. | B. |
|-------------------------------|------------------------|----------------------|---------------------|----------------------|---|-----------------|----|
| | Lat. 58° 10 | Lat. 55 42 | Lat. 63 40 | Lat. 52 | Lat. 45 15 | | |
| January | 29 44 | 29 42 | 29 18 | 29 77 | 29 83 h | 29 74 | |
| February | 62 | 54 | 76 | 30 18 h | 778 | 725 | |
| March | 28 | 38 | 41 | 29 84 | 65 | 66 | |
| April | 65 h | 57 | 82 h | 30 17 | 64 | 85 | |
| May | 44 | 48 | 61 | 29 89 | 35 | 67 | |
| June | 56 | 59 h | 63 | 88 | 77 | 74 | |
| July | 43 | 44 | 50 | 72 l | 34 l | 63 l | |
| August | 52 | 57 | 57 | 84 | 79 | 79 | |
| September | 51 | 44 | 76 | 92 | 65 | 65 | |
| October | 37 | 46 | 33 l | 76 | 67 | 75 | |
| November | 18 l | 33 l | | 75 | 51 | 64 | |
| December | 53 | 52 | | 99 | 74 | 89 h | |
| Mean of the whole Year. | 29 46 | 29 47 | 29 ,557 | 29 892 | 29 643 | 29 727 | |
| ☿ Highest | 30 41 Feb. 28. | 30 ,40 Feb. 27. | 30 36 Feb. 23. | 30 70 Feb. 18. | 30 50 Jan. 7. | 30 30 Dec. 20. | |
| ♁ Lowest | 28 31 Jan. 18. | 28 23 Jan. 18. | 28 18 Oct. 12. | 28 75 Oct. 12. | 28 95 Nov. 27. | 28 90 Nov. 10. | |
| Differ. | 2 10 | 2 17 | 2 18 | 1 95 | 1 55 | 1 40 | D. |

A Table

Thermometrical Heights and Depth of Rain in 1729.

A Table of the monthly mean Thermometrical Heights in several Places in the Year 1729.

| 1729. | Crane-Court. | Southwick. | Upsale. | Wittemberg. |
|-------------------|----------------|-------------|--------------|---------------|
| January | 67 3 | 70 | 80 | 70 ,9 |
| February | 69 ,2 | 74 | 82 ,7 | 67 ,5 |
| March | 60 3 | 69 | 70 ,6 | 56 ,3 |
| April | 55 ,2 | 61 | 58 ,9 | 51 ,6 |
| May | 42 ,6 | 53 | 48 ,5 | 36 ,0 |
| June | 34 ,9 | 43 | 37 ,3 | 30 ,2 |
| July | 33 ,1 | 42 | 35 ,1 | 29 ,0 |
| August | 33 ,8 | 43 | 40 ,4 | 29 ,65 |
| September | 38 ,6 | 46 | 47 ,1 | 37 ,6 |
| October | 51 ,1 | 57 | 60 ,8 | 50 ,2 |
| November | 56 ,8 | 60 | 66 ,3 | 59 ,6 |
| December | 58 ,8 | 63 | 71 ,4 | 70 ,6 |
| Mean of the Year. | 50 ,1 | 56 ,7 | 57 ,6 | 49 ,09 |
| Thermom. | | | | |
| Highest | 12 ,5 June 10. | 13 June 10. | 22 5 June 9. | 14 ,75 May 23 |
| Lowest | 80 ,5 Jan. 7. | 88 Jan. 4. | 97 Jan. 5. | 95 ,0 Jan. 1. |

A Table of the Depth of Rain which fell in several Places in the Year 1729, in Inches and Decimals.

| 1729. | Crane-Court. | Southwick. | Kent. | Ostrogothia. | Upsale. | Wittemberg, Stylo Novo. | Padua. |
|---------|--------------|------------|---------|--------------|---------|-------------------------|---------|
| Jan. | ,739 | ,16 | ,499 | ,830 | 1 ,153 | | 1 ,085 |
| Feb. | ,785 | ,48 | 1 ,069 | 1 ,050 | 1 ,027 | | 1 ,245 |
| March | 1 ,125 | 1 ,31 | 1 ,286 | ,600 | ,826 | ,48 | 2 ,902 |
| April | 1 ,600 | 1 ,10 | 2 ,197 | ,005 | ,000 | ,905 | 2 ,768 |
| May | 1 ,515 | 1 ,55 | 2 ,216 | 3 ,865 | ,875 | ,94 | 2 ,634 |
| June | 1 ,200 | 0 ,83 | ,730 | 2 ,930 | 2 ,450 | ,815 | 3 ,134 |
| July | 1 ,04 | 2 ,26 | 2 ,153 | 1 ,615 | 2 ,578 | 1 ,31 | 4 ,526 |
| August | 3 ,04 | 2 ,44 | 2 ,533 | 1 ,405 | ,747 | 1 ,365 | ,578 |
| Septem. | 3 ,505 | 5 ,32 | 2 ,343 | 2 ,940 | 2 ,687 | ,78 | 3 ,267 |
| October | 1 ,420 | 2 ,20 | 2 ,218 | 1 ,050 | ,139 | 1 ,43 | 6 ,294 |
| Novem | 2 ,425 | 4 ,18 | 4 ,334 | 2 ,150 | ,855 | 1 ,305 | 4 ,186 |
| Decem. | 1 ,950 | 1 ,68 | 1 ,947 | 3 ,040 | 1 ,140 | 1 ,295 | 2 ,804 |
| Total | 20 ,344 | 23 ,51 | 23 ,525 | 21 ,480 | 14 ,477 | 11 ,625 | 35 ,423 |

A Table

Barometrical Heights in the Year 1730.

A Table of the monthly mean Barometrical Heights, and also of the greatest Ascents and Descents of the Mercury observed in several Places, in the Year 1730, in Inches and Decimals.

| 1730. | Crane Court, London. Lat. 51° 31' | Southwick in Northampt. Lat. 52 54 | In Kent. Lat. 51 | Hudicksvall in Sweden. Lat. 62 | Ostrogothia in Sweden. Lat. 56 | Upsale in Sweden. Lat. 59 48 | A. |
|-------------------------|--------------------------------------|---------------------------------------|---------------------|-----------------------------------|-----------------------------------|---------------------------------|----|
| January | 20 .04 | 27 .79 | 29 51 h | 29 61 | 29 50 | 29 66 | |
| February | 29 .61 | 39 | 06 | 50 i | 29 | 60 | |
| March | .52 l | 34 l | 03 l | 77 | 45 | 79 | |
| April | 90 | 66 | 37 | 77 | 52 | 77 | |
| May | .76 | 55 | 15 | 63 | 58 | 72 | |
| June | .83 | 60 | 24 | 75 | 35 | 75 | |
| July | .84 | 61 | 31 | 82 | 31 | 78 | |
| August | .94 | 70 | 39 | 75 | 38 | 74 | |
| September | .90 | 34 l | 37 | 75 | 44 | 75 | |
| October | 68 | 49 | | 96 n | 64 | 93 h | |
| November | 79 | 55 | | 50 l | 26 l | 56 l | |
| December | 30 .09 h | 83 h | | 84 | 68 h | 89 | |
| Mean of the whole Year. | 29 .825 | 29 .57 | 29 .27 | 29 .725 | 29 .455 | 29 .745 | |
| ♀ Highest | 30.35 Dec. 1. 13. | 30.30 Jan. 10. | 30.01 Jan. 10. | 30.52 Dec. 1. | 30.40 Dec. 1. | 30.71 Dec. 1. | |
| Lowest | 28.70 Mar. 8. | 28.53 Mar. 8. | 28.28 Mar. 8. | 28.70 Dec. 10. | 28.4 Jan. 18. | 28.95 Dec. 10. | |
| Differ. | 1.65 | 1.77 | 1.73 | 1.82 | 1.95 | 1.81 | C. |

| 1730. | Syenaker in Sweden. Lat. 58° 10' | Lunden in Sweden. Lat. 55 42 | Bettina in Sweden. Lat. 58 49 | Abo in Finland Lat. 60 40 | Wittemberg in Saxony, by Mr Hafius. Lat. 52 | Padua in Italy. Lat. 45 15 | B. |
|------------------------|-------------------------------------|---------------------------------|----------------------------------|------------------------------|--|-------------------------------|----|
| January | 29 39 l | 29 57 | 29 96 | 29 68 | 29 823 h | 29 88 | |
| February | 46 | 23 l | 81 | 435 | 428 l | 55 | |
| March | 42 | 34 | 97 | 61 | 48 | 46 l | |
| April | 59 h | 56 | 30 03 | 705 | 677 | 64 | |
| May | 54 | 46 | 29 89 | 55 | 99 | 67 | |
| June | 53 | 55 | 89 | 60 | 667 | 67 | |
| July | 40 | 51 | 87 | 665 | 671 | 69 | |
| August | 53 | 59 | 89 | 56 | 776 | 80 | |
| September | 48 | 57 | 30 04 | 30 05 h | 80 | 82 | |
| October | 56 | 61 | 11 | 29 76 | | 72 | |
| November | 46 | 30 | 29 74 l | 355 l | | 76 | |
| December | 43 | 65 h | 30 12 h | 68 | | 96 h | |
| Mean of the whole Year | 29 .48 | 29 .495 | 29 .943 | 29 .637 | 29 701 | 29 .705 | |
| ♀ Highest | 30.42 Dec. 1. | 30.22 Dec. 1. 13. | 30.98 Dec. 1. | 31.20 Dec. 1. | 30.57 Jan. 30 | 30.40 Dec. 20. | |
| Lowest | 28.43 Dec. 10. | 28.61 Dec. 31. | 28.95 Dec. 10. | 28.64 Nov. 23. | 29.00 Feb. 27. | 28.08 Feb. 27. | |
| Differ. | 1.99 | 1.61 | 2.02 | 1.56 | 1.37 | 1.44 | D. |



Thermometrical Heights, and Depth of Rain in 1730.

A Table of the monthly mean Thermometrical Heights in several Places in the Year 1730.

| 1730. | Crane-Court. | Southwick. | Upsale. | Wittemberg. | Naples. | Bengal. |
|---------|----------------|------------|-----------------|------------------|-----------------|---------|
| Jan. | 67 9 | 69 | 74 | 72 | 50 5 | 30 |
| Feb. | 63 | 68 | 72 | 67 | 48 3 | 22 ,4 |
| March | 56 ,27 | 62 | 74 5 | 60 | 40 | 6 ,9 |
| April | 50 2 | 58 | 56 2 | 48 | 40 | 4 ,0 |
| May | 41 30 | 49 | 42 4 | 35 | 40 | 5 ,2 |
| June | 37 7 | 46 | 29 9 | 29 | 19 5 | 5 ,3 |
| July | 35 22 | 42 | 21 90 | 26 | 16 7 | 8 ,8 |
| August | 33 8 | 44 | 34 05 | 29 | 14 2 | 9 ,4 |
| Septem. | 39 8 | 47 | 50 21 | 40 | 22 6 | 6 ,2 |
| October | 50 1 | 55 | 62 20 | | 29 | 14 ,4 |
| Novem. | 55 5 | 59 | 72 27 | | 40 1 | 23 ,4 |
| Decem. | 49 51 | 70 | 73 10 | | 49 9 | 32 ,3 |
| Mean | 48 35 | 55 | 55 22 | | 34 3 | 14 ,2 |
| Highest | 10. 5. July 25 | 16 July 24 | 9. 1. July 27. | 11. July 25. | 9. Aug. 17. 0 | Jan. |
| Lowest | 77. 5. Jan 7 | 83 Dec. 14 | 86. 7. Mar. 16. | 81. 50. Jan. 15. | 60. Jan. 10. 40 | Dec. |

A Table of the Depth of Rain which fell in several Places in the Year 1730, in Inches and Decimals.

| 1730. | Crane-Court. | Southwick. | Kent. | Ostro-gothia. | Upsale. | Wittemberg, Stylo Novu. | Naples. | Padua. |
|---------|--------------|------------|---------|---------------|---------|-------------------------|---------|---------|
| Jan. | 450 | 45 | 624 | 705 | 164 | 78 | 3 89 | 112 |
| Feb. | 1 230 | 1 53 | 2 054 | 870 | 412 | 1 68 | 1 434 | 2 906 |
| March | 3 595 | 2 61 | 4 067 | 2 730 | 1 983 | 2 86 | 739 | 4 592 |
| April | ,670 | 84 | 985 | 605 | 165 | 1 98 | 2 39 | 1 638 |
| May | 1 755 | 2 5 | 1 805 | 2 260 | 4 120 | 3 23 | 1 39 | 4 467 |
| June | 3 755 | 3 39 | 2 876 | 1 535 | 755 | 2 31 | 1 00 | 6 505 |
| July | 2 390 | 1 93 | 2 598 | 2 445 | 1 904 | 2 01 | 2 173 | 2 339 |
| August | 020 | 0 85 | 131 | 505 | 525 | 3 07 | 0 0 | 4 269 |
| Septem. | 2 100 | 1 65 | 2 043 | 3 140 | 1 579 | 2 16 | 2 67 | 1 090 |
| October | 2 460 | 2 94 | 2 424 | 1 670 | 1 103 | 61 | 2 52 | 5 254 |
| Novem | 1 570 | 1 93 | 2 065 | 915 | 831 | 2 97 | 2 91 | 0 534 |
| Decem | 1 500 | 81 | 1 322 | 890 | 1 105 | 2 09 | 3 22 | 0 894 |
| Total | 21 ,495 | 21 ,0 | 22 ,924 | 18 ,360 | 14 ,646 | 25 ,75 | 24 ,336 | 34 ,300 |



First, I observe upon the Barometrical Tables of these two Years, that they confirm former Remarks made by Dr *Derham* and others, of the Consent of the Barometers in Places at a good Distance from each other. Not only the monthly mean Heights agree in the three Diaries of these two Years here in *England*, but also the greatest Ascent and Descent of the *Mercury* happen commonly on the same Day, and the Barometers have been found to agree in their Motions to an Hour, so far asunder as *Townely* in *Lancashire*, and *Greenwich* near *London*, which is near 160 Miles, although that might be partly accidental. The Barometer at *Crane-Court* and *Southwick*, distant about 55 Miles, being compared, seem very seldom to vary from their mean Difference above $\frac{1}{15}$ and $\frac{1}{2}$ each Way; at *Southwick* and *Kent* something more. From whence it might be expected, that the Weather should be much the same in all these Places; which nevertheless seems not to agree with Accounts in some Years from different Parts in this Island, not very far distant: And I myself have observed sometimes Clouds to lie in one Part of the Horizon for a great Part of a Day, which have discharged a large Quantity of Rain in Places not far off, while the Place, where I have been, has all the while enjoyed fair Weather, and *vice versa*. Whence it appears, that the Barometrical Alterations of the Air extend farther than their Effects, as to the Production of Rain, at those Times. Comparing the Diaries of *Crane-Court* and *Upsale*, I find the Barometers vary from their mean Difference an Inch and half each Way; *Crane-Court* and *Padua* as much, or more, and often go a-pace quite contrary Ways at the same Time, and their monthly Differences are also very variable, so that their Agreement at any Time seems to be but accidental.

Secondly, I observe, that the Descents of the *Mercury* below the mean Heights of each Place, taken in this Way of Dr *Jurin's*, are generally much greater than the Ascents of it above; and there are also other extraordinary Descents of the *Mercury* in every Year of the same Kind. The Reason I take to be, because the Expansion of the Air, whereby it becomes lighter in some one Place, being the Original of the Alterations in the Atmosphere, it's Effects by Condensation or Accumulation of the Air in the Places round about will be more dispersed, and therefore less sensible.

Thirdly, The Variation or Range is greater the farther North, as has been heretofore observed, and appears in these Tables, in which I have put the Latitude of each Place; and likewise it is greater generally in the Winter than Summer Months. The Sum of the Motion of the *Mercury* upwards and downwards, taken from the *Berlin* wandering Line, with a Pair of Compasses, in the Year 1726, amounts to about 76 Inches, which gives $5\frac{1}{3}$ for a Month, and about 0,21 for each Day. But the Barometer is by much most steady in the Summer.

Fourthly, The mean Height of the Barometer hath already been applied to determine the respective Heights of Places, and also the absolute Height above the Surface of the Sea. Dr *Scheuchzer*, in his Tables,

supposes, from Mr *Marriot*, the mean Height at the Surface of the Sea to be 28¹¹ ¹¹¹¹ Paris Measure, which reduced to *English*, gives 29 Inches, 993. This agrees very well with a Diary communicated to the Society, containing 10 Months of the Year 1723, and *Jan.* 1724; the Author of which found by Experiment, that in the Place where his Barometer was kept, the *Mercury* stood $\frac{1}{10}$ and $\frac{1}{2}$ higher than at the Surface of the Sea, which was not far from his Habitation. The mean Height of the Barometer for those 10 Months (leaving out the *Jan.* following, which seems to be a very irregular Month) I find to be 29, 825, to which adding $\frac{1}{10}$ $\frac{1}{2}$, it will give the mean Height at the Surface of the Sea 29.975; so the Difference between these is only .018, and therefore probably may be near the Truth, but may hereafter be more exactly determined by Experiments. Then allowing about 90 Feet, or rather less, for each 10th of an Inch in Height of the *Mercury* in smaller Altitudes, or in greater, according to the Tables calculated for that Purpose, by Dr *Scheuchzer* and Dr *Nettleton*, and published in the *Transactions* of this Society, l. c. & N^o 388. you will have the Height of each Place pretty near, provided the Observations be carefully made, and continued for a sufficient Time; for the yearly mean Heights in one of the Places in these Tables appear to differ near $\frac{1}{10}$ of an Inch in these two Years; and in most of them, the last of these two Years exceeds the first, two or three Hundreths: The Barometer also ought not to be removed to a lower or higher Place.

Upon the Thermometrical Tables, and those of the Rain, I have at present no Remarks to make, but what are obvious on first Sight; only that the Thermometers agree, especially as to the hottest Days in the Year, more than might be expected from Places at such a Distance.

The Winds are of so uncertain and variable a Nature, that they require a more than ordinary Care and Diligence in making the Observations, and a great Length of Time, and Comparison of a vast Number of them, before any Thing can be deduced more than is commonly known; and therefore I shall not endeavour to do it at this Time, but only give this Hint, that if the Observers would take particular Notice, in great Storms, of the Time when the *Mercury* first begins to rise, whether before, or after, or in the very Height of it, it might be a Direction to judge when an Abatement or Increase of it might be expected, (if any regular Order should be found therein) which might be serviceable on some Occasions. But if any Attempt should be made to lay down any Thing certain concerning the Rise and Progress of the variable Winds, it will appear, by considering the Cause of the Trade-Winds, that for the same Cause the Motion of the Air will not be naturally in a great Circle, for any great Space, upon the Surface of the Earth any where, unless in the Equator itself, but in some other Line; and, in general, all Winds, as they come nearer the Equator, will become more and more easterly, and as they recede from it, more and more westerly, unless some other Causes intervene.

These

These are all the Observations I have at present to offer on this Subject, which I should have been glad if they had been more material, and answerable to the Labour bestowed by the curious Observers; but they may assure themselves, that the Diaries communicated to the Society will be carefully preserved, for the Perusal of those who may be inclined to enquire farther into this Part of Nature; and perhaps by the Continuance of this Method, in Process of Time, a Discovery may be made of some regular Course in these Things, which may be of Use.

2. The Diaries that continue throughout the said 5 Years, are only those kept at *Crane-Court*, *Southwick*, and *Coventry*. The *Ken'sh* Diary for the Year 1731 is wanting, and ends with the Year 1734. I have, in my former Account of the Years 1729 and 1730, given an Account of the Method and Contents of the two First. Mr *Henry Beighton's* from *Griff* near *Coventry*, contains the Height of the Barometer at several times of the Day, in Inches and Decimals, and the Weather. That from *Upsal* by Mr *Celsius*, from *Hudicksval* by Mr *Broman*, and from *Abo* by Mr *Sporing*, go no farther than the Year 1731; for which Year there is also one from *Lunden* by an Author whose Name I do not find; for it appears not to be Mr *Conrad Quensel's*, whose end in the Year 1730, from the same Place: It contains Observations on the Barometer twice a Day, in *Swedish* Measure, which I have reduced to *English*; the Wind and Thermometer, which is a particular one of his own.

An Account and Abstract of the Meteorological Observations communicated to the Royal Society, for the Years 1731, 1732, 1733, 1734 and 1735. By the same No. 466. p 243. Read Dec. 9. 1742.

Mr *Weidler's* Diary from *Wittemberg* continues to the End of the Year 1734. In the Year 1732, he alters his Method of the Barometrical Heights, from *Paris* to *London* Measure, and the Days of the Month from the *New Style* to the *Old* one, to make them the better correspond with our Observations. He gives a very accurate Account of the *Phænomena* of several Northern Lights in the Ends of the Years 1731 and 1733, and Beginning of the Year 1734. His Diaries also contain some few Astronomical Observations, and extraordinary Occurrences.

Captain *Christopher Middleton's* Journal of his Voyage to *Hudson's-Bay* is published already. The *Naples* Diary by Dr *Cyrillus* ends in the Year 1732, and also that from *New-England* by Mr *Dudley*.

For the Year 1734, that from Dr *Pack*, at *Canterbury*, exhibits in one View, by a Table for every Month of the Year, in the first Column, the Quantity of Rain, and the Evaporation: In the second, third, and fourth, the greatest and least and middle Heights of the Barometer Thermometer, and Hygrometer: In the fifth, the Meteors, by Variety of Marks, which he gives an Explanation of: In the sixth, the Direction and Strength of the Winds. He gives also a Description of the Instruments he invented, and made use of, for Observation of the Quantity of Rain and Evaporation, and the Hygrometer, with a Draught of each. For *Jan.* there is a particular Table, containing great Variety.

Meteorological Observations for 1731, 1732, 1733, 1734, and 1735. Variety of Observations for every Day of that Month. The Thermometer is peculiar to himself, as far as I know; and he gives no Rule to reduce it to the Standard. There is a Letter of his, relating to a Chart of the Levels of *Kent*, which, he thinks, are so contrived as to cause a Circulation of Air from the Sea, which is of great Use. Mr *Forth's* Diary, at large, from *Darlington*, begins in the Year 1737; but he has given an Abstract for the 3 preceding Years: In which the greatest, least and middle Height of the Barometer is given for every Month; which Mean, upon Examination, I take to be found in the way used in these Tables, and therefore I have put them in as such. By a Letter of his it appears, his Thermometer stands at 45° , when Mr *Hawksbee's* stands at 33, which is 12 Difference; and, I suppose, he means they differ so much throughout the Scale; so by that Rule I have reduced his Observations to the Table. *Quere*, At what Time of the Day the Observations were made, and where the Thermometer was placed; for the mean Heights differ but little from those at *London*, as he observes in his Letter. There is an Extract of a Letter from *Signor Didacus de Revillas* to *Dr Mortimer*, containing an Account of the Rain that fell at *Rome*, beginning with *August* 1734, and ending with *July* 1735, in *Paris* Measure, which I have reduced to *English*.

Marquis Poleni's Diaries, at large, from *Padua*, end in the Year 1730; but he sent an Abstract of his Observations for the Six following Years, which was published in the *Philosophical Transactions* N^o. 448*. in which the Account of the Depth of Rain being entire, I have inserted it in the Table, for the reader comparing it with other Places.

These are all the Manuscript Observations communicated to the *Royal Society*, relating to *Meteorological Observations*. I have added the Observations of the Barometer, Thermometer, and Rain, at *Edinburgh*, from the four Volumes of *Medical Essays*; and Mr *Dopplemaier's* Barometrical Observations, from the printed ones at *Norimberg*, to make the Tables as general as I could. The Tables are drawn up in the same manner as those for the Years 1729 and 1730; and from them various Observations and Comparisons may be made, in the same manner as has been done by several Hands heretofore, particularly, *Dr Plot*, *Dr Derbam*, *Mr Locke*, *Marquis Poleni*, and others, as appears in the *Transactions* of this *Society*; and many more such Observations may be added, by those that are curious in these things, at their Pleasure.

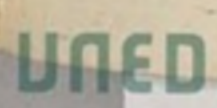
* See §. LVIII. of this Chapter.

Meteorological Observations for 1731, 1732, 1733, 1734, and 1735. 591

A Table of the monthly mean Heights, and also of the greatest Ascents and Descents of the Barometer, observed in several Places, and communicated to the Royal Society, for the Year 1731, in Inches and Decimals.

| 1731. | Crane-Court, London. Lat. 51° 31' | Southwick in Northamptonsh. Lat. 52 31 | Coventry in Warwickshire. Lat. 52 34 | Upsal in Swe- den. Lat. 59 48 | Hudicksval in Sweden. Lat. 62° |
|---------------------------|---|--|--|-------------------------------------|--------------------------------------|
| January | 29 ,83 | 29 ,61 | 29 ,44 | 29 ,71 | 29 ,69 |
| February | 78 | 57 | 31 | 98 | 74 |
| March | 30 20 | 92 | 72 | 71 | 99 |
| April | 29 71 | 51 | 31 | 79 | 86 |
| May | 30 00 | 72 | 52 | 79 | 79 |
| June | 29 92 | 66 | 48 | 66 | 71 |
| July | 95 | 72 | 51 | 68 | 76 |
| August | 86 | 65 | 48 | 85 | 92 |
| September | 96 | 70 | 49 | 65 | 59 |
| October | 93 | 67 | 47 | 84 | 82 |
| November | 77 | 54 | 33 | 61 | 56 |
| December | 88 | 61 | 39 | 66 | 88 |
| Mean of the whole Year | 29 ,89 | 29 ,658 | 29 ,45 | 29 ,74 | 29 ,77 |
| ☿ Highest | 30 ,50 Mar. 7. | 30 ,11 May 30 | 29 ,96 May 31 | 30 ,48 Oct. 29 | 30 ,52 Dec. 23 |
| ☿ Lowest | 29 ,00 Feb. 12. | 28 ,82 Feb. 12 | 28 ,59 Feb. 12 | 28 ,66 Dec. 6. | 28 ,59 Dec. 6. |
| Differ. | 1 ,5 | 1 ,29 | 1 ,37 | 1 ,82 | 1 ,93 |

| 1731. | Lunden in Sweden. Lat. 59° 48' | Abo in Find- land. Lat. 60 40 | Wittemberg in Saxony. Lat. 52° | Naples in Italy. Lat. 41 | Edinburgh in Scotland. Lat. 56 20 |
|---------------------------|--------------------------------------|-------------------------------------|--------------------------------------|--------------------------------|---|
| January | 29 ,37 | 29 ,54 | 29 ,48 | 29 ,09 | |
| February | 43 | 52 | 60 | 11 | |
| March | 57 | 45 | 70 | 30 | |
| April | 43 | 55 | 48 | 03 | |
| May | 65 | 58 | 86 | 14 | |
| June | 51 | 48 | 73 | 29 | 29 05 |
| July | 53 | 48 | 77 | 01 | 07 |
| August | 48 | 66 | 71 | 03 | 07 |
| September | 64 | 47 | 78 | 17 | 06 |
| October | 59 | 28 87 | 82 | 06 | 03 |
| November | 34 | 29 21 | 47 | 14 | 08 |
| December | 29 | 46 | 77 | 32 | 05 |
| Mean of the whole Year | 29 ,48 | 29 ,44 | 29 ,66 | 29 ,14 | 29 ,58 |
| ☿ Highest | 30 ,91 Jan. 10. | 31 ,12 Dec. 21 | 30 ,21 June 1 | 29 ,4 Sape. | |
| ☿ Lowest | 20 ,1 Jan. 29 | 28 ,90 Dec. 7. | 28 ,66 Jan. 29 | 28 ,76 Jan. 29 | |
| Differ. | 1 ,81 | 2 ,22 | 1 ,55 | 00 ,64 | |



A Table of the monthly mean Heights, and also of the greatest Ascents and Descents of the Thermometer, observed in several Places in the Year 1731, and communicated to the Royal Society.

| 1731. | Crane-Court. | Southwick. | Upsal. | Abo. | Wittemberg | Naples. | Edinburgh. |
|------------------------|--------------|-------------|-------------|--------------|--------------|-------------|------------|
| January | 70 .8 | 72 | 76 .8 | 93 .3 | 82 .4 | 54 .5 | |
| February | 64 4 | 66 5 | 71 1 | 95 5 | 79 9 | 45 9 | |
| March | 57 2 | 57 5 | 65 7 | 91 5 | 72 2 | 45 4 | |
| April | 56 2 | 57 | 60 1 | 82 | 62 9 | 38 3 | |
| May | 39 9 | 42 | 43 2 | 68 | 46 | 26 6 | |
| June | 36 1 | 38 | 38 3 | 50 5 | 43 7 | 17 7 | 48 |
| July | 32 1 | 36 | 37 4 | 50 | 41 3 | 12 7 | 41 |
| August | 33 1 | 37 | 40 3 | 49 | 39 7 | 14 3 | 45 |
| September | 38 4 | 42 | 47 2 | 61 5 | 48 9 | 18 9 | 49 |
| October | 46 6 | 49 | 56 3 | 73 | 60 7 | 26 3 | 57 |
| November | 59 9 | 59 5 | 65 7 | 83 | 66 4 | 36 9 | 69 |
| December | 63 1 | 63 5 | 72 9 | 90 | 77 9 | 49 9 | 74 |
| Mean of the whole Year | 49 .8 | 52 .0 | 56 .3 | 74 .1 | 60 .1 | 32 .3 | |
| Thermom. Highest | 8 July 31. | 10 June 31. | 16 Aug. 2. | 20 June 21. | 26 June 27 | 5 June 20. | 28 July 4. |
| Lowest | 82 Jan. 3. | 80 Jan. 8. | 91.6 Jan 31 | 120 Jan. 31. | 108 Jan. 13. | 60 Jan. 23. | 05 Nov. 18 |
| Difference | 74 | 79 | 75 | 100 | 82 | 55 | 67 |

A Table, in Inches and Decimals, of the Depth of Rain which fell in several Places, in the Year 1731, communicated to the Royal Society.

| 1731. | Crane-Court. | Southwick. | Upsal. | Wittemberg, N.S. | Naples. | Padua. | Edinburgh. |
|-----------|--------------|------------|---------|------------------|---------|---------|------------|
| January | .125 | .81 | .774 | 1 .557 | 2 .60 | 2 .546 | |
| February | 82 | 1 04 | 330 | 934 | 2 8 | 3 093 | |
| March | 05 | 15 | 2 544 | 1 775 | 478 | 976 | |
| April | 1 26 | 2 07 | 587 | 801 | 2 478 | 3 434 | |
| May | 39 | 33 | 669 | 2 610 | 1 130 | 602 | |
| June | 2 30 | 3 38 | 3 074 | 1 616 | 870 | 4 253 | 2 .05 |
| July | 2 085 | 1 65 | 2 681 | 1 513 | 347 | 3 402 | 54 |
| August | 1 73 | 1 54 | 1 402 | 222 | 3 239 | 7 372 | 1 85 |
| September | 55 | 1 47 | 1 913 | 1 898 | .213 | 2 216 | 2 02 |
| October | 1 36 | 1 34 | 1 171 | 1 068 | 3 0 | 4 354 | 1 47 |
| November | 1 53 | 1 49 | 460 | 2 699 | 4 04 | 1 653 | 1 42 |
| December | 1 40 | 2 30 | 397 | 1 927 | 6 76 | 306 | 3 12 |
| Total | 13 .60 | 17 .57 | 16 .002 | 18 .620 | 27 .955 | 34 .207 | |



The Barometrical Table for the Year 1732.

| 1732. | Crane-Court. | Southwick. | Kent. Lat. 51. | Coventry. | Wittemberg. | Naples. | Edinburgh. | | | | | | | |
|------------------------------|--------------|------------|-------------------|-----------|-------------|-----------|------------|----------|--------|---------|--------|----------|-------|----------|
| January | 29 ,75 | 29 ,54 | 29 ,53 | 29 ,27 | 29 ,54 | 29 ,03 | 29 ,3 | | | | | | | |
| February | 87 | 65 | 62 | 38 | 53 | 11 | 4 | | | | | | | |
| March | 76 | 57 | 52 | 33 | 35 | 14 | 6 | | | | | | | |
| April | 71 | 52 | 64 | 27 | 43 | 28 95 | 5 | | | | | | | |
| May | 70 | 50 | 36 | 26 | 54 | 96 | 5 | | | | | | | |
| June | 96 | 71 | 71 | 52 | 54 | 97 | 8 | | | | | | | |
| July | 91 | 65 | 55 | 46 | 54 | 29 38 | 7 | | | | | | | |
| August | 95 | 70 | 66 | 52 | 64 | 03 | 9 | | | | | | | |
| September | 91 | 63 | 70 | 47 | 64 | 22 | 6 | | | | | | | |
| October | 58 | 68 | 27 | 15 | 39 | 10 | 3 | | | | | | | |
| November | 30 00 | 75 | 89 | 88 | 47 | 24 | 8 | | | | | | | |
| December | 29 74 | 47 | 48 | 28 | 52 | 10 | 8 | | | | | | | |
| Mean of the whole Year | 29 ,82 | 29 ,627 | 29 ,53 | 29 ,37 | 29 ,51 | 29 ,1 | 29 ,60 | | | | | | | |
| ♀ Highest | 30 ,5 | Feb. 14. | 30 ,13 | Nov. 24. | 30 ,29 | Sept. 25. | 29 ,96 | Nov. 25. | 30 ,25 | Dec. 9 | 29 ,40 | Jan. 14. | 31 ,0 | Aug. 28. |
| Lowest | 29 ,0 | Dec. 31. | 8 ,70 | Dec. 30 | 28 ,32 | April 5. | 28 ,54 | Dec. 30. | 28 ,72 | Nov. 17 | 28 ,82 | May 28. | 28 ,2 | Nov. 18. |
| Differ. | 1 ,5 | | 1 ,43 | | 1 ,97 | | 1 ,42 | | 1 ,524 | | ,58 | | 2 ,8 | |

The Thermometrical Table for the Year 1732.

| 1732. | Crane-Court. | Southwick. | Wittemberg. | Naples. | Edinburgh. |
|-------------------------------|--------------|-------------|--------------|-------------|-------------|
| January | 66 ,1 | 67 ,5 | 86 ,5 | 53 ,5 | 75 |
| February | 53 8 | 57 | 67 4 | 43 | 65 ,5 |
| March | 57 | 58 5 | 66 8 | 39 8 | 65 5 |
| April | 47 9 | 52 | 53 7 | 34 3 | 63 |
| May | 45 3 | 48 5 | 42 2 | 22 4 | 54 |
| June | 37 6 | 40 | 38 8 | 19 2 | 41 5 |
| July | 32 8 | 36 5 | 35 3 | 8 3 | 43 |
| August | 36 | 40 | 41 6 | 15 9 | 46 |
| September | 42 | 44 | 53 9 | 23 | 54 |
| October | 47 8 | 51 | 58 9 | 24 5 | 61 |
| November | 62 1 | 64 5 | 78 8 | 42 | 72 |
| December | 64 2 | 66 | 84 5 | 49 2 | 73 5 |
| Mean of the whole Year. | 49 ,3 | 52 | 58 ,8 | 31 ,3 | 59 ,5 |
| Thermom. Highest | 19 Aug. 20. | 20 Aug. 13. | 3,5 July 16. | 4 July 17. | 28 July 7. |
| Lowest | 80 Dec. 12. | 88 Dec. 11. | 113 Dec. 11. | 57 Jan. 14. | 89 Dec. 14. |
| Difference | 61 | 68 | 109,5 | 53 | 61 |

Meteorol. Observat. for 1731, 1732, 1733, 1734, and 1735.

A Table for the Depth of Rain for the Year 1732.

| 1732. | Crane-Court. | Southwick. | Kent. | Wittem-berg. | Naples. | Padua. | Edin-burgh. |
|-----------|--------------|------------|---------|--------------|---------|---------|-------------|
| January | ,525 | ,9 | ,537 | ,399 | 5 ,70 | 2 ,129 | 1 ,28 |
| February | 1 90 | 1 2 | 2 276 | 1 464 | 52 | 1 959 | 2 409 |
| March | 1 15 | 1 4 | 1 216 | 917 | 33 | 2 765 | 79 |
| April | 2 765 | 1 2 | 1 310 | 2 514 | 1 30 | 5 432 | 3 1 |
| May | 3 2 | 3 4 | 3 494 | 1 864 | 434 | 1864 | 4 62 |
| June | 1 05 | 6 | 803 | 2 308 | 2 08 | 2 872 | 1 19 |
| July | 1 13 | 1 8 | 1 527 | 2 929 | 1 20 | 1 585 | 3 19 |
| August | 1 5 | 1 7 | 931 | 1 390 | 1 13 | 3 112 | 1 62 |
| September | 1 14 | 7 | 825 | 1 833 | 78 | 089 | 0 00 |
| October | 2 39 | 3 7 | 3 295 | 1 346 | 4 70 | 9 164 | 2 52 |
| November | 1 2 | 1 2 | 1 269 | 1 435 | 3 34 | 957 | 41 |
| December | 1 705 | 2 6 | 1 471 | 1 524 | 4 82 | 3 528 | 3 61 |
| Total. | 19 ,655 | 20 ,5 | 18 ,954 | 19 ,923 | 26 ,334 | 35 ,456 | 24 82 |

The Barometrical Table for the Year 1733.

| 1733. | Crane-Court. | Southwick. | Kent. | Coventry. | Wittem-berg. | Edin-burgh. |
|-------------------------|-----------------|-----------------|------------------|----------------|------------------|-----------------|
| January | 29 ,96 | 29 ,68 | 29 ,65 | 29 ,43 | 29 ,78 | 29 ,8 |
| February | 81 | 55 | 54 | 31 | 67 | 6 |
| March | 65 | 43 | 35 | 21 | 49 | 6 |
| April | 85 | 65 | 54 | 43 | 62 | 7 |
| May | 89 | 70 | 80 | 50 | 57 | 8 |
| June | 91 | 67 | 68 | 44 | 68 | 8 |
| July | 90 | 67 | 51 | 46 | 65 | 7 |
| August | 81 | 56 | 43 | 36 | 55 | 6 |
| September | 89 | 62 | 53 | 41 | 99 | 6 |
| October | 97 | 72 | 30 04 | 48 | 70 | 8 |
| November | 30 01 | 75 | 06 | 50 | 74 | 7 |
| December | 29 85 | 53 | 29 66 | 36 | 68 | 5 |
| Mean of the whole Year. | 29 ,87 | 29 ,63 | 29 ,65 | 29 ,40 | 29 ,67 | 29 ,68 |
| ⚡ Highest | 30 ,55 Oct. 19. | 30 ,17 Oct. 19. | 30 ,52 Oct. 19. | 30 ,1 Oct. 18. | 30 ,68 Sept. 22. | 31 ,0 Jan. 18. |
| Lowest | 28 ,95 Mar. 22. | 28 ,69 Jan. 1. | 28 ,53 Sept. 25. | 28 ,5 Feb. 2. | 28 ,62 Nov. 12. | 28 ,4 Sept. 26. |
| Differ. | 1 ,6 | 1 ,48 | 1 ,99 | 1 ,51 | 2 ,6 | 2 ,6 |

The

The Thermometrical Table for the Year 1733.

| 1733. | Crane-Court. | Southwick. | Wittemberg. | Edinburgh. |
|------------------------|----------------|-------------|--------------|----------------|
| January | 60 ,1 | 61 ,5 | 78 ,8 | 70 |
| February | 59 | 60 | 70 | 68 ,5 |
| March | 59 | 59 5 | 68 6 | 68 5 |
| April | 52 8 | 51 5 | 53 6 | 59 |
| May | 45 3 | 47 | 50 5 | 51 |
| June | 35 2 | 36 | 38 3 | 41 |
| July | 28 5 | 32 5 | 36 1 | 38 |
| August | 35 9 | 39 5 | 41 7 | 47 |
| September | 45 4 | 48 | 57 2 | 54 |
| October | 53 4 | 56 | 72 5 | 62 5 |
| November | 56 | 58 | 68 7 | 62 5 |
| December | 54 | 55 5 | 68 9 | 64 |
| Mean of the whole Year | 47 ,9 | 50 | 50 ,4 | 57 |
| Therm. Highest | 16 June 26. | 10 June 25. | 3,5 June 28. | 28 June 26. |
| Lowest | 72 ,5 Jan. 21. | 85 Jan. 22. | 99 Jan. 19. | 86 ,5 Jan. 21. |
| Differ. | 56 | 75 | 95,5 | 58,5 |

A Table of the Depth of Rain for the Year 1733.

| 1733. | Crane-Court. | Southwick. | Kent. | Wittemberg. | Padua. | Edinburgh. |
|-----------|--------------|------------|---------|-------------|---------|------------|
| January | ,69 | 1 ,0 | 1 ,235 | ,562 | 1 ,855 | 1 ,37 |
| February | 1 16 | 1 4 | 1 925 | 562 | 405 | 2 52 |
| March | 2 145 | 2 2 | 2 161 | 1 183 | 5 642 | 2 63 |
| April | 1 70 | 1 | 1 815 | 621 | 3 816 | 81 |
| May | 55 | 0 05 | 216 | 1 642 | 5 33 | 08 |
| June | 2 65 | 2 | 1 742 | 2 308 | 2 712 | 2 13 |
| July | 1 54 | 2 2 | 979 | 1 45 | 3 874 | 63 |
| August | 3 225 | 3 6 | 3 354 | 2 308 | 3 679 | 2 67 |
| September | 1 37 | 1 4 | 1 499 | 517 | 589 | 1 83 |
| October | 91 | 6 | 790 | 828 | 2 788 | 1 08 |
| November | 52 | 5 | 1 081 | 3 61 | 382 | 32 |
| December | 2 44 | 1 7 | 13 201 | 3 151 | 1 065 | 3 62 |
| Total | 18 ,9 | 17 ,5 | 19 ,998 | 18 ,742 | 32 ,137 | 19 ,69 |

Meteorol. Observat. for 1731, 1732, 1733, 1734, and 1735.
The Barometrical Table for the Year 1734.

| 1734. | Crane-Court. | Southwick. | Kent. | Coventry. |
|------------------------|-----------------|-----------------|-----------------|-----------------|
| January | 30 ,06 | 29 ,80 | 29 ,88 | 29 ,53 |
| February | 29 85 | 60 | 69 | 39 |
| March | 76 | 52 | 61 | 28 99 |
| April | 95 | 69 | 84 | 29 49 |
| May | 82 | 54 | 52 | 33 |
| June | 87 | 55 | 65 | 44 |
| July | 87 | 63 | 65 | 44 |
| August | 77 | 57 | 60 | 37 |
| September | 30 04 | 56 | 65 | 37 |
| October | 00 | 47 | 46 | 30 |
| November | 38 | 74 | 79 | 53 |
| December | 29 76 | 22 | 24 | 02 |
| Mean of the whole Year | 29 ,92 | 29 ,58 | 29 ,63 | 29 ,43 |
| ☿ Highest | 30 ,75 Nov. 28. | 30 ,25 Jan. 12. | 30 ,34 Jan. 11. | 30 ,05 Jan. 12. |
| ☿ Lowest | 28 ,7 Dec. 15. | 28 ,10 Dec. 15. | 28 ,19 Dec. 15. | 27 ,9 Dec. 15. |
| Differ. | 2 ,05 | 2 ,15 | 2 ,15 | 2 ,15 |

| 1734. | Darlington. | Wittemberg. | Noremburg. | Edinburgh. |
|------------------------|-------------|-----------------|-----------------|----------------|
| January | | 29 ,8 | 28 ,58 | 29 ,9 |
| February | | 72 | 96 | 6 |
| March | 29 ,40 | 51 | 34 | 5 |
| April | 6 | 59 | 97 | 8 |
| May | 30 10 | 54 | 65 | 8 |
| June | 29 8 | 63 | 42 | 8 |
| July | 8 | 56 | 66 | 7 |
| August | 9 | 60 | 63 | 6 |
| September | 7 | 37 | 71 | 6 |
| October | 8 | 07 | 48 | 5 |
| November | 3 | 66 | 71 | 9 |
| December | 8 | 57 | 5 | 0 |
| Mean of the whole Year | 29 ,87 | 29 ,56 | 28 ,63 | 29 ,64 |
| ☿ Highest | | 30 ,35 Jan. 11. | 29 ,2 Jan. 22. | 30 ,6 Jan. 12. |
| ☿ Lowest | | 28 ,45 Dec. 14. | 27 ,66 Dec. 26. | 28 Dec. 14. |
| Differ. | | 1 ,89 | 1 ,53 | 2 ,6 |

The

The Thermometrical Table for the Year 1734.

| 1734. | Crane-Court. | Southwick. | Darlington. | Wittemberg. | Edinburgh. |
|------------------------|---------------|-------------|-------------|--------------|---------------|
| January | 67 | 68 | | 81 ,2 | 75 |
| February | 58 ,7 | 57 ,5 | | 66 3 | 65 |
| March | 51 7 | 54 | 60 ,6 | 63 9 | 61 |
| April | 47 6 | 50 | 51 1 | 53 4 | 54 |
| May | 45 3 | 47 5 | 46 3 | 40 6 | 55 |
| June | 36 9 | 39 | 40 2 | 32 | 43 |
| July | 34 7 | 35 5 | 35 6 | 33 | 41 |
| August | 34 6 | 37 | 37 3 | 34 5 | 46 5 |
| September | 45 6 | 47 | 45 4 | 49 5 | 55 |
| October | 56 4 | 56 5 | 55 6 | 71 | 61 |
| November | 61 1 | 64 | 60 3 | 88 6 | 72 |
| December | 63 5 | 65 | 63 ,4 | 76 7 | 74 |
| Mean of the whole Year | 49 3 | 52 | | 57 ,5 | 58 ,5 |
| Thermom. & Highest | 20 Aug. 8. | 23 Aug. 23. | | 9 June 28. | 19,5 June 19. |
| Lowest | 77,5 Jan. 16. | 87 Jan. 10. | | 102 Nov. 27. | 92 Jan. 13. |
| Differ. | 57,5 | 64 | | 93,5 | 72,5 |

A Table of the Depth of Rain for the Year 1734.

| 1734. | Crane-Court. | Southwick. | Kent. | Canterbury. | Darlington. | Wittemberg. | Rome. | Padua. | Edinburgh. |
|-----------|--------------|------------|--------|-------------|-------------|-------------|-------|--------|------------|
| January | 1 ,01 | ,5 | 1 ,63 | | | ,86 | | 1 ,03 | ,59 |
| February | 1 935 | 2 6 | 2 43 | | | 2 04 | | 1 73 | 59 |
| March | 1 79 | 1 8 | 1 98 | ,74 | 3 ,25 | 2 95 | | 1 55 | 2 12 |
| April | 45 | 6 | 59 | 75 | 1 7 | 55 | | 1 7 | 1 |
| May | 4 17 | 5 1 | 3 89 | 1 49 | 2 1 | 3 7 | | 4 37 | 3 31 |
| June | 3 21 | 1 3 | 2 13 | 3 59 | 2 4 | 1 67 | | 4 55 | 2 21 |
| July | 1 11 | 1 8 | 1 4 | 1 94 | 1 6 | 2 47 | | 7 01 | 7 |
| August | 1 76 | 4 | 2 16 | 2 34 | 2 4 | 1 09 | 3 59 | 3 08 | 1 28 |
| September | 1 | 1 7 | 1 59 | 1 54 | 1 35 | 2 01 | 5 83 | 2 89 | 1 17 |
| October | 2 1 | 2 8 | 3 13 | 3 94 | 2 4 | 2 08 | 5 83 | 4 39 | 1 32 |
| November | 1 77 | 9 | 1 49 | 1 61 | 2 3 | 73 | 5 15 | 1 3 | 1 6 |
| December | 4 27 | 4 4 | 7 26 | 6 52 | 1 7 | 75 | 6 02 | 4 9 | 2 33 |
| Total | 24 ,57 | 27 ,5 | 29 ,72 | 23 ,98 | 21 ,2 | 20 ,95 | | 38 ,56 | 19 ,22 |

The
lowest
distance

Meteorological Observations for 1731, 1732, 1733, 1734, and 1735.

The Barometrical Table for the Year 1735.

| 1735. | Crane-Court. | Southwick. | Coventry. | Darlington. | Norimberg. | Edinburgh. |
|------------------------|--------------|----------------|--------------|-------------|----------------|------------|
| January | 30 ,09 | 29 ,47 | 29 ,13 | 29 ,4 | 28 ,3 | 29 ,5 |
| February | 1 | 63 | 42 | 4 | 7 | 7 |
| March | 29 84 | 36 | 15 | 73 | 41 | 3 |
| April | 30 03 | 49 | 26 | 45 | 60 | 7 |
| May | 14 | 60 | 42 | 30 7 | 54 | 8 |
| June | 11 | 56 | 35 | 29 92 | 63 | |
| July | 02 | 50 | 32 | 65 | 64 | |
| August | 31 | 72 | 46 | 92 | 83 | |
| September | 23 | 69 | 52 | 97 | 86 | |
| October | 19 | 69 | 44 | 30 10 | 72 | |
| November | 00 | 45 | 26 | 29 65 | 60 | |
| December | 13 | 59 | 37 | 80 | 71 | |
| Mean of the whole Year | 30 ,09 | 29 ,56 | 29 ,34 | 29 ,75 | 28 ,63 | |
| ∅ Highest | 31 Jan. 4 | 30,17 Feb. 11. | 30 Feb. 2. | | 29,22 Nov.24 | |
| Lowest | 28,6 Jan. 8 | 28,00 Jan. 8. | 27,9 Jan. 8. | | 28,02 Jan. 10. | |
| Differ. | 2,4 | 2,17 | 2,1 | | 1,19 | |

The Thermometrical Table for the Year 1735.

| 1735. | Crane-Court. | Southwick. | Darlington. | Edinburgh. |
|------------------------|--------------|-------------|-------------|------------|
| January | 65 ,2 | 65 | 62 ,8 | 73 |
| February | 62 8 | 62 ,5 | 66 3 | 74 |
| March | 55 9 | 60 | 56 2 | 69 |
| April | 49 7 | 50 5 | 49 3 | 61 |
| May | 46 5 | 48 | 45 2 | 54 |
| June | 39 5 | 41 5 | 39 1 | |
| July | 35 8 | 37 5 | 36 2 | |
| August | 34 6 | 38 | 34 | |
| September | 39 7 | 42 | 44 3 | |
| October | 55 9 | 56 | 56 2 | |
| November | 55 1 | 56 5 | 58 | |
| December | 61 5 | 62 | 64 2 | |
| Mean of the whole Year | 50 ,11 | 52 | 50 ,9 | |
| Thermom. | | | | |
| Highest | 21 Aug. 13. | 21 Aug. 13. | | |
| Lowest | 76 Dec. 16. | 81 Dec. 23. | | |
| Difference | 55 | 60 | | |

A Table of the Depth of Rain for the Year 1735.

| 1735. | Crane-Court. | Southwick. | Darlington. | Padua. | Rome. |
|-----------|--------------|------------|-------------|--------|-------|
| January | 2 ,36 | 2 ,1 | 1 ,65 | 4 ,05 | 6 ,26 |
| February | 1 78 | 7 | 2 40 | 2 42 | 67 |
| March | 2 24 | 2 2 | 2 26 | 5 16 | 5 30 |
| April | 1 16 | 1 7 | 1 18 | 1 45 | 2 72 |
| May | 2 04 | 1 5 | 1 50 | 2 68 | 2 68 |
| June | 2 08 | 2 4 | 2 21 | 3 86 | 3 22 |
| July | 3 14 | 2 3 | 3 11 | 4 99 | 0 00 |
| August | 1 49 | 3 2 | 2 03 | 72 | |
| September | 1 56 | 3 2 | 1 04 | 1 28 | |
| October | 98 | 1 7 | 1 98 | 1 87 | |
| November | 2 69 | 1 7 | 2 87 | 54 | |
| December | 1 5 | 2 1 | 1 84 | 63 | |
| Total | 22 ,83 | 25 | 24 ,07 | 29, 68 | |

LVIII. These Observations are made according to Dr Jurin's Directions, and with the same Instruments, that were made use of in the 6 preceding Years.

A Summary of Meteorological Observations made for 6 Years at Padua, by the Marquis Poleni, F. R. S. No. 448. p. 239. June, &c. 1738.

TABLE A.

| | 1731. | 1732. | 1733. | 1734. | 1735. | 1736. |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Dig. Dec. | Dig. Dec. | Dig. Dec. | Dig. Dec. | Dig. Dec. | Dig. Dec. |
| January | 2 546 | 2 129 | 1 855 | 1 034 | 4 052 | 6 541 |
| February | 3 093 | 1 959 | 0 405 | 1 735 | 2 420 | 2 981 |
| March | 0 976 | 2 765 | 5 642 | 1 558 | 5 162 | 2 721 |
| April | 3 434 | 5 432 | 3 816 | 1 706 | 1 452 | 1 227 |
| May | 0 602 | 1 864 | 5 330 | 4 372 | 2 681 | 4 444 |
| June | 4 253 | 2 872 | 2 712 | 4 555 | 3 865 | 2 777 |
| July | 3 402 | 1 585 | 3 874 | 7 015 | 4 992 | 3 064 |
| August | 7 372 | 3 112 | 3 679 | 3 082 | 0 720 | 1 844 |
| September | 2 216 | 0 089 | 0 589 | 2 899 | 1 287 | 2 479 |
| October | 4 354 | 9 164 | 2 788 | 4 391 | 1 878 | 0 529 |
| November | 1 653 | 0 957 | 0 382 | 1 307 | 0 542 | 1 454 |
| December | 0 306 | 3 528 | 1 065 | 4 909 | 0 634 | 0 572 |
| Sum of the whole Year. | 34 207 | 35 456 | 32 137 | 38 563 | 29 685 | 30 633 |

This

Meteorol. Observat. for 1731, 1732, 1733, 1734, 1735, and 1736.

This Table represents the Water of 6 Years, collected from Rain and melted Snow. If you take all the Months together, you will find that the Quantity of Water, which fell in the Months of *November*, Dig. 6. Dec. 295. is the least; and that what fell in the Months of *July*, Dig. 23. Dec. 932. is the greatest: Whereas in the preceding 6 Years the smallest Quantity fell in the Months of *Feb.* and the greatest in *Oct.* The Difference between the least and greatest Quantity before was Dig. 22. Dec. 796; but now it is Dig. 17. Dec. 637.

It appears also from the same Table, that the Year 1735 was the most dry, being Dig. 29. Dec. 685; and that 1734 was the moistest, being Dig. 38. Dec. 563. In the preceding 6 Years the Difference between the most dry and the most wet was Dig. 27. Dec. 505; but in these Dig. 8. Dec. 878.

TABLE B.

| | Winter. | | Spring. | | Summer. | | Autumn. | |
|-------|---------|------|---------|------|---------|------|---------|------|
| | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. |
| 1731. | 5 | 759 | 6 | 647 | 13 | 598 | 8 | 17 |
| 1732. | 4 | 522 | 10 | 300 | 7 | 226 | 10 | 186 |
| 1733. | 6 | 321 | 15 | 758 | 8 | 762 | 3 | 759 |
| 1734. | 4 | 74 | 8 | 14 | 14 | 34 | 10 | 125 |
| 1735. | 10 | 450 | 10 | 848 | 7 | 805 | 3 | 337 |
| 1736. | 11 | 945 | 8 | 54 | 6 | 371 | 4 | 588 |
| Sum. | 43 | 71 | 59 | 621 | 57 | 796 | 40 | 12 |

In this Table it appears, that the Quantity of Water collected in Summer and Autumn, in 3 Years, was greater than the Quantity collected in Winter and Spring; and that in the other 3 Years it was less: Whereas in the former Space of 6 Years the Quantity collected in Summer and Autumn was always the greatest. In those 6 Years the Seasons, according to the Increases of the Sums of Water collected, were to be placed in the following Order; Winter, Spring, Summer, Autumn: But in the last 6 Years they must be placed thus; Autumn, Winter, Summer, Spring.

In this Space of 6 Years, the Sum of the Quantity of Water collected in Summer and Spring exceeds the Sum of Water collected in Winter and Autumn. And in both Spaces the Summer is one of the Seasons of greater Quantity, and the Winter of less.

TABLE

TABLE C.

The Barometer decreasing from the Noon of the preceding Day to the Noon of the Day on which it rained.

The Barometer increasing from the Noon of the preceding Day to the Noon of the Day on which it rained.

| Number of the Days on which it rained. | Wind at Noon on the Days in which it rained. | Number of the Days on which it rained. | Wind at Noon on the Days in which it rained. |
|--|--|--|--|
| 140 | N | 80 | N |
| 47 | NE | 29 | NE |
| 15 | E | 7 | E |
| 18 | SE | 4 | SE |
| 27 | S | 14 | S |
| 28 | SW | 17 | SW |
| 33 | W | 24 | W |
| 62 | NW | 31 | NW |
| Sum 370 | | Sum 206 | |

As I wondered in the corresponding Table of the former 6 Years, so in this Table also I have observed, not without Wonder, that there was no greater Difference between the Numbers of the Increase and Decrease of the Height of the Barometer (on the rainy Days) than between 370 and 206: Which is almost the same as that of the former Tables; namely, 378 and 211.

It is worthy also of Observation, that in the whole former Space of 6 Years the rainy Days were 589; and in the latter 576: A small Difference only of 13 Days between both Spaces. In both a greater Quantity of Rain was brought by the N. than by any other Wind; and the least by the E. and S E.

TABLE D.

The Barometer decreasing from the Noon of the preceding Day to the Noon of the Day on which it snowed.

The Barometer increasing from the Noon of the preceding Day to the Noon of the Day on which it snowed.

| Number of the Days on which it snowed. | Wind at Noon on the Days in which it snowed. | Number of the Days on which it snowed. | Wind at Noon on the Days in which it snowed. |
|--|--|--|--|
| 3 | N | 5 | N |
| 1 | NE | 2 | NE |
| 1 | W | 1 | SW |
| 1 | NW | 1 | W |
| Sum 6 | | Sum 9 | |

Meteorol. Observat. for 1731, 1732, 1733, 1734, 1735, and 1736.

In the first 6 Years it snowed more when the Barometer decreased, than when it increased; but it is the contrary in this Table. In those 6 Years there were 18 snowy Days, and in these there were 15.

TABLE E.

| | Sum of the Heights of the Barometer. | | Sum of the Heights of the Thermometer. | | Mean Height of the Barometer on each Day. | | Mean Height of the Thermometer on each Day. | |
|-------|--------------------------------------|------|--|------|---|------|---|------|
| | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. |
| 1731. | 10850 | 65 | 18286 | 25 | 29 | 72 | 50 | 9 |
| 1732. | 10870 | 19 | 18361 | 30 | 29 | 70 | 50 | 17 |
| 1733. | 10867 | 18 | 18301 | 95 | 29 | 77 | 50 | 14 |
| 1734. | 10850 | 24 | 18305 | 78 | 29 | 73 | 50 | 15 |
| 1735. | 10861 | 21 | 18274 | 87 | 29 | 76 | 50 | 6 |
| 1736. | 10870 | 7 | 18338 | 42 | 29 | 70 | 50 | 10 |

The mean Height of the Barometer in this whole Space of 6 Years is Dig. 20. Dec. 73. differing only 3 decimal Parts from that of the former 6 Years, which was Dig. 29. Dec. 70.

The mean Height of the Thermometer for each Day in this Space is Dig. 50. Dec. 12. differing only 4 decimal Parts from that of the former 6 Years, which was Dig. 50. Dec. 16.

The daily mean Heights both of the Barometer and Thermometer, belonging to each Year, hardly differ in this Table; as they agreed also very well together in the Table of the former 6 Years.

TABLE F.

| Years. | Months. | Days O. S. | Hours. | Greatest Height of the Barom. | | Least Height of the Barom. | | Height of the Thermometer. | | Winds. | Weather. |
|--------|---------|------------|--------|-------------------------------|------|----------------------------|------|----------------------------|------|--------|----------------------|
| | | | | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. | | |
| 1731. | Feb. | 6 | 15 | 30 | 26 | | | 48 | 36 | NW | Fair. |
| | Jan. | 29 | 15 | | | 28 | 70 | 47 | 92 | SE. | Foggy. |
| 1732. | Dec. | 10 | 15 | 30 | 20 | | | 48 | 32 | N | Fair. |
| | Mar. | 11 | 2 | | | 28 | 85 | 49 | 67 | SW | Cloudy. |
| 1733. | Jan. | 23 | 15 | 30 | 48 | | | 48 | 62 | NW | Fair. |
| | Mar. | 19 | 15 | | | 28 | 96 | 49 | 18 | N | Rain. |
| 1734. | Jan. | 12 | 15 | 30 | 34 | | | 48 | | N | Fair. |
| | Dec. | 15 | 15 | | | 28 | 88 | 48 | 30 | S | Cloudy. [Part. |
| 1735. | Feb. | 8 | 15 | 30 | 30 | | | 48 | 40 | NW | Cloudy for the most. |
| | Mar. | 17 | 15 | | | 29 | | 49 | 48 | W | Small Rain. |
| 1736. | Nov. | 19 | 15 | 30 | 20 | | | 48 | 70 | N | Fair |
| | Feb. | 12 | 15 | | | 28 | 88 | 48 | 74 | NW | Cloudy. |

TABLE G.

| Years. | Months. | Days O. S. | Hours. h | Height of the Baro- meter. | | Greatest Height of the Therm. | | Least Height of the Therm. | | Winds | Weather. |
|--------|---------|---------------|-------------|----------------------------------|------|-------------------------------------|------|----------------------------------|------|-------|--------------------------|
| | | | | Dig. | Dec. | Dig. | Dec. | Dig. | Dec. | | |
| 1731. | June | 29 | 15 | 29 | 80 | 52 | 40 | | | SE | Fair. |
| | Jan. | 27 | 15 | 29 | 30 | | | 47 | 44 | NW | Small Rain. [ternately |
| 1732. | July | 20 | 4 | 29 | 62 | 52 | 52 | | | NW | Sun-shine and cloudy ai- |
| | Dec. | 6 | 15 | 29 | 55 | | | 47 | 75 | W | Fair. |
| 1733. | June | 29 | 15 | 29 | 86 | 52 | 38 | | | NW | Fair. [Part. |
| | Dec. | 13 | 15 | 30 | 10 | | | 47 | 85 | W | Cloudy for the most |
| 1734. | July | 1 | 15 | 29 | 70 | 52 | 24 | | | NE | Sun-shine & cloudy air. |
| | Jan. | 14 | 15 | 30 | 12 | | | 47 | 92 | SW | Fair. |
| 1735. | Aug. | 26 | 15 | 29 | 78 | 52 | 18 | | | W | Fair. |
| | Dec. | 27 | 15 | 30 | 14 | | | 47 | 74 | W | Sun-shine & foggy. |
| 1736. | July | 22 | 15 | 29 | 90 | 52 | 30 | | | NE | Fair. |
| | Dec. | 20 | 15 | 29 | 78 | | | 47 | 92 | W | Cloudy. |

By comparing these Tables with the corresponding ones in my former, it appears that the greatest Height of the Barometer, Dig. 30. Dec. 48. exceeded the greatest in the former 6 Years, which was Dig. 30. Dec. 40. But the Depression of the Quicksilver Dig. 28. Dec. 70. yields to that of the former 6 Years, which was Dig. 28. Dec. 56.

The greatest Height of the Thermometer in these new Tables is Dig. 52. Dec. 52; in the former Dig. 52. Dec. 54; only two decimal Parts more. The least Height in these Tables is Dig. 47. Dec. 44; in the former Dig. 47. Dec. 58. Therefore in the last 6 Years the Quick-silver sunk 14 decimal Parts lower than in the former.

TABLE H.

| Years N. S. | Paris Inches. | Lines. |
|----------------|------------------|------------------|
| 1731. | 31 | 11 $\frac{3}{4}$ |
| 1732. | 30 | $\frac{7}{8}$ |
| 1733. | 32 | 5 $\frac{2}{3}$ |
| 1734. | 35 | 5 $\frac{1}{2}$ |
| 1735. | 28 | 7 $\frac{4}{5}$ |
| 1736. | 29 | 2 $\frac{4}{5}$ |
| Sum 187 | | 9 $\frac{1}{3}$ |

This Sum of 187 Inches, 9 $\frac{1}{3}$ Lines, being divided into 6 equal Parts, gives the mean Measure of the Water for each Year 31 Inches, 3 $\frac{7}{12}$ Lines. In the former 6 Years it was found to be 35 Inches $\frac{7}{12}$ Lines: Therefore the Difference is 3 Inches 9 Lines.

Now if we add the Sums of these 2 Spaces of 6 Years into one, and divide it by 12, we shall find the mean Quantity for each Year to be
 K k k k 2 33 Inches

23 Inches $2 \frac{1}{2}$ Lines. And if we compare this Quantity with the mean Measure of Water, which falls at *Paris* 19 Inches, or 18 Inches 8 Lines, it will appear, that there falls a much greater Quantity of Water at *Padua*, than at *Paris*.

These 6 Years furnish also an Observation, that there sometimes falls at *Padua* in 24 Hours, a much greater Quantity of Water, than ever falls within the same Space of Time at *Paris*. From the Noon of *Oct.* 27, 1732, O. S. Wind N. to the Noon of the following Day, there fell 2 Inches of Rain and about 9 Lines, which is much more than ever was observed to fall at *Paris*.

The greatest Height of the Barometer, *Jan.* 23, 1733, observed in these 6 Years, being reduced to *French* Measure, is 28 Inches $6 \frac{2}{3}$ Lines. The least Height *Jan.* 29, 1731, is 26 Inches $10 \frac{7}{10}$ Lines. The Difference between the greatest and least Height is 1 Inch 8 Lines. And as the greatest Difference at *Paris* was 1 Inch $11 \frac{1}{2}$ Line, it exceeds that at *Padua* $3 \frac{1}{2}$ Lines. Thus the Differences in my former Account are confirmed by these new Observations.

I have found, by repeated Observations, the Declination of the magnetic Needle in *Apr.* 1733 to be $13 \frac{1}{2}$ Deg. to the W. At the latter End of 1736 I found it to be $13 \frac{4}{10}$ Deg. Therefore, by comparing this with my former Account, it will appear, that the Declination was greater in the 3 first of these 6 Years, than in the 3 last.

Padua, June 1, 1737.

Remarks on the
Weather, with
3 Synoptical
Tables of me-
teorological Ob-
servations for
14 Years, viz.
from 1726 to
1739, both in-
clusive, by
Geo. Lynn,
Esq; No. 460.
p 686. April,
&c. 1741.

LIX. Having, for these 14 Years last past, kept a constant Register or Diary of the Altitudes of the Barometer and Thermometer, the Quantity of Rain, Course of the Winds, &c. according to Dr *Jurin's* Invitation, the five first Years of which have been communicated to the R. S. I now send the remaining 9 Years at large, ending *Dec.* 1739, in the same Method as formerly. But, believing it would be of good Use, both here and abroad, if the mean Heights of the Barometer, Thermometer, and Quantity of Rain in every Month of the whole 14 Years, with the collateral Means, both of the Months and Years, were brought all into one View together, I have taken the Pains to range them accordingly in a Scheme, or Table. The Meaning of the several Columns in that Scheme is, in a great Measure, explained by the Titles of them; and by the lowest Line you will find, that the mean Height of the Barometer for the whole 14 Years is 29.58 Inches; the mean Quantity of Rain annually, 23 Inches; and the mean Altitude of the Thermometer $\left| \begin{smallmatrix} 56 \\ 52 \end{smallmatrix} \right|$ that is, at the coldest Time of the Day 56, at the hottest 48, and their Mean 52. In the middle Column, viz. that of Rain, the Commas, Semicolons, and Colons, over the Figures, denote, by their Manner of placing, from the Left to the Right, what Time in the Month the Rain fell, whether at the Beginning, Middle, or latter End; the Comma [,] denotes a small Quantity, the Semicolon [;] a middling Quantity, and the Colon [:] a large Quantity; shewing the different

ferent Proportion that fell at those Parts of the Months. The Thermometer made use of all along, is that of Mr *Hauksbee*, and kept constantly in the same Place, as mentioned by Mr *Geo. Hadley* *. And the Altitudes of the Thermometer are taken but twice a Day, viz. at the coldest, which is at Sun-rise, or sometimes a little after; and at the hottest, viz. between 2 and 4 in the Afternoon: By which Method are gained the proportional Heats for every Month in the Year, and their Difference, as also between that of Day and Night, for 13 Years together; not reckoning in the Year 1726, which may be seen by the Scheme to be in another Method, and not filled up.

Great Care has been taken, in casting up and dividing, to get the exact Mediums and Sums; and I was not a little surpris'd to find, in casting up the Column of the mean Altitudes of the Thermometer collaterally, that as those for *July*, being the hottest Month, are $\left| \begin{array}{l} 41^{\circ} 30' \\ 35^{\circ} \end{array} \right|$ so the Altitudes of *June* and *Aug.* on each Side of it, come out exactly equal to one another, and also those of *May* and *Sept.* these last only differing in their Morning and Evening Heats or Altitudes, which does not alter their Medium of $44^{\circ} \frac{1}{2}$.

When there is a Haziness in the Air, so that the Sun's Light quails by Degrees, and his Limb is ill defined, it is a pretty certain Sign of Rain, especially if the *Mercury* falls. The like Haziness at Night is still more a Sign of it.

It is observable, that though the *Mercury*, in the Summer Months, does not so much vary in it's Altitude as at other Times of the Year, yet in that Season we have the most Rain: It should seem therefore, that the different Warmths (and consequently Rarefaction of Vapours) in the upper and lower Currents of the Air, and those Currents mixing, and sometimes wholly interchanging, are then the more immediate Causes of the Rains, if not also of Thunder and Lightning.

Black fleecy Clouds, formed upon a sudden Flurry of the Wind, are generally succeeded by a Shower; and the shifting of the Wind in a little Time almost round the Compass, in hot Weather, is often succeeded by a Thunder-shower.

Several Times, when the *Mercury* has been a good while high, and so continues, there has fallen mistling Rain, especially about the New and Full Moon, with an Easterly Breeze, which the Borderers on the Coast of *Lincolnshire* and *Norfolk* call *Tide-Weather*, and may be occasioned by the Vapours arising from the Tides, which then cover a vast Wash of Sands in their Neighbourhood.

Those Vapours sometimes reach us here in *Northamptonshire*, but I believe seldom further W.

The Nights are for the most Part calmer than the Days; and the Winds seldom settled in their Quarter, or at their Strength, till some Hours after Sun-rise, and generally die away again before Sun-set.

Southwick, April 21, 1740.

* See §. LVII.

N. Lat. $52^{\circ} - 31'$.

Synoptical

Synoptical Tables of the Meteorological Observations made by George Lynn, Esq; at Southwick, near Oundel in Northamptonshire, for the Years from 1726 to 1739 inclusively.

The Barometer's mean Altitude (above 29 Inches)
in 100 Parts of an Inch,
In the Years

| | 1726 | 1727 | 1728 | 1729 | 1730 | 1731 | 1732 |
|--|------|------|------|------|------|------|------|
| <i>January</i> | | .36 | .28 | .70 | .79 | .61 | .54 |
| <i>February</i> | | .51 | .86 | .66 | .39 | .57 | .65 |
| <i>March</i> | | .66 | .48 | .54 | .34 | .92 | .57 |
| <i>April</i> | .75 | .72 | .48 | .60 | .66 | .51 | .52 |
| <i>May</i> | .74 | .49 | .64 | .57 | .55 | .72 | .50 |
| <i>June</i> | .63 | .58 | .68 | .69 | .60 | .66 | .71 |
| <i>July</i> | .68 | .65 | .64 | .64 | .61 | .72 | .65 |
| <i>August</i> | .45 | .77 | .64 | .72 | .70 | .65 | .70 |
| <i>September</i> | .44 | .50 | .59 | .42 | .34 | .70 | .63 |
| <i>October</i> | .77 | .44 | .38 | .52 | .49 | .67 | .68 |
| <i>November</i> | .74 | .84 | .53 | .32 | .55 | .54 | .75 |
| <i>December</i> | .50 | .33 | .51 | .52 | .83 | .61 | .47 |
| The mean Altitudes in the several Years. | | .57 | .56 | .57½ | .57 | .66 | .61 |

| | The Barometer's mean Altitude (above 29 Inches) in 100 Parts of an Inch, In the Years | | | | | | | The mean Altitudes collate- rally. |
|--|---|------|------|------|------|------|------|--|
| | 1733 | 1734 | 1735 | 1736 | 1737 | 1738 | 1739 | |
| January | .68 | .80 | .47 | .26 | .86 | .70 | .45 | .58 |
| February | .55 | .60 | .63 | .22 | .58 | .61 | .60 | .55 |
| March | .43 | .52 | .36 | .44 | .45 | .46 | .48 | .51 |
| April | .65 | .69 | .49 | .70 | .67 | .53 | .34 | .52 |
| May | .70 | .54 | .60 | .58 | .70 | .52 | .60 | .60 |
| June | .67 | .65 | .56 | .76 | .73 | .50 | .56 | .64 |
| July | .67 | .63 | .50 | .67 | .59 | .72 | .67 | .65 |
| August | .56 | .57 | .72 | .63 | .55 | .60 | .61 | .63 |
| September | .62 | .56 | .69 | .71 | .46 | .65 | .49 | .56 |
| October | .72 | .47 | .69 | .33 | .60 | .52 | .71 | .57 |
| November | .75 | .74 | .45 | .64 | .68 | .67 | .32 | .61 |
| December | .53 | .22 | .59 | .53 | .70 | .58 | .65 | .54 |
| The mean Altitudes in the several Years. | .63 | .58 | .56 | .54 | .63 | .59 | .54 | .58 |

The

The Quantity of Rain in Inches and Decimals for every Month, In the Years

| | 1726 | 1727 | 1728 | 1729 | 1730 | 1731 | 1732 |
|---|-------------------|------|-------------------|-------------------|-------------------|-------------------|-------------------|
| January | 4.2 | 3.1 | 4.0 | 0.2 | 0.4 | 0.8 | 3.9 |
| February | 1.0 | 2.6 | 0.9 | 0.5 | 1.5 | 1.0 | 1.2 |
| March | 1.5 | 1.4 | 3.3 | 1.3 | 2.6 | 0.1 $\frac{1}{2}$ | 1.4 |
| April | 1.0 | 1.2 | 2.0 | 1.1 | 0.8 | 2.1 | 1.2 |
| May | 0.4 | 4.3 | 1.4 | 1.6 | 2.5 | 0.3 | 3.4 |
| June | 4.0 | 3.2 | 2.8 | 0.8 | 3.4 | 3.4 | 0.6 |
| July | 3.7 | 2.0 | 3.2 | 2.3 | 2.0 | 1.7 | 1.8 |
| August | 0.3 | 0.3 | 1.0 | 2.4 | 0.8 $\frac{1}{2}$ | 1.6 | 1.7 |
| September | 5.2 | 2.0 | 0.8 $\frac{1}{2}$ | 5.3 | 1.6 | 1.5 | 0.7 |
| October | 1.5 | 1.5 | 2.8 | 2.2 | 3.0 | 1.4 | 3.7 |
| November | 1.4 | 0.4 | 1.5 | 4.2 | 2.0 | 1.5 | 1.2 |
| December | 2.5 | 2.8 | 2.4 | 1.7 | 0.8 | 2.3 | 2.6 |
| The mean Quantity of Rain in the several Years. | 26. $\frac{1}{2}$ | 25. | 26. | 23. $\frac{1}{2}$ | 21. | 17. $\frac{1}{2}$ | 20. $\frac{1}{2}$ |



| The Quantity of Rain in Inches and Decimals for every Month, In the Years | | | | | | | The mean Quantity collaterally. | |
|---|-------------------|-------------------|------|------|------|------|---------------------------------|-----|
| 1733 | 1734 | 1735 | 1736 | 1737 | 1738 | 1739 | | |
| January | 1.0 | 0.5 | 2.1 | 2.3 | 1.0 | 1.7 | 2.4 | 1.8 |
| February | 1.4 | 2.6 | 0.7 | 2.9 | 2.2 | 0.8 | 3.1 | 1.6 |
| March | 2.2 | 1.8 | 2.2 | 2.1 | 2.1 | 1.0 | 1.3 | 1.7 |
| April | 1.0 | 0.6 | 1.7 | 0.6 | 0.4 | 1.3 | 2.2 | 1.2 |
| May | 0.02 | 5.1 | 1.5 | 0.8 | 1.7 | 1.9 | 1.9 | 1.9 |
| June | 2.0 | 1.3 | 2.4 | 1.4 | 1.8 | 3.4 | 1.5 | 2.3 |
| July | 2.2 | 1.8 | 2.3 | 6.0 | 0.7 | 1.2 | 1.7 | 2.3 |
| August | 3.6 | 4.0 | 3.2 | 1.7 | 5.7 | 1.6 | 2.5 | 2.2 |
| September | 1.4 | 1.7 | 3.2 | 1.4 | 3.8 | 1.8 | 1.8 | 2.3 |
| October | 0.6 | 2.8 | 1.7 | 2.6 | 1.8 | 1.8 | 0.8 | 2.0 |
| November | 0.5 | 0.9 | 1.7 | 0.6 | 0.6 | 0.7 | 1.7 | 1.4 |
| December | 1.7 | 4.4 | 2.1 | 2.0 | 2.3 | 1.2 | 1.9 | 2.2 |
| The mean Quantity of Rain in the several Years. | 17. $\frac{1}{2}$ | 27. $\frac{1}{2}$ | 25. | 24. | 24. | 18. | 22. $\frac{1}{2}$ | 23. |



Remarks on the Weather, &c. for 14 Years.

The Thermometer's mean Altitudes taken (from April 13th, 1727) at the coldest and hottest Time of the Day, and their Mean, In the Years

| | 1726 | 1727 | 1728 | 1729 | 1730 |
|---|---|-------------------------------|-----------------------------|-----------------------------|-----------------------------|
| January | | at 10 at 3 65 | 68 65 66 $\frac{1}{2}$ | 70 66 68 | 69 64 66 $\frac{1}{2}$ |
| February | | at 10 at 3 59 57 58 | 69 62 65 $\frac{1}{2}$ | 74 67 70 $\frac{1}{2}$ | 68 61 64 $\frac{1}{2}$ |
| March | | at 10 at 3 62 58 60 | 59 53 56 | 69 60 64 $\frac{1}{2}$ | 62 54 58 |
| April | at 10 at 3 40 33 36 $\frac{1}{2}$ | 52 45 48 $\frac{1}{2}$ | 57 47 52 | 61 50 55 $\frac{1}{2}$ | 58 46 52 |
| May | at 10 at 3 25 20 22 $\frac{1}{2}$ | 45 39 42 | 47 35 41 | 53 42 47 $\frac{1}{2}$ | 49 38 43 $\frac{1}{2}$ |
| June | at 10 at 3 36 31 33 $\frac{1}{2}$ | 42 32 37 | 41 30 35 $\frac{1}{2}$ | 43 30 36 $\frac{1}{2}$ | 46 35 40 $\frac{1}{2}$ |
| July | at 10 at 3 37 31 34 | 37 26 31 $\frac{1}{2}$ | 41 31 36 | 42 30 36 | 42 32 37 |
| August | at 10 at 3 40 31 35 $\frac{1}{2}$ | 43 27 35 | 43 34 38 $\frac{1}{2}$ | 43 31 37 | 44 32 38 |
| September | at 10 at 3 43 | 49 38 43 $\frac{1}{2}$ | 53 43 48 | 46 37 41 $\frac{1}{2}$ | 47 39 43 |
| October | at 10 at 3 52 | 57 51 54 | 58 52 55 | 57 50 53 $\frac{1}{2}$ | 55 43 49 |
| November | at 10 at 3 62 | 66 60 63 | 67 61 64 | 60 57 59 $\frac{1}{2}$ | 59 52 55 $\frac{1}{2}$ |
| December | at 10 at 3 70 | 71 68 69 $\frac{1}{2}$ | 72 70 71 | 63 60 61 $\frac{1}{2}$ | 70 65 67 $\frac{1}{2}$ |
| The mean Altitudes of the Thermometer in the several Years. | | 54 46 50 | 56 49 52 $\frac{1}{2}$ | 57 48 52 $\frac{1}{2}$ | 56 47 51 $\frac{1}{2}$ |



The Thermometer's mean Altitude taken at the coldest and hottest Time of the Day only, and their Mean, In the Years

| | 1731 | 1732 | 1733 | 1734 | 1735 |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| January | 75 69 72 | 70 65 67 $\frac{1}{2}$ | 65 58 61 $\frac{1}{2}$ | 71 65 68 | 68 42 65 |
| February | 70 63 66 $\frac{1}{2}$ | 61 53 57 | 64 56 60 | 61 54 57 $\frac{1}{2}$ | 66 59 62 $\frac{1}{2}$ |
| March | 63 52 57 $\frac{1}{2}$ | 64 53 58 $\frac{1}{2}$ | 64 55 59 $\frac{1}{2}$ | 59 49 54 | 64 56 60 |
| April | 62 52 57 | 56 48 52 | 57 46 51 $\frac{1}{2}$ | 56 44 50 | 55 46 50 $\frac{1}{2}$ |
| May | 50 34 42 | 53 44 48 $\frac{1}{2}$ | 54 40 47 | 53 42 47 $\frac{1}{2}$ | 53 43 48 |
| June | 45 31 38 | 46 34 40 | 43 29 36 | 44 34 39 | 46 37 41 $\frac{1}{2}$ |
| July | 43 29 36 | 42 31 36 $\frac{1}{2}$ | 38 27 32 $\frac{1}{2}$ | 40 31 35 $\frac{1}{2}$ | 42 33 37 $\frac{1}{2}$ |
| August | 42 32 37 | 47 33 40 | 45 34 39 $\frac{1}{2}$ | 42 32 37 | 43 33 38 |
| September | 48 36 42 | 49 39 44 | 52 44 48 | 51 43 47 | 46 38 42 |
| October | 52 46 49 | 55 47 51 | 60 52 56 | 60 53 56 $\frac{1}{2}$ | 60 52 56 |
| November | 62 57 59 $\frac{1}{2}$ | 67 62 64 $\frac{1}{2}$ | 61 55 58 | 66 62 64 | 59 54 56 $\frac{1}{2}$ |
| December | 66 61 63 $\frac{1}{2}$ | 68 64 66 | 58 53 55 $\frac{1}{2}$ | 67 63 65 | 64 60 62 |
| The mean Altitudes of the Thermometer in the several Years. | 56 47 52 | 57 48 52 | 55 46 50 | 56 48 52 | 56 48 52 |

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Remarks on the Weather, &c. for 14 Years.

The Thermometer's mean Altitude taken at the coldest
and hottest Time of the Day only, and their Mean,
In the Years

| | 1736 | 1737 | 1738 | 1739 | The mean Altitudes collaterally. |
|--|--------------|--------------|--------------|--------------|--|
| <i>January</i> | 64 60 62 | 63 59 61 | 63 57 60 | 63 58 60½ | 67 62 64½ |
| <i>February</i> | 71 67 69 | 65 59 62 | 66 61 63½ | 60 53 56½ | 66 59 62½ |
| <i>March</i> | 63 54 58½ | 65 58 61 | 62 54 58 | 65 57 61 | 63 55 59 |
| <i>April</i> | 57 46 51½ | 56 47 51½ | 58 49 53½ | 60 52 56 | 57 48 52½ |
| <i>May</i> | 54 44 49 | 49 35 42 | 48 36 42 | 49 37 43 | 50 39 44½ |
| <i>June</i> | 42 30 36 | 47 35 41 | 46 37 41½ | 44 33 31½ | 44 33 38½ |
| <i>July</i> | 41 31 36 | 41 29 35 | 42 30 36 | 41 32 37 | 41 30 35½ |
| <i>August</i> | 42 32 37 | 47 39 43 | 45 37 41 | 46 36 41 | 44 33 38½ |
| <i>September</i> | 49 38 43½ | 47 40 43½ | 51 43 47 | 48 41 44½ | 49 40 44½ |
| <i>October</i> | 53 47 50 | 60 55 57½ | 57 50 53½ | 60 53 56½ | 57 50 53½ |
| <i>November</i> | 62 57 59½ | 62 56 59 | 69 57 60 | 68 63 65½ | 63 58 60½ |
| <i>December</i> | 63 60 61½ | 67 65 66 | 65 62 63½ | 70 66 68 | 66 63 64½ |
| The mean Alti- tudes of the Ther- mometer in the several Years. | 55 47 51 | 56 48 52 | 55 48 51½ | 56 48 52 | 56 48 52 |

LX. We made use of a very exact Barometer, divided both by a *Paris* and *London* Scale into Inches and duodecimal Parts of an Inch, with a sliding Index. The Room, in which it is placed, is a little above the Middle of the Capitoline Cliff: Hence it is in a mean Region between the upper and lower Parts of the City.

Our mercurial Thermometer is like that of *Fahrenheyt*, but it's Bason is neither spherical nor cylindrical, nor of any other Figure commonly used in Thermoscopes; but has a hemispherical Concave, that the whole Mass of Quicksilver, contained between the two hemispherical Sides of the Glass, may the more readily follow the Variations of the Atmosphere; and that the Ascent and Descent of the Quicksilver may by no Means be vitiated by the Variations of the Glass, which arise from a more intense Heat or Cold. The whole Capacity of the Instrument is divided into 5000 Parts, into as many of which the Scale is divided, as the Tube can contain, beginning at the Top. The Quicksilver rises to the Beginning of the Scale, and Top of the Tube, with the Heat of boiling Water. The Cold of Water beginning to freeze, sinks it to 178° , and actual Frost to 180° . But if the Cold is more intense, and the Quicksilver falls below this Degree, the Increase of Cold is marked by a greater Number of Degrees. This Thermometer is placed on the Outside of a Window, opposite to the E N E, and Steps of the Capitol; so that it never receives the direct Rays of the Sun; and is therefore fit to shew the Degrees of Heat and Cold accurately.

We collected the Rain after *Dr Halley's* Method, in a cylindrical Vessel, nine Inches deep, *London* Measure, and 2 Feet 4 Inches in Diameter. Out of this Vessel the Water is received through a Spout into another cylindrical Vessel, one Foot both in Depth and Diameter, covered with a Lid, to keep the Water from evaporating. When the Rain ceases, it is taken out, and measured in another cylindrical Vessel, exactly measuring one Foot, and exactly equal in Diameter to $\frac{1}{10}$ of the Diameter of the greater Vessel, which immediately receives the falling Rain. Therefore, since the Diameters of these Vessels are as 10 to 1, their Basis will be as 100 to 1.

Therefore because of the reciprocal Altitude of equal Cylinders with the Basis, one Inch Depth of Water in the greater Vessel will be equal to 100 Inches in the smaller. That is, the Inches of Water which this smaller Cylinder measures, show as many $\frac{1}{100}$ Parts of an Inch Depth of Rain. But in the small Vessel, the Rule used to measure is purposely divided into Inches and Tenths, so that each Division thereon shews $\frac{1}{1000}$ Part of an Inch Depth of Rain.

We generally made 4 Observations every Day; and sometimes more; in the Morning early, at Noon, after Sun-set; and about 2 Hours before Midnight; and in Summer at 2 or 3^h p. m.

The thermometrical Observations relating to Cold in Winter are to be understood of the Morning, unless it is otherwise mentioned: For

*Extracts from:
the Roman
Meteorological
Diaries for
1741, by the
Abbot Didacus
de Revillas,
Prof. Math.
Acad. Rom.
F. R. S. No.
466. p. 193.
Read Nov. 18,
1742.*

at that Time the Air is naturally coldest. In Summer they are to be understood of Noon or Afternoon, when the Heat is strongest.

1741
January.

Though there fell almost as great a Quantity of Rain in the last 2 Months of the preceding Year, as in the other 10, yet *Jan.* was very rainy: For the same Winds, which ruled on the Days next the preceding Solstice, and generally bring Rain at *Rome*, prevailed also at the Beginning of this Month: Namely, the E. and S. and the intermediate Winds. Hence proceeded Rain, and the Sky was for the most Part cloudy. It was Full-Moon after Midnight of the first Day of the Month. The Barometer at this Time fluctuated between 8 and 10 Lines above 29 Inches. The Thermoscope indicated a great Cold, falling to 158° , which was much less than that in the Beginning of *November*, when it froze in the Streets, the Thermoscope being then at 178° .

On the 8th the Northern Winds began to prevail, especially the N N E, the Sky was cleared from Clouds, and a pleasing Serenity succeeded; which continued, with very little Interruption, till the 17th, being hardly ever disturbed by Morning Fogs, or scattered Clouds. But the Barometer, which on the 10th had risen to 29 Inches $10\frac{1}{2}$ Lines, fell continually, and on the 17th was fallen to 29 $\frac{4}{4}$, the Wind E N E. In the Night of the 16th and 17th, the Wind being at N E, it froze: The Thermometer marking 180° . And this was the greatest Cold of the whole Year. The last Quarter of the Moon was on the 9th after Midnight, and the New-Moon on the 17th Afternoon.

On the 19th the S. and E. and S E prevailing again, the Barometer fell to 29.1 with an E. Wind. This was the least Height of the Quick-silver in the whole Year, though on the 25th it fell to 29.1 $\frac{1}{4}$. Very frequent Showers till the 28th: But especially on the 25th and 26th there were remarkable Depressions of the Barometer. On the 25th we collected 2 Inches of Water, and on the 26th, $1\frac{1}{2}$ Inch. On these Days the Thermoscope hardly ever departed from 156 and 160° early in the Morning. The first Quarter of the Moon was on the 23d after Midnight.

Besides the Showers, which fell on the 25th and 26th, the Snows of the Mountains being melted by the S. Winds, brought a great Quantity of Water into the *Tiber*; which overflowing it's Banks on the 27th, not only drowned the adjacent Fields to the City, but also the lower Parts of the City itself. The Basis of the Columns in the Portico of the Pantheon were covered with Water. It rose 9 Inches higher than the other Flood of the 7th of last Month.

At the latter End of *Jan.* the Winds were Northerly again, especially N N E, and brought fair Weather. The Coldness of the Air was shewn by the Thermoscope being at 169° in the Morning. Full-Moon on the 31st after Sun-set.

The greatest Cold of this Month was marked by the Thermometer being at 180° .

The greatest Height of the Barometer was — Inches 30.1
 Least — — — — — 29.1
 Depth of Rain — — — — — 6.847

The fair Weather hardly lasted to the 2d Day of the Month: On February the 3d the Sky was covered with Clouds, and a little Rain fell; the Clouds continued frequent till the 8th, the Barometer hardly ever fell from the Height of 29.10; gentle Winds at S. and E.

On the 8th the last Quarter of the Moon before Midnight; Wind E N E, then N E, Barometer 29.11 $\frac{1}{2}$: And the clear Weather continuing, it arose on the 14th to the greatest Height of this Year, 30.5. But neither the clear Nights nor Northerly Winds, continuing till the 24th, could bring a Frost, except on the Night preceding the 20th, when there was a hoar Frost on the Grass: The Thermometer being at 177 $\frac{1}{2}$. On the 15th Wind N E, New-Moon: On the 22d, Afternoon, first Quarter; Wind N N E.

Till the 19th the Barometer kept at the Height of 3 or 4 Lines above 30 Inches: Then descending gradually, it came to 29.9 $\frac{1}{2}$ on the 25th. Then the Sky was cloudy; and on the 26th and 27th, a little Rain fell, the S. and E. blowing alternately. The Winds and Weather were various till the End of the Month, the Barometer scarce falling from the Height of 29.10. The Cold was moderate on these Days in the Morning: The Thermometer standing between 165 and 169^o.

Therefore the greatest Cold of this Month was - Degrees 177 $\frac{1}{2}$
 Height of the Barometer — Inches 30.5
 Least — — — — — 29.7 $\frac{1}{4}$
 Quantity of Rain — — — — — 0.200

This Month began with rough S. Winds and Clouds. Full-Moon March on the 2d, Afternoon. Then E. and S E Winds being mixed with the S. Winds, brought frequent Showers and Clouds till the 9th. The Barometer falling daily from the Beginning of the Month, fell on the 3d to 29.3 $\frac{1}{4}$, and though it rose again that Day to 29.6, and continued rising, yet a small Shower fell in the Evening, But on the 6th, after a new falling of the Barometer, there fell above an Inch of Rain, with a S S E Wind; and a smaller Shower, with an E. Wind on the 9th.

On the 10th was the last Quarter of the Moon, Afternoon; the Barometer rose; Wind N N E, fair Weather, which continued till the 26th, with strong N E Winds, sometimes Westerly at Sun-set: It blew hardest on the 13th. The same N. and W. Winds intermixt, accompanied not only the New-Moon on the 17th, and the first Quarter on the 23d, but also the Days nearest to the Equinox. The Winds were moderate before the Equinox, but they grew stronger afterwards, and brought on a cold Air from the 24th to the 27th, especially on the 26th, when it froze at Night, and destroyed all the early Blossoms.

The

The Thermometer was that Night 179° , and on the others 175° . The Barometer, which on the Morning of the 22d rose to $30.1 \frac{1}{4}$, fell gradually, till on the 26th it was at $29.8 \frac{1}{4}$.

The next Day Wind S S E, Clouds and Rain, which continued to the End of the Month; Wind frequently. The Barometer varied between 29.6 and 29.9 . The Thermometer, early in the Morning, was from 165 to 168° .

| | | | | |
|----------------------------------|---|---|---------|--------------------|
| The greatest Cold this Month was | — | — | Degrees | 179 |
| Height of the Barometer | — | — | Inches | 30.2 |
| Least | — | — | | $29.2 \frac{1}{2}$ |
| Quantity of Rain | — | — | | 2.034 |

April.

The first Half of this Month had only the first and second Days quite fair. Full-Moon the 1st. The Wind seldom blew from the N. unless at Sun-rising: It was generally S. and E. Many small Showers: Frequent Clouds. The Morning of the 9th was misty, dark, and then rainy: The preceding Night was the last Quarter of the Moon. The Barometer was generally about 29.6 . On the 10th it fell to 29.2 , and did not continue rising till the 13th. The Air was generally moderate: But on the 7th and 8th there was a cold N N W Wind, the Thermometer falling to 165° .

On the 15th, New-Moon Afternoon; the Barometer rose almost to 30.1 Inches. The Northern Winds now began to prevail, and brought a sharp Air from the 16th to the 20th. The Thermometer continued between 161 and 163° . The Fairness of the Weather and rising of the Barometer continued till the 22d, when the Moon was in the first Quarter, after Sun-set: And the Barometer having risen to $30.1 \frac{1}{4}$ Inches, fell that Day and the next, the Wind being E S E. The Sky was cloudy.

On the 24th, $15 \frac{1}{4}^{\text{h}}$, the Thermometer being at 158° , and the Barometer at $30.0 \frac{1}{2}$ Inches, the Sky being quite clear, with a gentle E N E Wind, a short Earthquake was perceived by many; in *Tuscany* and the neighbouring Provinces it was stronger, and caused great Damage, especially in the *Morea*.

The rest of the Month was very various, the Winds being sometimes S. sometimes E. the Sky sometimes clear, sometimes cloudy, but without Rain. The Barometer sunk gradually, and on the 30th, when it was Full-Moon before Midnight, it had fallen to $29.5 \frac{1}{4}$; Wind S S E, a little cloudy.

| | | | | |
|-------------------------|---|---|---------|--------------------|
| Greatest Cold | — | — | Degrees | 165 |
| Height of the Barometer | — | — | Inches | $30.1 \frac{1}{2}$ |
| Least | — | — | | 29.3 |
| Quantity of Rain | — | — | | 2.035 |

May.

A strong S. Wind made the first Day dark, though the Barometer rose a little: In the Evening the Wind changed to the W. and then to
the

the N. a Shower fell with Hail. Barometer $29.6\frac{1}{2}$, Thermometer 164° . The Air was very cold, especially on the 4th and 6th: But on the 5th, the Wind being at N E, and the Sky clear, the Vines about the City were frozen. At the Beginning of the Month it was seldom fair; frequent small Showers, and very frequent Clouds. On the 5th the Barometer kept at 30 Inches, and fell gradually till the 11th to $29.5\frac{1}{4}$. On the 10th, 2 Days after the last Quarter of the Moon, there fell a very copious Shower.

From the 11th to the 14th, when it was New-Moon at Midnight, the Wind changing from N W to W. the Barometer rose again to 29.11 , the Sky being almost continually clear. Then the Winds were variable, but the W. prevailed, and the Barometer fell again: On the 16th a small Shower, after which it grew clear, and the Barometer rose again; but fell on the 20th, when there was a Shower again, with a S. Wind.

The rest of the Month, the Winds being W. and sometimes S. made both the Face of the Sky and Temperature of the Air various; and the same Winds accompanied the first Quarter of the Moon on the 22d, and Full-Moon on the 30th. The Barometer, though subject to continual Variations, did not much recede from 29 Inches 9 Lines; except on the 17th, when it reached almost 30 Inches. It remained in this Elevation till the last Day of the Month. On the two last Days the Sky was serene, but foggy.

Except the first 5 Days of the Month, the Thermometer continued between 153 and 163° at Sun-rising. But though it generally reached to 150° about Noon, yet on the 16, 19, 11, 13, and 19, the Heat increasing, and S. Wind blowing, it was at 142° .

| | | | |
|---|-----------|--------|-------------------|
| Greatest Height of the Barometer this Month | — | Inches | 30 |
| Least | — — — — — | | $29.4\frac{1}{4}$ |
| Quantity of Rain | — — — — — | | 2.299 |

The Sky was generally serene, and the Winds W. on the first four June. Days of the Month. The Barometer, which on the first Day was at $29.10\frac{1}{2}$, gradually fell with some Variations; and on the 4th, after a gentle S E Wind in the Morning, it changed to E N E, and the Sky was disturbed by a short Storm and Shower. The S E generally blew on the following Days; and though the Barometer hardly sunk, there was a new and more copious Rain, with Thunder, and a W. Wind, about 6 in the Evening, it being the last Quarter of the Moon. The Sky was rainy the next 3 Days, the E. Winds prevailed, and the Barometer varied between 8 and 9 Lines above 29 Inches. It fell a little on the 11th, there was a short Shower, Wind S S E.

Then succeeded a Serenity, seldom interrupted by Clouds, with E. and W. Winds alternately, but chiefly the latter, to the End of the Month. But at Noon there was often a gentle Gale from the S. which at Sun-setting often gave Place to the W.

The Barometer rose on the 13th to 29.11, and continued there all the Month; but sometimes it rose to above 30 Inches.

The New-Moon was on the 13th, before Noon, and the first Quarter on the 21st, after Midnight, the Sky being serene and mild. It was Full-Moon on the 28th, the Barometer fell, and some Clouds appeared, with a W. Wind. The nearest Days to the Solstice were very mild.

The Thermometer was generally between 146 and 150° in the Morning; at Noon it was between 138 and 144°.

| | | | |
|----------------------------------|-----------|--------|--------------------|
| Greatest Height of the Barometer | — — — | Inches | 30.1 $\frac{1}{2}$ |
| Least | — — — — — | | 29.8 |
| Quantity of Rain | — — — — — | | 0.762 |

July.

The ten first Days of this Month had the like serene Aspect, though the S W Winds generally prevailed, during that Time the Barometer stood constantly at above 30 Inches. But afterwards it fell gradually, and Clouds began to spread in the N. especially at Sun-rising.

The last Quarter of the Moon was after the Evening of the 5th, and on the following 2 Days the Western Horizon was very red, especially about Sun-setting; Wind S W. The New-Moon was after the Evening of the 12th, when there were frequent Coruscations in the N E. The next Day the S W raged furiously about Noon, and the whole Sky was covered with Clouds. After Sun-set it was calm again.

On the 14th the Barometer had fallen to 29.8, and broken Clouds appeared here and there. It rose again to 29.9, and fell again; the Weather was various, and on the 18th the Sky was covered with dark Clouds, it thundered and rained; Wind S S W. There were more frequent Showers on the 3 following Days; especially on the 20th, on the Night before which the Barometer fell to 29.6 $\frac{1}{2}$; Wind S E, and then E.

On the 20th, after Sun-set, was the first Quarter of the Moon, the Sky being cloudy and rainy; a strong N E by N. Wind rose, and raged the following Day. The Winds were afterwards more mild to the 25th. The Barometer began to rise on the 21st in the Evening, and continued rising. A pleasant Serenity lasted till the latter End of the Month, there being only now and then some light Clouds.

On the 27th and 28th the Wind was at first S E, then S. and S W, the Barometer fell a little. But on the 28th, 29th, and 30th, a misty and thick Band darkened the Western Horizon, it being elsewhere clear. On the 31st the Mist was thickened into Clouds, the Barometer sunk again, a great Shower fell; Wind S E.

The Thermometer rose to 128 on the 7th, about 2 in the Afternoon; and on the 17th at the same Hour got up to 122: Which was the greatest Degree of Heat in the whole Year, though it rose also to the same Degree in Aug. The rest of the Month it stood at between 140 and

and 143 in the Morning; and generally between 132 and 135 in the Afternoon.

| | | | |
|----------------------------------|-------------------|--------|--------------------|
| Greatest Height of the Barometer | — — — | Inches | 30.0 $\frac{1}{4}$ |
| Least | — — — — — — — — — | | 29.6 $\frac{1}{2}$ |
| Quantity of Rain | — — — — — — — — — | | 3.629 |

On the first Day of this Month, though the Barometer constantly rose, and a N E by N. Wind blew in the Morning, yet, a W. Wind succeeding, there fell a little Rain; afterwards the same Wind continuing, and sometimes changing to N W, the fair Weather continued a long Time, there being only a thick Fog in the Morning of the 5th, 6th, and 7th. The Barometer then stood at near 29.11; and the Winds were Northerly. On the 9th, the Barometer rose to above 30 Inches, but fell again to 29.11. On the 12th, 13th, and 14th, the Mornings were foggy; Wind S S W. August.

The last Quarter of the Moon was on the 3d at Midnight, and the New-Moon on the 11th in the Morning; Wind S W.

The S S W, which blew on the 14th, continued intermixt with W. till the 18th. On the 15th the Thermometer was 122 $\frac{1}{2}$, on the 16th 122, at 2 p. m. which indicated the greatest Heat of the whole Year. The Wind blowing gently at S. and W, the Heat abated; and the Barometer falling a little, the Sky was covered with Clouds. But at Night, the Wind changing, the Barometer rose again, and the fair Weather returned. The next Day the Moon came to the first Quarter after Noon.

The fair Weather, with Northerly Winds, lasted till the 23d. But then the S S W succeeding, Clouds and Thunder ensued. It rained at Night, the Barometer being at 29.8 $\frac{1}{4}$. In the Morning the S E restored the fair Weather for 3 Days, the Barometer varying but little. Then the Northerly Winds prevailing, especially on the 27th, after a short Rain at Night, accompanied by Thunder, the Air grew cold: The Thermometer fell in the Morning to 149°, and from thence to the End of the Month varied between 148 $\frac{1}{2}$ and 147°.

The Farmers imputed to this Sharpness of the Air the Skins of the ripening Grapes being hardened, and the Clusters shrivelled, which before had given Hopes of a plentiful Vintage.

In the mean Time the Barometer rose to 29.10 $\frac{1}{2}$; Wind N E by E: But on the last Day of the Month it fell a little, and the Sky was covered with Clouds about Noon.

| | | | |
|----------------------------------|-------------------|--------|--------------------|
| Greatest Height of the Barometer | — — — | Inches | 30.0 $\frac{3}{4}$ |
| Least | — — — — — — — — — | | 29.8 $\frac{1}{4}$ |
| Quantity of Rain | — — — — — — — — — | | 0.486 |

On the first 5 Days of this Month the Weather was various, sometimes fair, and sometimes cloudy. Several little Clouds frequently appeared September.

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peared in the Northern Part of the Sky in the Morning. The Wind was generally N E by E. at Sun-rising, and S. about Noon. The Barometer varied between 29.8 and 29.10, and though on the 5th in the Evening it rose to 29.11, it fell again a little at Night, and the next Day it rained with a S W Wind. We observed the same on the 8th, when after Rain in the Afternoon and Thunder, the N E and E. Winds prevailed, and the fair Weather returning lasted till the 12th.

On the 2d the Moon came to the last Quarter, Wind S S W. On the 9th, New-Moon; Wind N W.

The 12th was fair almost the whole Day; Wind N E by E, and then W. The Barometer fell gradually. At Night the Sky was a little cloudy; Wind S E. Next Day, the Wind blowing from the same Quarter, and the Barometer falling gently to 29.9, there fell a great Shower, amounting to almost 2 Inches. Next Night the N E Wind brought Clouds, and the Barometer rose half a Line. The fair Weather lasted to the End of the Month, being sometimes interrupted by Clouds. There were frequent Mists also, especially on the 23d, 24th, 25th, and 30th, at Sun-rising. The Moon came to the first Quarter, with a S. Wind and fair Weather before Sun-rising on the 17th, and was at the Full on the 25th before Sun-rising, with the same Wind.

After the 20th, the Barometer varied but little from 20 Inches. In the Morning the Winds blew between N. and E. generally, seldom between S and W. This State of the Atmosphere accompanied the Days nearest to the autumnal Equinox, the Barometer keeping at about 30 Inches. About the latter End of the Month Wind N N E.

The Thermometer shewed various Degrees of Heat and Cold, both in the Morning and Afternoon. For on the 3 first Days, at Sun-rising, it was between 140 and 142°; at Noon between 130 and 133°. Afterwards it varied very much, for at Sun-rising it was often at 152, and sometimes at 153½. After Noon it was generally between 134 and 138; about the End of the Month it rose to 126½, which was the greatest Heat of the whole Month, Wind W.

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|----------------------------------|-------|--------|--------------------|
| Greatest Height of the Barometer | — — — | Inches | 30.1 $\frac{1}{4}$ |
| Least | — — — | | 29.7 $\frac{1}{3}$ |
| Quantity of Rain | — — — | | 2.605 |

October.

This Month was very remarkable for Novelties. The last Quarter of the Moon was on the 1st Day, after Sun-set, Wind N E by E, Weather fair. The N N E Winds, which prevailed at the latter End of last Month, continued also at the Beginning of this. The W. Winds succeeded till the 12th. The Barometer stood at a little above or below 30 Inches: But on the 8th at Night it rose to 30.4 $\frac{1}{4}$.

The same Night, the Sky being clear, 4 Hours after Sun-set there was an *Aurora Borealis*, which overspread the whole Sky from N. to W. with a remarkable Redness. The Houses hindered me from seeing

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ing quite to the Horizon. An Hour afterwards, the Redness gradually changed to whitish: A little afterwards the Light was extinguished, and returned again, but fainter toward the W. In a little Time it quite disappeared. The Wind blowed gently from the W. the Thermometer was at 148° .

This Northern Light was seen an Hour after Sun-set, in the *Placcetine*, but in a different Form. It declined a little from the N. toward the W, and illuminated a third Part of the Heavens with a whitish Light. Very thin Clouds, like standing Pillars, arose from the Horizon, but did not intercept the Light of the fixt Stars, or sensibly vary. The white Brightness continued all Night: But about Day-break it grew red, and declined a little toward the E. Thus in the E. the Sky shone with the natural Light of the Dawn; but in the N. with the Red of full Day-break: And so was illuminated with a double Light at once. The next Evening it was seen again from 9 till 4 Hours after Sun-set. Then upon the Disappearance of this Light, a darker Night than usual seemed to succeed. At *Rome*, though, the Sky was clear, and it was New-Moon that Night, we did not observe any Trace of an unusual Light.

From the 9th the Barometer fell gradually, the fair Weather and West Wind continuing. But on the 12th about Noon, this Wind darkened the Sky with very thick Clouds. Then the Barometer sinking to $29.11 \frac{1}{4}$, there fell a great Shower, of almost $2 \frac{1}{2}$ Inches.

A little after Sun-set, the fair Weather returned; and the next Morning Clouds were seen only at the Northern Horizon, Wind S E. The Evening being fair, the Barometer rose to $30.0 \frac{1}{4}$, though the S W blew, and then the S.

In the Morning of the 14th, Wind S W, and about Noon S, after Noon it rained. The next 2 Days it rained, Wind sometimes S, and sometimes N E. On the 16th, which was the Day before the first Quarter, there was Thunder and terrible Lightning, accompanied with Rain: But in the Evening the fair Weather returned. The Barometer kept steady at $29.10 \frac{1}{2}$ till the 19th, when it fell a little at Sun-set. The next Night some Showers began to fall, which continued to the End of the Month, the Barometer being generally above 29.9 . They were very heavy on the 21st, 23d, and 24th; and what is very observable, on the 23d, there fell near 6 Inches of Rain in about 6 Hours, with a very strong S. Wind, accompanied with Thunder, Hail, and Lightning. The Barometer had fallen that Day to $29.6 \frac{1}{2}$, and the Thermometer was at 149° . On the 24th it rained an Inch, though the Barometer had risen a little. Next Night it was Full-Moon. The rest of the Month the Barometer continued to rise a little, the Weather was various, but generally cloudy; Wind N. mixt with E.

The Thermometer generally kept between 151 and 154 in the Morning: At Noon between 139 and 144. But on the last Days of the Month

Month it was between 156 and 160 in the Morning: At Noon between 151 and 152.

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|----------------------------------|-----------|--------|--------------------|
| Greatest Height of the Barometer | — — — — — | Inches | 30.4 $\frac{1}{4}$ |
| Least | — — — — — | | 29.6 $\frac{1}{2}$ |
| Quantity of Rain | — — — — — | | 10.895 |

November.

The N E and neighbouring Winds blew almost all this Month, with various Weather. The Barometer constantly kept at above 29.10, except on the 7th and 8th, when it fell to 29.8 with a S E Wind, and a great Shower fell on the 8th, when it was New-Moon after Noon. But the Barometer recovering it's former Elevation, and exceeding it on the 16th, when the Moon had passed the first Quarter, it rose to 30.4 $\frac{1}{2}$, with a N E Wind. This Height of the Barometer fell very little short of the greatest Height of this Year.

On the 17th and 18th, at Sun-rising, the Thermometer was at 170 and 171, with a clear Sky and N E Wind. Then on the 20th and 21st, the Barometer fell hastily to 29.8 $\frac{1}{2}$, with Rain, Thunder, and Lightning, Wind S. The Thermometer was then between 155 and 161. On the 22d, after Sun-set, the Moon being at full, and the Barometer at 30.2, the fair Weather returned, and the Thermometer fell in the Morning to 166°. But the Barometer fell a little, and it rained again. Then after 2 Days of fair Weather (when a cold Air and N E Wind in the Morning had sunk the Thermometer to 174 $\frac{1}{2}$) Wind N E by E. to the End of the Month, either Clouds or Rain. On the 28th the Barometer fell remarkably to 29.1 $\frac{1}{4}$. But in a short Time, the same Wind continuing, it rose again; and the Moon was in the last Quarter on the 29th at Night.

This Month therefore the Barometer fell from a remarkable Height, almost to the lowest, in a Space of 12 Days.

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|------------------|-----------|--------|--------------------|
| Greatest Height | — — — — — | Inches | 30.4 $\frac{1}{2}$ |
| Least | — — — — — | | 29.1 $\frac{1}{4}$ |
| Quantity of Rain | — — — — — | | 3.488 |

December.

The N E Winds which prevailed last Month, continued till the 20th of this: The Sky was generally clear, except on the first 6 Days, in which the Barometer varied between 30 and 29.9, though a little Rain accompanied it's falling. On the other 14 Days it was but little above or below 30. On the Morning of the 8th (Full-Moon) and on the 10th and 11th it rose to 30.2. After the 15th, which was the first Quarter of the Moon after Noon, it fell a little from the Height of 30.1 $\frac{1}{2}$, and the Sky appeared cloudy.

The Thermometer, which a little before Sun-rising on the 2d, was at 174, kept on the following Days till the 11th at the same Hour between 165 and 170. But the Cold increasing, it stood on the 13th at 174 $\frac{1}{2}$, and then the Cold abated.

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On the 20th about Noon, the S. Winds began to blow, the Sky to be darkened, and the Barometer to fall. This Descent being more precipitate the following Night, amounted to above 3 Lines, being at 29.5 $\frac{1}{2}$ in the Morning. Before Noon on the 21st, it thundered, a strong S. Wind blew, and a large Shower fell.

On the 22d before Noon it rained again, Wind S W, Full-Moon. And because the Winter Solstice happened on the 21st at Sun-set, the Winds which prevailed on the nearest Days to that Solstice, were for the most Part S. mixed with S W, S E, and E; then the Sky was rainy to the End of the Month; Winds S E and E; and on the 26th alone there fell above 3 $\frac{1}{2}$ Inches of Rain, the Barometer being at 29.10 $\frac{1}{2}$. But when it came on the 28th to almost 30 Inches, another Inch of Rain fell on the succeeding Night; and it rained again the next Night, when the Moon came to the last Quarter. At this Time there fell many Showers, the Thermometer being at 161 in the Morning, and the Air very mild.

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|----------------------------------|-------|--------|--------------------|
| Greatest Height of the Barometer | — — — | Inches | 30.2 |
| Least | — — — | | 29.3 $\frac{1}{2}$ |
| Quantity of Rain | — — — | | 8.501 |

Since in *Feb.* the Barometer was at it's greatest Height, 30.5, and in *Jan.* at it's least, 28.5, the Scale of the Variations of the Barometer this Year was 16 Lines, or 1 $\frac{1}{3}$ Inch; and the mean Height 29.9.

General Observations on the Meteorological Diaries for 1741.

In *Jan.* also the greatest Cold of the whole Year was indicated by the Thermometer being at 180; and in *July* and *Aug.* the greatest Heat by it's being at 122. Therefore the Scale of the Variations of the Thermometer was 58°, or so many of those Parts, of which the whole Capacity of the Thermometer contains 5000. Therefore taking from this last Number 122 Parts, which the Quicksilver did not occupy in the greatest Heat; it's Bulk at that Time was only 4878 Parts; and it lost 58 of these Parts in the greatest Cold. Or if we divide the Bulk of the Quicksilver increased by the greatest Heat into 1000 Parts, then 11 $\frac{2}{3}$ of those Parts will have been lost in the greatest Cold. For there is nearly the same Proportion between 4878 and 58, as between 1000 and 11 $\frac{2}{3}$.

The Quantity of Rain that fell this Year was Inches 43.780. Now from the Observations of the former 8 Years, the mean Quantity of Rain was 34 Inches; and in 1737, which exceeded the rest in Quantity of Rain, there fell only 36.788. Therefore the Rain of 1741 exceeded the Mean by 9.780; and the greatest of 1737, by 6.992. It must by no Means be omitted, that in the 3 last Months of the Year alone there fell 22.884, which not only exceeded half the Quantity of Rain of this whole Year, but $\frac{2}{3}$ of the mean yearly Rain. The greater Quantity of Showers this Year fell therefore in the 3 last Months.

The Showers also of *July*, which measured 3.629, were very unusual; for since our Application to these Observations, we have never perceived.

perceived a whole Inch of Water to fall in that Month. And this perhaps was the Cause, that the Summer Fruits very much abounded with Worms this Year: As the Husbandmen ascribed also the great Number of Worms, which injured the Olives, to the too great Abundance of autumnal Showers.

Another unusual Phænomenon also accompanied the autumnal Rains: For many and long Showers fell, when the Barometer was risen not a little above the mean Height. Though it must be acknowledged, that the Barometer generally fell a little from a greater Height before the Descent of Showers.

In this Year, as in others, the NW Winds were seldom observed to blow; and the E. Winds most frequently about *Rome*. The E. and S. Winds generally brought Clouds or Rain, and the N. and W. Winds fair Weather: Sometimes, but very seldom, the contrary.

The Winds which blew most frequently on the nearest Days to each Solstice, frequently prevailed in the following Season. We observed the same also, with regard to the Winds near the Equinoxes, but not altogether so sensibly. This Observation *Blanchini* has observed to hold for a long Course of Years, and I have found it seldom to vary.

When the Weather was calm, especially in Summer, the E. Winds were generally observed to blow gently in the Morning, the S. about Noon, and the W. at Night.

The magnetical Needle varied this Year from N. to W. $15^{\circ}, 40'$. The Increase of Variation therefore from 1730, was $4^{\circ}, 40'$. For the Variation that Year was 11° .

The following Observations on the epidemical Diseases of this Year were made by *S. Leprotti*, Chief Physician to the Pope, and *F. R. S.*

In the Winter some few had Inflammations in the Breast; but many had Catarrhs, Inflammations of the Tonsils, and rheumatical Disorders. About the End of *January* also, some petechial malignant Fevers began, especially among those who lived near the *Tiber*; many who lived in the same House being seized by them at the same Time. These Fevers were continual, and did not at all intermit; but they all came on like those, which approached most to the Nature of Tertians, being alternately one Day more vehement than another. These were accompanied, among other Symptoms, by a vehement Pain of the Head, which was succeeded by a Drowsiness and Diarrhœa. They were cured by bleeding, and the Use of Diluents, and the Bark, without any Emeticks or Purgatives, which some make Use of on these Occasions.

About the End of the Spring, these Fevers were succeeded by regular Intermittents; which for the most Part were favourable, but attended generally by grievous Head-achs: And these also were cured by bleeding and the Bark. This Sort of Fevers has continued through the Summer and Autumn, to the present Winter.

In the Summer some were attacked by a Diarrhœa and Cholera. Some spurious Inflammations of the Breast, and Catarrhs have appeared
this

this Winter: But the above-mentioned intermitting Fevers are most epidemical.

In the 2 last Months of the Year many fell ill suddenly, some of Apoplexies, others of internal Disorders of the *Præcordia*. Lastly, it is worthy of Observation, that Diseases arising from Worms were frequent in Summer and Autumn, which in some acute Cases were thrown off by vomiting and purging. This was chiefly observable in the Country People.

LXI. 1. The Mildness of the preceding Winter produced epidemical catarrhal Fevers in *Feb.* and *March*.

March 14, the Cold was unusually severe, and was brought by an impetuous N E Wind, which blew 2 Days before.

May 5, the Cold of the Night injured the Vines and Wallnuts, and scorched the Corn, especially in low Places; so that the Ears were afterwards empty.

Some Meteorological Observations made at Wittemberg in 1733, by Joh. Fred. Weidler, Prof. Math. Pr. and Sc. 1736.

F. R. S. No. 441. p. 238. Apr.

2. *Feb.* 17, the Barometer was at 28.7, which is lower than I ever observed it before. It predicted a most horrid Storm, and Violence of the Wind, which at 3^h p. m. blew a great Number of Tiles off the Houses, so that it was very unsafe walking in the Streets. This Storm did great Mischief, in *Saxony* and other Parts of *Germany*, to the Buildings, Woods, and Gardens, broke old Oaks and other Trees, and blew down several Persons in the open Fields.

An Observation made in 1734, by the same No. 442. p. 269. July, Sc. 1736.

LXII. In *Jan.* there fell 131 Measures of Rain, 111 in *Dec.* and 108 in *Oct.* but in *March* and *May* it rained very little. Thus on comparing the Seasons together, we find Winter and Autumn the most rainy, and Spring and Summer the most fair, especially Spring. This is common in our Country, and seems to be most agreeable to the Temperature of the Air, and to a hot and dry Season of the Year. It may seem strange, that at *Paris* the greatest Quantity of Rain should fall in *July*, *Aug.* and *Sept.* as it has been constantly observed by M. de la Hire. Perhaps it may be owing to the Situation of that Country, which has the Sea to the N. and W. and to the Disposition of the Air, that such Storms, as are attended by copious Showers, are more plentiful there in Summer. But we, who are washed by the *Tyrrhene* Sea on the S. and W. and surrounded by the *Apennines* on the S. and E. have fewer of those rainy Storms: For the Vapours being raised from the Sea in greater Quantity by the hot Summer Sun, being carried to the Land, may produce more copious and frequent Rains in the Northern and Champain Country of *France*: But on our Coasts, the Vapours rising in less Quantity from the *Tyrrhene* Sea, will supply less Matter for Rain in Summer; especially as the *Apennine* Mountains and the Winds blowing against them at that Season from the Midland Countries, will easily repel them, when they are brought towards the Land. From this mutual Strife of the Winds from Sea and Land we are sub-

A Physical History of the Air and Earth for 1732, by Nicholas Cyrill, first Prof. of Physick in the University of Naples, and F. R. S. No. 430. p. 184.



ject to those Summer Storms, called by our People *Tropee*, which are remarkable for Thunder and Lightning, rather than for much Rain.

The Snow, which lay deep upon the Mountains about the End of 1731, still remained upon them in *Jan. Feb.* and *March* 1732, the old Snow being continually increased by the falling of new. We often observed even *Vesuvius* to be covered with Snow: But it seldom lay in the City, and adjacent Country. It froze only on the 29, 30, and 31 Days of the last Year; the first moderately, the second more, and the third less, when it thawed after Noon. *Hauksbee's* Thermometer was at 57; the first 2 Days it was calm, but on the 3d the Wind was N W. At the End of *November* and Beginning of *December* it froze in the City, first more, and then less. It hailed *Feb.* 23 near the City: *March* 4, in the City: *Apr.* 4, and after the 20th, it was observed in the Mountains. *Sept.* 14, at *Foggia*, there was a Whirlwind and Hail, which did Mischief to Men and Cattle in the open Fields.

The Strength of the Winds was various, and they were often opposite. In Winter the W. generally prevailed, turning sometimes to the S. and sometimes to the N. which is very common with us, who have the Sea on that Side. The N. Winds blowed seldom; but *Jan.* 1 and 2, there was a very strong N E, and then abating a little, and changing to the N W, the Mountains were sprinkled with Snow.

In this Place it may be proper to animadvert on the Instrument for observing the Strength of Winds, described in the *Philosophical Transactions**; which is not only uncertain, but false. A transverse moveable Wing is hung to a common Weathercock, and a Quadrant divided into Degrees is placed near it. When there is no Wind, the Wing hangs perpendicular; but it is raised by the blowing of the Wind, and according to the Strength of the Wind it rises more or less, and shows the Degrees of Strength on the Quadrant. But this is evidently false; for the Wind may be raised 10 or more Degrees from its perpendicular Situation by a very small Strength of Wind: And the more it recedes from the perpendicular, the more the Difficulty of the Elevation of the Wing increases: So that if in the first Elevation of the Wing, 2 Degrees of Strength of the Wind are sufficient to go over 10 Degrees of the Quadrant; then 4 Degrees of Strength will hardly be able to acquire 10 Degrees more of the Quadrant; and so the Strength of Wind augmented to the 6th and 8th Degree will hardly be sufficient to raise the Wing to the 30th Degree of the Quadrant. Whence it appears, that we cannot use this Machine to measure the Strength of the Wind exactly; because the proportional Increase of it will not answer to the Degrees marked on the Quadrant. It will be better therefore to make use of *Dr Jurin's* Method of measuring the Strength of the Winds, as I have done in my Observations †.

* Vol. II. Chap. 1. §. xvii.

† Vol. VI. Part ii. Chap. 1. §. xxxvii.

The Quicksilver in my Barometer fell once, *May* 20, to Inches 28.82, *London* Measure, which was the greatest Sinking that Year: And though the Liquor of the Thermometer differed not a little from it's greatest Rarefaction, yet People were almost suffocated by the Heat. On the contrary, the greatest Height of the Barometer, 29.38, was *Dec.* 10, the Wind blowing 2 Degrees at E. the Air being dry and cold, and *Vesuvius* raging furiously. But that whole Month the Height of the Quicksilver was constantly observed to be greater than in the other Months of the Year; but *Nov.* 20, 21, 23, and *Dec.* 16 and 17, it came to 29.30. The mean Height of my Barometer is 29.4. Though the Ascent of the Quicksilver generally denotes fair Weather and Northerly Winds, as it's Descent on the contrary usually accompanies impending Rains and Southerly Winds; yet the contrary often happens. Hence some may perhaps conclude, that not so much the various Weight of the external Air, as some Alterations of the Quicksilver itself may conduce to the various Motion of the Quicksilver in the Barometer.

The Thermometer, which was one of *Hauksbee's*, afforded the following *Phænomenon*. The greatest Heat of this Year was from *July* 9 to the Beginning of *Aug.* The Heat came to the greatest Height *July* 17, 23, and 24, the Liquor rising to 4. This Ascent used to happen in former Years: But what was peculiar in this Year, was the greatest Heat continuing almost equal Day and Night for 22 Days: The Liquor keeping about 5, 6, 7, and 8, except *July* 16, when the S. and N N W Winds blowing by Turns, with Thunder, it rained at Times to the Height of almost an Inch, when the Thermometer fell suddenly from 8 to 20.

The greatest Cold was observed at the End of last Year, and Beginning of this, the Thermometer falling to 56 and 57, when there was Snow on the Mountains, and Frost in the City. In *Dec.* when there was Ice seen, the Thermometer fell to 55 and 56. Here I think it proper to observe, that in the Table put to *Hauksbee's* Thermometer, Frost is set at the 65th Degree. But I have found from the Observation of several Years, that it has frozen, when the Thermometer sent to me fell only to 55. Whence it is plain, that Freezing requires a smaller Degree of Cold at *Naples* than at *London*. This *Phænomenon* will be the Subject of a particular Discourse, when I shall have made some more accurate Experiments.

I shall now mention something about our *Vesuvius*. It was silent almost the whole Year: But at the latter End, after *Dec.* 9, it began to emit Smoak with Violence in the Day, and sometimes Flame in the Night. On the 20th both Smoak and Flame increased greatly. Hence on the following Days there was an inward Grumbling and Noise, like the Explosion of Cannon, which was heard at the Distance of several Miles; so that the Windows and Shutters shook. Burning Stones were thrown on high from the *Crater* of the Mountain, which afterwards falling down, and sticking to the Sides of the Hill, afforded a beautiful,

though terrible, Spectacle to our City, and to Places more remote. The Ashes were scattered over the neighbouring Parts farther or nearer, according to the Determination and Strength of the Winds. From *Dec.* 27 and 28 a very thick Smoak, rising not very high, overspread the neighbouring Places thick with Ashes. After *Dec.* 29, the Smoak and Noise gradually decreased: And after *Jan.* 4, all was quiet.

We were told, that *Ætna* at the same Time vomited forth a great Quantity of Fire and Smoak, with Noise: And that *Stromboli* thundered with an unusual Noise, and threw forth a violent Flame: So that the frequent Rumbling of the Island, and Flames bursting out with Noise, seemed to the Inhabitants of the Western Part of *Campania*, as if two Navies had been engaged in Fight.

This Year was unfruitful in Corn, except Maiz; but produced great Plenty of all Sorts of Fruit; and the Wine was in greater Quantity and more delicious than in the preceding Year.

*An Account of
Mr Sutton's
Invention and
Method of
changing the
Air in the Hold,
and other close
Parts of a
Ship; commu-
nicated to the
Royal Society,
by R. Mead,
M. D. Physi-
cian to his Ma-
jesty. F. R. S.
and Reg. Coll.
Med. Lond.
No. 462. p. 42.
Read Feb. 11.
1741-2.*

LXIII. 1. It is found by daily Experience, that Air shut up and confined in a close Place, without a Succession and fresh Supply of it, becomes unwholsome, and unfit for the Use of Life. This is more sensibly so, if any stagnating Water be pent up with it. But it grows still worse, if such an Air as this is made use of in Respiration, that is, becomes moister and hotter, by passing and repassing through the Lungs.

These bad Effects, in different Degrees, according to the different Manner in which Air is inclosed, are observed in many Cases; particularly in deep Wells and Caverns of the Earth, in Prisons or close Houses, where People are shut up with Heat and Nastiness: But most of all in large Ships, in which, with the Stench of Water in the Hold, many Men being crouded up in Close-quarters, all the mentioned Circumstances concur in producing greater Mischief than would follow from any of them single.

The Reason of these bad Effects is this: It is that Property of the Air which is called it's Elasticity or Springiness, which makes it so useful to our Life. When any Part of it is inclosed and kept from the Communication of the outward Air, it expands itself, and, in Proportion to the Closeness of the Place, loses it's Spring; and if any Heat or Moisture comes to it, the elastic Force may be quite lost and destroyed: And not only so, but if it happens to be impregnated with noxious *Effluvia*, either from unwholsome Substances of any Kind, or from the infectious Breath of diseased Bodies; it will become quite poisonous and deadly, in a Manner suitable to the original Cause.

It is proposed at present to find out a Remedy for this Evil in Ships only: But by making Alterations according as particular Places require, the same may be applied to any Houses or Parts of them, as Prisons, the sick Wards in Hospitals, &c. Now it is a natural Consequent of the Elasticity of the Air, that when it is rarefied in any Part, (which is most effectually done by Heat) the neighbouring Air will rush that Way, till this Part is brought to be of an equal Density and Elasticity with

with

with itself; and this again will be followed by the Air next to it: So that, if a Conveyance for Air be laid from the Hold or Well of the Ship, and a Rarefaction of the Air therein be made; the foul Air from this Place will run or be drawn out that Way, and fresh Air from the adjacent Parts will succeed in it's Room.

It is upon these Principles that the following Scheme is most humbly offered to the R. Hon. the Lords of the Admiralty, and Commissioners of the Navy, which it is hoped will be found effectual for clearing the bad and corrupted Air from the Holds and other close Parts of his Majesty's Ships; and thereby prove beneficial to the Publick, by preserving the Healths of many of his Majesty's good Subjects serving on board the same; the whole Thing being indeed easy to be executed, and what will no Ways incumber, or be troublesome, in any of the Vessels where it shall happen to be applied; the same being, in short, no more than this: That whereas in every Ship of any Bulk there is already provided a Copper or Boiling-place proportionable to the Size of the Vessel, it is proposed to clear the bad Air by Means of the Fire already used under the said Coppers or Boiling-places, for the necessary Uses of the Ship.

It is well known, that under every such Copper or Boiler, there are placed two Holes separated by a Grate; the first of which is for the Fire, and the other for the Ashes falling from the same; and that there is also a Flue from the Fire-place upward, by which the Smoke of the Fire is discharged at some convenient Place of the Ship.

It is also well known, that the Fire once lighted in these Fire-places, is only preserved by the constant Draught of Air through the fore-mentioned two Holes and Flue; and that if the said two Holes are closely stopped up, the Fire, though burning ever so briskly before, is immediately put out.

But if after the shutting up the above-mentioned Holes, another Hole be opened, communicating with any other Room or airy Place, and with the Fire; it is clear, the said Fire must again be raised and burn as before, there being a like Draught of Air through the same, as there was before the stopping up of the first Holes: This Case differing only from the former in this, that the Air feeding the Fire will now be supplied from another Place.

It is therefore proposed, that in order to clear the Holds of Ships of the bad Air therein contained, the two Holes above-mentioned, that is, the Fire-place and Ash-place, be both closed up with substantial and tight Iron Doors; and that a Copper or Leaden Pipe, of sufficient Size, be laid from the Hold into the Ash-place, for the Draught of Air to come in that Way to feed the Fire. And thus it seems plain from what has been already said, that there will be from the Hold a constant Discharge of the Air therein contained; and consequently, that that Air so discharged must be as constantly supplied by fresh Air down the Hatches, or such other Communications as are open into the Hold; whereby

whereby the same must be continually freshened, and it's Air rendered more wholesome, and fit for Respiration.

And if into this principal Pipe so laid into the Hold, other Pipes are let in, communicating respectively either with the Well or lower Decks, it must follow, that Part of the Air consumed in feeding the Fire, must be respectively drawn out of all such Places, to which the Communication shall be so made.

Some Observations upon the same, with critical Remarks upon the Use of Windsails, by William Watson, F. R. S. No. 463, p. 62. Read April 1, 1742.

2. As nothing is more conducive to the Health of the human Body, than taking a sufficient Quantity of wholesome Air into the Lungs, so the contrary is attended with pernicious and often with destructive Consequences.

One of the great Uses of Air in Inspiration is, to cool the Blood passing through the Lungs, where Nature has provided, according to the excellent *Malpighius*, that the Blood should be distributed through a vast Number of exceedingly fine Arteries, which are applied all round the thin Vessels of the Lungs; and by this Means the Blood is exposed to the Air under a prodigious large Surface, whereby the Putrefaction is prevented, which, from the alcalescent Quality of that Fluid, would otherwise be speedily destructive.

Observations inform us, that contagious Distempers are more frequent in hot Climates than cold; and in closely built Cities fully inhabited, than in Towns: The former may, in some Measure, proceed from the too great Heat of the Air, not fully answering the above-mentioned Purposes; and the latter from too many People breathing in the same Atmosphere, thereby rendering it unfit for Respiration.

It has been frequently tried, that if a Gallon of Air be contained in a Bladder, and by Means of a Blow-pipe inspired and expired into the Lungs of a Man, without having any Communication with the external Air; in the Space of a Minute, or little more, it becomes heated, and unfit for Respiration; and without the Addition of fresh Air, the Person would speedily be suffocated. The Diving-bell is another Instance of the same Kind, where a constant Supply of fresh Air must be had, to keep out the Water, and refresh the People included.

Although Air is absolutely necessary to our Existence, and Necessity constrains us inevitably to breathe therein, it may be made a Vehicle of most malignant Poisons, as the famous *Grotto del Cani* in *Italy*; poisoning Air by Charcoal, Air impregnated with the Fumes of fermenting vegetable Liquors, stagnant Air, either alone or mixed with Water, soon becomes pernicious, and very offensive; as in Wells digged for Supply of Water, and disused for some Time; also in the Wells and in the Holds of Ships, where what is usually called the Bulge-water, if the Ship is tight, and the Water not pumped out often, soon becomes so extremely poisonous, as frequently to suffocate those Seamen, who, as the Pumps are subject to be clogged with Filth, venture down to cleanse them; and also to affect Persons at a Distance with violent Head-

achs,

achs, cold Sweats, and frequent Vomitings, which continue more or less, in Proportion to the Distance from the Well of the Ship when the Injury was received, and the Degree of Putrefaction in the Water and Air.

The Air, in Ships particularly, is very liable to be vitiated; not only from the Bulge-water, but from too many People breathing in the same Atmosphere; especially in Ships of War, Hospital-Ships, and those used in the *Guinea-Trade* for *Negroes*, where a Number of uncleanly People, being stowed too close together, heat the Air, make it replete with noxious *Effluvia*, destroy the Particles therein adapted to cool the Lungs, particularly the acid nitrous Gas, which is so abundant in cool Air, and manifests itself not only from the Quantity of nitrous Crystallizations, which may be collected from Caverns of the Earth, especially those open to a Northerly Aspect, but from exposing Pieces of the Flesh of Animals fresh cut, or their Blood, whereby the Colour of their Surfaces are soon changed from a dark deep Red to a more lively and florid one. Air robbed of this valuable Property, and replete with hurtful ones, not only from the People, but from the stinking Water in the Well and lower Parts of the Ship, must produce the most putrid, if not pestilential Fevers.

Although the *Æquilibrium* within Places confined is maintained by the external Air, yet unless, by Openings properly adapted, the Air is suffered to pass freely through, the external Air proves as a Stopple to the internal, and only mixes with the next in Contact; as is evident from the common Occurrence in Privies, which are scarcely offensive in clear Weather, but are much so in foul or windy, from a Diminution of the incumbent Pressure, when the Vapours that have been pent up, expand themselves to a considerable Distance.

To prevent the above-mentioned Inconveniencies, and preserve the Healths and Lives of that valuable Part of the Nation, the Seafaring People, many Schemes have been thought of; particularly the Machines of those two very worthy ingenious and industrious Members of this Society, the Rev. Dr *Hales*, and the Rev. Dr *Desaguliers*; the first by an Instrument which he calls *The Ship's Lungs**, and the latter by a Machine †, which is an Improvement of the *Hessian Bellows*: But as these have been laid before the Society by the Gentlemen themselves, I shall pass them over, and proceed to mention the Contrivance commonly made use of, I mean the Windsails. They are made of the common Sailcloth, and are usually between 25 and 30 Foot long, according to the Size of the Ship, and are of the Form of a Cone ending obtusely: When they are made use of, they are hoisted by Ropes to about two Thirds or more of their Height, with their Basis distended circularly by Hoops, and their Apex hanging downwards in the Hatchways of the Ship; above each of these, one of the common Sails is so disposed,

* See Dr *Hales's* Treatise of Ventilators.

† See these *Transactions*, No. 437.

that the greatest Part of the Air, rushing against it, is directed into the Windfall, and conveyed, as through a Funnel, into the upper Parts of the Body of the Ship. These must be hung up and taken down every Time they are used, and the Supply by this Method is not constant. Though Custom has given a Sanction to this Device, it is subject to many Inconveniencies: *1st*, Each Ship having commonly three of these, (one to each Mast) the Seamen are a considerable Time in getting their Apparatus ready, and hoisting them up, to make use of. *2^{dly}*, They can only be used in mild Weather. *3^{dly}*, Near the Equator, where fresh Air is most wanted, there sometimes happen such stark Calms, that they are useless by not having Air enough to distend them. *4^{thly}*, The Air hereby admitted passes only into the upper and more open Parts of the Ship, so that the Well, &c. receive no Change therefrom; and it is observed, that sometimes, upon using them after some Discontinuance, they drive offensive Air into the Cabin, and more airy Parts of the Ship; like as the pouring some fresh into stinking Water makes more Water stink, though in a less Degree. *5^{thly}*, They are improper to be used in the Night-time, when the People are sleeping between Decks. And, *lastly*, admitting they had none of the former Inconveniencies, their Use must be destructive in Hospital-Ships; where, though fresh Air imperceptibly received is absolutely necessary to preserve the Crew as free as possible from the infectious Breath and Exhalations of the diseased and wounded Seamen, yet Blasts of Wind, pouring impetuously into the very Places where the Sick lie, must be attended with such Consequences as are too obvious to mention.

To remedy these Inconveniencies, to prevent Air proving foul even in the Wells and Holds of Ships, and to cause imperceptibly a large Circulation of fresh Air into every Part of the Ship at all Times, Mr *Sutton* has invented this Scheme, which is useful not only in these Cases, but, by altering some Parts, as particular Places require, may be applied to Houses, close Parts of Prisons, Wells at Land, Privies, Hospitals, &c.

Nothing rarefies Air so considerably as Heat, and whenever it causes a Diminution of the Density of the Air, that Part next in Contact will rush in, and be succeeded by a constant Supply, till the Air becomes of an equal Degree of Elasticity. Therefore, if a Tube be laid in the Well, Hold, or any other Part of the Ship, and the upper Part of this Tube be sufficiently heated to rarefy the impending Column of Air, the *Æquilibrium* will be maintained by the putrid Air from the Bottom, which being drawn out this Way, a Supply of fresh Air from the other Parts of the Ship will succeed in it's Place; which Operation being continued, will entirely change the Air in all the Parts of the Ship. This Principle, exactly conformable to the Doctrine of Pneumatics, is the Basis of Mr *Sutton's* Machine, which being put in Execution on board the *Hulk* at *Deptford*, before the Lords of the Admiralty, Commissioners of the Navy, *M. Folkes*, Esq; *Dr Mead*, &c. performed to their

their Satisfaction, in bringing Air from the Bread-room, Horlop, and Well of the Ship at the same Time, in such Quantity, that large lighted Candles being put to the End of Tubes, the Flame was immediately sucked out as fast as applied, though the End of one of the Tubes was above 20 Yards distant from the Fire. The Method is as follows:

To boil the Provisions of the Ship's Company, they must have a Copper which is bigger or less, in Proportion to the Size of the Ship, and Number of the Crew: This Copper is fixed in Ships in the Manner as on Land, having under it two Holes divided by an Iron Grate. The first Hole, having an Iron Door, is for the Fire; the Ashes from the Grate drop through into the Bottom of the other; the Smoke passes through a Chimney, and is discharged as usual. After the Fire is lighted, it is supported by the Air from the Parts next the Ash-pit; but having, contrary to the usual Custom, adapted an Iron Door, like the former, made very tight, to prevent the Ingress of Air, the Fire would soon be extinguished, if not supplied by some other Aperture; in order to which, one or more Holes are made through the Brickwork in the Side of the Ash-pit; and Tubes of Lead or Copper, fitted closely in the Holes, and made fast, are laid from thence into the Well, and other Parts of the Ship; by which Means the Air next the Bottom of the Tubes rushes through them, and the foul and stinking Air succeeding, is transmitted through the Fire, and passes off, without offending, by Means of the Chimney; and a Supply of fresh Air from the other Parts of the Ship continually fills the Place of the former, the Fire requiring a constant Support, which Support will be wanting, not only during the Continuance of the Fire, but while any Warmth remains in the Fire-place, Copper, or Brickwork, as was observed on board the *Hulk* at *Deptford*, where the Draught of Air through the Tube lasted above 12 Hours after the Fire was taken away. This being considered, as the dressing the Provisions for a Number of People will take up some Hours every Day, the Warmth of the Brickwork and Flues will continue a Draught of Air from one Day to the next. Mr *Sutton* proposes thus to circulate the Air by the same and no greater Expence of Fire than is customarily used for the Necessities of the Ship. The Operation of the Machine will be equally useful in large as small Ships; for the greater the Number of People they have on board, the larger Quantity, and longer Continuance, of the Fire will be necessary to dress the Provision; and therefore there will be required a greater Quantity of Air to support that Fire. The Size and Number of the Tubes need not be specified, because as the Consumption of Air is in Proportion to the Quantity of Fire, the wider the Tube, and greater the Number, the less the Velocity of the Air, and *vice versa*.

I several Times observed in this Machine, when for the Sake of Observation, after the Fire was well lighted, and the lowest Iron Door left open, that the Flame did not ascend so high, or burn so fierce; but

immediately upon shutting thereof, when the Draught of Air was only through the Tubes, the Flame soon recovered it's former Vigour.

There is likewise, especially in large Ships, not only a Copper, but also a Fire-grate like those used in Kitchens: That the Heat and Smoke of this also may not be useless, an Iron Tube may be fixed behind the Grate, and inserted quite through the Brickwork, and through the Deck, so that one End thereof will stand about a Foot, or little more, in the Chimney above the Brickwork, and the other will enter into the Hold, or any Part of the Ship; so that the upper End being heated, the Draught of Air will be supplied from below, as in the other Case. This likewise was tried on board the *Hulk*, with an Iron Tube about 2 $\frac{1}{2}$ Inches in Diameter, and the lighted Candles held at the Bottom of this Tube were extinguished as fast as by any of the other.

It may be objected, that a Number of Tubes take up too much Room, especially in Merchants Ships, and are subject to be broken or injured by loading or unloading: To remedy which, it is adviseable, that only one Tube of a convenient Size be made fast unto the Side of the Ash-pit, and, as soon as it comes through the main Deck, to compress it (a circular or any other Form being equally useful) not too close; and it may be divided into as many Ramifications as may be thought necessary, (especially as the Bread-room, Store-room, &c. cannot be kept too sweet, a Branch for each of these) and these Branches be carried between the Beams which support the Deck, till they come to the Side of the Ship, and there let down likewise between the Beams into the Places intended; by which Contrivance their Operation will not in the least be obstructed, and the Tubes be secured from any Accident.

The Simplicity of this Machine, it being so little cumbersome, it's Operation without any Labour to the Seamen, the small Expence to put it in Execution, and maintain it, besides the before-mentioned Considerations, are other Arguments for it's general Use.

Stockholm, Nov. 1, 1732.

Concerning an Improvement of the Diving-Bell, by Mr Martin Triewald, F. R. S. Captain of Mechanics, and Military Architect to his Swedish Majesty. No. 444. p. 377. Nov. &c. 1736.

LXIV. Having the sole Privilege for diving on all the Coasts in the *Baltic* belonging to his *Swedish Majesty*, no Opportunity has been wanting to make sufficient Trials with the Diving-Bell and Air-Barrels in several Depths, according to the ingenious Improvement of *Dr Halley*, made in the Year 1716, but with some small Additions.

Experience has likewise convinced me, that no Invention built upon any other Principles than those of the *Campana Urinatoria*, can be of Use in any considerable Depths; or that the Diver, in any other Invention whatever, can be a single Moment safe. I will not, for Brevity-sake, mention the many Impediments that attend other Inventions, only that of a Water-Armour, in which the Man is drowned in an Instant, when such a Machine receives the least Leak: Whereas Experience has shewn, that when such an Accident has happened to the

Diving-

Diving-Bell, as to my Knowledge it did once, when the Diver was 12 Fathom under Water, and a pretty large Hole happened to be struck in the Bell, by a Bolt of the Wreck he went upon, at which Time the Air rushed out of the same with such Violence as astonished the Beholders by the excessive boiling on the Surface of the Water, fearing, not without Reason, that the Man in the Bell was drowned; but he clapped his Hand to the Hole or Leak, and gave a Sign to be hauled up, which was done with all the Ease and Safety as if no Accident had happened to him, the Water having only risen about $\frac{1}{2}$ a Foot into the Bell by this Leak.

The very same Diver that was then in the Bell is 63 Years of Age, and has used the Business of Diving ever since he was 20, in a common Diving-Bell, till of late, and is as yet a pretty strong and healthy Man: He declares that never a worse Accident happened to him in his Business but once, when the Bell he was in rushed down at once about a Fathom or more, by the Carelessness of those that worked the Bell; at which Time the Blood came out of his Nose and Ears, feeling besides an intolerable Pressure on his whole Body; which shews, that when a Man in a Diving-Bell is slowly and gradually let down, he at such a Time and by Degrees respiring compressed Air, which by the Lungs is forced into the Blood, cannot feel the external Pressure, though of highly compressed Air, surrounding him, and that of the Water reaching some Parts of his Body, which Convenience no other Invention can yield or afford, where the Diver is to draw his Breath from Air in it's natural State.

I have often with a great deal of Pleasure observed, that when I have caused the Bell to stop, being lowered down 5 Fathom, and the Diver taking in the Air contained in an Air-Barrel, lowered down a Fathom deeper than the Bell, without opening the Cock for discharging the hot Air; the Water would, by the Access of the Air out of the Barrel, be quite, or to a very small Matter, expelled out of the Bell; and when the same was again lowered down 5 Fathom more, the same Operation with another Air-Barrel repeated, and the Bell afterwards hauled up, it was no small Matter of Delight to see, that every Fathom the Bell came up, it would discharge itself of the superfluous and large Quantity of Air, which came up from the Bottom of the Bell in very large Bubbles, as big as Eggs of an *Ostrich*; which Discharge of Air and Phænomenon continued, till the Equilibrium of the Air in the Bell, and Pressure of the Water, was restored, and till the Bell came above the Surface of the Water.

At other Times I have observed, when no Air was by the Way taken into the Bell, but the same lowered down the common Way, and hauled up again after some Time, that the very Instant when the Bell should part with the Surface of the Water, the Strength of two Men more was required at the Capston at that Time, than before and after the Bell hung freely in the Air; from whence I presume it plainly

appears, that the Air which passes through the Lungs of a living Creature, loses it's Elasticity, and that the Lungs of a Man make a Kind of a Vacuum in the Bell; for which Reason the Diver feels at the very Instant, when the Bell parts with the Water, a very smart Pressure his in Ears.

Though Experience thus has taught me, that no Invention is more safe and useful than the *Campana Urinatoria*, with the ingenious Improvements of Dr *Halley*; yet I have likewise found, that this Invention is not to be made use of without considerable Charge, requiring a large Vessel, and Number of Hands, to the working and managing of such a large Diving-Bell, and the Air-Barrels with their respective Weights for sinking; which Charges, however, according to the Depth of Water, and the Value of what is to be fetched up from the Bottom of the Sea, may not be regarded: But since it more frequently happens in these Parts, that Cargoes of a far less Value than the Loadings of *Spanish Galleons*, &c. are to be dived for; then next to the Goodness of the Invention, I have found myself necessitated to think how the Expences might be lessened, and that the Diving-Bell nevertheless might answer all Intents and Purposes of Dr *Halley's*; which Improvement is as follows:

Fig. 42:

The Diving-Bell, A B, I have caused to be made of Copper, and reduced the same to a very little Compass in regard to that of Dr *Halley's*, as you will see by the Scale under the Draught, by which Means it is easily managed by two Hands: Yet I presume that a Diver may not only live in the same for as long a Time, and with as much Ease, at a very considerable Depth of Water, as in a Bell of twice it's Capacity, for this Reason, though a Man in a large Bell has undoubtedly more Air than in a less, and consequently should be able to subsist a great while longer on a large Quantity of Air, than on a small Parcel; yet because his Head for the most Part is kept in the upper Part of the Bell, where the hot Air takes up it's Place and Residence, he receives very little or no Benefit of the Air under his Chin or Breast, though never so fit for Respiration; which Air nevertheless in the lower Parts of the Bell will remain cool a long Time after he has been in the Bell, and with Difficulty drawn his Breath; which cannot be denied, and is very obvious to any body who has been in a *German Bagnio*, and such as are made use of in this Country, where in a single Room all the Degrees of Heat are to be felt, by Means of a Contrivance like Stairs to the very Top of the Ceiling, a Man when he places himself on the uppermost Step will feel an excessive Heat, so that any body not very much used to it cannot endure the same, nor draw his Breath, but will faint away; whereas on the first, second, and third Steps from the Floor, the Heat is very moderate; nay, sometimes the Air near the Floor pretty cool, when at the same Time near the Ceiling the Heat of the same is intolerable. I will not mention many other Instances I could produce.

To encounter this Inconvenience I have caused a spiral Tube of Copper, b, c, to be placed close to the Inside of the Bell, so fixed that the same may be taken out and cleansed at Pleasure, and with Ease; and at the same Time not to incumber the Diver when he is in the Bell; at the upper End of this Tube b, a flexible Leather Tube is joined 2 Foot long, at the End of which is a turned Ivory Mouth-piece, which the Diver (as soon as he perceives the Air to grow hot in the Top of the Bell) keeps constantly in his Mouth, which he is able to do by Means of the flexible Tube in whatever Posture he is in, standing, sitting, bowing his Head, &c. And all the while he draws his Breath through the aforementioned Tube, and the Air from c; by which Contrivance he not only draws continually cool and fresh Air as long as any is in the Bell, but occasions at the same Time a Circulation, which is so necessary to the very Being of Air, (especially in a compressed State) and it's Preservation for the use of Animals, which I have found to be of great Consequence; and so much the more necessary, as any body who has been in a Diving-Bell for a long Time, without any new Supplies of Air, and has been reduced to the last Extremity of breathing in the same, will agree with me, that when at such a Time the Bell begins to be hauled up, and by that Means the compressed Air allowed to expand and be put into Motion never so little, the Man receives, as it were, a new Life, and incredible Comfort and Ease.

Again, when, in Coal-pits, Levels are driven in the Coal or through Dykes, the Air of the Level or Adits growing hot by the Breath and Sweat of the Hewers and Workmen for want of a Circulation of the Air; I have found it to be an excellent Remedy, to place along the Side of the Drift or Adit, a square wooden Box, open at both Ends, laid from the Place where the Air is cool and good, reaching as far, by joining one Box close to another, as where the Work is carried on. Thus, by this simple Contrivance, a Circulation of Air is obtained, and sometimes to that Degree, that when a Candle is held at the End of the Box where the cool Air enters, the Flame is driven out by the Current of cold Air entring and circulating through the Box.

By which Experiment I am apt to think, that though the Diver should not keep the End of the flexible Tube in his Mouth, which he may do with all the Ease in the World, yet that the Air would circulate through the Copper Tube, and he receive no small Benefit by it. D D D D are the Weights for sinking the Bell, so contrived as with great Ease to be hooked on the same hanging on the Cable. The Iron Plate E, fixed to the Chains F F F, serves the Diver to stand upon when he is at work.

The Bell is extremely well tinned within all over; and as in all Rivers, and the Coasts of the *Baltic Sea*, the Water is extremely clear and bright, because of no Ebb and Flood, I have placed three strong convex Lenses G G G. By these Means the Diver cannot only see what is under him, but likewise on all Sides at a good Distance.

These

These Glasses have strong Copper Lids like Snuff-boxes, HHH; which Lids are shut, when there is no Occasion to discover any Objects on the Bottom of the Sea, and serve to preserve the Glasses from being broken.

A Narrative of a new Invention of expanding Fluids, by their being conveyed into certain ignified Vessels, where they are immediately rarefied into an elastic impelling Force, sufficient to give Motion to Hydraulopneumatical and other Engines, for raising Water, and other Uses, &c. by John Payne. No. 461. p. 821. Aug. &c. 1741.

Fig. 44.

LXV. To produce a great Power at a small Expence, is what every body desires in moving Machinery; and is what, by this new Invention, we have proved by Experiments and Practice to be a great Improvement, when applied to that noble Invention the *Fire-Engine*: Therefore I shall proceed to give a short Description of the Vessels and Machinery contrived for that Purpose, *viz.*

A Pot or Vessel made of wrought or cast Iron, nearly the Figure of a Cone, whose Diameter at the Base is 4 Feet, with Holes round the Edge for Nails or Screws to fasten a globular Head of Copper of about 5 $\frac{1}{2}$ Feet Diameter. There is then placed in the Inside a small Vessel or Machine, which I call a Disperfer: This Bason or Vessel hath Spouts round the Sides fixed to it, and the Bottom thereof resteth on a Centre-pin; and in the Middle of this Bason or Vessel is a Socket, with Holes near the Bottom, to let the Water or Fluids pass from above, through an Iron Pipe of about 7 Feet long, the lower End of which is placed in the Socket, so as the End of the Pipe will be always immersed in Water in the Bason, to prevent the expanded Fluids from returning up the Pipe; and the other End of this Pipe goes up through the Copper-head, which is inclosed very tight, but so as it may easily be moved with a circular Motion, in order that the Water or other Fluid, which is conveyed through this Iron Pipe down into the Disperfer, may be dispersed or showered round, on the Sides of the red-hot Pan, or ignified Vessel, in a very exact Manner.

This evaporating Vessel being thus completed, we then take 1, 2, or more of these Vessels, with these Contingencies, and place it or them in a reverberatory Arch or Canal, for conveying the intense Heat of a strong Fire, the Flame of which encompasses the Metal-Pot or Pots, and brings them to a red Heat; and in that Condition they are continually kept, while in Use, with the Water running from a Cistern or Vessel (where the Water is heated) through a Gauge-cock down the Iron Pipe into the Disperfer, which conveys it to the Sides of the ignified Vessel or Pot, when it is immediately rarefied or expanded into an elastic Steam or Vapour, fit for Application to give Motion to sundry Sorts of Machinery, &c.

Fig. 43.

- A, A Globe made of Copper, 12 Inches Diameter.
- B B, Two Brass Cocks, one opposite to the other, fitted very tight.
- C, A Handle or Bale, fastened to the Globe, by which it may be hung or held up.
- D, A small Valve, or Clack, fitted to the upper Cock, of one Inch Diameter.

The

The whole thus fitted, weighed 15 Pounds 3 Ounces *Troy*, or 12 Pounds 9 Ounces $\frac{1}{2}$ *Avoirdupois*; and, filled with Water, it weighed 45 Pounds 7 Ounces, from which deduct the Metal, the Weight of Water is 32 Pounds 13 Ounces $\frac{1}{2}$ *Avoirdupois*, which is about 4 Gallons, containing about 925 cubical Inches.

This Vessel or Globe I then hung over the large Vessel F, in which Water was rarefied or converted into Steam; and by the Pipe E, at the large Cock G, which being open, as also the other Cocks B B, the Steam had a free Passage through the Globe A, by which the Steam excluded or forced out the Air that was in the Globe, and by it's elastic Quality supplied it's Place; when both Cocks B B were suddenly shut, and the Globe A taken down and hung over a Vessel of cold Water, with the lower Cock B, immersed in Water, and then opened under Water; on which the Water rushed into the Globe very furiously, until it had supplied the *Vacuum*, when the Cock was again shut, and the Globe, with the Water, put in the Scales, and then found to weigh 44 Pounds 9 Ounces; which take from 45 Pounds 7 Ounces, the whole Weight, as before, there remains but 14 Ounces, the Difference, which sheweth that all the Air was nearly excluded out of the Globe by the Steam: In Ounces it stands thus, $\frac{727}{713}$, which is very near a perfect *Vacuum*.

I again excluded the Air out of the Globe with Steam as before, and both Cocks B B being closed with the Globe full of Steam, we put the Globe in the Scales, and it weighed 12 Pounds 10 Ounces $\frac{1}{2}$. I then opened one of the Cocks, and let in the Air, on which the Scale descended; and, by adding Weight in the other Scale, it was found to weigh 12 Pounds 11 Ounces; which shewed that the Weight (not the Pressure) of the Air the Globe contained, was $\frac{1}{2}$ an Ounce *Avoirdupois*.

The Globe being filled with Steam as before, and condensed with cold Water on the Outside of the Globe, and the Metal again made very dry, and the Air let into the Globe, the Water from the condensed Steam was found to weigh 4 Penny-weight.

The Globe filled with Steam as before, only now I continued the Globe longer with the Steam passing through it, by which it acquired a greater Degree of Heat; for I found by those Experiments, that the least Degree of Cold less than the Steam, a Part would be condensed again into Water, by which the Quantity could not be certainly attained to, that would exclude the Air out of a certain Space, which is the chief End of this Experiment. But in this Experiment I succeeded better; for, on weighing the Globe, when the Steam was condensed, the Air let in, and all cold, it was as followeth, *viz.* 15 Pounds 3 Ounces 2 Penny-weights *Troy*, the Weight without the Steam being 15 Pounds 3 Ounces; so that the Weight of the Water condensed from the Steam, or the Water converted into a strong elastic Steam to fill the Space of this little Globe, is but 2 Penny-weights, or $\frac{1}{10}$ of an Ounce

One Ounce Troy of Water, by which $\frac{1}{15}$ of an Ounce Troy of Water fills, when converted into Steam, 925 cubical Inches of Space in a Vessel, so as to exclude nearly all the Air. I repeated this Experiment several Times, and found it nearly the same; and by immersing the Cock in Water, and opening it again, as in the first Experiment, I found the Weight of Water to be nearly as above, and to make about $\frac{15}{16}$ Void or *Vacuum*; so that 1 Ounce Troy of Water makes 9250 Cube-Inches of Steam, of equal Force with the like Number of Inches of Air; and with this Remark, that the Weight of the Steam is much less than the Weight of common Air; for in this Globe I found the Air to weigh $\frac{1}{2}$ Ounce *Avoirdupois*, or 9 Penny-weight *Troy*; and the Steam, which filled the same Space, to weigh but 2 Penny-weight *Troy*, which is but little more than $\frac{1}{3}$ th Part, and shews how very small the Particles of Water are when so divided by the Force of Fire, and of what Force. From which I shall conclude, that 1 cubic Inch of Water will discharge or force out 4000 Inches of Air from a Vessel of that Content, which I have likewise proved by other Experiments in working the Fire-Engine: Therefore I shall make it my Standard in some future Calculations for Practice, about that noble Machine.

I proceeded, as before, with Steam in the Globe A; and condensed it, as in the third Experiment; and then tried the Pressure of the Atmosphere on the Clack or Valve D, and found it required about 10 lb *Troy*, to lift the Clack from it's Tube of 1 Inch Diameter; but in this I was not exact with small Weights.

I excluded the Air with the Steam, and in Place of the Clack I screwed on very tight a Plate, on which I placed a Glass Receiver, as usual, with the Air-Pump; and then, turning the Cock, the Air under the Glass Receiver expanded itself into the Globe, by which I had equally a Share of the *Vacuum* partly made in the Globe, and could thereby make many Experiments that are made with the Air-Pump, &c. which I mention only, that some curious Gentlemen may hereafter make some further Observations by the like Experiments.

Observations
from Experi-
ments made by
J. Payne.

1. That a Pot or Vessel, of the Size and Shape here mentioned, will (being kept to a dark-red Heat, and the Water regularly dispersed) rarefy or expand 50 Gallons of Water, Wine-Measure, *per Hour*.

2. That a Cube-Inch of Water will make in Practice 4000 Inches of Steam; or that the elastic Steam of one Cube-Inch of Water is sufficient to exclude the Air out of a Vessel that is in Content 4000 Inches.

3. That the above 50 Gallons will produce 46,000,000 Cube-Inches of elastic Steam *per Hour*, which is *per Minute* 770,000.

4. That the second Pot or Vessel, as in the Draught TAB. VI. Fig. 2, will rarefy or expand 40 Gallons of Water, Wine-Masure, *per Hour*, and will produce 36,960,000 Cube-Inches of elastic Steam *per Hour*, which is *per Minute* 616,000 Inches.

5. That

5. That both being united together make 1,386,000 Cube-Inches of Steam every Minute, from 346 Inches of Water.

6. That, by an Experiment made at a Fire-Engine, 40 Gallons of Water *per* Hour, made into elastic Steam in this Method, will effectually give Motion to a 24 Inch Cylinder *Fire-Engine*.

7. That, by true Experiments made at *Wedgbury* and *Newcastle on Tyne*, one hundred Weight, containing 112 lb of Pit-coals, will and is sufficient in this Method to expand or rarefy 90 Gallons of Water *per* Hour into an elastic Steam or Vapour.

8. That, by the best Accounts and Observations I could get and make, they consume under their Boilers to make the same Quantity of Steam, 300 Weight of Pit-coal, at 112 lb to the 100, in working a *Fire-Engine* one Hour.

9. That 95 Gallons of Water *per* Hour, expanded or rarefied into Steam, will work a 36 Inch Cylinder Engine.

10. From these Observations I conclude, that this new Invention will save at least 60 *per Cent.* in Pit-coals to work a *Fire-Engine*.

A, A, *The two Pots.*

B, B, *The two Copper Heads or Globes.*

C, C, *The two sinking Pipes, for waste Water, that is not evaporated.*

D, D, *Clacks or Valves to keep out the Air.*

E, E, *The two Dispersers and Spouts.*

F, F, *The Stools with a Centre-pin, on which the Disperser resteth.*

G, G, *The two Iron Pipes, in which the Water is conveyed to the Cistern.*

H, *A Cistern of hot Water.*

I, I, *Two Cog-wheels to turn the Disperser.*

K, *A Steam-pipe, in which is conveyed the Steam to the Cylinder.*

L, *The Cylinder of the Fire-Engine.*

M, M, *Leaden Pipes that convey hot Water from the Cistern in the Disperser.*

Fig. 43.

CHAP. II.

HYDROLOGY.

I. **MALHOLM** is a pretty Country Village, situated on the Southern Side of a monstrous high Hill, the Ascent of which is not very steep. By a Break between this Hill and another, which are joined by a Rock, which measures 82 Yards perpendicular, and seems to be about $\frac{1}{4}$ of the Height of the Hill, I conclude the Hill to be about 120 Yards perpendicular. On the Top of this Rock there still remains

A Description of a large Lake called Malholm Tarn, near Skipton in Craven, in the County of York, by

John Fuller,
Esq; jun.
F. R. S. No.
459. p. 612.
Jan. 5. 1741.

remains the Appearance of a Channel for 2 or 300 Yards together, which, by it's having no Mould or Earth to cover it, I judge to have been a Passage for that Water, which formerly used to tumble over the Precipice, but now has found a Passage under-ground, and flows out at the Bottom of the Rock, being now called *Air-Head*, viz. the Head of the River *Air*. The Rock is called *Malholm Cove*.

Between the Top of this Mountain and the Tops of four others, is *Malholm Tarn* *. (I say the Tops of them, for though they steep a Quarter of a Mile towards the Lake from their Tops, it is at a Mile and an half down to the flat Country on the Outside.) This Lake is between 3 or 400 Acres. The Shape of it is a Parallelogram, the Length of which equals about twice the Breadth: There are no Weeds in it. In a fine still Day, you may see the white chalky Bottom, where it is 10 or 12 Foot deep. I wonder *Camden* takes no Notice of this Lake, for it must have been there in his Time, and he must have been very near it; for he describes a Precipice, which I am pretty certain is the Northern Side of one of those very Hills which help to form *Malholm Tarn*. There are but 2 visible Springs that supply it with Water, one lies E. the other N W; and by what I could guess, there are only these 2 Springs; for the Discharge seems to be no greater than what these Springs supply.

The superfluous Water of this Lake is discharged by a gliding Stream, about 4 Feet broad, and 2 or 3 Inches deep; which runs above-ground about 2 or 300 Yards, and then dips under-ground at two different Places about 10 Yards distant from one another. What becomes of these Streams after their dipping, (though the Relation appears somewhat fabulous, yet) as it is affirmed by all the Men of Credit in the Neighbourhood, I could not help believing it. About a Mile below *Malholm* Village there are 2 Springs that discharge themselves into the River *Air* about 10 Yards distant from one another, one somewhat greater than the other. The Neighbours assured me, that if Wheat-chaff was put into either of the Rivulets at the Place of their dipping, in about 8 Hours Time it would come out at the greater or lesser Spring, and not out of both, into the River *Air*, which is from the Place of their first dipping about 2 $\frac{1}{2}$ Miles. By this it appears, that these 2 Rivulets never communicate in their subterraneous Passage.

The *Tarn* abounds with only 2 Sorts of Fish, *Trouts* and *Perch*: The *Trouts* very large and red; the *Perch* far exceed in Size and Goodness any I have ever seen, being commonly 20 Inches long, weighing 4 or 5 Pounds. They are taken only with Hooks, it being so deep and stony, that you cannot draw a Net: The only Bait for them is an Earth-worm; the rocky Soil, and the Springs coming so little a Way, affording them very little of that Sort of Food.

II. Mar. 8, 172 $\frac{1}{2}$, the Tide flowed 20 Foot 5 $\frac{1}{2}$ Inches, as I took it by a Level from that High Water Mark to Low Water the next Morn-

A High Tide
in the River
Thames, on

* A Saxon Word for a Lake.

Fig. 41.

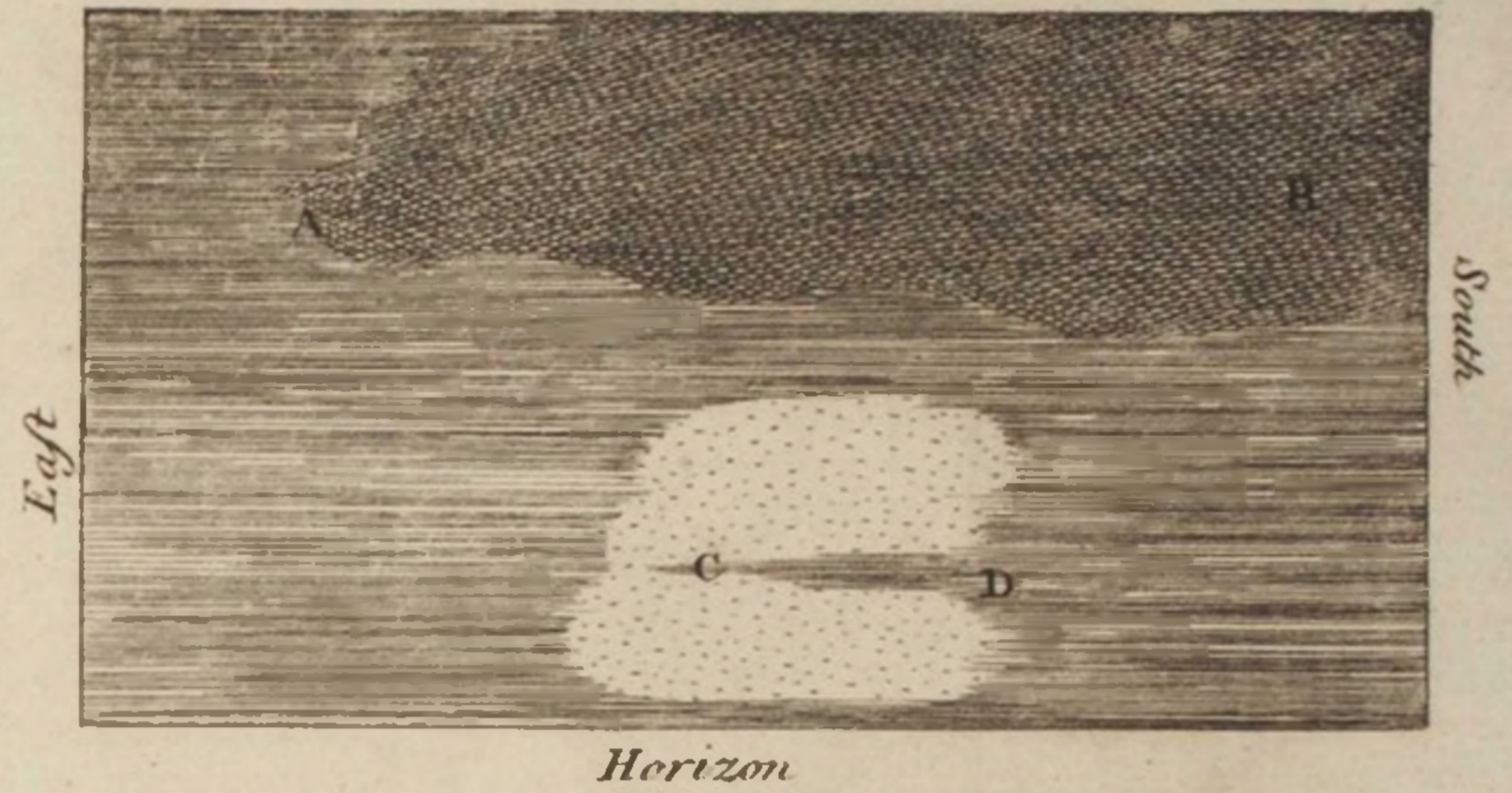
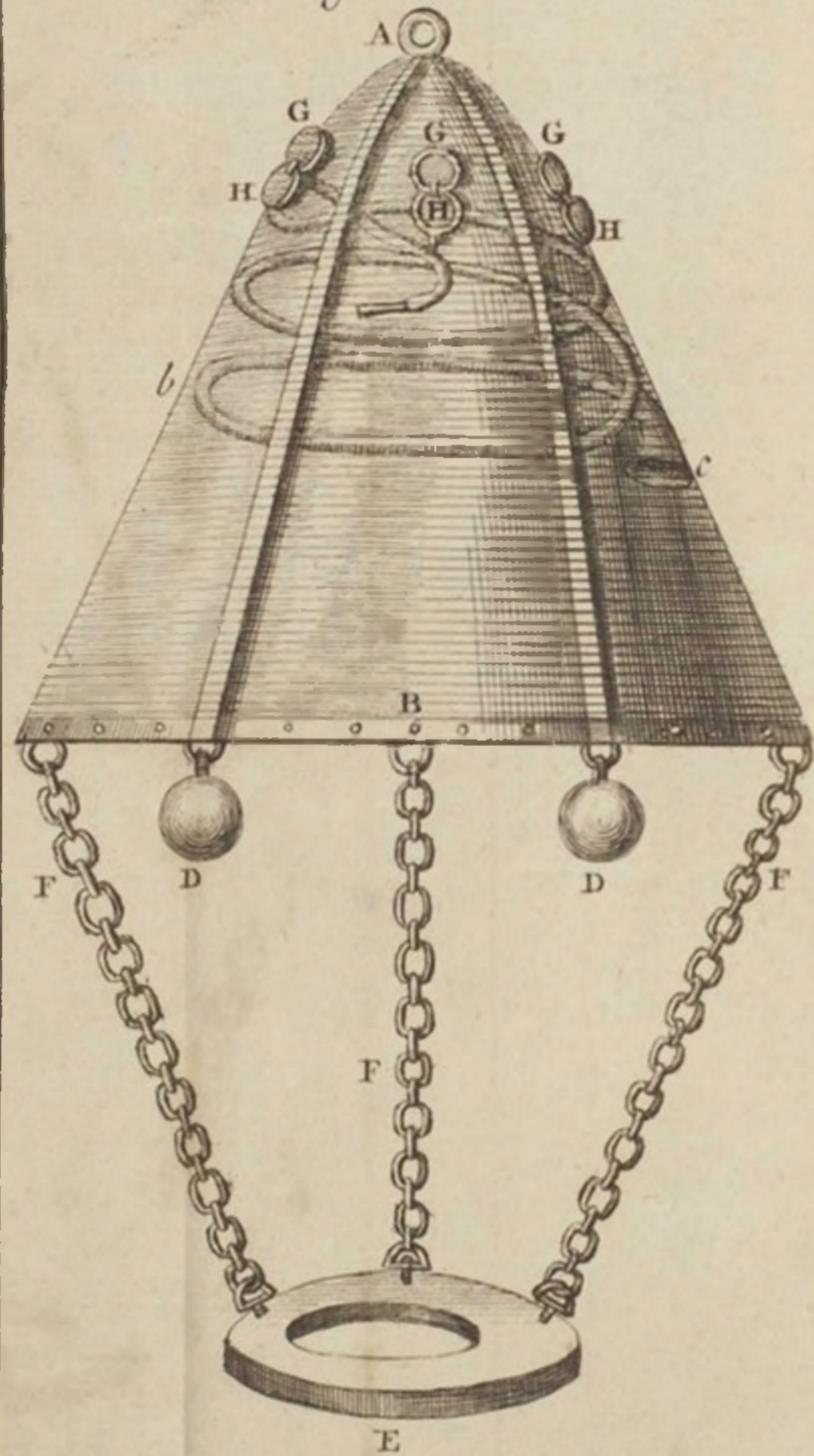


Fig. 42.



A Scale of 4 English feet for Figure 42.

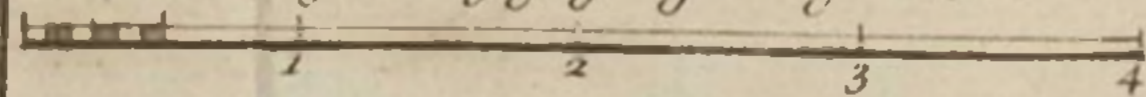


Fig. 44.

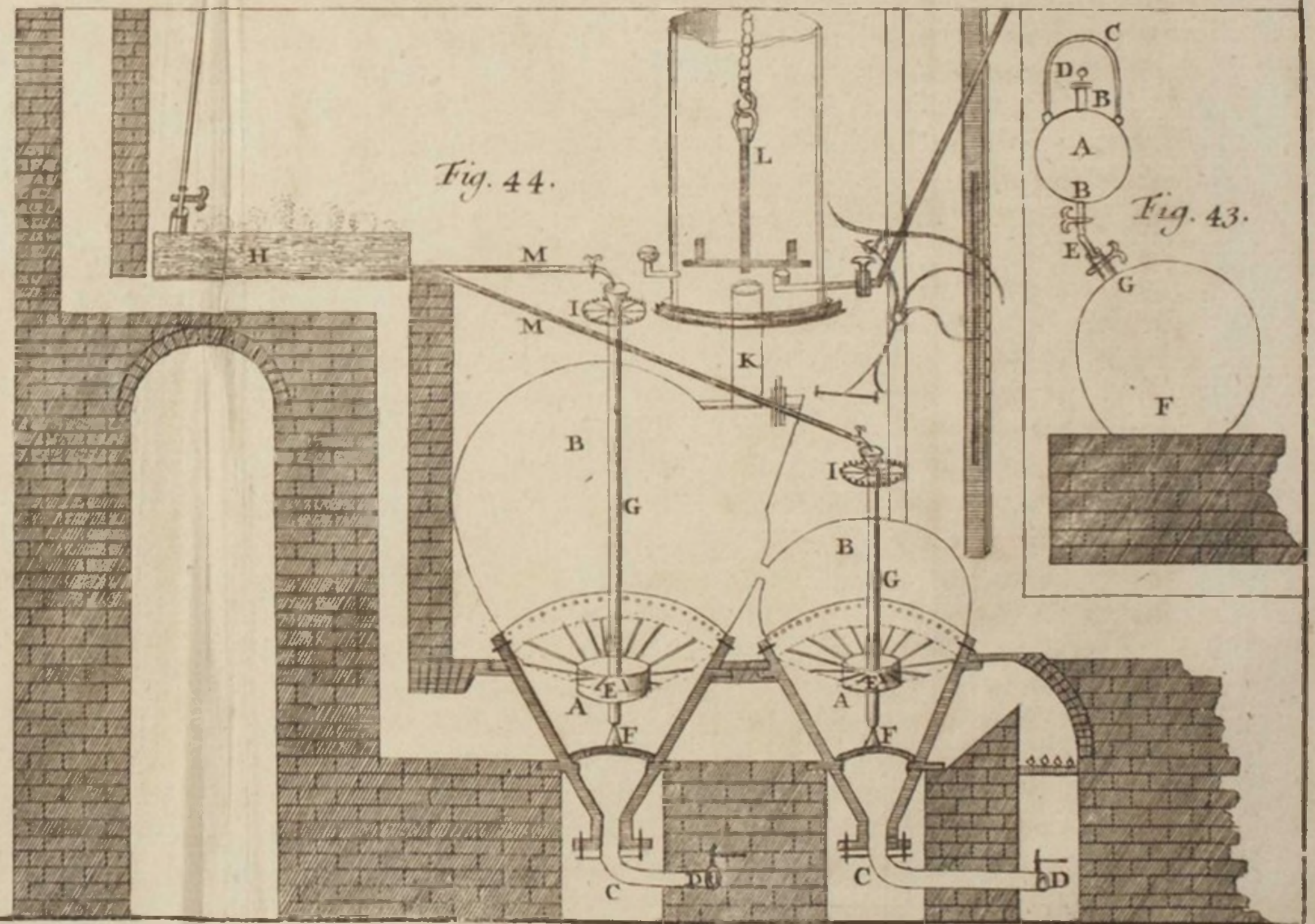
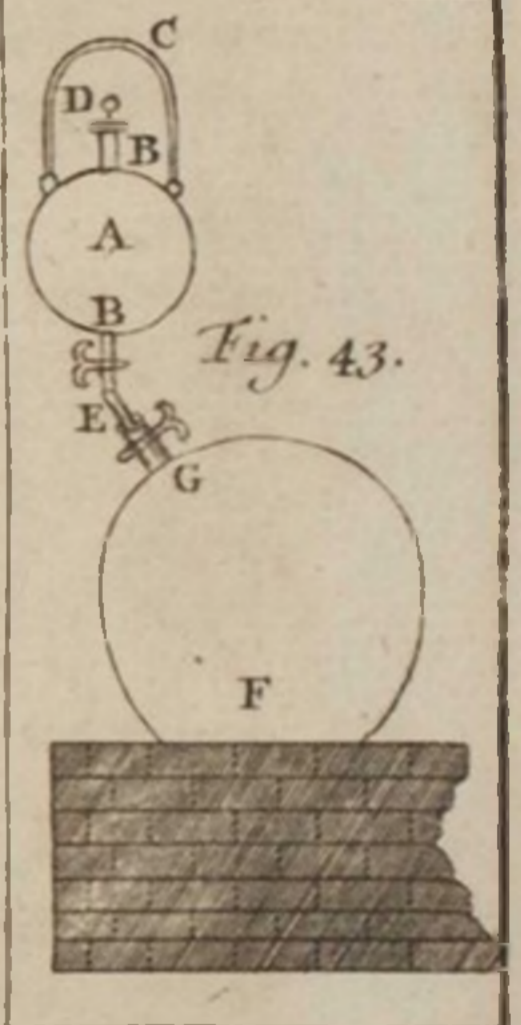
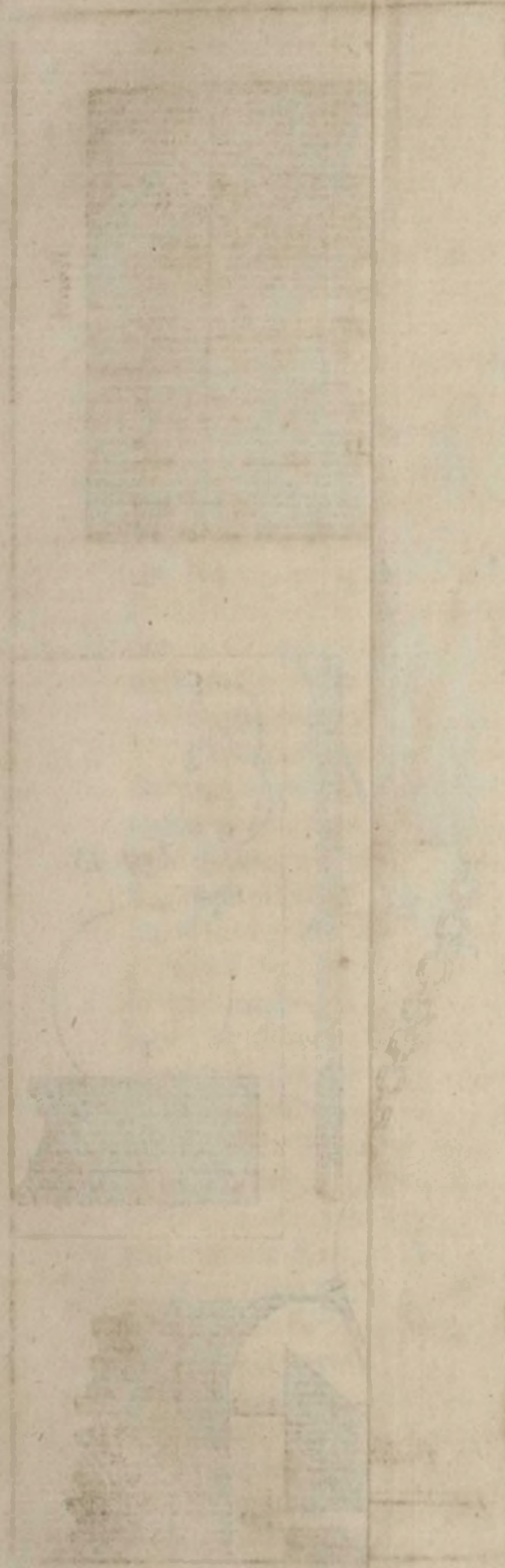


Fig. 43.





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ing, and was 4 Inches higher than had been known for 40 Years before.

But on Feb. 16, 173^t, the Tide rose at the same Place 6 $\frac{1}{2}$ Inches above that Mark, and flowed near 2 Foot the last half Hour but one before High Water.

New Crane, Feb. 17, 1735-6.

N. B. If the Tide had flowed it's full Time, it would have flowed half an Hour longer, and had drowned the whole Level.

III. Dr *Hales*, in his learned Paper lately read at the *Royal Society*, wherein he proposes a Method of rendering Sea-Water fresh, and wholesome to drink, mentions a Diversity of Saltness of the Water at the *Nore* in the Mouth of the *Thames*, and the Water taken up in the *Mediterranean Sea*, this containing $\frac{1}{2}$ of Salt, the former $\frac{1}{20}$. Mr *Boyle*, in his Observations of the Saltness of the Sea, p. 4, saith, that about *Holland* the Salt in the Sea-Water hath been found to be $\frac{1}{4}$. In the *English Channel*, p. 31, he found Sea-Water $\frac{1}{3}$ heavier than Conduit-Water; and, by immersing a Lump of Sulphur in it, he found the Difference $\frac{1}{33}$; but by Distillation *ad siccitatem*, p. 33, he found the Salt to be $\frac{1}{30}$, and in another Trial $\frac{1}{27}$. It is certain the Sea differs in Saltness in different Parts: It is in general observed, that in hottest Climates the Water is the saltest. At *Mosambique* Mr *Boyle*, *ib.* p. 29, relates an Instance of a Ship drawing two Hands-breadth less Water than usual. On the contrary, when Salt-Water freezes, it hath been thought to let fall all it's Salt; the Ice of Sea-Water, and the Water melted from it, tasting fresh, and being good for boiling Meat and Pease in: Capt. *Middleton*, being in *Hudson's Streights* in July 1738, took Ice from under the Surface of the Sea, which he melted till he got 40 Quarts of Water, which he evaporated to Dryness, and out of that Quantity had only six Ounces of Salt, or about $\frac{1}{213}$.

IV. Exp. 1. Upon steeping or infusing some Scrapings of Gall in it, (after standing a long Time) it turned of a bright Purple Colour.

Exp. 2. Upon the Instillation of *Ol. Tartari per Deliq.* it immediately became troubled or muddy, and seemed as if Goblets of Fat were fluctuating in it. This unctuous Matter, upon long standing in Repose, came gradually into closer Contact, and at last subsided.

Exp. 3. Upon the Instillation of *Spirit of Vitriol*, it deposited a Milk-white greasy Sediment; which, after 12 Hours Repose, occupied $\frac{1}{3}$ Part of the Vehicle or Liquor.

Exp. 4. Being mixed with a Solution of *Saccharum Saturni*, it let fall a small Quantity of a greyish Powder.

Exp. 5. Being severally and separately mixed with Solution of Sublimate, with *Sp. Sal. Armoniac.* and with Sugar of Violets; it neither fermented, deposited any Sediment, grew turbid, nor changed Colour; except only from the Sugar of Violets, which turned it of a dark Green.

Feb. 16,
1735-6, by
Mr Thomas
Jones. No.
440. p. 198.
Jan &c.
1736.

An Examination of Sea-Water frozen and melted again, to try what Quantity of Salt is contained in such Ice, made in Hudson's Streights by Capt. Christopher Middleton, F. R. S. at the Request of C. Mortimer, R. S. Secr. No. 461. p. 806. Aug. &c. 1741.

Experiments, by Way of Analysis, upon the Water of the Dead Sea; upon the hot Spring near Tiberiades; and upon the Hammam Pharoan Water; by Charles Perry, M. D. made on his Journey thro' the Holy Land, &c No. 462. p. 48. Read Feb. 25. 1741-2.



Experiments by Way of Analysis on several Waters.

Observations. This Water is highly saturated with Salt, insomuch that any Measure of it preponderates fresh Water under equal Surfaces, in the *Ratio* of 5 to 4.

It has also a wonderful Acrity, insomuch that being held in the Mouth for a short Time, it constringes it in like Manner as Alum does.

I cannot (from the above *Experiments*, and the Appearances which resulted from them) conclude, that this Water is impregnated with any Thing more than mere Salt, which is of a very acrid, alkaline Nature; and something else, which may be of a compound Nature, partly sulphureous, and partly bituminous. But, to speak negatively, it may be presumed, I think, that it neither partakes of Steel, Alum, nor Vitriol, nor yet of a pure, genuine Sulphur: And, consequently, as I take it, can afford no other, nor better Effects, to such as may bathe in it, than other Sea-Water; except only, that it's greater Degree of Salt, and superior Weight, may somewhat heighten the same Effects.

*Experiments
(by Way of A-
nalysis) upon
the hot Spring-
Water near
Tiberiades.*

Exp. 1. Oil of *Tartar. per Deliq.* ℥ss, being mixed with ℥iiss of the Water, it became troubled and muddy; and after standing 12 Hours in Repose, $\frac{1}{4}$ of the whole, from the Bottom upwards, appeared like white Wool: But this woolly Water, being separated by Filtration, and left to dry, seemed no other than a yellowish Oker.

Exp. 2. I mixed ℥ss *Sp. Vitriol* with ℥iiss of the Water, and, after 12 Hours standing still, I found a large Sediment of a white unctuous Matter.

Exp. 3. Solution of *Sublimate* ℥ss being mixed ℥iiss of the Water, it became turbid and yellowish, and yielded an earthy Sediment in small Quantity; whence I conclude it contains a *Sal murale*.

Exp. 4. One Ounce and half of the Water, mixed with ℥ss of a Solution of *Sacch. Saturni*, deposited a greyish Sediment of a lateritious Matter, in small Quantity.

Exp. 5. One Ounce and half of the Water, mixed with ℥ss *Sp. Sal. Armoniac*, turned turbid, of a Colour betwixt Green and Blue; and after 12 Hours Repose, yielded a woolly Sediment of four Digits deep.

Exp. 6. One Ounce and half of the Water, mixed with ℥ss *Sacch. Violar.* became troubled, and of a dark-yellowish Colour.

Exp. 7. One Ounce and half mixed with ℥ss of Scrapings of Galk, became of a fine Violet Colour; but when shook, was as deep as Ink.

Observations. This Water (as appears to my Judgment) contains a good deal of a gross fixed Vitriol, some Alum, and a mural Salt of a limy Quality.

'Tis too salt and nauseous for internal Use; but by bathing in it, must be good for all cutaneous Distempers, and especially for the Scurvy and Leprosy: For it will powerfully deterge, scour, and clean the excretory Pores; and it may, by it's Weight and *Stimulus*, restore them to their natural State, Strength, and Elasticity. It may, by the same Means, restore the lost or impaired Tone of the Solids in general: In Consequence of which it may thin the Blood, help it's Circulation, and promote

promote

promote the natural Digestions and Secretions; and thus, finally, it may be useful in Rheumatisms, Dropsies, Jaundices, and nephritic Diseases.

Exp. 1. This Water being mixed with the Scrapings of Gall, manifested no sensible Change at first; but after long standing it grew somewhat greenish.

Exp. 2. Upon the Instillation of *Sp. Sal. Armoniac.* it became turbid; and on standing some Time in Repose, deposited a dark-greyish Powder, in small Quantity.

Exp. 3. Four Ounces of the Water, being mixed with *Ziss Saccb. Violar.* manifested no Change, except what would necessarily result from the Tincture of Violets.

Exp. 4. Being mixed with a Solution of *Sacch. Saturni*, it became immediately very turbid; but on standing some Time in Repose, it deposited a large dark-brown Sediment, leaving the Vehicle troubled and whitish.

Exp. 5. I mixed a Solution of *Sublimate* with it, upon which it became immediately yellow; but, after standing at Rest, it deposited a woolly unctuous Matter, in small Quantity.

Exp. 6. Being mixed with *Ol. Tartari per Deliq.* it became of a chyly Colour and Substance, or of a turbid pearly Colour.

Exp. 7. Being mixed with *Spirit of Vitriol*, it manifested no Change, either of Colour or Transparency.

Observation. I conclude from the *Phænomena* which appeared upon Analysis, that this Water is impregnated with a good deal of a gross earthy Sulphur, a neutral Salt, a small Quantity of Alum, but no Proportion of Vitriol.

This cannot be used inwardly, it being nauseous beyond Expression: It smells somewhat like rotten Eggs, but much worse. But, used by Way of Bath, it may cleanse the Skin of all Foulnesses, purge and deterge the cutaneous Glands from all foul noxious Humours: It may reinforce the natural Heat and Vigour, (where they are decayed) and may restore the impaired Digestion: And hence, finally, it may promote Virility in Men, and Fecundity in Women. It may likewise be useful in the Gout; as also in Epilepsies, and other Diseases of the nervous Class.

V. The *Newbausel*, commonly called *Cement-Waszser*, Waters are well known by the Learned. *Kircher* in his *Mundus subterraneus* *, *Dr Edward Brown*, in his *Travels* †, and *Jacobus Tollius*, in his *Epistolæ Itinerariæ* ‡, have mentioned them, not to speak of other less-considerable Writers.

They rise a Mile from *Newbausel*, in that vast Copper-Mine, which is known by the Name of *Herrn Grund*. We have no Knowledge of the Discovery of them, but from the Traditions of the Vulgar. That they

Analysis of the Hammam Pharoan Water, near Corromondel, on the Way to Mount Sinai.

Of the Cement-Waszser Waters in Hungary, by Matthias Bellius, F. R. S. and Collegue of the R. S. of Sciences at Berlin. No. 450. p. 351. Oct. 1738.

* Tom. II. p. 185.

† P. 186.

‡ P. 191.

were not famous in the time of *George Agricola*, we may infer from his Silence. It is said however, that they were accidentally found in 1605; when *Newhausel* was plundered and burnt. The Miners, in that Confusion, concealed their Instruments in the Mines, where they lay in moist Places above a Month, and were found incrustated with Copper, when taken out; and the more so, in Proportion as they lay deeper. This induced them to make Channels to receive these *æristic* Waters, and afterwards to inclose them.

They soon discovered, that Iron being thrown in was consumed, and turned to an equal Quantity of the purest Copper. This way of procuring Copper was found to be so compendious, that they have made 20 of these Inclosures. We shall take notice only of two of these, from which we may form a Judgment of the rest. The chief of these is sunk 85 *Orgyæ*, and the Access to it is by a winding of 151 *Orgyæ*. Here the Water distils from the Sides of the Mine, and is received at first in a small Bason, from whence it flows into a larger, and is divided into Channels. In the smaller Bason they put little Pieces of Iron, such as Horse-shoes; and in 3 or 4 Weeks time, find them turned to Copper, retaining their former shape, but being a little more elevated. This Water is more efficacious, than that which is received in the larger Bason. It corrodes the Iron more languidly; for at first there floats upon the Water only a yellowish Scum, which afterwards sticks to the Iron, and is scraped off every Month with great Exactness, and laid in a particular Chamber to drain. This Scum is called *Schmund* by the Miners. They repeat this Operation, till all, or the greatest Part of the Iron is consumed.

The other Chamber is 15 *Orgyæ* deeper; and from it's Form and Situation is called the *Long* one, being 2 *Orgyæ* in Breadth, and 25 in Length. The Copper-water drops here in greater plenty than in the other Inclosures or Chambers. For besides the dropping from the Sides and Cavities of the Mine, there are two perpetual Springs, which continually issue to the Thickness of a Straw. Both these Springs open on the South, one of them 3 Paces on the Left-hand from the Entrance of the Chamber, the other 5 Paces more inward. To keep the Waters from being wasted, they are brought through little Ducts, partly into Channels, and partly into square Basons, where they throw their Iron. We observed, that the Channels made for the Reception of the Water and Iron, are so carefully disposed on the Ground, that none of the dropping Water can be lost. What is received after that manner in one Channel, runs over into another, that into a third, and so on; but the Efficacy of the Water is diminished in every Channel. In the middle of the Wall of this Chamber there drops a peculiar limpid Water; which is therefore collected in a particular Bason. Into this they throw the Copper made in the other Chambers, when they desire to have it more pure. As the Chambers are steep, the Waters that flow from the Channels and Basons, are quite absorbed by the porous Bottom of the Mine.

Mine. Besides these Receptacles, there are in the Caverns of the Mine many moist Places, which give a copper Colour to Iron; which shews that most of the humours of the Mine are of that Nature.

The Water looks greenish in the Basons; but in a clear Glass it is as transparent as Crystal. It has no Smell, but has an astringent vitriolic Taste. On our tasting it at the Spring, it blistered our Lips. Whilst we were in the Mine, and travelled 3 or 4 *German* Miles thro' subterraneous Windings, we felt no other disorder in our Lips than a slight itching; but as soon as we came into the open Air, they began first to swell, and then to form Matter. When the Water drops in larger Quantities it grows weaker, and has a less sensible Effect upon Iron. It is so far from rotting the wooden Troughs and Basons, which receive it, that it consolidates them, and makes them last longer than they otherwise would. The Chambers, in which the Basons are inclosed, have not any strong Smell, or any Vitriol in them. But in some of the Chambers, one may find here and there a little Stone resembling blue Vitriol. At the Sides of some of the Caverns, we found a sort of Salt, mixt with a moist, yellow Earth, insipid, and friable like the *Lapis Specularis*. The Miners, a people subject to Diseases, drink this Water, as a medicated Potion, in desperate Disorders, with great Confidence of Success. It soon works either upwards or downwards, or both ways. In an *Ophthalmia*, the use of it is safer, if it is applied with Caution after the manner of a *Collyrium*.

The Copper obtained from these Waters is more pure, more ductile, and more fusible, than any other sorts of that Metal; which makes it be sought after in the making of Snuff-Boxes, and other such like Utensils. Whilst this Copper is yet in the Water, it is more friable, than after it is taken out: For then the Particles are more strongly concreted, and grow solid. The Scum beforementioned is only indigested Copper precipitated from the Water, and adhering to the Iron. It is carried every Year to the Copper-work at *Newbausel*, and is there melted into the purest Copper; and that without much Loss; because the Iron being corroded by the Copper-water, leaves but very little heterogeneous Matter in the Scum. Before these Springs were injured by a Inundation, which happened in our Time; a much greater Quantity of Copper was produced from Iron. For it is certain, that in 1707, 88 hundred weight of Iron was turned to Copper, whereas now they hardly get 20 hundred Weight in a Year. Hence we may conclude, that this Inundation greatly diminished the Efficacy of the Water: For fewer Chambers formerly produced more Copper, than is now made in 20. Indeed many of them now do not produce any solid Copper, but only the Scum already mentioned, which must at last be melted down with a strong Fire.

I shall now relate the Experiments made by me and my Friends, in order to discover more perfectly the Nature of these Waters.

A Pound

A Pound of the strongest and most pregnant Copper-Water gradually and gently evaporated, grew turbid and let fall something of a yellow Powder; and being afterwards boiled to Dryness, left *Ʒij*s of a greenish *Residuum*. This *Residuum* being afterwards dissolved in Water, afforded a green Solution; which being filtered and evaporated, yielded *Ʒij* of a crystalliform Vitriol. What remained of the Powder was yellow, and Gr. *vj* in Weight.

A Pound of the same Water, precipitated with Oil of Tartar, grew turbid, and became of a Sea-green Colour. It left a Residue in the Filtre, which being dried, afforded *Ʒij*s, with a little common Salt.

A Pound of the Water in a Bottle close shut, began sensibly to tinge a small Wedge of Iron, that was put into it, of a Copper Colour, having several Bubbles adhering to it. The next Day the Water grew turbid and whitish, having several whitish Streaks at the Bottom of the Bottle, and about the Wedge; and after some Days we found a yellow or Copper-like Sediment.

From these Experiments we learn,

1. That this is a true Copper-Water, and saturated with Vitriol of Copper, and that it flows from a Solution of *Pyrite* in the metallic Veins; and hence that it may be called a *vitriolated Water*.

2. That this Water corrodes and dissolves Iron, and precipitates the Particles of Copper existing in it, as in a *Menstruum*; or lets them fall to the Bottom, after being separated by this Dissolvent; assuming the Form of the injected Iron, to which they adhere. This is abundantly confirmed by a nice Inspection of this Copper: For it is formed into a solid and smooth Mass, but infinite little Grains, like the Eggs of Fishes, uniting, it coalesces into one friable and extremely brittle Body. It is a Thing well known to all Chymists and Workers in Metals, that one Metal is precipitated by another. Thus Quicksilver dissolved in *Aqua fortis* precipitates Silver; Silver precipitates Lead; Lead Copper; and Copper Iron. Hence if you dissolve Copper in *Aqua fortis*, and then put Lead into it, you may observe the same Transmutation, as we have now observed in our Copper-Water: For that *Menstruum* will corrode and dissolve Iron; and in that Action, the Copper being mixed with the *Menstruum*, will be separated from it, and gradually and gently subside into the Place of Iron.

These Rules being established, the Notions which some have too hastily admitted, on considering the Effects of these Waters may easily be refuted.

1. There being taken out of this Water a Quantity of Copper equal to the Iron put in, it is falsely inferred, that the Iron being corroded by the Water, lets fall the Particles of Copper which it contained, as freed from a Bond, and entirely consumes the other material Particles, and makes them vanish.

2. Nor can the essential Transmutation of Iron into Copper be admitted in all this Work of Nature: Which the Alchemists persuade themselves

themselves and others to believe; as if a more ignoble and imperfect Metal could have it's whole Substance changed into another more perfect and noble. For it sufficiently appears from these Experiments, and is evident from physical Reasoning, that our Water by no Means changes Iron into Copper, but only deposits the Particles of Copper, with which it was before impregnated. Nay the contrary might be proved from our Observations. For if Iron and Copper, the most nearly related Metals, cannot be changed into each other by the Assistance of Nature; much less can it be expected from Art, how skilful soever. Now that Iron and Copper are more related than any other Metals, is made more than probable by *Henckelius* in his *Kieffs Historie*, or *History of Pyrite*, where he affirms, that among so many Experiments, he never met with any one Piece of Copper Ore, that was not affected by the Magnet. Thus this attractive Virtue of the Magnet operates upon Copper next to Iron. And as Iron and Copper both afford what is properly called Vitriol, which cannot be said of the rest, in the same Form; for they are of the like Substance and Colour, green or blue; if there was any such Thing as the pretended Hermaphrodite Vitriol, it would certainly be discovered in this Workmanship of Nature, which it is not.

That this Water of *Newbausel*, as was said before, derives all it's Power and Efficacy from a dissolved *Pyrites* of Copper, is proved also from the Works at *Schmolnicz*: For the whole metallic Country about that Town is full of *Copper Pyrite*; so that the Copper-Water abounds not only in the Mines, but on the very Surface; so that it is more pregnant and efficacious than this of ours. In dry Weather the People of *Schmolnicz* pour common Water upon Heaps of *Pyrite*, which being received in Troughs and Basons, acquires the same Power and Efficacy as the natural Copper-Waters.

VI. Obs. 1. I took ζ iv of the *Westashton* Water, with as much Milk, and set them on the Fire; as soon as they boiled, the Milk began to curdle, which denotes a brackish Salt of a neuter Nature. The Water changes Syrup of Violets green.

Obs. 2. Some Powder of Galls infused in this Water, gives it a Tinge of a brown Purple, by which it appears, that this Water is Chalybeat: For all martial Waters will, with Galls, turn blackish or inky.

Obs. 3. A fixt *Alcali*, as *Ol. Tartar. per deliq.* and a volatile one, as *Sp. Sal. Armoniaci*, caused a white Precipitation, which denotes an aluminous cretaceous Earth.

Obs. 4. A Solution of Salt of Lead, causes a Cream-like, or a troubled milky Colour.

Obs. 5. The usual acid Spirits, viz. Spirit of Salt, Nitre, and Vitriol, cause no Alteration; which shews that the Water is itself impregnated with an Acid.

Obs. 6. The Water being evaporated to a Pellicule, deposits saline Crystals of a rough or austere Taste, being of a styptic Nature; and separates a martial yellowish Okre (which is attracted by the Loadstone)

An Examination of Westashton Well-Waters, belonging to Tho. Beach, Esq; a Well about 4 Miles from that of Holt, by Ambrose Godfrey Hanckewitz. No. 461. p. 828. Aug. 1741.

and is an Absorbent, for it ferments with Acids. The remaining Brine, being evaporated to Dryness, leaves a Salt of a lixivious alkaline Taste.

Obs. 7. Some of these Salts being put into Water, 3 Parts out of 4 dissolve very readily; but 1 Part will not dissolve at all, but is of a talcky Nature, and unalterable in the Fire.

Hence we may observe, that chalybeat Waters, as long as they retain their natural sulphureous Gas are capable of keeping suspended, or floating in them, these talcky Substances; but that Boiling drives away that sulphureous Gas, upon which this talcky Substance subsides, and cannot again be dissolved in Water, and remains fixt against the Power of the Fire; for it suffers no Alteration upon a red-hot Iron, neither emitting Flame, nor melting, as neither doth Talck itself.

Obs. 8. These chalybeat Waters contain somewhat of the same Nature as our cathartic *Epsom-Salt*, only not so mild upon the Tongue; for by this Examen, when their Gas is gone, they are found to contain two Sorts of such-like Earths; the one absorbent, fermenting with Acids; and the other fixt, or talcky: And that this Substance is really talcky, is confirmed by the digging up of a pretty deal of Talck in the sinking this Well.

All the Salts of the medical Waters are more generally alkaline than acid, being of a martial Nature, impregnated with Sulphur, which gives them a muriatic Taste.

We may hence conclude, that this *Westaston* Water is a very good chalybeat Water; and, by Report, more plentiful and more constant all the Year round, than the Well at *Holt*, which Spring diminishes much at a certain Time of the Year; but both seem alike for their Virtues, and physical Use, being both alike martial.

VII. 1. The Water is bright and clear to the Sight, of no Smell, yet of a bitter Taste.

To know it's constituent Parts, the following Experiments were made; and, first, to try whether there is any alkaline Salt in it.

Rhenish Wine was mixt with the mineral Water. *Rhenish Wine* is a subtilized *Acidum essenziale* in a spirituous and oily Liquor: Wherefore an alkaline Salt should have been manifested; but it was unaltered.

Distilled Vinegar is a stronger vegetable Acid; but, mixed with the Water, procures no Alteration.

Spiritus Salis, Nitri, and Vitrioli, the three strongest and purest mineral Acids, being mixed with the mineral Water, there was no Change or Precipitation.

Mercurius sublimatus corrosivus, is a Dissolution of Quicksilver in concentrated Spirit of Salt, which, being dissolved in common distilled Water, manifested not only the volatile, but also the fixed alkaline Salt, in any Liquor, infomuch that it precipitates the *Volatiles* to a white, and the *fixed* alkaline Salts to a red Powder; but, mixed with this Water, produced no Precipitation.

An Examination of the Chiltenham mineral Water, by Conradus Hieronymus Senckenberg; which may serve as a Method in general for examining mineral Waters. Ibid. p. 830.

Vitriolum

Vitriolum Martis is an acid Salt, intimately mixed with Iron-Earth: Being dissolved, and put into another Liquor, it will presently betray the alkaline Salts by precipitating them; but should it find no contrary Salt, then somewhat of the Iron-Earth will settle to the Bottom; as is common in dissolving all Sorts of *Copperas*: And so it happened by mixing this mineral Water with it, when a brown Powder settled, which is the *Terra Martialis*.

All these Experiments shew evidently, that no *alkaline Salt* is in the said mineral Water.

For, to try whether there is any acid Salt to be found in this Water, the following Mixtures were made:

Aqua Calcis Vivæ, which contains an Earth impregnated with *alkaline Salt*, makes a very quick Discovery of an *Acid*, by Precipitation; but, mixed with this Water, caused no Variation.

Syrupus Violarum, having a very sensible vegetable Tincture, which, by mixing it with a small Quantity of any *Acid*, turns *red*, and, with an *alkaline Salt*, *green*; but, mixed with this Water, keeps it's Colour.

Oleum Tartari per deliquium, which is an *alkaline Salt*, dissolved in Water: And,

Spiritus Salis Armoniaci, a volatile *alkaline Salt* in Water, they being mixed with this mineral Water, the Mixture grew milky, and a little after a white Precipitate settled. This happens when a fixed or a volatile alkaline Salt meets with a neutral Salt; then they join together, and somewhat of the alkaline Earth falls down.

Milk mixed with a mineral Water, and boiled in equal Proportion, will make a Separation, by meeting with either an *acid* or *alkaline Salt* in it, or, by finding of the last Salt, the Mixture will change red; but our mineral Water may be boiled with it in several Proportions, without any Change or Precipitation.

According to these Experiments, there is no *acid Salt* in this Water.

To see whether there is no *Iron* or *Copperas* in it,

If the *Solution of Galls* is mixed with any Liquor, and grows black, then it is a Sign of *Iron* or *Copperas*; but our mineral Water, mixed with it, turned a little brownish, because of the Salt in the Water.

To know whether there is any *Brimstone* in a mineral Water, it is to be inquired with a polished Piece of Silver, which, being put in the Water, will turn black or yellowish; but this did not happen with this Water.

To find out the *acidum salinum* in a mineral Water, you must mix with it *Solutio Argenti*, which turns instantly *white*, and a light Precipitate falls, being the *Luna Cornea*.

A Solution of *Saccharum Saturni*, mixed with the Water, yields the *Magisterium Saturni*.

All the above-mentioned Experiments certify, that our mineral Water contains no *alkaline* nor *acid Salt*, no *Iron*, *Copperas*, or *Brimstone*: Therefore from the same Experiments it is evident, that the *Chiltenham*

Water consists of a *Sal medium fixum vel neutrum*, and a dissolvable *Terra alcalina vel cretacea*, which may be separated.

By a *Sal medium*, is to be understood a Salt being neither of an *alcaline* nor an *acid* Nature; and that will not precipitate any Solution made with such Salts, nor, mixed with the Syrup of Violets, will change it's Colour.

These neutral Salts have always their Origin from an *alcaline* and an *acid Salt*; and, according to the *alcaline Salt* they meet with, so they are qualified. So we have the *Tartarus vitriolatus*, consisting of the *Sal alcali fixum*, and *Acidum vitriolicum*.

The *Arcanum duplicatum* of the *Sal alcali*, Salt-petre, and *Acidum vitriolicum*.

The *Sal Mirabile GLAUBERI*, consisting of common Salt, and it's *Terra fluxilis*, and an *Acidum vitriolicum*; but with this Difference, that the *Sal Mirabile* will soon melt in a Crucible with a gentle Fire; but *Tartarus vitriolatus*, *Arcanum duplicatum*, &c. will not melt, even with the strongest Heat, because of the Difference of the Earth in the *alcaline Salt*, which in the common *alcaline Salt* is very fixed, but in the common Salt very volatile and fusible.

Such a *Sal medium* as the *Sal mirabile* we find in this mineral Water, yet mixed with some common Salt.

As for the Bitterness of this Water, there is no other Reason for it than the *Terra Cretacea*, which is proved by the *Epsom-Salt*, where the *Terra alcalina Salis communis*, joined with the *Acidum vitriolicum*; and after the same Manner in the *Sal mirabile*, the *alcaline Earth* causes the bitter Taste. The same may also be found, by mixing Quick-lime with Spirit of Vitriol, and it will produce a very bitter Taste; but the Mixture of Quick-lime with Spirit of Nitre causes a Bitterness which exceeds Gall.

One Pound Troy of this Water yields 29 Grains of the said *Sal medium*, and 3 Grains of the Earth.

Remarks by
C. M. Ibid.
p. 834.

2. The R. Hon. Lord Cadogan had communicated a short Account of these Waters to the *Royal Society* on April 17, 1735, being a Letter his Lordship had received from Mr Tho. Dundass, Surgeon to his Lordship's Regiment, dated at Gloucester, March 25, 1735, wherein he gives an Account of some few Experiments he had made on these Waters; which mostly agree with the preceding ones; as that there were no Marks of a chalybeate Nature in them; nor any Signs of *Nitre* or *Sulphur*: But that six Quarts of this Water being distilled very carefully, the Sediment at the Bottom of the Vessel was nothing more than *Alum* and *Sal Gem*, to which it owes it's *purgative Quality*. Some of the Salt of this Water, being put into a Solution of Silver, quickly made a Precipitation of the Silver. Mr Dundass says, that some *alcaline Liquors*, as *Oil of Tartar*, Spirit of *Sal Ammoniac*, &c. being dropt into some of the Water, immediately produced a violent Effervescence; which plainly shews a great *Acidity*, which he ascribes to the *Alum* in this

this Water. M. Senckenberg found no such Effervescence on mixing these two alkaline Liquors with the Water; but only says it grew milky, and a little white Precipitate subsided. I can account for this material Difference no otherwise, than by supposing, that the *Acid*, which caused the Effervescence in Mr Dundass's Experiment, was a volatile Gas, which was not quite spent in being carried no farther than *Gloucester*, but which was quite evaporated and flown away before the Water came into M. Senckenberg's Hands in *London*: And as to the *Alum*, Mr Senckenberg did not attend to it.

“ Mr Dundass thinks these Waters may be of Use in a lax Constitution, when the Humours are of an *alcalescent* Nature; but, when *acescent*, must do Hurt.”

VIII. *Dulwich* is a Village lying about 6 Miles S. of *London*, at the Foot of that Ridge of Hills which divides the Counties of *Kent* and *Surrey*. The Purging-Springs, which have been esteemed for about 100 Years, and are commonly known by the Name of *Dulwich-Waters*, have been improperly so called; those Springs arising in a Valley on the S. Side of those Hills, in the Middle of a large Common belonging to the Parish of *Lewisham* in *Kent*; whereas *Dulwich* is on the North Side of the Hills, in the Parish of *Camberwell* in *Surrey*.

An Account of a new Purg-ing-Spring discovered at Dul-wich in Sur-rey, by John Martyn, F. R. S. Prof. Botan. Can-tab. Ibid.

There has not been any medicinal Spring observed in *Dulwich*, before that which is the Occasion of this Discourse.

p. 835.

In the Autumn of 1739, Mr Cox, the Master of a well-known House of good Entertainment, called the *Green Man* at *Dulwich*, lying about a Mile beyond the Village, was desirous to dig a Well for the Service of his House, there being no Spring of good Water near it. And as it was probable, that he would be obliged to dig pretty deep, I was willing to observe what *Strata* of Earth he dug through. The first 20 Feet in Depth seemed to be only the Clay, which, in a long Tract of Time, had been washed off from the steep Hill, at the Foot of which his House is situated. It was intermixed with Pieces of Roots and Leaves, and with other Fragments of vegetable Substances. In digging 40 Feet deeper, the Clay was found of various Colours, brown, blueish, and black, intermixed with a considerable Number of *Pyrite* or *Cop-peras* Stones, and some pretty large Masses of the Waxen-vein or *Lucus Helmontii*, which is also found in great Plenty on the Sea-Shore near the *Spaw* at *Scarborough*.

The Well being digged to the Depth of 60 Feet, and no Water appearing, Mr Cox caused it to be covered up, and gave himself no farther Trouble about it that Winter. The following Spring, on my coming down, it was opened. I found 25 Feet of Water, of a sulphureous Smell and Taste, which went off, after the Well had been opened some Days.

As I had a strong Suspicion, that this Water was impregnated with some Mineral, I made an Inquiry into the Nature of it by the following Experiments:

1. It

A new Purging-Spring discovered at Dulwich.

1. It curdled Milk.
2. It became green, when mixed with Syrup of Violets, which Colour disappeared in a few Days.
3. Being poured on Green Tea, it did not acquire any Colour.
4. Being mixed with powdered Galls, it acquired a deeper brown Colour than Rain-Water did, and continued turbid; whereas the Rain-Water continued clear, after the Galls were subsided.
5. Being shaken in a close-stopped Phial, it dislodged a Vapour on opening the Phial before the Commotion ceased, with a more audible Noise than common Water did.
6. Being mixed with Oil of Vitriol, and Oil of Tartar, a much more considerable Ebullition was raised, than by the Mixture of those Liquors with Rain-Water.
7. Six Quarts of this Water, being boiled to a Pint, let fall a large Quantity of a fine, whitish, insipid Powder; and the Water so boiled had a very strong saline Taste, with a Mixture of Bitterness, not unlike the *Sal catharticum amarum*.
8. It let fall a copious white Sediment, on the Addition of the Oil of Tartar, which has the same Effect on a Solution of Alum, or of *Sal catharticum amarum*.
9. The boiled Water, after it had deposited it's Earth, precipitated large white Flakes, on the Addition of Oil of Tartar.
10. It differs from a Solution of common Salt. For the Oil of Tartar, being dropped into that Solution, caused only a slight Precipitation, which was soon afterwards absorbed again by the Water.
11. It does not lather with Soap.

Having made these Experiments, I was satisfied, that this new Spring was really a Purging-Water, as it has since been found by Experience. Some of Mr Cox's Family drank of it with Success, which encouraged several other Persons to try it, to their great Advantage.

Being drank fresh, in the Quantity of 5 Half-pint Glasses, it purges quickly, not sinking, but raising the Spirits.

It is found to be very diuretic.

These Properties of the *Dulwich-Water* do not seem to be owing to any of the Materials found in digging the Well. The *Pyritæ* are known to be a Mixture of Iron and Sulphur; but this Water seems to have hardly any Parts of Iron in it [Exp. 3 and 4]. The Spirit, with which it abounds, [Exp. 5 and 6] may, perhaps, be owing to a Fermentation of the Sulphur, which is continually flying off, as appears by the strong Smell of it, after it has been for some Time covered up. And Mr Cox has lately informed me, that a Silver Cup, which has been often used in drinking this Water, has acquired a yellowish Colour.

The *Ludus Helmontii* affords nothing but Iron: Nor does the Clay, through which they dug, discover any Salt in it's Composition. We may therefore conclude, that the Hill, which lies between the old Wells and

and

and this new one, contains the purging Salt, with which these Waters are impregnated.

I do not find any material Difference between the old and new Waters, except in the Convenience of drinking them. The old Wells are at a Distance from any House, except some few Huts, and exposed to the Rain and Land-Floods, by which they are often injured: The new Well is a Mile or two nearer to *London*, well secured from any Injuries of the Weather.

December 11, 1740.

IX. When first we saw the *Spout*, it was whole and entire, and much of the Shape and Proportion of a Speaking-Trumpet, the small End being downwards, and reaching to the Sea, and the big End terminated in a black thick Cloud. The *Spout* itself was also very black, and the more so the higher up. It seemed to be exactly perpendicular to the Horizon, and it's Sides perfectly smooth, without the least Ruggedness. Where it fell, the Spray of the Sea rose to a considerable Height, which made somewhat of the Appearance of a great Smoak.

Description of a Water-Spout seen about Sunset, May 21, 1732, Lat 32° 30' N. Long. 9° E. from the Meridian of Cape Florida, by Mr Joseph Harris. No. 428. p. 78. Apr. &c. 1733. Fig. 45.

From the first Time we saw it, it continued whole about a Minute, and 'till it was quite dissipated about 3'. It began to waste from below, and so gradually up, whilst the upper Part remained entire, without any visible Alteration, 'till at last it ended in the black Cloud above. Upon which there seemed to fall a very heavy Rain in that Neighbourhood. As it wasted, the Bottom of the remaining Part was irregular, somewhat like the Trunk of a Tree broken asunder: There was but little Wind, and the Sky elsewhere was pretty serene. We judged the *Spout* to be above 2 Leagues off, and I think the Angle under which the small End appeared, must be at least 20'. According to which Estimation, the Thickness of it must be upwards of 60 Yards, and it's Height or Length about $\frac{1}{4}$ of a Mile.

CHAP. III.

MINERALOGY.

I. SIR JAMES LOWTHER having Occasion to sink a Pit very near the full Sea-Mark, for the draining one of his principal Collieries near *Whitehaven*, in the County of *Cumberland*, which was known would be near 80 Fathom in Depth to the best Seam of Coals, which is 3 Yards thick; the Work was carried on Day and Night very successfully, through several Beds of hard Stone, Coal, and other Minerals, 'till the Pit was sunk down 42 Fathom from the Surface, where they came to a Bed of black Stone, about 6 Inches thick,

An Account of the damp Air in a Coal-Pit of Sir James Lowther, Bart. sunk within 20 Yards of the Sea; communicated by him to the R. S.

very

No. 429. p.
109. July, &c.
1733.

very full of Joints, or open Cliffs, which divided the Stones into Pieces of about 6 Inches square, the Sides whereof were all spangled with Sulphur, and in Colour like Gold. Under this black Stone lies a Bed of Coal 2 Foot thick: When the Workmen first pricked the black Stone Bed, which was on the rise Side of the Pit, it afforded very little Water, contrary to what was expected; but instead thereof a vast Quantity of damp corrupted Air, which bubbled through a Quantity of Water, then spread over that Part of the Pit, and made a great hissing Noise; at which the Workmen being somewhat surprized, held a Candle towards it, and it immediately took Fire upon the Surface of the Water, and burned very fiercely; the Flame being about half a Yard in Diameter, and near 2 Yards high, which frightened the Workmen so that they took the Rope, and went up the Pit, having first extinguished the Flame, by beating it out with their Hats; the Steward of the Works being made acquainted with it, went down the Pit with one of the Men, and holding a Candle to the same Place, it immediately took Fire again, as before, and burnt about the same Bigness; the Flame being blue at the Bottom, and more white towards the Top. They suffered it to burn near half an Hour, and no Water being drawn in that Time, it rose and covered the Bottom of the Pit near a Yard deep, but that did very little abate the Violence or Bulk of the Flame, it still continuing to burn upon the Surface of the Water. They then extinguished the Flame as before, and opened the black Stone Bed near 2 Foot broad, that a greater Quantity of Air might issue forth, and then fired it again; it burned a full Yard in Diameter, and about three Yards high, which soon heated the Pit to so great a Degree, that the Men were in Danger of being stifled, and so were as expeditious as possible in extinguishing the Flame, which was then too strong to be beaten out with their Hats; but with the Assistance of a Spout of Water, of 4 Inches Diameter, let down from a Cistern above, they happily got it extinguished without further Harm. After this no Candles were suffered to come near it, 'till the Pit was sunk down quite through the Bed of black Stone, and the 2 Foot Coal underneath it, and all that Part of the Pit, for 4 or 5 Foot high, was framed quite round, and very close jointed, so as to repel the damp Air, which nevertheless, it was apprehended, would break out in some other adjoining Part, unless it was carried quite off as soon as produced out of the Cliffs of the Stone; for which End a small Hollow was left behind the Framing, in order to collect all the damp Air into one Side of the Pit, where a Tube, of about 2 Inches square, was closely fixed, one End of it into the Hollow behind the Framing, and the other carried up into the open Air, 4 Yards above the Top of the Pit; and through this Tube the said damp Air has ever since discharged itself, without being sensibly diminished in it's Strength, or lessened in it's Quantity, since it was first opened, which is now 2 Years and 9 Months ago: It is just the same in Summer as in Winter, and will fill a large Bladder in a few Seconds, by placing
a Funnel

Pla. VI. Vol. VIII. part 2. page 656.

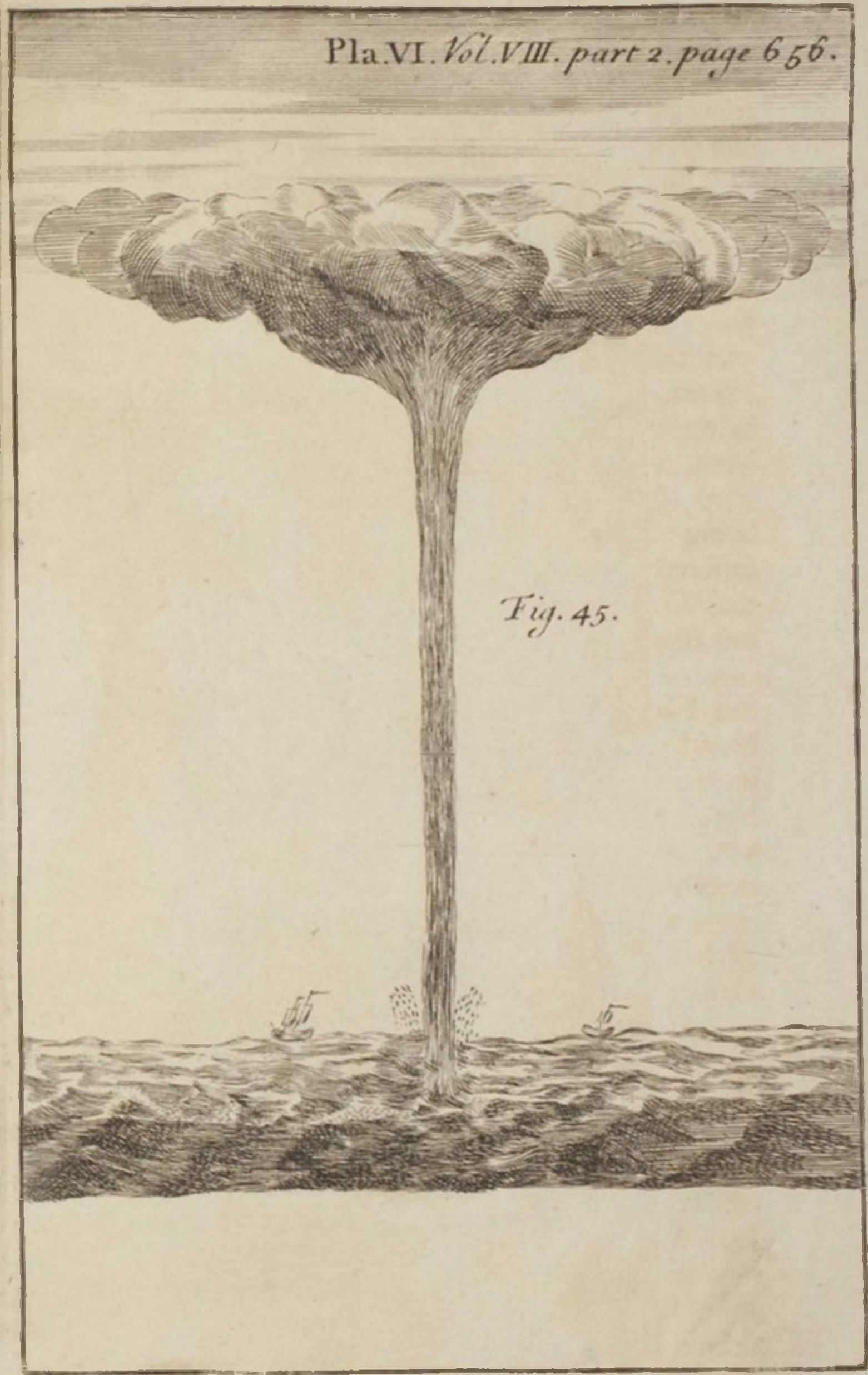
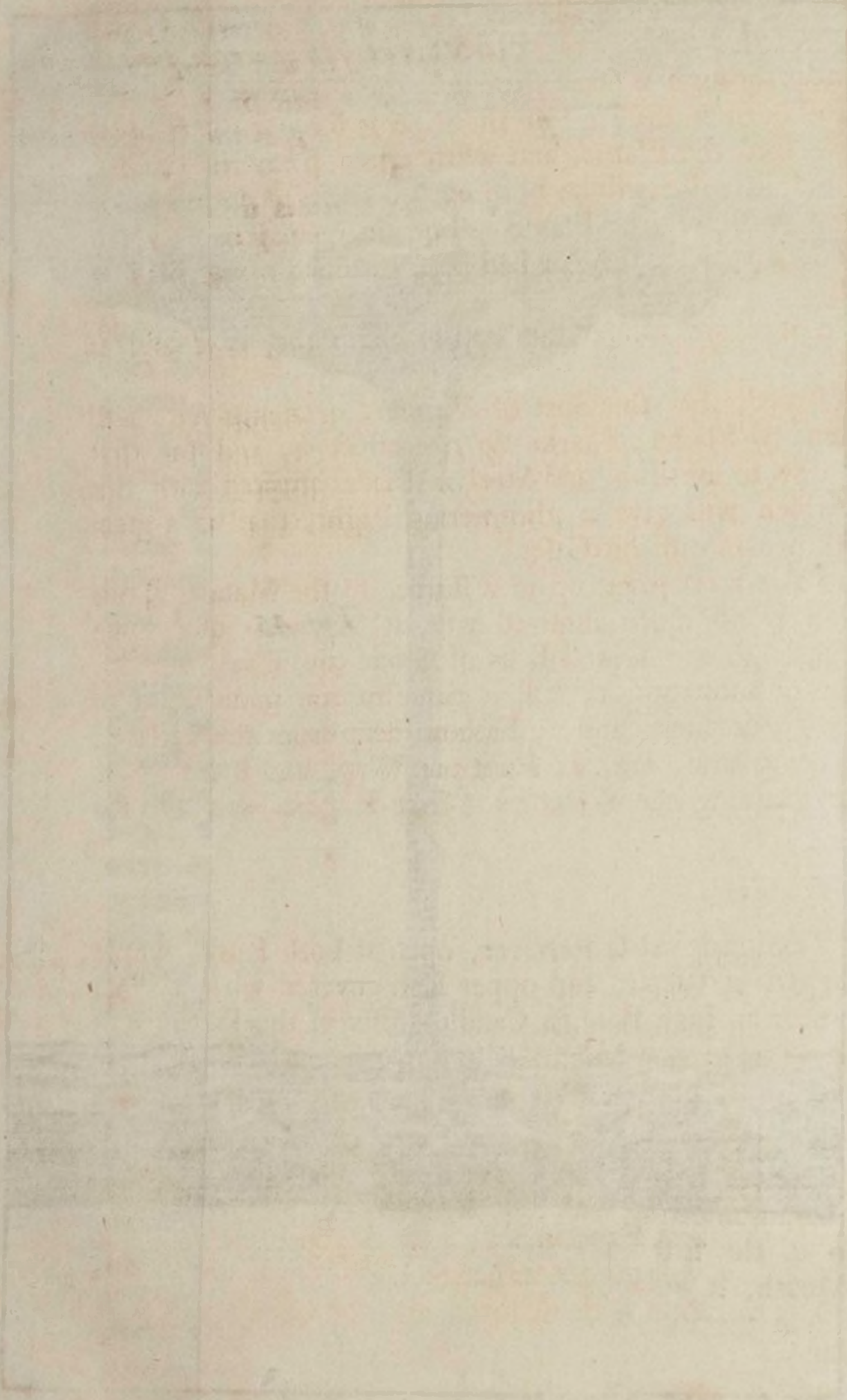


Fig. 45.



a Funnel at the Top of the Tube, with the small End of it put into the Neck of the Bladder, and kept close with one's Hand.

The said Air being put into a Bladder, as is above described, and tied close, may be carried away, and kept some Days, and being afterwards pressed gently through a small Pipe into the Flame of a Candle, will take Fire, and burn at the End of the Pipe as long as the Bladder is gently pressed to feed the Flame, and when taken from the Candle, after it is so lighted, it will continue burning 'till there is no more Air left in the Bladder to supply the Flame. This succeeded in *May* last before the *Royal Society*, after the Air had been confined in the Bladder for near a Month.

The Air, when it comes out at the Top of the Tube, is as cold as frosty Air.

It is to be observed, that this Sort of Vapour, or damp Air, will not take Fire except by Flame; Sparks do not affect it, and for that Reason it is frequent to use Flint and Steel in Places affected with this Sort of Damp, which will give a glimmering Light, that is a great Help to the Workmen in difficult Cases.

After the damp Air was carried up in a Tube, in the Manner above described, the Pit was no more annoyed with it, but was sunk down very successfully through the several Beds of Stone and Coal, without any other Accident or Interruption, 'till it came to the main Seam of Coals, which is 3 Yards thick, and 79 Fathom deep from the Surface; and the said Pit being oval, *viz.* 10 Foot one Way, and 8 the other, it serves both for draining the Water by a Fire-Engine, and also for raising the Coals.

Whitehaven, Aug. 1, 1733.

II. Exp. 1. In a cylindric Glass Receiver, open at both Ends, whose lower End is plunged in Water, and upper End covered with a Plate with an Hole of near an Inch Bore, a Candle of six in the Pound will not burn quite the Time of one Minute before it goes out.

Exp. 2. A Candle will burn almost as long when the Receiver is quite covered.

Exp. 3. The Receiver having the Hole of the Plate open, and a Pipe at Bottom communicating with the external Air, will burn but a little longer than in the first Experiment; and if you blow in at the Pipe with your Mouth, it will go out rather sooner.

Exp. 4. Blow in at the Pipe with Bellows, and the Candle will burn as long as you will.

communication with the outward Air, unless the outward Air be forcibly driven in at the said Communication or Pipe. By the Rev. J. T. Desaguliers, LL D. F. R. S. No. 442. p. 281. July, &c. 1736.

An Experiment to shew that some Damps in Mines may be occasioned only by the burning of Candles under ground, without the Addition of any noxious Vapour, even when the Bottom of the Pit has a Commu-

III. 1. In *June* 1733, a Farmer, in Hopes of finding a perpetual Spring of good Water, sunk a Well, whose Diameter was 7 to the Depth of 45 Feet; (through a Soil whose Surface was a Kind of Brick

An Observation of an extraordinary Damp in a

Well in the Isle of Wight, by Mr Benj. Cooke, F.R.S. No. 450. p. 379 Oct. 3^o. 1738.

Earth mixed with Sand, which in descending became almost wholly hard, coarse, yellow Sand) which Work employed the Labourers about 20 Days, without finding the least Appearance of Water.

At the Distance of about 18 Feet from the Top, a *Stratum* of a mineral Mixture, about 9 Inches thick, was dug through, without any Inconvenience; nor were the Workmen in the least incommoded in carrying on the Work, till about the 12th Day after, when towards the Evening they were much annoyed with a faint suffocating Heat, (which they compared to that coming from the Mouth of an Oven) and which, as they were drawn up, was most remarkably perceived, when they came opposite to the mineral *Stratum* above mentioned, to come out in the Form of a warm sulphureous *Halitus*.

The next Morning, a lusty young Man attempted to go down (Hand over Hand, as the Workmen call it) by Means of a single Rope which was used to draw up the Earth digged out; but as soon as he came opposite to the above-mentioned *Stratum*, he became incapable of sustaining his own Weight, fell down to the Bottom, and died immediately.

Another young Man, not suspecting the Cause, had the Rope nimbly drawn up; and having seated himself astride a Cross-stick fixed to the Rope for that Purpose, was hastily let down to his Friend's Assistance; but when he came to the same Distance from the Top, he was observed to give the Rope a very great Shock, and when he came to the Bottom, fell down, as the other had done before him, was seized with violent Convulsions, which held him more than a Quarter of an Hour, and then he expired.

A third Person, in Hopes of fetching up this second before he was quite dead, was tied fast into a large Basket, and let down with more Caution; but when he came to the same *Stratum*, finding his Breath going, (as he expressed it) he cried out, and was drawn up again; but remained in the open Air, for the Space of near half an Hour, pale as dead, panting and speechless.

The dead Bodies were, within 3 Hours Space, drawn up by the Help of a Sort of Tongs, used to fetch Things up from the Bottom of the Sea; but brought such a disagreeable Stench in their Cloaths with them, as made several hardy Men, who assisted in doing of it, vomit.

The next Day a Cat was let down, and at the same Place seized with Convulsions; but being drawn quickly up again, soon came to herself; which Experiment was repeated several Times for some Weeks following, by which it was found, that this destructive Vapour was sometimes of a greater and sometimes lesser Force, and sometimes quite gone, so that the Cat felt no Uneasiness; and a lighted Candle, which would sometimes be immediately extinguished as soon as it sunk below this deadly *Stratum*, would burn clearly at the very Bottom.

It was very remarkable, that there was a whitish Fog in the Well, so thick that one could but just see the dead Bodies through it.

Water being scarce in that Place, the Well was left open for about 8 Months, in Hopes the Damp might at last wholly leave it; but instead of so doing it became worse; and not confining itself within it's first Bounds, it overflowed at the Top, where, when the Air was moist, it appeared like a thin white Fog; and when the Air was dry, could be perceived like a warm Breath, at all Times diffusing a sulphureous Stench, (something like that which arises from Filings of Iron, while corroding with Vinegar) affecting those who came into it with a Giddiness, Shortness of Breath, and Propensity to vomit; so that at last the Well was filled up, being troublesome to the Family which lived near it.

I have sent you a little Quantity of the *Stratum* above-mentioned, which is continued to the neighbouring Clift, where, when heated with the Summer's Sun, it gives a noisome sulphureous Smell, and is, after moderate Rains, covered with a yellowish efflorescent Salt, very astringent and acid.—On the Shore below there are gathered *Pyrites*.

2. I have recollected some further Observations on the Damp. The Vein which was cut through in the Middle of the Well, from whence were emitted the fatal *Effluvia*, is a crude Ore made up with Iron, Sulphur, and acid Salts, mixed with *Pyrites*.

A farther Account by the same. Ibid. p. 382.

These *Effluvia* were not perceived till after the Vein had imbibed the Air for several Days.

Whilst the Air continued dry, these *Effluvia* subsided, and lay in the lower Part of the Well, which seemed filled near to an exact Level with the *Stratum* from whence they came.

But when the Weather became rainy, the Quantity as well as the *Impetus* of the *Effluvia* increased to such a Degree, as to appear in Mornings over the Top of the Well, in the Form of a Mist, and gave great Annoyance to those that came within it's Sphere of Action.

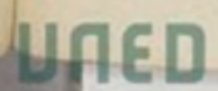
From hence it is worth observing, that the same Damp, according to the Variation of the Weather, is specifically heavier or lighter than the Air.

IV. The Quarry at *Pymont*, 800 Paces from our chalybeat Springs, has been used these 100 Years for Stones to build the neighbouring Houses. When I was building my own House 20 Years ago, and often went into the Quarry, the Workmen told me, that they frequently found dead Birds in a deeper Pit, and sometimes shewed me several Sorts of Birds newly dead.

An Account of a sulphureous vaporiferous Cavern in the Quarry at Pymont, like the Grotto del Cane at Naples, by Jo Phil. Seip, M. D. Aulic Counsellor and chief Physf. to the Pr. of Waldeck, and F. R. S. No. 448. p. 266. June, &c. 1738.

I suspected at first, that some poisonous mineral Matter, like Smalt or Orpiment, might be mixed with the Stones, and dissolved by the Rain-Water, of which the Birds might have drunk. But when I went into the Pit myself, and leaned down my Head to take out the Birds, I was immediately struck with a most penetrating Smell, so that I was obliged to retire, being giddy and asthmatic.

Thus the Mystery was discovered, and I judged this suffocating sulphureous Steam to be of the same Original and Nature with that,



A sulphureous vaporiferous Cavern.

which we observe in our Fountains, in fair, calm, and dry Weather, in the Mornings and Evenings, where Birds are suffocated in an Instant, and Ducks swimming in the great Spring, used for a Bath, can scarce subsist a few Moments.

I was so far from thinking it adviseable, that I rather judged it would be dangerous to our chalybeat Springs, to make more of those Chimneys, and so let out the sulphureo-spirituos Vapours from the Inside of the Mountains, which ought rather to be kept in to sharpen the subterraneous Waters.

For this Reason, and on my Representation, the Prince of *Waldeck* forbid the Workmen to dig any deeper into the Quarry, and so to let out the mineral Steams. Only I begged of his Highness one square Pit, of 6 Feet on each Side, to use sometimes as a dry Bath, and about 12 Years ago I covered it with an Arch, and shut it up with a Door. This little Cavern, defended and confined by Walls, cannot defraud our chalybeat Springs of their sulphureo-spirituos Virtues, since it is certain, that this Vapour does not always rise, but only when the Weather is mild and serene, the Winds E. and N. dry and not stormy, but blowing gently, and when Fogs and Vapours rise before Thunder.

The Steam also is found only in Mornings and Evenings; and as the Sun ascends gradually in the Day-time, so the Vapour descends, and towards Noon goes quite under the Stones, and entirely vanishes. About Evening it begins to return; and after Sun-set comes out again plentifully. This Steam is not like watery Vapours and Fogs, and never shews itself visibly, except in the Sun-Beams, when the tremulous Motion of the Vapour shews it as if it flashed from the Stones at short Intervals.

The Steam is generally confined within a certain horizontal Line, and seldom rises and exerts it's Power above 1, 1 $\frac{1}{2}$, and 2 Feet. Therefore if any one goes down into the Pit, let him stand upright in it, and not bow his Head below the Line, and he will not perceive any Smell, or have his Organs of Respiration affected. But at certain Times, especially when the Air is calm and very dry, with violent Thunder and Lightning, the Vapour rises, and exerts it's noxious Effects to the Height of 5 or 6 Feet or more; but this seldom happens.

I have observed the following *Phænomena* in this mineral Steam.

1. On going into the Cavern, and standing erect, one perceives no Smell at all; but in a few Moments the Feet grow hot, and the Steam penetrates quickly through the Shoes, and excites a stimulating Sensation in the Skin, as if it was stung with Nettles, which gradually extends itself to the Legs and Thighs, warming the lower Parts, as if they were near a Fire.

If you stand quiet in this Manner for a short Time in the Pit, the Sweat is drawn out, first in the lower Parts, afterwards all over the Body, without any Trouble or Uneasiness.

2. Those

2. Those who bow down their Heads to the Bottom of the Pit, presently perceive a most penetrating Smell; their Respiration is suppressed; the Eyes water, and are sensible of such an Acrimony as proceeds from Onions and Horse-radish; the Mouth is filled with a sulphureous Taste; the Head is giddy and drowsy; so that they are in Danger of falling down and being suffocated.

3. All Sorts of Insects, as soon as they touch the Vapour, fall down and die.

4. Sometimes the smaller Birds, if the Steam is very copious, are suffocated in the very Moment of their Entrance; but they often seem for some Moments to be convulsed, flutter, jump, gape, and imitate the Gesticulations of such Animals as are deprived of Air; and at last expire.

If Care is taken to observe exactly when the Birds drop, and begin to faint, before they are quite dead, and to carry them immediately into the open Air, especially if Air is blown into their Mouths, they awake as it were from a profound Sleep, revive, and soon come to themselves, so as to escape entirely without any Loss of Life or Health. In this Manner I have treated a Bird 10 Times in one Day, and have afterwards preserved him a long Time alive.

5. The larger Birds and domestick Fowls continue longer in our Pit, especially if they can stretch their Necks above the Line, or by frequent Leaps get above the Sphere of Vapour, and so breathe the free Air by Intervals; but if the Vapour is copious, or their Heads are kept at the Bottom of the Cavern, they suffer in like Manner with the smaller Birds.

6. The larger and stronger any Quadruped is, the longer it escapes Suffocation, but at last they all drop like the Birds. But they recover much more easily in the open Air, especially if they are plunged into Water, or sprinkled plentifully therewith.

7. Our Vapour presently extinguishes Fire, especially Flame, and Candles, either open or in Lanterns.

It is a pleasant Experiment to set a Bundle of Straw on Fire, and hold it down to the Bottom of the Cave; for the Flame is presently extinguished; if you raise it again into the free Air above the Sphere of the Vapour, it immediately bursts into Flame again, and you may repeat this as often as you please.

8. When the Vapour is copious and strong, Gun-powder will not catch Fire at the Bottom of the Pit. Sparks from Flint and Steel fall upon Gun-powder, but do not fire it.

In 1724, when I first inclosed the Pit, I considered how I might apply to the Health of Man this wonderful Vapour, which is much more subtile and penetrating than any of our chymical Spirits: For I did not find the Vapour to be arsenical, or corrosive, like that which rises from burning Sulphur. It does not adhere to the Lungs, and corrode them, but only takes away the Air, and obstructs Respiration:

But

The icy Cave of Szelicze.

But this Effect is not so sudden on Man, but that he may have Time to remove himself with Safety. I have often, by Way of Experiment, staid in the Cave as long as I could bear the Vapour, to the very Point of Fainting and Suffocation; I have opened my Mouth to draw in the Vapour, and at last recovered by leaping into the open Air. I never found any Inconvenience from this, but rather felt my Breast and Respiration lighter; and sometimes, when I have had a Defluxion and Cough, I have found the Obstructions to be dissolved and dissipated by this Fumigation.

There is not under Heaven a more short and easy Method of raising a Sweat; for after a few Moments Stay in this vaporous Cave, the whole Body flows with Sweat.

The Country People have sometimes found great Relief here from Swellings of the Feet, Rheumatisms, and arthritic Pains of the Joints. But because the Vapour sometimes rises above it's usual Sphere, and then is too strong and intolerable, I have been afraid, lest any rash Person, making too long a Stay in the Cave, might lose his Life; for which Reason I have not ventured to make so hazardous an Experiment.

Pymont Wells,
May 12, 1736. N. S.

*An Account of
the icy Cave of
Szelicze, by
Matthias He-
lius, F. R. S.
No. 452. p 41.*

V. At the Foot of the Mountain *Carpathus*, toward the South, lies the County of *Thorn*, which takes it's Name from the Tower of *Thorn*. It's Limits are restrained within a narrow Compass by the Hills, which are prodigious. Among these may be reckoned the Mountain which rises between *Szelicze* and *Borsua*; not that it is bigger than the others; but because of it's extraordinary Appearance, of which we are now going to give an Account.

The Village of *Szelicze* is situated among Woods and Forests; it is hilly and barren, the Weather is rough, and the Air cold, with strong and almost continual N. Winds, which blowing from the high and snowy *Carpathus*, make the Air so cold, that Flies and Gnats cannot live there, when it is warm in all the Country round about. Near this Village the Cave, of which we are speaking, opens from the Mountain above-mentioned, with a great Mouth toward the N. For it is 18 *Orgyæ* high, and 9 broad; whence it is sufficiently accommodated for the full Reception of the N. Wind. The deep and subterraneous Passages of the Cave wind toward the S.

When the Cold is severe in the Country, the Air within the Cave is warm; but it freezes there, when the Sun shines with the greatest Heat. When the Snow is melted, and Spring begins, the inmost Part of the Cave, which lies toward the meridian Sun, emits a limpid Water, which being frozen into a transparent Ice, by the Power of the internal Cold, forms Icicles, that hang down, as thick as large Tubs, branching out into many surprizing Forms. The Water, which hap-
pens

pens to fall on the sandy Ground, is said to freeze soonest. Thus not only the Arches, which are formed by Nature in the solid Rock, but also the Floor of the Cave is covered thick with clear Ice. This Ice shines so all about the Cave, that you would think it was incrusted with Crystal.

This unusual Sight is the more surprising to the Beholders, as the Cave grows broader and deeper. That Part of which is passable, is 50 *Orgyæ* deep, and 26 wide, and of unequal Height. The Recesses beyond this are so steep as to be inaccessible. Nor has any one yet attempted to go farther down this slippery Precipice, which would require to be cut into Steps with vast Labour. Some have attempted to sound it with a Plummet, but as the Descent is not perpendicular, like a Well, but breaks out into various Windings, the Experiment has proved fruitless. Those have succeeded best, who have fired Muskets well charged into it: For the Report has lasted several Minutes, with a very great Eccho, like a long rolling Clap of Thunder; which shews that the Cave is very deep, and has many winding Recesses.

The freezing Disposition of this Cave increases with the Heat of the Sun. At the Beginning of the Spring, the Winter Warmth begins to lessen; as the Spring comes on, the Cold of the Cave increases in Proportion to the outward Warmth. But when the Summer is advanced, and the Heat of the Air is the greatest, then all within is Winter, and the Frost most intense. Then all the Drops, which distil from the Vault, are frozen till they are increased to the Bulk of large Casks, and appear like the Ruins of broken Rocks. The Exudations from the Sides of the Cave are formed into astonishing Incrustations, which are spread like Carpets wrought with the exactest Art. The rest of the Ice adheres mutually, according to the Vicissitudes of the Heat without. For if the Heat is continual and vehement, a greater Quantity of Ice is added to the Icicles, and to the Sides and Bottom of the Cave; but if the Heat happens to be moderated by N. Winds, or falling Showers, the Waters are more slow in freezing, and the Ice itself gives, and begins to form little Rivulets: But when the Heat increases again, the Cave returns to it's icy Temper. Some have observed, that it predicts the Vicissitude of the Weather as well as a Barometer. For if the outward Air is beginning to grow hot, the Waters within the Cave will freeze hard some Hours before the Heat is sensible: And, on the contrary, the Ice will give some Hours before the outward Air grows cool.

The Nature of this Cave furnishes it with such a Quantity of the clearest Ice, that 600 Waggon's loaded every Week would not be sufficient to exhaust it. It is customary with the Inhabitants, when they are at Leisure, to fetch out the Ice to cool their Liquors, and frequently melt it into Water to drink. They have a high Opinion of it's Wholsomeness, and think it is lighter on the Stomach, and more
easily

The icy Cave of Szelicze.

easily discharged through the Pores or Bladder, than other Water, and not without Reason.

There are however different Climates in this Cave. At the first Entrance there is a pleasant Air, like an *Etesian* Gale. A few Steps farther it grows cold; if you proceed, it makes you shiver, and you are glad to button up your Cloaths, which you wore open before you came in. But if you descend farther, the Cold is so severe as to be almost intolerable: But when the autumnal Nights begin to grow cold, the Ice begins to melt, and as the Cold increases, to form Rivulets of Water, till in the Depth of Winter it is all gone, and the Cave is in a Manner dry. Then the Air within is mild and pleasant, and the Cave becomes a Refuge for Insects, and other Animals, to escape the outward Cold. For besides swarms of Flies and Gnats, and whole Flights of Bats and Owls, the Hares and Foxes retreat hither, till upon the Return of the Spring the Cave resumes it's icy Nature. The Surface of the Cave, which is exposed to the meridian Sun, abounds in Grass, and affords good Pasture for Cattle.

This is the Matter of Fact. Now let us consider a little, how this unusual Nature of the Cave may be explained. There are universally such Vicissitudes of Heat and Cold in subterraneous Places, that they seem to contend with each other. For when the Air without is hot, the Recesses of such Caves are cold; and they are warm again, when the Air without is cold. This we are taught by daily Experience, in Wine-Vaults, which are not sunk very deep. For the Effect of Heat is such, that when it beats upon the Earth, an Element thick of itself, moist, and cold, it drives in it's internal Cold, and greatly condenses it in Caves formed either by Nature or Art. It is the reverse, when Cold lies upon the Surface of the Earth; for then it draws from it's inmost Bowels the Heat, from what Principle soever it is conceived, which makes the Air warm, wheresoever it is capable of diffusing itself through any Caverns. I may here mention an old Custom among my Countrymen, of cooling Wine, all over the champain and hot Country of *Hungary*. For when they travel through vast Desarts, or are obliged to make any Stay in them, where there is neither Ice nor Spring-Water to cool their Liquors; they dig a Pit about 2 Feet deep, and bury their Bottles of Wine in it, covering them over again very close. Then they burn Straw or Reeds over the Place, and when the Fire is out, they dig up their Wine as cool as if it had been put into the coldest Water. Whence now is this Cold brought to the Wine? Surely the Fire, which suddenly heats the Surface of the Pit, drives the natural Cold of the Earth, condensed on all Sides, about the Bottles, which at Length pervades them, and renders them agreeable to the Taste.

Hence we may easily conjecture what are the Causes of the different Temperatures of the Cave of *Szelicze*. The Power of the outward
Heat

Heat beating on the Surface of the Cave, the native Cold of the Earth and Rocks, which form the Arches underneath, first makes the Waters cold, and then freezes them: Till, the Air being cooled again, the Heat is drawn forth that is conceived in the inmost Bowels of the Earth. When I say this, I do not come into the Opinion of *Morin*, who divides the Earth as well as the Air into 3 Regions; the first of which is alternately cold and hot; warm in Winter, and cold in Summer, to the Depth of 400 Toises, or *Orgyæ*. The second, he says, is always hot, as he himself found by Experience in the Mines of *Hungary*. He conjectures that the third is always cold, as being nearest to the Centre of the Earth; just as the middle Region of the Air is always cold, and the upper, which is nearest the Sky, is always hot. Let *Morin* answer for the Truth of this. As for the perpetual Heat of the second Region in the Mines of *Hungary*, it is not always right. None of the *Hungarian* Mines indeed, that I am acquainted with, are sunk to the Depth of 400 *Orgyæ*, and hardly any so deep as 200 Toises, because of the Waters that obstruct the digging. How then could any one be certain of the Temperature at the Depth of 400 Toises? Mines have their different Regions, warm in some Places, and cold in others, when they do not exceed 80 *Orgyæ* in Depth. But let us return to our icy Cave.

Not only the common Cause, the incumbent Heat, which has been assigned, but the very Position of the Cave, and it's Texture contribute to it's Properties. For it gapes wide to receive the N. Winds, which come from *Carpathus*, and are very frequent, and rage chiefly in the Spring and Summer Months, rushing down from Mountains covered with Snow, and bringing Particles of Frost along with them, which entering the Hollows of the Cave, and being condensed by the outward Cold, easily pervade the dropping Water, and constringe it into Ice. Besides the Disposition of the Chambers is to be considered, which are all composed of Rocks, strongly compacted, sometimes sustained on high, and sometimes seeming to fall in Ruins. The Nature of the Rocks of *Carpathus* is saline, nitrous, aluminous, and vitriolic. Therefore what can be more easy, than a copious Generation of Ice in this Cave, from the Mixture of the icy with the other Particles? They will assent to this, who have learned the artificial Congelation of Liquors, by repeated Experiments. For Snow or Ice, mixed with an equal Quantity of common Salt, Nitre, Alum, or Vitriol, and put about a Vessel of Water, freezes it even in the middle of Summer, or near the Fire; not to mention other Experiments.

VI. *Ribar* is a Village in the County of *Zol*, 1 ½ Mile S. from *Neu-*

An Account of the Cave of Ribar, which sends forth noxious Effluvia, by the same. lb.d. p. 48.

to the uncommon Nature of this Cave. It was therefore in a Manner left to itself, overgrown with Bushes, and seldom visited. It was then in Form of a copious Fountain, and the Water rising to a good Height, flowed on all Sides, as it does in a Conduit, where the Water flows into a Reservoir, and then runs over, till it gets into artificial Passages. The Water was petrifying; and generating a *Tophus*, formed it by Degrees into such a Mass, that there grew up a Sort of Hill about the Mouth of the Spring. This tophaceous Stone increased by Degrees so far, that the Spring itself was stopped up, not being able to rise any longer to the Top of the Fountain. This was helped by the Industry of the Peasants, who were glad to stop up the Spring, because it did Harm to their Cattle.

This was the ancient State of the Spring, the Footsteps of which appear at present on the S. Side of the Meadow, at the Foot of a woody Hill. But afterwards, when plentiful subterraneous Veins of Water flowed from the late Fountain in hidden Passages, the Ground began to give Way near the old Fountain, and at Length formed a new Opening. Then it began to emit noxious Vapours again, and to be destructive to Birds and other Animals. This Cavern gaped in the Form of a Funnel, the Lips of which, being 24 Paces long, and 12 wide, grew narrower by Degrees, till they ended at last in a little Hole at the Bottom, whence the noxious Vapour issued forth. The murmuring Noise of running Water is still heard there, so that we may easily conjecture, that a River flows through those dark Passages, and at last loses itself in some Kind of Swallows. It has not yet broken out any where, though the Ground slopes downward into a Valley, at a small Distance from the Cavern.

In 1708 I made several Trials on the Nature of this Cavern, with the Assistance of a curious Friend. In the first Place, I fastened a well grown Chicken to the End of a Pike, and held it over the Mouth of the Cave, so that the Vapours, as they issued, must necessarily reach it. I had hardly brought it to the Place, when it began to flutter, and in a Moment expired. We opened the Chicken, but only found the Blood stagnated in the *Præcordia*; the rest of the Body was quite sound. Then I cut some Steps in the Ground, and went down myself, to observe the subterraneous Waters; but I was obliged to make more Haste in going up, than I did in getting down; for my Breast began to be obstructed, and my Head to grow giddy. We wondered that this Vapour should be so very noxious, and yet not emit any Sort of Fog, but have the Air above it pure and clear. We therefore endeavoured to discover, what Sort of Vapour this could be, which killed Animals so soon, and yet was imperceptible to the Eyes. We thought, that the firing a Musket into it, was the readiest Way to lead us to the Discovery. The Cavern thundered with the Noise, and emitted Smoak for several Hours afterwards. We concluded from this Experiment, that the Flash of the Powder had set Fire to the sulphureous Exhalations,

tions, which being whirled about, continued to exhale a long Time afterwards. Indeed there was an extraordinary Smell of Sulphur, like what I have observed in the Baths, before a Storm.

Having observed this sulphureous Exhalation, it was easy to conclude, that the ill Effects of it were owing to a volatile and very subtile Sulphur. Therefore we were solicitous to get some of the Water out of the Cavern, to confirm the Experiment. We were moved to this by the frequent Sight of Birds lying dead about the Hole: For we seldom approached it, either in the Morning, or after Dinner, without finding some new Destruction. We gave great Attention to a Hedge-hog, which in one Night's Time was so swoln, and it's Skin distended in such a Manner, that the Prickles, which otherwise adhere strongly enough, seemed to be thrust out by the very Roots. This gave us Room to suspect, that the Animal had not only inspired the Vapours of the Cavern, but had also drunk of the Waters, which boil up violently, and are absorbed again. The Lungs being livid, and the other Bowels unusually distended, shewed that the Animal had both tasted the Water, and sucked in the Vapour; and it began already to have an ill Smell. We therefore drew up some Water from the Bottom of the Cavern, not without Hazard to the Servant, who was let down with Ropes Head foremost. It was clearer than Crystal, very light, and in a Manner ethereal, of a moderately sulphureous Smell, with something of acid, and a little Acrimony, but not biting the Tongue or the Palate. In short, they seemed to come very near to the Nature of the neighbouring *Acidulae*. We tasted it at first cautiously, but being by Degrees confirmed by each other's Example, we at last ventured to take large Draughts of it. This we did without any Offence to our Stomachs, though most of us were tender enough, being just come for the use of the hot Springs; nay, some were desirous of mixing it with the generous *Hungarian Wine*.

These Observations we have made diligently for several Years, that we might be enabled to form a Judgment, whether *Agricola* and *Werner* justly call the Exhalations of this Cave pestilential. A late Writer boldly asserts, that all Poison proceeds either from a Putrefaction of the Earth, or from I know not what Vitiosity of stagnating Humour; each of which Opinions we shall now examine. In the first Place, though the Vapours of this Cave are mortal, yet they are certainly not pestilential; for they do not kill Animals by any congenial Poison carried along with them; but from other Cause, which I shall mention afterwards. If these Exhalations were pestilential, the Waters could not be drunk; much less could the Animals killed by them, such as Chickens, Thrushes, Pigeons, and Hares, be eaten, without Loss of Life, at least of Health; as frequently done by those who bathe in these Waters. But you will say, perhaps a Putrefaction of the Earth, or Vice of some stagnating Humour, produces these fatal Effects. But it is neither of them: For if you admit this, the Vapours of the Cavern must necessarily

A Description of the Cave of Kilcorny in Ireland.

cessarily be thick, and the Water turbid, and of an ill Taste: Whereas it is clear, and the Taste not putrid, but subacid; besides, it has been already observed, that the Vapours are imperceptible to the Eye. Therefore the fatal Effect of this Vapour must be ascribed to a Quantity of very subtile Sulphur, and a Mixture of the Exhalations of the Minerals, which are hurried along, together with the Waters, through those subterraneous Passages. Not that they are in their own Nature destructive, but that their too great Subtilty, filling the *Bronchia* of the Lungs suddenly, and shutting out the necessary Air for Respiration, choak up the Blood therein immediately, and kill Animals sooner than can be imagined. Those who think otherwise, are greatly mistaken, and bestow an unjust Mark of Infamy on our Cavern.

However we may form a Judgment of the sulphureous Nature of the Exhalations of our Cavern, from the neighbouring Baths, which are of the same Nature, but have denser Streams, and are sometimes more intense, and sometimes again more remiss, according to the different Dispositions of the Air. For when the Air is hot, and the Sky disposed to a Storm, the Baths always smell of Sulphur most intolerably, and are offensive and sometimes fatal to those who use them; especially when the Waters are fresh let in. I saw a strong, hearty Man, in the Vigour of his Age, who bathed one Afternoon, when a great Storm was gathering: He bore the sulphureous Vapours a great while, but was attacked by a Fever, which carried him off in four Days. I do not know whether our Cavern is subject to these Vicissitudes of Weather, for I did not attend to this Observation so accurately as I ought to have done. This is certain, that, even when the Weather is clear, and there is no Suspicion of a Storm, the noxious Efficacy of the Vapours varies, and kills the Animals that are brought to it sometimes sooner, and sometimes later; and that it quite ceases sometimes, and as it were loses it's Nature; the Causes of which I have not discovered myself, nor do I remember, that any of my Friends have made the Discovery. The Inhabitants have now covered the Cavern with Boughs in such a Manner, that it is hardly accessible. The Destruction of Birds also is not now so frequent as formerly, which I ascribe to the Water-course running deeper than it used to do.

A Description of the Cave of Kilcorny in the Barony of Burren in Ireland, by Mr Charles Lucas, Apothecary at Dublin. No. 456 p. 360. Jan. &c. 1740.

VII. That Part of Ireland called *Burren*, is a small Barony in the N W Part of the County of *Clare*, and bounded on the North Side by the Bay of *Galway*. It is from one End to the other a Continuation of very high, rocky, Lime-Stone Hills, there being little or no plain Land throughout the whole. It is that Part of which it is reported, that *Oliver Cromwell* said, (when he came to storm a few Castles in it) that he could neither see Water enough to drown a Man, Wood enough to hang a Man, or Earth enough to bury a Man in: Notwithstanding it is most fertile, and produces immense Quantities of Juniper, and some Yew; besides great Variety of the capillary Herbs, *Virga Aurea*, *Verbena*, and some other common Plants, I have found the *Teucrium Alpinum*

Alpinum

Alpinum magno flore, of Caspar Bauhin, and a large shrubby *Cinquefoil*, answering the Description Mr Morison gives, in his second Volume of *Hist. Oxon.* of his *Pentaphylloides rectum fruticosum Eboracense*.

The Inhabitants are but few, and they mostly poor Cottagers, whose chief Stock is a Parcel of Goats. They are courteous and good-natured to Strangers, though very wild and unpolished; weak, blind, superstitious Zealots to the Church of *Rome*, and (like some more polite People in the World) led and enslaved by a Set of mean, ignorant, and illiterate Priests.

The Place where this Cave lies, is called *Kilcorny*: It is a pretty low Valley, in Comparison to the Hills that surround it: The Entrance is into the East End of it, (for it lies East and West) about Midway. There are the Ruins of an old Church, and, a little Westward of it, an even Plain of about an Acre of Ground; on the North Side of which, under a steep rugged Cliff, lies the Cave.

The Mouth of it is level with the Plain, about three Feet Diameter: It has been much larger, but was blocked up with Lime and Stone, which plainly appears still, but to what Purpose is not known. Some conjecture it was an Attempt to restrain the great Flux of Water; but the fabulous Natives, who tell numberless romantic Tales of it, say, it is a Passage to the *Antipodes*; and that a Stud of fine Horses have been seen coming out of it very often, to eat the Corn sown in the Valley: They further add, that many Stratagems have been tried to catch some of them; but, with the Loss of some Mens Lives, they could catch but one Stone-horse, the Breed of which, being very valuable, they say is kept to this Day by *O Loghlen*, which with them is a Kind of titular King that they pay great Respect to. But to return to the Cave:

When you pass this narrow Entrance, it grows much wider and loftier. The Floor is a pretty even Rock, from 2 to 4 or 5 Yards broad: The Sides and Top are rugged and unequal, from 6 to 12 or 14 Feet high.

About 40 Yards from the Door, there is a pretty deep Pit, 7 or 8 Yards over; but, when passed, the Floor is plain and even, as before, for about 200 Yards, which is the farthest that any one known has ventured into it: For my Part, I did not pass this Pit, but have seen several that did, whose Veracity I can depend upon. Most People that have gone into it, went by a Thread or Clue; others have carried a Bundle of Straw, and dropped it by the Way, to guide their Return; which seems altogether unnecessary, there being no Windings or Chambers throughout of any Extent. It is all over, even in the Depth of Winter, as dry as any Place of the Kind under-ground can be; and what seems very prodigious, is, that it often pours forth such a Deluge as covers the adjacent Plain, sometimes with above 20 Feet Depth of Water.

The

The Times of it's overflowing are uncertain and irregular; sometimes it does not happen above once in a Year or two, but most commonly 3 or 4 Times a Year: It is sometimes observed to succeed great Rains and Storms, though it often happens without either.

The neighbouring Inhabitants are alarmed at it's Approach, by a great Noise, as of many falling Waters at a Distance; which continues for some Hours before, and generally all the Time of the Flood.

The Water comes forth with extreme Rapidity from the Mouth of the Cave, and likewise from some smaller Holes in the low Ground, attended with a surprising Noise: It flows for a Day or two, and always returns into the same Cave, and partly into the small Holes, from whence it was observed to come before, but with a more slow and tardy Course. The Water is of a putrid Quality, like stagnated Pond-Water, insipid as Spring-Water. It always leaves a filthy muddy Scum upon the Ground it covered, which greatly enriches the Soil.

It has been known sometimes (though rarely) to overflow and ebb in 6 or 8 Hours Time, but in a much less Quantity.

There is neither River or Lake any where in that Part of the Country, and it is above 6 Miles from the Sea. There are very near it several much lower Valleys, in which there is no Appearance of Water, unless a little Rain-Water collected in a Pit, in the Fissure of a Rock, or the like.

*An Account of
the Eruption of
Vesuvius in
May 1737, by
Nicolas Mi-
chael d'Ara-
gona, Prince
of Cassano,
and F. R. S.
Translated
from the Ita-
lian, by T. S.
M. D. F. R. S.
No. 455. P.
237. Nov. &c.
1739.*

VIII. Mount *Vesuvius* is generally esteemed about 7 Miles distant from *Naples*. It rises in the Middle of a large Plain, which surrounds it on every Side. It is better than 4 Miles from the Sea, and the Foot of the Mountain is seen to begin from the Sea-Coast, which growing gradually higher, reaches the first Plain, to which one can easily ride on Horseback. The Figure of the Plain is almost circular, being about 5 Miles in Diameter, and half a Mile perpendicular Height above the Level of the Sea. This is the Basis of the Mountain, out of which arises another, called by the People of the Country *Monte-vecchio*, whose perpendicular Height is about 400 Paces, and it's Top little less than 2 Miles in Circumference, of an irregular Figure. The said Top, before the Year 1631, was of the Form of a Baion, but all surrounded with aged Oaks, and vastly large Chestnut-Trees, whose Fruit afforded Food sufficient for a Number of Cattle that fed thereon. In the Bottom a Cavern was observed, into which People descended above 200 Paces, by difficult and interrupted Paths; and this Opening was looked upon as the ancient Mouth, which for a long Space of Time had constantly cast up great Quantities of bituminous Matter, and had at the same Time burnt up a considerable Part of the neighbouring Country, cultivated by the Inhabitants round the Hill.

Concerning the Eruptions that have happened heretofore, they are very numerous, as well ancient as modern.

Of the first, several are taken Notice of by *Berosus Chaldaeus*, *Polybius*, *Strabo* in the Time of *Augustus*, *Diodorus*, and *Vitruvius*; and
in

in *Trajan's* Reign the Name of the Mountain became more famous by the Death of *Pliny*. From that Time forward, it is not doubted, that the Eruptions were less frequent down to the Year 1139; when, after a considerable Eruption, it began to take Rest, and continued quiet somewhat less than 5 Centuries; so that the horrid Remembrance of the past Ruins was pretty well obliterated out of the Minds of the neighbouring Inhabitants; who, vainly flattering themselves with Hopes, that the inflammable Matter was spent, planted the whole District round the Mountain, which, by it's Fertility, became the Delight of these Parts. But, in Process in Time, they found themselves deceived and frustrated in their Expectations: For in the Year 1631, during six Months Space, continual Rumbings were heard, and Shocks of Earthquakes felt: And afterwards, in *Dec.* a dreadful fiery Eruption happened, which first blew up Part of the Mountain into the Air, in a terrible Manner, and then vomited out Water, Ashes, Stones, and Fire; inundating almost the whole Country around to the Sea, and for above 7 Miles in Breadth, with the irreparable Loss of more than 4000 People. After which the Mountain became silent, and remained considerably diminished in it's Height, from what it had been before.

It continued quiet for 29 Years, but having rekindled in 1660, it's Fire filled the whole Capacity of the immense Hollow, which remained since the Year 1631; whence, after several lesser Eruptions, a new Mountain appeared in 1685.

In 1707, not only the Inhabitants of the Neighbourhood, but also the whole City of *Naples*, were put into great Terror, and not without Reason, by the Apprehensions of a Renewal of the dismal Tragedy of 1631, upon Account of the frequent Noise and Shocks, the Fire seen on the Top of the Mountain, with a vast Quantity of Ashes, which issuing out with Impetuosity, were dispersed all over our Hemisphere, and darkened the Light of the Sun for one whole Day's Space. These were all manifest Signs of the impending Desolation; and yet (whether by a Miracle of our particular Protector *St Januarius*, as some were of Opinion, or by natural Causes) this dreadful Day, which had portended so much Mischiefe, was beyond Expectation, and to our great Astonishment, followed by another as pleasant as could be desired: For the Air was quite serene, and clear of the Ashes; and on the Mountain there was no other Appearance but that of a little Smoke.

In the Year 1724, the Quantity of Ashes and Stones, thrown from the Top of the Mountain, were so heaped from the Bottom up to the Edge of the old Mountain, that the whole Space from the old Hill to the new, appeared but one continued Mountain.

In 1730 there was another Eruption of *Vesuvius*, which, though very inconsiderable in respect of the last, yet was the Occasion of much Fear.

This present Year 1737, to the Month of *May*, the Mountain was never quiet: Sometimes emitting great Quantities of Smoke, at other Times.

Times red-hot Stones; which, for want of a sufficient impelling Force, fell on the same Mountain. But in order to a clear Idea of all the Circumstances presaging the impending Eruption, it is requisite to know, that in the Beginning of *May*, a Smoak only was seen to issue from the open Mouth at the Top; and from the 16th to the 19th, subterraneous rumbling Noises were heard.

On the 19th, Fire was seen to burst out in thick black Clouds; and the same Day there were several loud Reports, returning quicker towards the Evening: And still more on *Sunday* Night, when there constantly appeared a very great Smoak mixed with Ashes and Stones; and the Neighbourhood felt some Shocks, like those of a weak Earthquake.

On *Monday* the 20th, at 13^h, the Mountain made so loud an Explosion, that the Shock was strongly felt not only in the Neighbourhood, but also in the Cities twelve Miles round. Black Smoak, intermixed with Ashes, was seen suddenly to rise in vast curling Globes, which spread wider as it moved farther from the Basin. The Explosions continued very loud and frequent all this Day, shooting up very large Stones through the thick Smoak and Ashes, about a Mile high, to the Horror of the Beholders, and Danger of all the neighbouring Buildings.

At 24^h, amidst the Noise, and dreadful Shocks, the Mountain burst on the first Plain, a Mile distant obliquely from the Summit, and there issued from the new Opening a vast large Torrent of Fire; whence, by the Quantity of Fire incessantly thrown up into the Air, at a Distance all the South Side of the Mountain seemed in a Flame. The liquid Torrent flowed out of the new Vent, rolling along the Plain underneath, which is above a Mile long, and near 4 Miles broad; and in its Way it spread very speedily near a Mile wide; and by the fourth Hour of the Night it reached the End of the Plain, and to the Foot of the low Hills situated to the South. But as these Hills are rugged with Rocks, the greatest Part of the Torrent ran down the Declivities between these Rocks, and into two Valleys; falling successively into the other Plain, which forms the Basis of the Mountain; and after uniting there, it divided into four lesser Torrents, one of which stopped in the Middle of the Road, 1 $\frac{1}{2}$ Mile distant from the *Torre del Greco*. The second flowed into a large Valley. The third ended under the *Torre del Greco*, near the Sea; and the fourth at a small Distance from the new Mouth.

The Torrent which flowed into the Valley, ran as far as between the Church of the *Carmelites*, and that of *the Souls of Purgatory*, by the 8th Hour on *Tuesday*. The Matter of the Torrent ran like melted Lead: In 8 Hours it made 4 Miles; and, consequently, it flowed $\frac{1}{2}$ a Mile in an Hour: A new and remarkable Circumstance of this Eruption, seeing *Bulifone* thought it very strange, that in the Eruption of 1698, the Torrent had advanced 60 Paces in an Hour; whence he infers, that
such

such great Swiftneſs proceeded from a greater Degree of Liquefaction of the Matter. The Trees, which the Torrent light on in it's Way, upon the firſt Touch took Fire, and fell under the Weight of the Matter.

The Torrent which ran behind the Convent of the *Carmelites*, after ſetting the little Door of the Church on Fire, entered not only therein, but alſo through the Windows of the Veſtry, and into two other Chambers. In the Refectory, it burnt the Windows; and, what is ſurpriſing, the Glaſs Veſſels, that ſtood on the Tables, were melted into a Paſte by the violent Heat of the Fire. Sixteen Days afterwards, the Matter continued hot, and was very hard, but it was broke by repeated Blows.

A Piece of Glaſs faſtened on the Top of a Pole (and thruſt into this Matter) was in 4 Minutes reduced to a Paſte. Under the Maſs of the Torrent were heard frequent Reports, which made the Church ſhake, as if by an Earthquake. Along the whole Surface of the Torrent, there appeared ſmall Fiſſures, out of which iſſued Smoak, that ſtunk of Brimſtone mixed with Sea-Water; yet theſe Exhalations are not poiſonous, but rather a Remedy for ſome Diſeaſes. The Stones round about theſe Fiſſures were obſerved to be covered with ſublimed Salts, the Nature of which I ſhall explain hereafter.

Iron, thruſt into theſe Fiſſures, was taken out moiſt; but upon thruſting in Paper, it was not moiſtened, but rather ſomewhat hardened.

At the ſame Time when the new Mouth opened, that on the Summit of the Mountain vomited a vaſt Quantity of burning Matter, which, dividing into Torrents, and ſmall Streams, ran partly towards the *Salvadore*, and partly towards *Ottajano*; and at the ſame Time that this Matter iſſued out, red-hot Stones were ſeen to be caſt out of the Mouth, in the Miſt of black Smoak, frequent Flaſhes of Lightning and Thunder, all produced by the ſame Matter.

Theſe impetuous Expulſions of Fire continued till *Tueſday*, when the Eruption of the melted Matter, the Flaſhes, and thundering Noiſe, ceaſed; but a ſtrong S W Wind ariſing, the Aſhes were carried in great Quantities to the utmoſt Boundaries of the Kingdom; in ſome Places very fine, in others as coarſe as *Iſebian* Sand: And in the Neighbourhood they not only felt this plentiful Shower of Aſhes, but likewiſe Pieces of Pumice-Stones, and other large Stones.

Tueſday Night the Fury of the Mountain began to abate, ſo that on *Sunday* there was ſcarce any Flame ſeen to break out of the upper Mouth; and on *Monday* but little Smoak and Aſhes. This Day it began to rain plentifully, which continued to *Tueſday*, and afterwards for many Days: A Circumſtance which has conſtantly happened after the Eruptions of Times paſt.

The Damages done in the Neighbourhood by this Eruption of Fire and Aſhes, are incredible. At *Ottajano*, ſituated between $4\frac{1}{2}$ and 5

Miles from *Vesuvius*, the Ashes on the Ground were four Palms high. All the Trees were burnt (or blasted) the People terribly affrighted, and many Houses crushed by the Weight of the Ashes and Stones that fell.

After the Description of this fiery Eruption, the Academy of Sciences [at *Naples*] thought proper to make an accurate Analysis of the Matter, and of the Salts, that were collected in great Plenty near the above-mentioned Fissures; and, towards the Discovery of the Truth, they effectually made the following Experiments:

Exp. 1. Some of the Stones of *Vesuvius* being pounded small, and the Loadstone applied to the Powder, some few Particles were attracted by it; and the same Powder, put into *Aqua fortis*, caused a sensible Effervescence; whence it certainly contains no small Quantity of Iron: Which was also found upon Trial in another Eruption by *Tomaso Cornelio*. But for the greater Elucidation of Truth, one of these Stones being applied to the magnetic Needle, it turned to the Stone; and then carrying it round to the opposite End of the Needle, it immediately turned from it, in the same Manner as if Iron was applied near the Compass.

Exp. 2. The Stones are not all of the same Density or Colour, but various, and of different Ponderosity. Some are composed of real Talck, others full of Marcasites: Some are almost all sulphureous, others nitrose; some of a grey Colour, others red.

Exp. 3. The Matter of the Current is spongy at Top, but very dense towards the Bottom; which is a Proof of the Fusibility thereof, whereby the heavier Bodies subsided, and the lighter remained at Top.

Exp. 4. After growing hard, it retained Part of the Heat above a Month, though unequally: For in the inward Parts, where the Air had not free Access, and the Matter was more compact, the Heat was much stronger than towards the Surface.

Exp. 5. Twenty Days after the Eruption, in divers Parts of the Mountain, from the Bottom to the Top, there were seen to arise many pernicious Damps, [*Mofete*] especially from the Cavities, and the Fissures of former Torrents; as also on the Plain: But none were observed in the Matter of this last Eruption. They issued out of the Fissures under the Appearance of a cold Wind, and rose about 3 Palms high; then they moved along the Surface of the Ground, and, after a Progress of some Paces, disappeared. Animals, which happened to graze where these passed, were all killed thereby; and likewise a *Teresian* Friar, who inadvertently breathed the Vapour of one of these Damps.

Exp. 6. Having placed the Barometer in the Vapour, it underwent no Change, but the Thermometer fell somewhat more or less. A lighted Torch, thrust into them at two Palms from the Ground, was soon extinguished by the Action of the Damp.

Exp. 7.

Exp. 7. These Damps grew gradually weaker in their pernicious Effects for above 3 Months, even to the subsequent Autumn, as has been generally found in other former Eruptions, or when they happened to issue out of their Vents.

Exp. 8. Concerning the Salts which are generated in Abundance in *Vesuvius*, I have, by Order of the Academy, examined them by accurate Experiments. My Intention was to know, if besides Salt Ammoniac, there were also Sea-Salt, Vitriol, Nitre, or any other Salt. I thought there was no better Way of proceeding in this Inquiry, than by Crystallization; because it is universally allowed, that Salts in crystallizing constantly retain one certain and determinate Figure; Sea-Salt concreting into Cubes, vitriolic Salt into rhomboidal Parallelepipeds, Alum into Octædrons, and Nitre into rectangular Prisms on hexagonal Bases. I imagined, that if the Salt of *Vesuvius* happened to contain any Particles of the Salts above-mentioned, it would discover them after Crystallization. This Way of reasoning was confirmed by Experiment: For the *Vesuvian* Salt, in crystallizing, left on the Sides of the Vessels small Parcels of crystallized Salts, which, observed through a Microscope, resembled a Tree with it's Branches, on the Ends of which there appeared several Pyramids of an irregular Figure, but very sharp-pointed; and between the Branches there were interspersed in some Places a Group of Prisms, in others some small Cubes: Whence I inferred, that the aforesaid Salt was ammoniacal, and indeed a genuine and efficacious Salt-Ammoniac, with insensible Portions of Nitre and Sea-Salt. Which coincides with the Sentiments of the Royal Academy of *Paris* in 1705; with those of *Thomas Cornelius* in his *Progymnasma de Sensibus*; of *Dominicus Gulielmini* in his *Treatise de Salibus*; of *Dr Boerhaave* in his *Chemistry*, and many other Writers.

Exp. 9. In order to be convinced whether this Salt was really ammoniacal, and of the Nature of neutral Salts, I mixed it with Spirit of Vitriol, and Spirit of Salt, without producing the least Fermentation. I afterwards put some of it into Oil of Tartar *per deliquium*, and could not perceive any Ebullition; wherefore it is to be ranked among the neutral Salts.

Exp. 10. Thrown upon red Coals, it did not crepitate like Sea-Salt, but it boiled and swelled, and after evaporating, it dried up.

Exp. 11. It is of a very pungent Taste, strongly pricking the Tongue, and of a bituminous Smell of Brimstone, which occasions a violent Head-ach by it's volatile Texture.

Exp. 12. The Salts taken from different Stones are not all of the same Weight or Colour: For some are yellow and unctuous, as if rubbed all round with *Petroleum*: Others are very white, others blackish, and others of other Colours, according to the Stones they adhered to.

Exp. 13. I have likewise found by Experience, that the Salt Ammoniac of *Vesuvius* is much more efficacious than any other Salt known at this Day, in cooling Liquors. Upon dissolving some of it in Water,

it makes the Water so cold, that the Sides of the Vessel which contains it, can hardly be touched without Uneasiness, through the excessive Cold.

Exp. 14. M. *Geoffroy* looks on it as a singular Power of common Salt Ammoniac, that being mixed with a certain Quantity of Water, it rendered the Water so cold, that it made the Spirit of his Thermometer, 18 Inches high, fall 33 Lines. But I have shewn to several Persons, that the *Vesuvian* Salt makes the Liquor of a Thermometer, like his, fall $4\frac{1}{2}$ Inches; which is equal to 54 Lines. Wherefore the Efficacy of this Salt, in causing the Fall of the Liquor, exceeds the Efficacy of common Salt Ammoniac by 21 Lines.

Exp. 15. If round a Vessel full of Water cooled with Snow, there be put some of the Salt of *Vesuvius*, the Water freezes and grows hard in a very little Time.

Exp. 16. If you put a good Quantity of the Salt of *Vesuvius* into Snow set round a [Glas] Vessel full of Water, and then stir the Vessel, the Water contained therein becomes unfit to drink, having acquired a very disagreeable, acrid, sulphureous Taste; a manifest Sign, that the Salt is divided into small Particles, which passing through the insensible Pores of the Glas, enter into and mix with the Water.

Exp. 17. Of all Kinds of Salts, this dissolves in the greatest Quantity in Water; and perhaps the greater or lesser Dissolubility of a Salt in Water, will be [found] proportional to it's greater or lesser Effect in cooling Water.

Exp. 18. Being put into Brandy, or Oil, besides that very little of it is dissolved, it occasions no Descent of the Liquor in the Thermometer.

Exp. 19. Being mixed with Blood lately drawn from the Vein of a Man, but coagulated after settling, the Blood was thereby dissolved, and continued in that State for the Space of 24 Hours.

Exp. 20. A Solution [of this Salt] being injected into the Vein of a Dog, first occasioned Tremors, then universal Convulsions, and lastly Death: And 4 Hours afterwards, having opened the Dog, the Blood, which should have been coagulated, was found fluid, both in the Trunks of the Veins, and at the Ends of the Arteries.

Exp. 21. It has all the Properties of Salt Ammoniac to that Degree, that upon substituting this *Vesuvian* Salt, instead of common Salt Ammoniac, the strongest Sort of *Aqua Regia* may be had for dissolving Gold: Which Experiment was made with Success by M. *Lemery*, in the Academy of *France*.

Exp. 22. If a Lump of the mineral Matter be reduced to a fine Powder, and attentively viewed through a Microscope, it appears very like the Sand of *Ischia*, and is very proper for Writing-Sand: Whence I conjecture, that that Sand is nothing else, but the [same] Matter for a long Time comminuted by the Action of the Sea.

Exp. 23.

Exp. 23. In some of the Stones there appear some few Veins of Gold, in others of Silver, but insensible; and in others, which are very heavy, there is some Antimony.

Exp. 24. A great Dispute arose in the Academy on the Rise of the [Mofete] Damps; for what Reason these should be seen only in the old *Strata* of the mineral Substances, and not in the new, where by the Action of the Fire they ought to issue: Which *Phænomenon*, if I am not mistaken, may be accounted for in this Manner: As the cooling of the burning Matter begun at the Surface, we may think, that the more subtle heterogeneous Particles, upon the closing of the Pores at the Surface, remained in Quantities buried in the lower Parts of the Matter; which, in Process of Time, becoming acutangular, and of deleterious Figures, yet cannot offend while imprisoned: But in new Eruptions, wherein the Shocks given to the Matter produce many Fiffures, the Damps, meeting with less Resistance there, issue forth: As when the Air is a long Time pent up in some Hollow, upon giving it Vent, it generally comes out in a pernicious Vapour.

Exp. 25. It was observed, that the greatest Shocks happened to such Things as stood exposed to the *Volcano*; but that those Things which were not thus exposed to it, received but faint Shocks: A manifest Sign, that the Vibration of the Air had a great Share in the Shocks of the Earth: Which Circumstance is taken Notice of by *Borelli* with respect to Mount *Ætna*.

IX. I was lodged for some Time at *Chaja*, and afterwards at *Fontina Medina*, in the Face of this surprising Neighbour [Mount *Vesuvius*] which from thence doth not appear to be above 2 or 3 Miles distant.

It gave us Strangers constant Entertainment, by shewing us what it could do, as well as great Satisfaction to the People of *Naples*, who, whilst it continues burning more or less without ceasing, are under no Apprehension (and I believe with good Reason) of an Earthquake: But we little thought of being invited to a Sight, *Quod nunquam vidimus, & nunquam videbimus*; for by all the Accounts of the Living, there has not been any Eruption in their Remembrance near so violent, nor so furious; and Authors mention none to this Degree later than above 100 Years ago. On *Friday, May 17, 1737, N. S.* I observed, as far as I could see round, that the Mountain was covered with white Ashes a great Way down, as it hath been with Snow in the Winter, which I could not find any Body here, or at *Barra* near *Portiche*, take any Notice of; though I should be apt to think for the future, that it might be a Fore-runner; for I had never seen any Thing like it. *Pliny* observes in these Words, *Præcesserat per multos dies terræmotus minus formidolosus, qui Campaniæ non solum castella, verum etiam oppida vexare solitus.* (*Plin. Lib. vi. Ep. 20.*) Other Authors say the contrary, though it may very likely be so, round and near the Foot of the Mountain; but this Time I have not found any Body sensible of it here; but it is certainly true, that our Windows and Doors shook all the Time of the

Violence.

An Account of the Eruption of Mount Vesuvius, May 18, and the following Days, 1737, N. S. by an English Gentleman at Naples to his Friend in London. Ibid. p. 252. Dated Naples, Aug. 30, 1737, N. S.

Violence of the Eruption, which I take to be from the very great Concussion of the Air upon the violent Explosions: A Door which had a Latch, to my great Surprize, opened often of itself. I cannot conceive a tremulous Motion of the Earth from the Mountain hither, unless it were thoroughly cavernous from thence, which the People here deny, and particularly the Author *Paragallo*.

On *Saturday Night (May 18)* this great *Phænomenon* began, and increased so much on *Sunday*, that it brought half the People out to gaze at it, with great Variety (no Doubt) of Passions and Ratiocinations. There were certainly, amongst some, great Apprehensions, by their being employed in Processions, visiting their Churches, and exposing their Images of the *Virgin Mary*; but I looked upon them as very ungrateful to their great Patron [*St Januarius*] in having any Dread, when they even boast, that he has never failed delivering them from their greatest Distresses; but by the terrible Havock I have observed in their Country, as well as what has been made by this last Eruption, I find he hath always left them in the Lurch: However, as I had not lost a Grain of the Faith I ever had in that Saint,

I very boldly set out on *Monday* about two Hours before Sun-set. It was a melancholy Sight, to see the Road full of Numbers of poor Wretches, flying as from *Sodom*. I stopped on the Way, to observe the vast Clouds of Smoak, which was thrown up in a prodigious Column, to an Height not to be guessed at, which, by it's gentle Waving and Undulation, was a most beautiful Sight; and when it had mounted so high, that it had lost the Force of the Protrusion, it was carried by the Wind a vast Way; but not too far for one to observe how it's Rolls began to break, and, being dispersed and expanded, covered the Country underneath with Ashes and Darknes. There were many great Flashes of Lightning darted through this Pillar of Smoak, and frequent Discharges as of Cannon or Bombs, which were followed by falling Stars, such as we see from well-made Rockets. We turned off out of *Portiche*, to gain the North Side of the Mountain, as far as we could, in Chaises, till we were forced to get upon Asses or Mules.

It was now growing dark, and the Fire began to be visible, which it was not in the Day-time, the Sun bearing no Rival. The prodigious *Bouillon* of Fire, and the extreme Force it was expelled with, as well as the vast Height it was carried up to, are not to be described or guessed at. If I should imagine an hundred *Stentors* or *Polyphemus's*, with as many of *Pbaleris's* Bulls roaring all together, they could not bellow more terribly. But to have a truer Idea of this Scene, you must look into *Burnet's* most beautiful Painting of the general Conflagration. As we looked round this Northern Side, the whole Country appeared as if over-run by *Samson's* Foxes.

In a little Time, by the Light of the Mountain, (though that was much obscured by the Clouds and Pillar of Smoak) and the Help of our Torches, we scrambled over very rough Roads, till we got within
a Quarter

a Quarter of a Mile of the great *Lava* or Current: But then I ordered an Halt; for indeed the Scene on all Sides became so stupendous and terrible, that I thought I should make a very foolish Figure, if any Misfortune should happen to us.

We returned to *Portiche*, where we supped, and got home, much fatigued, by 2 in the Morning. The Fury of this Eruption was at it's Height this Night, as to burning; but the next Day (*Tuesday*) the Columns and *Bouillons* of Smoak were as great, and thrown out with as much Violence, which, as the Wind sat, carried it's Destruction, not of the large massy metallic Bodies, but of infinite Quantities of Ashes and Cinders, all that Day, and Part of the Night. Through the Columns of Smoak was a continued Lightning, the most beautiful Sight imaginable.

The following Day (*Wednesday*) we set out again to view the West Side of the Mountain at *Torre del Grejo*, 8 Miles from hence; where we heard, that the great *Lava* had stopped at the Church of the *Carmelites*, but not without carrying Part of it away: Yet the People were superstitious enough to think this Stop miraculous; though it made a great Breach on one Side, broke down and quite demolished their Sacristy, besides cracking the Roof. This *Lava* had from the Declivity taken the Water-course, which was the Preservation of the Country from being drowned (and the People had best look to themselves, unless they make another). This Hollow, which was for some Miles between 30 and 40 Feet deep, and as many wide, was not only filled up, but the Matter rose as many Feet above the Surface of the Land about it: We walked to view it on one Side, but the Heat was so intense, and the sulphureous Stench so suffocating, that we were obliged to keep at a good Distance; and I was well informed by several, that it continued very hot a Month or 5 Weeks after; so long in cooling is that great Quantity of bituminous and metallic Matter, with which this *Vomes* is loaded.

As the Fury of the Expulsion and Explosion was much abated on *Tuesday* Morning, the Stop here was about four that Day in the Afternoon; which might be the more easily conceived, when no more of this vast metallic Matter was discharged, and the Motion of all the rest was relented, for want of more Protrusion, and the Bitumen growing a little cooler. As this Stop was made at the Church, Part of the *Lava* took a Turn into the great large Road to *Salerno*, to a great Height; which Part is choaked up for ever, the Expence being immense to remove it. N. B. *Giulio Cesare Reputio*, one of the Authors who describes the Eruption in 1631, says, one of the massy metallic Bodies was in his Time weighed, and the Weight amounted to 500 *Cantaras*, a *Cantara* being nearly 200 Weight. They have since made the Road passable, by laying Earth upon the *Lava*, and so have added to the Hills of their Country. There are some who pretend to say, that the Matter discharged this Time in the different Currents or *Lava's* round

round about, would make a Mountain as big as their Sire. The *Carmelites* here soon fled, and were not come back ten Days afterwards, when we returned that Way, to visit the S E Side, to view the great Devastation which was made about *Ottajano*, 18 Miles from hence; for though the great Discharge of the metallic Body ceased on *Tuesday*, a vast Destruction of the Country followed for a long Time after; for as the Force of the Explosion was very great, it continued to throw out vast Showers of Cinders and Ashes. The Lands indeed, where the *Lava's* fall, are annihilated to the Owners; but the other Materials destroy all the Fruit and Produce of the Earth where they fall, which doth not recover for a long Time; and in this unhappy District, his Majesty hath, with great Goodness, taken off all Taxes for 10 Years.

As we turned on the Left from *Torre del Grejo* towards *Ottajano*, we passed all the Way through their *Masserias* [Farms]; and the Mountain, having the Weather-gage of us for 3 or 4 Miles, rained Ashes plentifully upon us, and we lost our Smell of every Thing but Brimstone. All the Trees, Vines, and Hedges, bent under the Weight of these Ashes, several Arms, and even Bodies of Trees, were broken with the Weight; so that in some narrow Roads we had Difficulty to pass. Within a Mile or two of the Prince of *Ottajano's* Palace (a very honest worthy Gentleman, who has suffered a Loss of above 100,000 Ducats, or 50,000 *l.* some say more) one can scarce frame to one's self a Sight of greater Desolation; ten successive Northern Winters could not have left it in a worse Condition: Not a Leaf on a Tree, Vine, or Hedge, to be seen all the Way we went, and some Miles farther, as we were informed: Here, and at the Town, they had a new Earth, about 2 Feet deep, some said more, by the Account of the miserable Inhabitants, who were a dismal Spectacle, though they had recovered their Fright, and seemed to be got into a new Heaven. The Storm fell so thick and heavy for that Time, that they almost all fled, and many Houses were beaten down. In one Convent, two or three Nuns were buried in the Ruins. At *Somma*, on the N E Side, it has made great Havock; a Monastery of Nuns was destroyed. After a long Day's Work, we returned at six o'Clock.

The Earth of this Country is, no Doubt, greatly compounded of Sulphur and Nitre, from whence Dr *Burnet* hath fixed it for the Beginning of the general Conflagration; though he has, out of a particular Spite to the People of *Rome*, laid the Commencement of it there. The great Quantities of Sulphur and Nitre are, to be sure, the Operators of these great Explosions, Lightnings, Bombs, Bellowings, and Expulsions of all this Matter; and Nature can certainly make much stronger and more elastic Gunpowder, than Mankind; else those great massy Bodies of Metals could not be thrown up with that vast Force, to that great Height. The Bodies are compounded of various Metals, and, as it were, incorporated with the Bitumen: They pretend to find some Silver, but I question whether the Gains will pay the Costs.
They

They have spoken of the *Lava's*, as if their Motion was quick ; but I observed otherwise, that it is slow, and the Progression rather like a vermicular one : And besides trusting to my Sight, I am rather apt to think it must be so, because, though in a great Declivity, these great Masses must be much retarded in their Motion, by their large unequal Points or Angles ; besides, the Glewyness of the Bitumen as it cooled, would very much impede a quick Motion ; which Bitumen is that Matter that flames, smokes, and is so very suffocating.

By some of the Ancients, these burning Mountains have been looked upon as Divinities, and that they lived there : To confirm which, there was a Marble found at *Capua* (as *Paragallo* affirms) with this Inscription, *Jovi Vesuvio sacrum D. D.* The *Greeks* made use of them in their Mythology, by clapping the Rebel Giants under them.

I must not conclude without saying something of the *Mofete*, upon which much have been written, particularly by *Leonardo de Capua* ; but all might be reduced into a narrow Compass. I mention it now, because it hath given great Terror to the Neighbourhood of this Mountain ; four or five Persons near *Torre del Grejo*, *Portiche*, and some other Place, having been killed by going into their Caves or Cellars : And it is particularly remarked to have been thus destructive all round the Hill, after the great Eruptions ; upon which the great Agitation and Rarefaction of this inflammable Earth, composed of such active Particles, even *Sal Ammoniac*, must send out vast and strong *Effluvia*, (or what in such close Places may properly be termed Exsudations) pernicious, no Doubt, when confined under-ground, and hindered from expanding and mixing with fresh Air : And, no Doubt, all round the Mountain they abound ; but the open Air is a Specific against their ill Effects ; as we see it is an immediate Cure to the poor Dog at the *Grotto del Cane*, and not any particular Quality of the neighbouring Lake, which throwing him into, I should rather think, would kill him, till he had recovered his Respiration and Spirits. *Virgil*, *Æn.* VII. 84, mentions these Damps :

————— *Nemorum quæ maxima sacro*
Fonte sonat, sævamque exhalat opaca mephitim.

And to these Stenches *Persius*, Satire III. l. 99, resembles the Scent of a stinking Breath :

Gutturæ sulphureas lente exhalante mephites.

The following Authors have given very ample Accounts of the Eruption of Mount *Vesuvius*, on Dec. 16, 1631.

Giulio Cesare Braccini ; Dell' Incendio fattosi nel *Vesuvio*, a 16 Dec. 1631, *Neapoli*, 1632, 4^{to}.

V O L. VIII. Part ii.

U u u u

Don

Don Juan de Quinones; El Monte Vesuvio, Madrid, 1632, 4^{to}.

Julius Caesar Recupitus; de Incendio Vesuviano Nuncius, Neapol. 1632-3, 8^{vo}.

Job. Bapt. Musculus; de Incendio Vesuvii. Neapol. 1633, 4^{to}.

Gaspar Paragallo; Ragionamento de' Tremuoti. Neapoli, 1689, 4^{to}.

The History of
an Earthquake,
which shook
Apulia, and
almost the
whole Kingdom
of Naples, in
1731, by Ni-
cholas Cyril-
lus, Pr. Prof.
Med. in Reg.
Universitate
Neapol. and
F. R. S. No.
428. p. 79.
Apr. &c.
1733.

X. March 9, 1730-1, O. S. 4^h a. m. an Earthquake shook the whole Kingdom of Naples, but chiefly Apulia. In it's Duration, all the Appearances mentioned by the Ancients were observed. First a Trembling, then a Shaking, and at last an Inclination, or Nutation of the Earth, like the Motion of a Ship. These various Motions succeeded each other for the Space of 3', and some Seconds. It was not observed by my Friend, whether the Nutations and Oscillations of the Earth were made according to the parallel Circles of the Earth, according to the Observation of modern Philosophers, who endeavour thereby to confirm the diurnal Motion of the Earth. But I myself and others have observed it to be so, not only in this, but also in former Earthquakes.

The Air at that Time was heavy with thick, low, hanging Clouds, which were afterwards dissipated by a gentle N E Wind. The next Day the Sun shone faintly, as if it were covered by very thin Clouds; but no such Clouds were distinguishable in the Sky. This Phenomenon has also been observed in subsequent strong Earthquakes. The Fishermen who were then at their Work on the Coast, observed the Sea to swell on a sudden, and rode out the Storm coming from the Northward, without any Wind; but thought themselves in Danger of Shipwreck.

The next Day, March 10, 8^h a. m. there happened a new but shorter and weaker Earthquake, in the same Province; not so weak, however, but that it was perceived here at Naples. This was preceded by a certain flashing or short Coruscation about the Mountain Garganus, which turning to Smoak or Fog, gradually disappeared. In the Country about Foggia, this Earthquake, and others also in April, Oct. and Nov. were generally preceded by a strong N E Wind, though the Air was sometimes quite still.

There was no small Ruin of Buildings, and Destruction of Persons crushed by them; for the Dead were reckoned to be about 600.

The Centre of these Shocks seemed to be at Foggia: For there were the most cruel Motions and Ruins; and from thence they diminished gradually to Places more remote; so that one might say, that the Propagation of this Motion was successively diminished (only so far as it was altered by the various Solidity and Interruption of the interjacent Earth) in a duplicate Ratio of the Distances: According to the common Laws in other Sorts of Motions.

The same was observed also in the Oscillations of Pendulums by two careful Observers. For Pendulums of a Palm in Length, at Asculum and Juvenatium, being applied to a graduated Semicircle, and moving

in the Shocks, swung more or fewer Degrees from the Centre of Oscillation, according to their less or greater Distance from *Foggia*: For the greater Number of these Degrees at *Asculum*, which is nearer; and the lesser at *Iuvenatium*, which is farther, answered almost to the duplicate *Ratio* of the Distances of these Places from the Centre of the Earthquake. And hence also it came to pass, that when the Earth shook but little at *Foggia*, the Pendulum vibrated but little at *Foggia*, and was observed to stand perfectly still at *Iuvenatium*.

In all the Shocks, which happened for almost a whole Year together, it was constantly observed in the open Fields, that they were preceded by a Noise and horrid Rumbling in the Air. Thus we read in *Pliny*, *Lib. ii. C. 80*, that terrible Noises, Groans, and sometimes Sounds, like human Cries preceded them. This Noise in the Air was spread in a contrary Determination: So that as the Parts of the Earth were shaken, with a Motion communicated from the Centre to the surrounding Places; so, on the contrary, the Motion of the Air was not obscurely propagated from the Circumference toward the Centre. This *Phænomon* has afforded no small Matter of Dispute among Philosophers; but I do not think myself concerned in it. I shall only observe, that this differs from *Aristotle's* Opinion, in his *Meteors*, that an external Wind was necessary to form an Earthquake: So that, according to him, an Earthquake on the Coast of *Achaia* was caused by a Conflict of the N. and S. Winds. Some indeed have suspected, that slight Earthquakes, which were formed after strong E. Winds, might arise from a Retardation of the diurnal Motion of the Earth, at least in that Track where the Wind blew.

This also is observable with regard to our Earthquake, that near the Farm of the *Carthusians* called *Tre Santi* (of which the House was levelled with the Ground by the first Earthquake in *March*) in the Place where the Bed of the Brook called *Fontana del Pesce* is most depressed, there burst out a new Source of copious, turbid, warm Water. This indeed is not new or unknown to the Ancients: For we learn from their Records, that Waters burst out from the opening Body of the Earth, just as the Water enters a Ship through it's Fissures: Nay, they relate farther, that not only little Springs have issued, but such Deluges as have ever overflowed Cities. This might seem still more probable to those, who thought with *Thales*, according to *Seneca*, that the Earth floated like a Ship upon the Surface of Water. But this will appear absurd to those, who know the real Structure of the terraqueous Globe.

The Water, which burst forth in the mentioned Part of *Apulia*, dried up gradually, and in the Space of a Month quite disappeared: But the dry Sand retained a Smell of Sulphur for some Time. Thus *Pliny*, *Lib. xxxi. C. 4*, says, that Earthquakes pour forth Water, and suck it up again. Hence it is no Wonder, that Lakes, Fountains, and Rivers are said to have appeared where they were not before; and to have dried up, where they formerly appeared.

The History of an Earthquake at Apulia.

It is generally reported, that the Wells poured out Abundance of Water at the Beginning of the Earthquake: But it is not to be imagined, that this was caused by the Shock; for then it must have been so violent, as to subvert the whole Kingdom of *Naples*. It must have been caused by new Waters flowing into the Springs.

The Water, which issued near *Tre Santi*, being examined, produced the following *Phænomena*.

1. Being compared with an equal Bulk of Rain-Water, and examined by the Areometer, it exceeded the Weight of it in this Proportion, that where the latter weighed ℥ j, the former weighed ℥ j Gr. 82: But it weighed only Gr. 15 more than the Spring-Water, which is saltish there.

2. A Pound of the same Water distilled to Dryness left ʒss of a Substance approaching to *Crocus Martis* sprinkled with ʒj of white, insipid Earth. The Magnet being applied to this Powder when dry, attracted some reddish Particles. During the Distillation, a Smell of Sulphur was very evident. This is a fresh Confirmation of *Lemery's* Experiments, which prove that subterraneous Fires and Volcanoes are caused by a Mixture of Iron and Sulphur; and consequently Earthquakes may be caused by a Succession of hidden Fires.

3. Having infused ʒiij of Galls finely powdered in ℥ ij of that Water, in a Quarter of an Hour it began to turn blue; and then the Powder precipitated.

This is an exact and true History of our Earthquake, without any of the hyperbolic Fancies, which are common in the Mouths of the Vulgar on these calamitous Occasions.

Naples, Dec. 12, N. S. 1732.

2. They tell me, the last Earthquake here has made a great Crack in the Side of Mount *Vesuvius*, above 30 Yards long. I am not sure if this be true or not, though I think it very possible; but I made another Observation upon it, which I think much more extraordinary; which is, that the second Shock, which was a very slight one, had a great Effect upon the Nerves: I and all the Company where I was, as soon as the Shock was over, were seized with a Shaking, just as if we all had the Palsy, our Teeth chattering in our Heads to such a Degree, that we could hardly speak; and I find, that half the Town felt the same Effect from it. It would be natural to imagine, that this Shaking was caused by the Fright, but it is easy to prove the contrary; because, in the first Place, the first Shock, which was much more terrifying, had not that Effect: Secondly, many People who were not sensible of the Earthquake, found themselves seized in the same Manner: Thirdly, Mr. ———, who used to be troubled with convulsive Fits, and had got quite cured of them here, was immediately seized with them again, after the Earthquake; and, fourthly, every Body, more or less, complained of Head-achs for some Days after.

*Of the same,
by the Hon.
Henry Temple,
Esq; Son
of the R. Hon.
the Lord Vis-
count Palmer-
ston. No. 456.
p. 340. Jan.
1740.*

XI. Sept.

XI. Sept. 5, 1732, about 11 in the Morning, an Earthquake was felt in diverse Places in *Maryland*; the most particular Account I have heard of it, was from Mr *Chew*. It shook his House for some Time, and stopped the Pendulum of his Clock; during it's Continuance, a rumbling Noise was heard in the Air, and many People who did not feel the Shaking, as well as those who did, complained of a Dizziness in their Heads, and Sickness at their Stomachs: At the same Time, I have been credibly informed, it was felt in *Pensylvania* and *New-England*; but I have not heard whether it extended to *N. or S. Carolina*.

An Account of an Earthquake in Maryland, by Mr Richard Lewis. No. 429. p. 120. July, &c. 1733.

XII. That this Country is subject to Earthquakes, is certain; and we have been often admonished of it since the first Settlement of the *English* here, which now is about 100 Years. Our printed Books and other good Records have taken Notice of the most remarkable that have happened. The first and most considerable Earthquake that I find in our History, and which seems to have been much like our last, was on *June 2, 1638*. This is said (by the Author, who was a Gentleman of Character and Probity) "to have been a great and fearful Earthquake: It was heard before it came, with a rumbling Noise or low Murmur like unto remote Thunder; it came from the Northward, and passed Southward; as the Noise approached near, the Earth began to quake; and it came at length with that Violence, as caused Platters, Tyles, &c. to fall down; yea, People were afraid of their Houses. The Shock was so violent and great, as that some being without Doors, could not stand, but were fain to catch hold of Posts, &c. About half an Hour after, or less, came another Noise and Shaking, but not so loud nor strong as the former: Ships and Vessels in the Harbour were shaken, &c." In 1658, there was another very great Earthquake, but no Particulars related. In 1660, *Jan. 31*, a great Earthquake. In 1662, *Jan. 26*, about 6 at Night, there happened an Earthquake, which shook the Houses, caused the Inhabitants to run out into the Streets, and the Tops of several Chimnies fell down. About the Middle of the same Night was another Shake; also in the Morning following the Earth shook again. In 1665, and in 1668, and 1669, the Earth was shaken; since which we have also had several Tremors of the Earth, but not very considerable; so that our People began to hope we should hear no more of them. But we are now convinced to Purpose, that *New-England* is still liable to the same Terror and Defolation that other Countries are from these extraordinary Motions of the Earth.

An Account of the several Earthquakes which have happened in New-England, since the first Settlement of the English in that Country, especially of the last, Oct. 29. 1727. Communicated to the R. S. by Paul Dudley, Esq; F. R. S. No. 437. p. 63. April, &c. 1735.

I now proceed to give the best Account I can of our late terrible Earthquake, which has so justly amazed and terrified the Inhabitants from one End of the Country to the other. The first Thing I shall begin with, is to give a short Account of the Weather or Season preceding the Earthquake: Our Winter in *Jan.* and *Feb.* was very moderate, and excepting a few cold Days, the Weather was pleasant, and no great Frost in the Ground. In the Beginning of *March* we had a great deal

of

of Snow, and some cold Weather, which soon went over; and on the 11th, 15' after 4, the Sun was eclipsed about 5 Digits, as near as I could make it without an Instrument; after which to the End of the Month we had pleasant Weather, Rain at Times, and once we had Thunder and Lightning. *April* for the most Part had fair pleasant Spring Weather, and a plentiful Rain in the Beginning and latter End of the Month. The Beginning of *May* was also pleasant Weather; the 9th, 10th, and 13th, a great deal of Rain: The 18th, a white Frost: 24th and 25th, cold Weather; from thence to the End of the Month very dry. The Beginning of *June* the same; Abundance of Thunder and Lightning at Times during the whole Month. In *July* also, though we had some Showers in different Places, yet in general it was a very dry Season, and a great deal of Thunder and Lightning also this Month; the 3 last Days of it so violent hot, that there was no working or travelling by Day, or sleeping by Night: The Beginning of *Aug.* was also exceeding hot, and in particular the first Day at Night from the Evening to Midnight we had a continued Coruscation or Lightning all round the Horizon; the like scarce ever remembered: It was truly terrible, though the Thunder was not severe. Dry Weather continued to the 10th, and then we had a plentiful Rain all over the Province, but our hot Weather held on to the End of the Month; and till about the Middle of *September* we had very hot Weather: So that take it all together, I have never known so much hot Weather in any one Summer in my Time. *Sept.* 16, we had such a violent Storm from the N E, as was never remembered, for the Fierceness and Strength of the Wind; it blew down Houses, Barns, and an infinite Number of Trees in our Orchards and Woods; a great deal of Rain also then fell. In *Oct.* preceding the Earthquake, we had a pretty deal of cold Weather; on the 23d, a great deal of Rain, with the S. Wind; on the 25th at Night, a hard Frost; on the 26th, winterish Weather, and a little Snow; 28th, cold, the Wind at N W: 29th, the Wind at N W, though little of it, but cold; in the Evening quite calm, and a clear Sky.

By this short Journal of the Weather the Learned will be able in some Measure to say, how far our Earth might be disposed to, or prepared for, the Earthquake that followed; first by a long continued Drought and extreme Heat, whereby the Earth became more porous, and abounded with Exhalations or Vapours inflamed, and which afterwards being shut up by the succeeding great Rains and Frost, and thereby hindered from an ordinary and easy Passage through the Pores and common Vents of the Earth, worked so much more forcibly and terribly upon one another. But Philosophers not being yet agreed on the Nature or certain Causes of Earthquakes, I pass on to the second Thing which I proposed to enquire into, viz. what Kind or Sort of Earthquake ours was. *Gilbertus Facchæus*, in his *Institutiones Physicæ*, cap. *Terræ Motus*, distinguishes Earthquakes into four Species; wherein he agrees with

with *Aristotle* and *Pliny*, with whom the first Species is a Shake or Trembling, and by them likened to the shaking Fit of an Ague. I cannot yet hear of any Breach or Opening of the Earth, through the whole Extent of our Earthquake. It has been said by some that were abroad, that the Earth sensibly rose up, and so sank down again; but I much question the Truth of it; for if there had been any such Succussion to raise the Earth to any considerable Height, the Houses would certainly have tumbled down, or the Exhalation forced it's Way by some Breach. Nor was our Motion of the Earth that which *Aristotle* and *Pliny* call a Pulse, or an intermittent Knocking, but one continued Shake or Trembling; and therefore must be ranked under the first Species, *viz.* a Tremor or Shake, without altering the Position of the Earth, and left all Things in the same Posture in which it found them, except the falling down of the Tops of some Chimnies, Stone Walls, &c. without Doors; Dishes and some other Things within Doors; which I shall observe when I come to speak of the Degree of the Shake.

That our Earthquake was of the first Species, is also proved from the Sound that accompanied it, since tremulous and vibrating Motions are proper to produce Sounds; which brings me to the third Particular, *viz.* the Noise or Sound that accompanied or immediately preceded our Earthquake. This indeed was very terrible and amazing; though I am apt to think it was thought more considerable by those within Doors, than such as were without in the Air. Some of our People took this Noise to be Thunder; others compared it to the Rattling of Coaches and Carts upon Pavements, or frozen Ground. One of my Neighbours likened it to the shooting out of a Load of Stones from a Cart under his Window. For my own Part, being perfectly awake, though in Bed, I thought at first my Servants, who lodged in a Garret over my Chamber, were haling along a Trundle-Bed: But, in Truth, the Noise that accompanies an Earthquake seems to be *sonus sui generis*, and there is no describing it. This Noise, as amazing as it was, in an Instant of Time, as one may say, was succeeded by a Shake much more terrible. My House, which is large and well built, seemed to be squeezed or pressed up together, as though an hundred Screws had been at Work to throw it down; and shook not only every Thing in the House, particularly the Bed under me, but the Building itself, and every Part of it so violently for the Time, that I was truly in great Fear it would have tumbled down, and my Family perished in the Ruin: But through the great Power and Mercy of God, we received no Harm. It is impossible to describe the Terror and Amazement that an Earthquake carries with it; and though I had never felt one before, yet I was thoroughly convinced what it was at the very Time.

The next Thing I proceed to, is the Degree or Greatness of the Shake. This will be best known from it's Effects. I have already mentioned the falling of the Tops of Chimnies, Dishes from Shelves, *China* Ware, &c. Doors unlatched, Bells jangling, Beds trembling,
Chairs

Chairs moving, &c. A Country Farmer tells me, he had 40 or 50 Rods of Stone Wall thrown down by it: And though I acknowledge these Effects are not very considerable, yet I cannot but be of Opinion, that our Earthquake, for it's Species, was as violent and terrible as any we meet with in History: And had the Tremor continued a Minute longer, or been repeated in the like Degree, our Houses had doubtless been many of them overthrown. One of my Neighbours that was walking home at the very Instant, tells me, the Noise first brought him to a Stand, and that during the Shake, the Earth trembled so under him, that he was so far from attempting to continue his Walk, that it was as much as he could do to keep upon his Legs, and expected every Moment the Earth would have opened under him. Another that was riding home, says, that upon the Noise the Earthquake made, his Horse stood stock still, and during the Shake, trembled to that Degree, that he thought he would have fallen under him. Our House-Dogs were also sensible and affected with the Earthquake; some of them barking, others howling, and making strange and unusual Noises. Nor was our Earth only affected with this Shake, but the Sea also in our Harbours, and our Shipping small and great much moved with it. I do not suppose it ever happens that Earthquakes of this Kind, of any Extent, are equal or alike in all Places; and accordingly I find by Information from our several Towns, that the Shake was much more moderate in some Parts of the Country than others.

The Time and Duration of the Shock—Our *Boston* News-Papers fix the Time at about 40' after 10 at Night: My own Watch was not so much by 5'; but the Clocks of the Town might be truest. The first Day of *Nov.* at Midnight, which was 3 Days after the Earthquake, the Moon changed. As to the Duration of the Shock itself—Whatever others may print or have printed, I can by no Means suppose it exceeded the Space of a Minute, if it was so long; I mean the first and great Shock; after which in the same Night we had 4 or 5 more lesser Tremors; and at sundry Times since the Earth has trembled in different Places (even to this *Nov.* 13) but without any considerable Effects or Extent.

The last Thing I have to mention, is the Course and Extent of the Earthquake. *Boston*, the Metropolis of this Province, lies in Lat. of $42^{\circ} 25' N.$ and $4^h 43' W.$ of *London*; as the Longitude between the two Places was settled by Mr *Thomas Brattle* of this Country, and Mr *Hodgson* of *London* many Years since: And making *Boston* a Centre, we have a certain Account, that our late Earthquake was felt in *Kennebeck River* to the Eastward, and at *Philadelphia* to the Westward, 150 Leagues distant one from the other upon a W S W and E N E Course nearest: And no Part of the intermediate Country, that I can understand, escaped the Shake; the Colonies of *Rhode-Island*, *Connecticut*, and *New-York*, that lie between us and *Pensylvania* being all affected, though not equally, particularly at *Philadelphia* they write, a small Shock. As
to

to the opposite Line or Latitude, as we may call it, of the Earthquake, we have two noted Islands to the S E, called *Nantucket* and *Martha's Vineyard*, about 90 Miles distant from *Boston*, and the first named lies about 12 Leagues into the Sea, distant from the main Land; both these Islands had the Earthquake. Our *English* Settlements towards the N W, do not yet exceed 40 or 50 Miles from *Boston*; but they all of them had this Earthquake very sensibly; and how far it might reach beyond them towards *Canada*, we cannot yet say. By this Calculation I believe it will be found, that our Earthquake was of a much greater Extent, than any yet taken Notice of in History: As to the Course of the Earthquake, or where it first began, I am not yet able to determine by all the Information I can get: For they write from *Rhode-Island*, *Connecticut*, *New-York*; and *Philadelphia*, all to the Westward, that it was between 10 and 11 at Night. The same again is affirmed from *Piscataqua*, *Casco-Bay*, and *Kennebeck River*, which are to the Eastward: So that as yet it seems to me, that the Earth, through the whole Extent aforesaid, was shaken very near at the same Time. Some of my Neighbours are positive, that it came from the Southward; while others again are confident, that where they were, it came from the North. But this is not to be wondered at, since, as I suppose, the subterraneous Channels or Caverns, through which the Exhalation passes, are not in any one continued streight Line, but branched out, and running upon all Points of the Compass, especially in such a vast Extent of Land.

I am now come to *Nov. 28*, and having met with some further Particulars omitted in the preceding Account: I shall throw them into a Postscript.

A Neighbour of mine, that has a Well 36 Feet deep, about 3 Days before the Earthquake, was surprized to find his Water, that used to be very sweet and limpid, stink to that Degree, that they could make no Use of it, nor scarce bear the House when it was brought in; and thinking some Carrion was got into the Well, he searched the Bottom, but found it clear and good, though the Colour of the Water was turned wheyish or pale. In about 7 Days after the Earthquake, his Water began to mend, and in 3 Days more returned to it's former Sweetness and Colour. I am also very credibly informed, that several Springs and good Watering-Places were some of them lowered, and others quite sunk and lost with the Earthquake. A worthy Divine in a Town about 20 Miles from *Boston*, assures me, that immediately after the Earthquake, there was such a Stink or strong Smell of Sulphur, that the Family could scarce bear to be in the House for a considerable Time that Night. The like is confirmed also from other Places. Persons of Credit do also affirm, that just before, or in the Time of the Earthquake, they perceived Flashes of Light. A Gentleman of Probity from *Newbury*, a Town situated between 30 and 40 Miles to the N N E

of *Boston*, writes Word, that at 40 Rods Distance from his House, there was a Fissure of the Earth, and near 20 Cart-Loads of fine Sand thrown out where the Ground brake, and Water boiled out like a Spring, and mixing with the Sand, made a Sort of Quagmire; but at the Date of his Letter, which was the 21st current, the Spring was become dry, and the Ground closed up again. Since the Receipt of this Letter, I understand, that the Ground where this Sand is thrown up, and round about it for a considerable Distance, is a solid Clay for 20 or 30 Foot deep, and nothing like Sand ever to be found there before; so that the Exhalation forced this great Quantity of Sand through a very deep *Stratum* of Clay. I am also very well satisfied, that the Earthquake was more violent in the Towns to the N. and N E. of *Boston*, than in those to the Southward and Westward; and in some of them that are rocky, the Earth shook but a few Days since.

An Account of a Shock of an Earthquake felt in Suffex, Oct. 25, 1734, communicated to the R. S. by Charles Duke of Richmond and Lenox, &c. F. R. S. No. 444. p. 361. Nov. &c. 1736.

XIII. 1. I know most of the People that have signed the inclosed Papers, to be Persons of Veracity: And what confirms me in my Opinion, that there really was an Earthquake, is, that almost every Body agree in the same Description, as to the Sensation, the Hour of it's happening, and the perfect Calm that was at that Time. I observe the Shock was vastly more felt towards the Sea-Side, as at *Shoreham, Tarring, Goreing, Arundel, and Havant*. At my House of *Goodwood*, which is near 3 Miles N. of *Chichester*, and about 7 from the Sea, it was not so perceivable as at *Chichester*, and where it was still less so than by the Sea-Side. I do not hear as yet that there was the least Touch of it in any Parts of the Vale on the N. Side of the Downs, which for the most Part run E. and W. I think, what Dr *Bayley* of *Havant* says of the different Motions of the Beds, according to the different Situations they were in, is very well worth observing. This Gentleman is a Doctor of Physick, and a very curious Man. I could have got above 50 more Accounts from the several Places I have mentioned; but as they all tend to the same Purport, I thought what I had already collected sufficient.

Havant, Octob. 25, 1734.

A Narrative of the same Earthquake by Edward Bayley, M. D. Ibid. p. 362.

2. Between 3 and 4 in the Morning, an Earthquake was felt here: The Shock was so considerable as to be observed by one or other in most Houses of the Town. I happened to be awake at that Time, and perceived the Bed shake under me with a quick tremulous Motion, which continued about 2 or 3'', then ceased; and after a very short Intermission was repeated in the same Manner, and lasted about the same Space of Time, as near as I could guess. I was at first much surprized at such an unusual Phænomenon; but upon a little Recollection, concluded it must be occasioned by an Earthquake, and was soon confirmed in my Conjecture by the concurrent Observations of my Neighbours, and afterwards by Accounts of the same from many other Places; in some of which it seems to have been more violent than here. Several Persons in this Place say, they not only perceived the shaking of their Beds,

Beds, but also the rocking of their Houses, together with a rumbling Noise of Drawers and the like moveable Goods in their Chambers and other Rooms. A learned and ingenious Gentleman in this Town informs me, that the Motion of his Bed appeared to him like the tossing of a Vessel when it crosses over a Wave, the Head and Feet thereof rising and falling alternately several Times; whereas mine seemed rather to rock from Side to Side: But these contrary Motions of the two Beds are easily accounted for, by considering the different Positions of them, my Friend's standing directly E. and W, and mine N. and S. For supposing the undulatory Motion which the Earth might have at that Time was propagated from E. to W, the same Kind of Motion which caused his Bed to rise up and down longways, must make mine rock from Side to Side; as may be observed in two Vessels sailing in contrary Directions on the same Waves of the Sea, that which crosses the Waves at right Angles being tossed up and down Endways, while the other moving in a Line parallel with the Waves, will be rocked from Side to Side. What makes me the more inclined to think the progressive Motion of this Earthquake to have been from E. to W, is, because it appears from the best Accounts I have yet had of it, that it was observed sooner E. than Westward, and likewise extended further from E. to W. than N. and S.

It may not be amiss to take Notice of some remarkable Phænomena which happened before and after, as well as some other Circumstances which immediately attended this Earthquake, most of them agreeing with those Signs which have been observed by the Learned to precede or accompany former Earthquakes in these and other Parts of the World. It is observable, that we have had of late more Rain and Wind for several Months successively, than for many Years past; especially from the Beginning to the Middle of this Month, about which Time it cleared up, and the Weather became suddenly very cold, with frosty Mornings, the Wind blowing generally pretty hard from N W. On *Wednesday* the 23d, the Cold abated considerably; it was cloudy, but we had no Rain that Day. The 24th was very calm all Day; it rained most Part of the Afternoon, though the Mercury stood at $30 \frac{2}{10}$. It continued very calm all Night, and rained hard for some Time before and after the Earthquake happened; but it soon cleared up, and we had a strong Gale of Wind, which rose within half an Hour, or, as some say, within a Quarter, afterwards: It continued blowing hard all the Forenoon. At 4 in the Morning I observed the Mercury continued at $30 \frac{2}{10}$ Inches, the Spirit of Wine at $55 \frac{5}{10}$; having risen about five Degrees since the late cold Weather.

N. B. My Barometer and Thermometer are both in one Frame, made by Mr *Hauksbee*. 29 Oct. 1734.

The Circumstances related by his Grace, and by Dr *Bayley*, are backed by the united Testimonies of several; many of whom are known to his Grace to be Persons of Veracity, and whom he procured to sign

Accounts of several Earthquakes.

Certificates of what they observed concerning this Accident at *Chichester* and other Places. It is unnecessary to trouble the Reader with each Certificate; the mentioning the Names of those who have subscribed them may suffice.

John Fletcher, Andrew and Sarah Adaire, Jane Johnson, Martha Freeland, Owen Apps, Sarah Bryers.

Sarah Tutte, and her Children Eleanor, Jane, and Sarah.

John Costellow, John Freeland, Matthew Faibers.

John and Sarah Bryers, John Long.

Thomas Turgis, Richard Silverlock: All of the City of Chichester.

Philip Boisdaune, Esq; of the Parish of Funtington in the County of Sussex.

This last-mentioned Gentleman, and the aforesaid Persons, dwelling in the City of *Chichester*, all agree that there was a manifest Shock of an Earthquake felt on *October 25*, about a Quarter before 4 in the Morning, which lasted by Fits some few Seconds, about a Quarter of a Minute, or while one might tell twenty, with a Motion sensibly slow: For most of the Accounts concur in this Particular, that the Chairs, Wainscot, Doors, Chests of Drawers, and other Moveables, were heard rattling; and one, that a Bell rung of itself just before they felt the heaving of their Beds; and that there was no Wind stirring at that Time, but that it rained, and the Wind rose soon after.

The Rev. Mr *Richard Green*, Prebendary of *Chichester*, and Rector of *Merston*, in the County of *Sussex*, had Informations of the same Tremblings, attended with the same Circumstances, being felt at *Shoreham, Goreing, Tarring, Findon, Arundel Castle, and Merston.*

John Shaw, Thomas Dagly, and John Towner, all Servants to the Duke of *Richmond*, at his Seat called *Goodwood*, felt the same.

Mr *John Jenkins*, Riding-Officer of the Customs, in the Parish of *West-Wittering*, near *Braglesham-Bay*, in the County of *Sussex*, described the Shock after the same Manner: And he adds further, that within half a Quarter of a Mile of his House, a young Man, of about 18 or 20 Years old, having been at the same Time to fetch up a Team of Horses from Grass, the Horses were so sensible of something more than ordinary, that they trampled, and seemed very much affrighted, as they were coming home.

A Shock of an Earthquake felt in Northamptonshire, in Oct. 1731. Ibid. p. 367.

XIV. To the foregoing Accounts of an Earthquake felt in *Sussex*, it is thought not improper to subjoin, from the Registers of the *Royal Society*, the following Intimation from the Rev Mr *Jos. Wasse*, Rector of *Aynho* in *Northamptonshire*, of "a Shock of an Earthquake felt there
" on Sunday, Oct. 10, about 4 in the Morning, 1731. This Gentle-
" man saith, that his Windows rattled, as if somebody had been
" dancing over-head. The Concussion lasted about a Minute; others
" thought it lasted about 2'. It alarmed the neighbouring Villages,
" *Bloxham*, 4 Miles S W from *Aynho*; *Barford*, 5; *Banbury*, 4 W;
" *Adderbury*, a Mile W; *Crowton*, a Mile to the E; and *Charlton*, as
" much

“ much to the N. There was no Notice of it's Progress S. or S E.
 “ About a Minute after, some of the Town of *Aynho* saw a great Flash
 “ of Lightning. In the Morning the Sky looked of a Land-Colour.
 “ It was said that there was a former Shock felt upon *Oct.* 8, about 3
 “ in the Morning; and that the latter was preceded by a Noise like
 “ distant Thunder.”

It is remarkable, that this Shock was perceived to extend more from E. to W, than from N. to S; which Particular was likewise observed in the last Shock felt in *Suffex* 1734.

XV. *Oct.* 29, 1727, about 10^h 40' p. m. there came a great rumbling Noise; but before the Noise was heard, or Shock perceived, our Bricks upon the Hearth rose up about $\frac{1}{4}$ of a Foot, and seemed to fall down and loll the other Way, which was in $\frac{1}{2}$ a Minute attended with the Noise or Burst. The Tops of our Chimneys, Stone Fences, were thrown down; and in some Places (in the lower Grounds, about 3 Miles from my House, where I dwell) the Earth opened, and threw out some hundred Loads of Earth, of a different Colour from that near the Surface, something darker than your white Marl in *England*; and in many Places, opened dry Land into good Springs, which remain to this Day; and dried up Springs, which never came again. It continued roaring, bursting, and shocking our Houses all that Night. Though the first was much the loudest, and most terrible, yet 8 more, that came that Night, were loud, and roared like a Cannon at a Distance. It continued roaring and bursting 12 Times in a Day and Night, until *Thursday*, *Nov.* 2, and then was not so frequent; but upon *Friday* in the Evening, and about Midnight, and about Break of Day upon *Saturday*, 3 very loud Roarings: We had the roaring Noise upon *Saturday*, *Sunday*, *Monday*, about 10 in the Morning, though much abated in the Noise.

Nov. 7, being *Tuesday*, about 11, it roared very loud, and gave our Houses a great Shock; and continued shocking from 3 Times to 6 every Day and Night until *Nov.* 12, when it was heard twice in one Hour in the Afternoon, from half an Hour after three to half an Hour after four. Sometimes the Roaring of the Earthquake was loud, other Times it seemed at a Distance, and much abated. *Nov.* 13, being *Monday*, two Hours before Day-break, the Roaring was loud, and shook the Houses. Upon *Wednesday* following, half an Hour past 2 in the Afternoon, there was a Roaring, but not so loud. It continued sometimes roaring loud, and shocking our Houses, for 5, 6, to 10 Times a Week, until *Dec.* 17 following; and then about half an Hour past 10 in the Evening, being *Sunday*, it roared very loud, and shook our Houses very much; another Shock the next Morning about four, much abated.

Jan. 3, 1727-8, about 9 at Night, an easy Shock.

Jan. 6, *Saturday*, there were five Shocks, attended with the Roaring, from about 9 at Night to 4 on *Sunday* Morning, which I heard;
 and.

*A Journal of
 the Shocks of
 Earthquakes
 felt near New-
 bury in New-
 England, from
 the Year 1727,
 to the Year
 1741, by the
 Rev. Mr Mat-
 thias Plant.
 N. 462. p. 33-
 Read Feb. 11,
 1741-2.*

Accounts of several Earthquakes.

and some People told me, who lived in the low Grounds, that for the Space of about half an Hour, it continually kept roaring every half Minute or Minute.

Upon *Wednesday, Jan. 24*, about half an Hour after 9 at Night, it roared exceeding loud, and was followed in half a Minute with roaring much abated in the Noise.

Jan. 28, Sunday, about half an Hour after 6 in the Morning, another easy Shock, and another about 10 the same Morning, easy: On the same Night about one, a loud Roaring and Shock.

Jan. 29, I heard it twice, though easy, that Day.

Tuesday, Jan. 30, about 2 in the Afternoon, there was a very great Roaring, equal to any but the first, for Terror: It shook our Houses so, as that many People were afraid of their falling down; Pewter, &c. was shaken off our Dressers; the People that were in the Church for Evening Service, ran out; the Lead Windows rattled to such a Degree, as that I thought they would all be broken. And there was another Shock the same Day, about an Hour and half after, though much abated.

Feb. 21, about half an Hour past 12 at Midnight, a considerable loud Roaring with a Shock.

Feb. 29, such another.

March 17, about 3 in the Morning, an easy Shock.

March 19, 40' past one at Noon, a small Noise; at 9 the same Night, a small Noise with a Shock.

April 28, 1728, about 5 in the Afternoon, a small Noise, but perceivable.

May 12, Sunday Morning, about 40' past nine, a long and loud Roaring, and shook the Houses.

May 17, about 8 in the Evening, a long and loud Roaring shook our Houses.

May 22, several small Roarings in the Morning; but about 10 the same Morning, long and loud, and shook our Houses.

May 24, about 11 at Night, loud and long Roaring shook our Houses.

Thursday, June 6, Saturday 8, about 3 in each Morning, a long and loud Roaring.

June 11, 9 in the Morning, a small Noise.

July 3, about 2 in the Morning, and *July 23*, about Break of Day, very loud and long, shook our Houses. Besides these Times I have mentioned, it has been often heard by me; but the Noise was small, so I forbore to set them down: I had Thoughts to have added no more Account of the Noise and Repetition of the Earthquake in my Church-Book; but acquainting my People with what I had done, they prevailed upon me to proceed again, which I did upon *March 19, 1728-9*. *Wednesday*, betwixt 2 and 3 in the Afternoon, it was loud and long, shook our Houses, being repeated twice in an Instant; and this was the

the

the longest and loudest Roaring, and the greatest Shock, that I ever heard, the first excepted, and that on *Jan. 30*, mentioned before. We had several small Shocks in this Interim.—But *Sept. 8*, 1729, about half an Hour past 3, it was loud and long.

Sept. 29, about half an Hour past 4 in the Afternoon, loud and long.

Oct. 29, I heard it twice this Night; one of the Times was about the same Time of Night the first Shock was.

Nov. 14, about 8 in the Morning, loud and long, attended with two Bursts like unto two sudden Claps of Thunder; shook our Houses.

Nov. 27, about 8 in the Evening, a very great Roaring, and a great Shock: It was heard at *Ipswich*, about 14 Miles distant.

Feb. 8, 1729-30, about 8 in the Evening, a small Shock, about Midnight loud and long, and gave our Houses a great Shock.

Feb. 26, about a Quarter before 2 in the Morning, the Noise was repeated twice in about one Minute: The first was loud and long, and shook our Houses equal to any but the first Shock; the second Noise was low, and seemingly at a Distance.

April 12, 1730, about 8 in the Evening, a very loud and long Noise, and a great Shock, equal, I thought, to any for Length and Noise, the first excepted.

July 28, about 9 in the Morning, a sudden and loud Roaring and Shock.

Aug. 15, about 8 in the Morning, a Shock of the Earthquake, twice repeated in a Moment of Time.

Nov. 6, about 11 at Noon, it was loud and long, and gave my House a Jar.

Nov. 14, about 9 in the Morning, a small Noise and Rumbling, no Shock.

Nov. 25, about 20' past 8 at Night, a loud and long Roaring, and gave my House a considerable Shock.

Dec. 6, about a Quarter of an Hour before 11 at Night, it was loud, and roared long, and made our Houses jar.

Dec. 11, about a Quarter before seven at Night, there was a small Burst, but shook my House.

Dec. 19, about half an Hour past 10 at Night, the Earthquake did very much shake our Houses, without any Noise or Roaring, more than ever before, the first Time excepted. It was felt at *Boston* 40 Miles, at *Piscataqua* 22 Miles, almost equal to what it was with us.

Jan. 7, 1730-1, about 7 at Night, it was loud and long, shook our Houses.

Jan. 11, about Midnight, loud and long, shook our Houses.

March 7, about 5 in the Evening, we heard the Noise, but no Shock.

May 28, 1731, about 9 in the Morning, I heard the Noise of the Earthquake very distinctly, but could not perceive that it shook.

July

Accounts of several Earthquakes.

- July 5, about Sun-rise, it was loud and long, shook our Houses.
- Aug. 21, 9 in the Evening, the Noise was small and short.
- Oct. 1, about 11 at Night, loud and long, shook our Houses.
- Feb. 7, 1731-2, about 7 at Night, a great Shock, shook our Houses.
- Sept. 5, 1732, about Noon, we had a severe Shock, which was perceived at *Boston* and *Piscataqua*, but attended with little or no Noise. The same Earthquake was heard at *Montreal* in *Canada*, at the same Time, and about the same Hour of the Day, and did Damage to 185 Houses, killed 7 Persons, and hurt 5 others; and it was heard there several Times afterwards, only in the Night, as the News-Papers gave us this Account.
- Dec. 30, in the Morning we had a Shock, and it had been heard by some People several Times within 3 Weeks before.
- March 1, a loud and long Noise of it.
- Oct. 19, 1733, a loud and long Noise about Midnight.
- Jan. 16, 1733-4, about 20' past 10 at Night, a loud and long Roaring.
- June 29, 1734, about a Quarter past 3 in the Afternoon, there was somewhat of a Noise of it.
- Oct. 9, about 20' past 10 in the Morning, a small Shock.
- Nov. 11 or 12, for it was about Midnight, we had the loudest Noise, and the greatest Shock, except the first: It was long, very awful and terrible.
- Nov. 16, about 6 in the Morning, there was a small Shock.
- Feb. 2, 1735-6, about a Quarter of an Hour before 6 in the Evening, there was a pretty loud Noise and Shock.
- March 21, about half an Hour past 10 in the Morning, it was somewhat loud.
- July 13, 1736, about three Quarters after 9 in the Morning, the Noise of it was loud.
- Oct. 1, about half an Hour past one at Midnight, it was loud and long, and a great Shock, twice repeated in an Instant.
- Nov. 12, about 2 in the Morning, there was a Shock with the Noise, and about 6 the same Morning it was something louder.
- Feb. 6, 1736-7, about a Quarter past 4 in the Afternoon, we had a considerable Shock.
- Sept. 9, 1737, about 20' past 10 in the Morning, it was very loud and long, and shook our Houses very much.
- Dec. 7, a little before 11 in the Night, the Ground shook very much, but we heard no Noise. Upon the same Dec. 7, at *New-York*, they had 3 severe Shocks of an Earthquake in the Night: It threw down there some Chimneys, and made the Bells to toll so as to be heard. At the same Time the said Shock and Noise was felt and heard in many other Places.
- Aug. 2, 1739, we had a great Shock; it made my House shake much, and the Windows jar. It was about half an Hour past 2 in the

the Morning: I think I never heard but two either louder, or longer, or greater.

Dec. 14, 1740, about 35' after 6 in the Morning, there was heard a pretty loud Noise of the Earthquake.

Jan. 18, 1740-1, about 4 in the Morning, there was heard the Noise of the Earthquake.

Jan. 25, 1740-1, about 10' before 4 in the Afternoon, there was a Shock of the Earthquake, with a loud rumbling Noise. This is the last that has been heard (and I pray God I may never hear any more such, and so long). I have omitted to set some down that were small, or such as I did not hear myself: I was very exact to the Time, so that what Account I have sent you, is most certainly true.

I thought an exact Account of so remarkable a Judgment, continued so long, might be acceptable: And although the first Night was the most terrible, as the Surprize was sudden, yet there never happened one Shock amongst us, but what occasioned some Alteration at that Time in every Person's Countenance and Constitution; and which Way soever any Person's Face happened to be, that Way the Noise of the Earthquake appeared to him: And I have frequently, in my Conversation with sundry Persons, been told by them, that for a few Minutes before a Shock of it came, they could foretel it by an Alteration in their Stomachs; occasioned (as I supposed) by an Alteration in the Air: I attest to the Truth of the Thing by my own Experience.

P. S. I forgot to tell you, that (except the first Shock) these frequent Repetitions of the Roaring and Shocks of the Earthquake were upon *Merrimack River*, and seldom extended above 7 or 8 Miles Distance from, or 20 or 30 up the said River; those Instances only excepted, which I have mentioned in the Relation; and the first Shock of it was greater with us than any where else in *New-England*; and the Tops of Chimnies and Stone Fences were thrown down only in these Parts.

XVI. We have had here very unsettled Weather; continual Rains, sometimes more, and sometimes less; continual Winds, chiefly from the S. and W, so that scarce any in this City remember to have seen the like. We cannot be said to want Wind here, since scarcely a Day passes without it, from some Point or other. But to observe in the Country one Wind in the Morning, another at Noon, and then a third at Night, is what surprizes us. In some Days, especially after the Winter Solstice, there have been felt extraordinary warm Southern Breezes, from whence People drew an ill Omen of the Health, or other Misfortunes, which every one figured according to his own particular Fancy: However, no one thought of the present Calamities, the Reasons of which are unseen by mortal Eyes; for where shall we find those Telescopes through which our Sight may reach the subterraneous Receptacles of that Matter, which, whether burned or fomented, makes the whole Earth start, and terrify Man? I look upon the Foresight of

An Account of the Earthquakes felt in Leghorn, from the 16th to the 27th of Jan. 1742. With some Observations made by the most Reverend Sig. Pasqual R. Pedini, Principal of the Clergy of the most eminent College of the said City. No. 463. p. 77. Read April 8, 1742.

these Accidents, as an Undertaking impossible to accomplish, and the prophetic fixing them to a certain Time, much more so: But observe to what a Pitch Ignorance or Fear carries some People; after the first Shock of the Earthquake, every Body was in great Consternation within this City, not so much for what they immediately felt, as through Fear of another infinitely more violent, which a certain *Milanese* Astrologer predicted to happen (as they said) *Jan.* 28. By Misfortune he was within a Day of it, the great Earthquake being the 27th; by this Means the Faith and Credit given to the Astrologer increased so much, that I do not know whether he has not more Reverence and Honour shewn him than the Prophets, and holy Gospel. There is no Need to prove, that this Science does not belong to Astrologers; for Effect shews it, since the Earthquake came a Day before his Prognostication. He has moreover predicted another Earthquake to happen *March* 6 next, upon which Numbers who are in the Country, and some at *Pisa*, will not return to *Leghorn* till that Day is past.

Jan. 16 was a very temperate Day, with a gentle Breeze between S. and W. A little after 24 Hours (about 6 at Night, according to the *English* Way of reckoning) I observed a certain dark Cloud, which passed with a bad Smell; of this I took but little Notice, having often smelt the like; and what might occasion a greater Inobservance, was, a great Cold, which prevented my distinguishing between Smells, whether good or bad: However, I saw this Cloud, blacker and thicker than the rest; settle within a Foot and an half on the Tops of the Houses, like the Smoke that the Peasants make in an Evening, when they burn their Garden Rubbish, or such-like. On account of the Cold I had, and this black Cloud, I went into a Friend's House: Finding him with Company, after a little common Discourse, he returned, it being *Tuesday*, and I remained with a few more. At 2 Hours in the Night, (8 *Eng.*) we thought the Pavement gave Way, and the Chamber shook: Some of us thought it proceeded from walking in another Chamber, others thought it was a Shock of an Earthquake; upon which I listened attentively, to hear if there might be any consequent Motion or Noise in the House, that I could attribute it to; but on the contrary every Thing was quite still: Upon this I went to the Window, and found a small Air from the South; the dark Cloud was no longer to be seen, but a thin slight Obscurity in the Air. Scarce a Quarter of an Hour passed, but the Chamber received a more violent Motion than the former, though not to frighten us very much. I observed a Motion in the Candles on the Table from W. to E. We then heard all the Bells in the City; on this my Friends and I went out of the House, and staid abroad till 4^h. I smelt the Stink no longer, but observed the Clouds increasing and thickening on every Hand, but always with a white Hue, like the Circle which is often seen round the Moon, but of a prodigious Extent. Every Body's Eyes were busied at this, looking on it as the Forerunner of something extraordinary, though no-body
knew

knew what would be the Event. Many asked my Opinion of this Novelty: I told them, I had observed the same Thing very often, and that the Consequence was sometimes Rain, or Wind, and very often nothing at all: In short, I persuaded them it was nothing out of the common Way, and did not portend any future Evil, as they thought. But returning home a few Minutes after 4 in the Night, I was got about half Way up the Steps, when another violent Shock began, far superior to the two former, which lasted about the Time one might say an *Ave, Maria*; the Motion was sudden, and the shaking of the House was from E. to W. The House wherein I live being S, and I standing fronting it, staggered twice to the Right-hand, and in great Danger of falling down all the Stairs.

At 10 Hours and a half were heard by many 2 other Shocks, (with a small Intermission of Time) much like the two first; however, I was not sensible of these. One waked me at 11^h 45', and another about an Hour after: These were perceived by every Body, but were of no Consequence; and I being between Sleep and Wake, could not tell which Way the House moved. In the Morning, *Jan. 17*, after the last Shock, there fell a little small Rain, like Hail, which turned to Snow about 14 or 15 Hours, which fell in such Abundance for an Hour, that the Streets and Tops of the Houses were quite covered; and a little more after Mid-day, which continued all the Remainder of the Day. On the 18th there were no sensible Shocks of the Earthquake, but there were now and then visible Undulations of the Ground, though of no Consequence. The 19th in the Morning, at Sun-rise, there were between the E. and S. certain Clouds very thick, which dispersed as they came nearer to the solar Disk; but there always remained a particular uncommon whitish Thickness in the Air, till 16^h, when it was entirely dissipated; a small Gale rose from the South, which soon fell again, and changed to the West; the Sun was so scorching, that it racked the Head to stay in it. At 18^h 30' I heard a rumbling Noise, which seized me with Horror, and expected an Earthquake was at hand, neither was I deceived, the House began to shake, and continued the Motion 8 or 10'': It came like a Blow, and the House waved from W. to E. At 19^h exactly, followed another Shock, which lasted about 3''; but I did not observe any Motion of the Building, being so surrounded by Numbers of People, that I could not stir, nor raise myself from kneeling, being then at Church. All the Remainder of the Day, quite till 23^h, the Earth was in continual Motion; and exactly at 23^h followed another Shock, like that at 18^h 30'. I felt nothing at all of this, by the Increase of the People, who poured in upon us. However, at 2^h, 3^h 30', and 3^h 50', I perceived 3 small Shocks; and from that Time to *Jan. 20*, at 23^h 30', I felt nothing: At this Hour there was a small shuddering, which was not universally observed. At 5^h 25' in the Night, followed a Shock like that of 18^h 30' of the 19th Day, with this Difference only, that the House waved from S E, and con-

Accounts of several Earthquakes.

tinued between 10 and 12''; there followed a strong Undulation of the Ground (something interrupted) until 20^h of Jan. 21; at 23^h of the said Day, being in the great Piazza of the City, I found a small Motion of the Ground, which was observed by a few more, that I happened to be in Company with.

Some Fishermen told me, that at the same Hour, Jan. 19, that we had the terrible Shock at *Leghorn*, they being at Sea between *Meloria* and *Gergona*, saw a small Part of the Sea rage violently, and raise itself to a great Height in a white Foam, with a dreadful Roaring, and frightened them so far as to imagine themselves lost, though it did not directly beat upon them, but felt it on one Side only; which made them imagine some violent Mischance at Shore; and keeping their Eyes always on that troubled Part of the Sea, perceived it made towards *Leghorn*, and broke on the old Fortrefs, which for a little while was hid from them. The Captain of a Ship, who came to this Port, says, that he saw, to his great Surprize, a few Miles distant from *Capo Corso*, several Streams running with great Impetuosity different Ways, and so very rough, that although he had a very fair Wind, he expected every Moment to be lost. This must have happened just before the Earthquake of Jan. 19 above-mentioned.

From the 20th to 23^h of Jan. 25, the Ground was in a continual Agitation: I suspected it might be my foolish Apprehensions: I asked every one I saw, but every body agreed there was some little Matter. To assure myself of the Truth, I put Water in a Bason, and put it on a Plain, observing it every Time I thought I felt any Thing, and saw it move: I continued this Observation till Jan. 26, and at 23^h on the 25th Day, there was a much greater Motion than that of the 20th Day; and from that Hour until 18^h 45' on the 27th Day, there was not the least Motion perceptible: Upon this I hoped the Evil was past, and comforted myself with thinking that Matter spent to which the Philosophers attribute this horrid *Phænomenon*; but found myself mistaken, for when I least expected it, and my Mind quite otherwise engaged, I was surprized the said Hour with a most dreadful Noise, which was followed by a treble Shock of the Earthquake in the most frightful Manner, and beyond Measure violent; it began by a succussive Motion, and followed by a Sort of Blow with horrible Violence; and at last came another succussive Motion, more horrible than the former: There was heard from under-ground a hollow terrible Rumbling, as if the whole Earth had broken to Pieces: It had a Motion like turning, and continued moving; the Houses waved 30 or 32'', from E. to W. I looked upon myself quite lost, and expected nothing less than the immediate Ruin of the House, especially when I beheld Part of the Door-case falling, and the Partition-Walls cracked; the Mortar fell all about like Rain, the Furniture and Cloaths hung to the Walls fell all down; in this I was confined, without being able to seek Safety out of the House, but stood fixed, and nailed up, (as it were)

by

by the surrounding Crowd of frightened Wretches that flocked in upon me: At last, however, I got out, and could hardly believe my Eyes, when I found the Houses all standing, having figured Things much worse than I found them; yet every Thing has suffered very much, there not being a single Edifice but what is damaged; although a great Part of the Hurt within the Houses proceeds chiefly from the Roguery of the Builders, who either when first built, or in repairing, used bad Materials; those which are well built have suffered scarce any Thing: Some must inevitably be rebuilt, chiefly those which remain leaning to one Side; which proceeds chiefly from the Load occasioned by their being raised so high. What has most surprized me is, the Number of Cracks in the Walls of this Collegiate Church, which were built without sparing any Cost, to make them a compleat Piece of Workmanship, and are of an extraordinary Thickness, as one may observe in some of the Openings in the Building and Vaulting, which was esteemed superior to any in this Town: From hence you may conceive a just Idea of the extreme Violence of the roaring Earthquake. As for myself, I look upon it as a particular Providence, that the whole City did not go to Wreck; and had not the Houses been in general very good, they must have come to the Ground. The Ruins consist in, *viz.* the Roof of the Church of *St John Baptist*, the Convent of *Augustine* Friars, the Roof of a Palace called *Rosciano*, belonging to the Family of *Borghesi* of *Sienna*. Besides these there are few others of Consequence, and but 3 People killed. There is an immense Quantity of Iron Chains used, to keep the Walls of the Houses together.

Upon account of the Inconveniences attending this Earthquake, an infinite Number of People went out of the Town; the Houses and Shops were abandoned instantly, to seek Refuge in the great Piazza: So great was the Consternation, that no one knew what he was about. It was an Object of the greatest Compassion, to see the Astonishment and general Confusion that prevailed; every body looked pale as Death, without knowing what he did or said. There was another small Shock at 19^h 0' 1'', at 19^h 15', and a third at 20^h: After this last, I staid till 21^h of *Jan.* 30, and then went away to breathe a little of pure and more quiet Air than you enjoy, and observed no further considerable Motion of the Earth; there remained, however, a continual Undulation, sometimes more, sometimes less; but must own, that from 22^h of *Jan.* 27, to 13^h 30' of the next Day, I could not perceive any Thing, because I retired, and went to lie on board a Ship.

We may observe here, that some Earthquakes happened in cloudy, some in serene, some in still, and others in quite stormy Weather. *Jan.* 16 at Night was Snow and Clouds, as above-noted, with a very small S. Wind from Midnight to Break of Day; the Fogginess turned into Clouds, which afterwards became Sleet and Snow. On the 19th in the Morning, was a bright Sun, but a gentle Breeze; about 23^h it was cloudy, which at last covered all the Sky, continuing cloudy all that

Accounts of several Earthquakes.

that Day and the next Night, when at 5^h 25' followed the above-mentioned Earthquake; and in the Morning about 13^h, there fell a small Sleet and a Westerly Wind. Before the Earthquake on the 19th, the Waters swelled, and then fell again; soon after they swelled half a Yard higher than they ever were used to do. I was told by many, that the same Night and the following, there was a strong Smell of Sulphur in the Streets; but my Cold prevented it's being perceived by me. This Smell was likewise found in the Water of some Wells. The Sea was seen in sundry Situations, now high, and then presently very low again; sometimes strongly agitated, and at others on a sudden calm. On Sunday, Jan. 20, a small Sleet fell all Day, and the Air was changeable till the 27th in the Morning, being, by Turns, serene, cloudy, foggy, windy, and damp, with South and Westerly Winds. The 27th in the Morning, was a pleasant fine Sky, and a bright Sun, but excessive hot: About 16 or 17^h, a brisk Westerly Wind arose, and with this full Wind we sustained, at 18^h 30', the violent Shock of the Earthquake; the Waters were observed to rise as high or something higher than the 19th. At Night, between 24^h and 1^h in the Night, it became cloudy in the W, with a strong Wind; from Midnight to Day-break, fell a small Sleet, which continued (with some Interruption now and then) till the 28th; between whiles the Sun shone. The 28th at Night, and the 29th Day, it rained violently, accompanied by strong blustering Winds from the W. The 29th it was all Day cloudy, with the same violent Wind and Rain. The 30th the Sun began to appear, but the Clouds were not all dispersed. At 21^h this Day I left *Leghorn*, and have not been able to make any further Observations.

It is said here, that the Sea roared with such Violence and Smartness, that it's Noise was like the firing of large Cannon. I have not seen any body who was then at Sea, but a Friend of mine informed me, that a Fisherman (a *Frenchman* by Nation) being then in his Boat, found it of a sudden raised up a prodigious Height, and then it fell down so low, that he thought it had touched the Bottom of the Sea, and concluded himself lost: During this uncommon Motion he affirms to have heard one of these Noises resembling the firing a Cannon, and afterwards felt no Storm. I give it neither for true or false, but as a Relation of others. It is assured me by many, that on the ninth Hour of the 10th Day, there was a small Shock of an Earthquake. These are all the Observations I have been able to make myself, and gather from other creditable Persons, having avoided the additional Stories that are commonly raised on such Occasions.

What has much attributed to the Preservation of this City, is the fatherly Care and Solitude of our Royal Sovereign, who, by the Means of his Royal Council of Regency, neither has or will ever fail giving us Instances of his Royal Munificence to this afflicted City; having ordered, that such Wood, Iron, &c. should be furnished as may be necessary for Repairs, with certain fixed Prices; having further
ordered

ordered one half of the Duty to be taken off of Flesh. He has also, at his own Expence, sent a most able Engineer, and two Master-Builders, to estimate and supervise the said Repairs: Neither has his Bounty failed to the more Indigent, who not having wherewithal to repair the Damages they have suffered by this Earthquake, he has ordered Money to be distributed for repairing them, that he may again see this his dear City vested in it's former Beauty. The Assistance and Watchfulness of the civil and military Power was likewise very great, even during the Time of the Earthquake; for by their Means there were no Disorders practised, not even in the Midst of the Hurry and Confusion, as it very commonly happens upon such Occasions.

P. S. I cannot omit to acquaint you with some Observations communicated to me after the writing of this Letter, by Sig. *Ferdinando Tidi*, a Gentleman of incontestable Credit, who being at his Seat in the Country, called *Popogna*, pretty high up a Hill, between the Mountain *Montenero*, and the Valley *Benedetto*, on Jan. 20, about 2^h 30' in the Night, he observed a large Circuit of Air in the West, (quite from the Island of *Corfica* to *Capo Mele*) thickened with Clouds, but open, and all the Remainder of the Sky covered with heavy dark Clouds; he saw the Air light, and extremely shining, so that one might easily read a Book; and, according to his Description, must have been a very bright *Aurora Borealis*. Besides this, he observed that when we had the Wind from S. or E, the Sea was in great Agitation, and ran towards *Leghorn*, but suddenly retired. I will likewise tell you, that Sig. *Giuseppi Vincenti*, Captain of the first *Lazaretto*, and present *Cansaloniere* of the City, a Person not easily to be imposed upon, having one Night, at about 3^h, opened his Window, saw a Cloud in the W, which was exceeding dark, except in the Middle, where a strong Light (like the Influence of the Sun just before it's Rise) discovered itself, and dispersed Beams of reddish Fire all over the Circumference of the Cloud, which was very extensive. He made a Friend of his observe the same Thing, but neither one or the other remember what Night it happened; and being uncertain of the particular Night, is the Reason I omitted it in the Account: But since it happens, that I am treating of these *Phenomenons*, which may have some Relation to the Earthquake, and proceed from the same first Cause, I imagine it must have been the same Night, though perhaps not. However it may have been, I have related to you a true Exposition of all Things as they really were; and there is now a Way opened for Philosophical Observations and Inquiries. As for me, I should be of Opinion, that it is a Collection of those Vapours and Exhalations proceeding from the Fermentation or lighting of those Particles of Matter, which occasioned the Earthquake.

XVII. The Parish of *Pardines*, in the District of *Issoire* (in *Auvergne*) is situated about a League from the Town of *Issoire* on the Road to *Clermont*, almost on the Top of pretty steep Hill.

This *ANarrative of an extraordinary Sinking down and Sliding away*

An extraordinary Sinking of Ground.

of some Ground
at Pardines
near Au-
vergne, by M.
T———
Translated
from the
French, by
Phil. Henry
Zollman, Esq;
F. R. S. No.
455, p. 272.
Nov. &c.
1739.

This Parish consists of two Villages, or Hamlets, distant from each other about 200 Paces; the one, which is called *Le Fort*, in which is the Parish Church, and Part of the Houses of the Inhabitants, stands upon a Rock; there appear the Remains of an ancient Fortification, with which some Houses were surrounded in the Time of the Wars.

The other Village, which is properly called *Pardines*, was composed of the greater Part of the Houses of the Inhabitants to the Number of 46 Buildings; the Ground whereon this Village was built, as well as that of the whole Hill, is a good and light Earth, mixed with a little white Clay: There are also found in it some Stones and Rocks of a middling Size. This Land was very well cultivated, and very fruitful, consisting of Fields sowed with Corn, of Orchards, and for the greater Part of Vineyards; the whole Ground was overspread with Fruit-Trees, particularly Walnut-Trees.

This Earth used to dry soon and chap from the Heat; they even observed in it long since Clefs of a considerable Depth, which sometimes growing wider and wider, formed several Gullies.

June 23, 1733, about 9 in the Evening, the Inhabitants of the Village of *Pardines* saw the Walls of their Houses shake sensibly; whereupon they all retired out of them, and saw that the Hill visibly melted away, as it were, the greater Part of the Land sliding along towards the Vale; others subsided sensibly; in some Places the Earth, opening itself formed new Gulls, and those that were observed there before, grew much wider; sometimes the Ground, which slid along in great Pieces, stopped and tumbled one Piece over the other; and the Rocks, which broke loose from that rolling Earth, precipitated themselves into the Valley, which at present is quite filled up with them, as well as with the Earth which rolled down, whereby the Road from *Issoire* to *Clermont* is become impassable.

All this was done, not with any impetuous Motion, but very gently, and even sometimes almost imperceptibly; a sensible Motion was observed during the Space of 3 or 4 Days at different Times; there was even a House which did not fall till the 10th of the present Month of *July*. During all that Time no Noise was heard, any otherwise than what proceeded from the Rocks falling into the Valley, and from some large Clods of Earth, which loosening themselves from the steeper Parts, fell down with Precipitation.

By this Rolling were carried away 26 Buildings, large or small, some of which subsided with the Ground, and, being shaken at their Foundations, tumbled on a Heap; the Remains of some others appear, as yet, on those Pieces of Ground that rolled down into the Valley.

It is computed, that the Lands which slid away, or were lost by being buried under the Rubbish of the others, amount to the Number of 466 *Oeuvres* of Vineyards, 40 *Septerées* of arable Land, and 56 *Oeuvres* of Grass-Fields, which all together may make up 150 Acres of *Paris Measure*. It is observable, that in this Number were comprised several

several Orchards, besides that the whole Ground was covered with Trees, either Walnut-Trees on the Hill, or Willows or Poplars in the Valley, of which they reckon 4000 in all.

If one may conjecture what was the Cause of so dismal an Accident, it seems it proceeded from the Situation of the Ground, and the Nature of the Soil. The first Surface of the Hill about 4 or 5 Foot deep, was a pretty light Earth, easily dried by the Heat of the Sun; under this first Layer there was a *Stratum* of fat Clay, which at present lies open in several Places, and is very moist, so that one even sees the Water bubbling out of it in some Places.

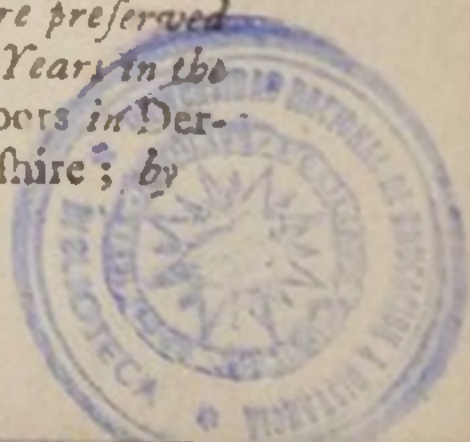
The great Rains that fell in the Beginning of the Spring, soaked through and diluted this *Stratum* of Clay, which retained and gathered all the Waters of the Hill running between the two Layers; the Heat of the Summer ensued, which dried up the upper Surface, and formed it into a Sort of solid Crust, which Crust resting itself upon a fat and moist Clay, and by it's steep Situation being inclined to slide towards the Valley, the whole Surface of it loosened itself by great Pieces, and breaking in several Places, slid along towards the Place whither it's Declivity would naturally carry it. There are some Parts which moved almost insensibly, and only sunk or subsided, either because the rolling of the neighbouring Soils made Room, that what was under this Surface might slide off, or perhaps because the Parts under this Surface had been hollowed a long while since, by the Waters which passed between this Surface and the *Stratum* of fat Clay. Other Parts, which were much more in Number, rolled all together towards the Valley, and one sees yet whole Pieces of Vineyards, with the Props remaining upright; which may easily be conceived: There are again other Parts, which in tumbling were overturned in different Manners.

I am to add here, that this Accident is not without Example in the Province of *Auvergne*; we have not indeed seen so considerable a one till now, yet it has often happened, that Pieces of Earth of a Quarter or half an Acre, have separated themselves all in one Piece, from the Top of a Hill, and slid down visibly on the Lands lying below.

How considerable soever this Accident may be in regard to the poor People who suffered by it, yet it was to be wished it was the only one that has befallen this Province. The overflowings of the River *Allier*, and of the Rivers and Brooks that run into it, and the Hail that fell almost continually since, have entirely ruined above 100 Parishes, in which they will have no Harvest this Year as for Corn and Hemp, nor any Vintage at all.

XVIII. The Persons of whom you have the following Account were lost in a great Snow on the *Moors*, in the Parish of *Hope*, near the *Woodlands* in *Derbyshire*, Jan. 14, 1674; and not being found until the 3d of *May* following (the Snow lasting probably the greatest Part of that Time) they then smelt so strong, that the Coroner ordered them to be buried on the Spot. The Man's Name was *Barber*; he had been

An Account of the dead Bodies of a Man and Woman which were preserved 49 Years in the Moors in Derbyshire; by



Dr Charles
Balguy of Pe-
terborough.
No. 434. p.
413. Sept. 1734.

a considerable Grasier, and was well known by the People that found him: But being reduced in his Circumstances, was then going off with his Servant-Maid for *Ireland*. They lay in the Peat-Moss 28 Years 9 Months before they were looked at again, when some Countrymen, having observed, I suppose, the extraordinary Quality of this Soil in preserving dead Bodies from corrupting, were curious enough to open the Ground to see if these Persons had been so preserved, and found them no Way altered, the Colour of their Skin being fair and natural, their Flesh soft as that of Persons newly dead. They were afterwards exposed for a Sight 20 Years, though they were much changed in that Time, by being so often uncovered; and in the Year 1716, Dr *Bourn* of *Chesterfield* was there, who gave me this Account of the Condition they were then in, viz. the Man perfect, his Beard strong, and about a $\frac{1}{4}$ of an Inch long, the Hair of his Head short, his Skin hard and of a tanned Leather Colour, pretty much the same as the Liquor and Earth they lay in: He had on a Broad-cloth Coat, which he tried to tear a Skirt off, but could not. The Woman, by some rude People, had been taken out of the Ground, to which one may well impute her greater Decay; one Leg was off, the Flesh decayed, the Bone sound, the Flesh of one Hand decayed, the Bone sound; on her Face, the upper Lip, the Tip of her Nose decayed, but no where else. Her Hair was long and springy as that of a living Person. He took out one of the Fore-Teeth, the upper Part of which, as far as was contained in the Socket, was as elastic as a Piece of Steel; and, being wrapped round his Finger, sprung again to it's first Form; but this Power was lost in a few Minutes after it had been in his Pocket.

Mr *Barber* of *Rotheram*, the Man's Grandson, was at the Expence of a decent Funeral for them at last in *Hope* Church, where, upon looking into the Grave some Time afterwards, it was found they were entirely consumed.

Mr *Wermald*, the Minister of *Hope*, was present when they were removed: He observed that they lay about a Yard deep, the Soil or Moss moist, but no Water stood in the Place at all. He saw their Stockings drawn off, and the Man's Legs, which had never been uncovered before, were quite fair; the Flesh, when pressed with his Finger, pitted a little, and the Joints played freely, and without the least Stiffness: The other Parts were much decayed: What was left of their Cloaths (for People had cut away the greatest Part to carry home as a Curiosity) was firm and good; the Woman had on a Piece of new Serge, which seemed never the worse.

These are all the Particulars of Moment which my Friends, who saw them at this Distance of Time, are able to recollect. The Thing is certainly very remarkable, as there are no Means known (I believe) of preserving dead Bodies so well.

XIX. In the mountainous Part of *Derbyshire*, about *Cromford*, is a Valley of at least a Mile and half long, walled on each Side with high craggy Rocks; the East Side cliffy, the West more reclining, but extremely rough and difficult of Ascent; being composed of large loose Pieces of the Lime-Stone Rock, of 5, 10, or 20 Ton Weight; that seem at some Distance of Time to have broken off from the Top of the Cliffs, and fallen down into the Valleys. — At the Bottom of the Valley, which seems to be a great gaping Fissure of the Rock, runs the River *Derwent* harshly along it's rocky Bottom. About the middle of the Valley, at near 50 Foot perpendicular Height from the River, issue forth several Rivulets of a luke-warm Water, that pour themselves into the *Derwent* below. Some of this Water, being collected in a Reservoir, on account of it's agreeable Warmth, hath of late Years been much used for bathing, and is called *Matlock-Bath*. Now for about the Compass of 5 or 600 Yards, near to where this Water gushes out, the Stone appears of a very different Texture and Complexion; and proves, upon Examination, to be a perfect Incrustation, formed upon the original Rock; composing a factitious Stone, of Earth, Vegetables, &c. of various Kinds, such as usually grow in rocky Places, as Polypody, Trichomanes, and other Species of the capillary Tribe, Mosses, Brambles, Ivy, Hazle, &c. — There are several large Grotto's at about 15 Foot above the Level of the River, lined most curiously with the *Stalactite*, *Lapides Stillatitii*, &c. Some of them nearly resemble large Bunches of Grapes, and other Clusters of Fruit, very beautiful to look upon. I found upon Examination, that the farther you penetrate into this Mountain, the closer and more compact the Stone appears; the Interstices in the petrified Matter being at the Depth of 15 or 16 Foot, almost filled up, and nearly as solid as the Lime-Stone, of which the original Rock is composed; and even within 4 or 5 Foot of the Surface, though very open and porous; yet is it so hard as to be used in the Building about the Bath; and I imagine it may be equally durable, though easier to work with the Saw, than the close Lime-Stone.

The Mountain in several Places jets out almost over the Brink of the River; under these Protuberances are the Grotto's, very dangerous and difficult to get at. It was here the Specimens I send you were collected*, but it is impossible to give you an Idea of the natural Beauty of the Place. The Frost-work, and incruusted Plants, are some of them so very delicate and tender, as to make it impracticable to bring them away with half their Beauty, by the most careful Conveyance. In one Place there is an Ivy creeping along the Rock, Part of it entirely petrified, another Part only incruusted, and a third still vegetating. In another Place is a Hazle-Tree, the Root whereof composes a Part of this petrified Mountain, the Branches some petrified, and some tenderly incruusted. As these are changed, others spring up, and in Time will

An Account of the Petrefactions near Matlock Baths in Derbyshire; with Conjectures concerning Petrefaction in general, by Mr. Moreton Gilks, F.R.S. No. 456 p. 352. Jan. &c. 1740.

* They are deposited in the Museum of the Royal Society.

undergo the same Fate. In short, nothing in Nature can give a more clear Idea, or more beautiful Representation, of the whole Business of Petrefaction, than a curious Observer will see, and frame in his Mind from this Mountain. He will see, that not only the Water, as it distils out of the Rocks, is capable of incrusting and petrifying the Bodies it meets with in it's Passage, but that even the Steams and Exhalations *, being highly saturated with these mineral Particles, will work the same Effect; as is evident in the Place under Consideration, and will generally best account for the Supply of petrifying Matter, brought to fill up the Vacuities that are left by the Decay and Waste of Vegetables incrufted over; and which, he will see, are in Course of Time constantly filled therewith. For although the Water of some Springs may be so loaded with mineral Matter, as, perhaps by penetrating the Pores of Wood and other lax Bodies, to increase greatly their specific Gravities; yet surely it is contrary to the Laws of Matter, and absurd to say, there is any hidden Property in such Waters capable of changing the Parts of one Body into another Body specifically different. It may in Time, no doubt, lose it's Texture and Coherency, by the Admittance of heterogeneous Particles of different Attractions; but the Cause of Coherency in the Parts of the original Body must entirely cease, and be dissolved, before it can be said to become a Part of any other Body whatever. Afterwards, indeed, the Space that was possessed by the Parts of the original Body, may be supplied by those of the new one, so as to make in Time a uniform Stone in the Shape of the original Plant: But if this petrified Plant be still kept in the Place where the same petrifying Quality continues to act upon it, it will lose even that Shape, and become a Part of the Body it is contiguous to; and so a great many of these petrified Plants, and other Bodies united together, will compose large Masses and whole *Strata* of Stone. This is clearly the Case in the Instance now before us, and perhaps it might be carried so far as to strengthen our Conception about the general Formation of the *Strata* of Lime-Stone or Marble; that appearing to be every-where, (notwithstanding Dr *Woodward* dispatches them much more expeditiously †) but especially in the *Peak* of *Derbyshire*, such a Petrefaction as I have been describing, quite finished. I could urge many Reasons for my Supposition, but I will not trouble you with them here, the Compass of this Letter not permitting me; nor do I know how far such Conjectures are capable of being used, with regard to the received Opinion of the World's Age; but if we had as good Authority to suppose it 60,000 Years old, as we have 6000, it would be worth the while to trace the Origin and Source of these petrifying Exhalations a little deeper than seems to have been done by Dr *Woodward*; and might either perfect his History, or produce a more rational System of the Earth than has yet appeared.

* Vide *Woodward's* Natural History, p. 136, 209.

† *Ibid.* Part II. Conf. 4.

You will find, amongst the Things I send, some Land-Coral found in a Lime-Pit, where is a great Quantity of it, between two *Strata* of Lime-Stone of at least 3 Foot thick. You will find also some few Pieces of *Pseudo-sapphirus*, and other Kinds of Spar; they are such as I picked out of the Fissures of the Rocks I have been describing. There is a vast Variety of these Things in the *Peak*, much greater than hath been taken Notice of by any one; as I shall convince the *Royal Society*, when I am able to present them with a complete Collection of *Derbyshire* Fossils, in which I have already made some Progress.

Burton, Nov. 26, 1735.

XX. 1. *Exp. 1.* Pure Quicksilver being only shaken in a dry, clean, Glass Vessel, affords a very fine, soft, black Powder.

Operation. I bought xxvi of Quicksilver of the *Amsterdam* Company, I squeezed it through Leather, and no Impurity remained. I washed it well with fair Water, and it continued pure. I rubbed it a good while with Sea-Salt, and the Colour of the Salt was not altered. I poured fresh Water upon this Salt and Quicksilver; and neither did this change Colour. In all this Operation there did not appear any Thing black, foreign, or foul, the Quicksilver being dried after the Ablution was bright. I poured it into a clean, dry Bottle, made of dark-green *German* Glass. I placed it in a Sand-Heat, with just Fire enough not to raise the Quicksilver; and that I might be sure, that all the Water was got out, for there is often some concealed in Quicksilver, I kept it in that State for 3 Days. I stopped the Bottle very close with a very solid, dry, clean Cork, thrust into the Neck of the Bottle, whilst it was hot; and closed it all over the Top with a Cement of Pitch, Resin, Saet, and Sulphur. I covered it with Linen bound on fast with Cords. I then put the Bottle into a wooden Case, fitting it so as to have the Sides touch; and filled the Spaces between the Bottle and the Case with dry Bran. The Lid of the Case had a Hole in the middle for the upper Part of the Neck of the Bottle to come out. The Bottle was tight in it's Case. Being thus prepared, I fixed it to the Hammer of a fulling Mill, that went Night and Day when the Wind blew: Thus it was continually shaken, by a perpendicular Motion up and down, from *March* 1, 1732, to *Nov.* 13 following.

The Vessel being opened, there was the same Weight of Quicksilver, covered all over with a great Quantity of very fine, soft, black Powder. I squeezed it through a clean Leather. The Quicksilver came through clear and pure. The Powder staid in the Leather, and had an acrid, metallic Taste, something like Brais.

Coroll. 1. Quicksilver, a most insipid Body of itself, acquires a metallic brassy Taste by mere shaking.

2. From being most mild, it becomes acrid and penetrating.
3. From a most shining Silver Colour, it becomes very black.
4. From a Fluid, it becomes a consistent Powder.

5. It

Experiments concerning Quicksilver, by Herman Boerhaave, M. D. F. R. S. &c. No. 430. p. 145. Nov. &c. 1733.

Experiments concerning Quicksilver.

5. It may therefore lie hid under the Form of such a Powder, and deceive the Ignorant.

Exp. 2. The most purified Quicksilver, being treated after the foregoing Manner, affords the same Powder in a far greater Quantity.

Operation. Suspecting that something foreign from the Nature of Quicksilver might possibly adhere to it, and be separated from it, by Motion in Form of that Powder, I brought over all the Quicksilver with a Sand-Heat from a Glass Retort; I poured it into the same Retort again, and distilled it as before. I repeated the Operation 60 Times. The Quicksilver was distilled 61 Times. At the Bottom of the Vessel there were 3v of red Powder, of which hereafter. This Quicksilver was very quick and shining. I got 3ij of this to be shaken as before.

Effect. The Weight was the same. There was a soft, black Powder, of an acrid, metallic Taste, resembling Brass to the Weight of 3ij Gr. xxvj; which is more than $\frac{1}{8}$: Whereas scarce $\frac{1}{128}$ of the common Quicksilver was turned to Powder by the same Operation.

Coroll. 1. Quicksilver 61 Times distilled, and very insipid, acquires a metallic Taste.

2. From being most mild, it becomes acrid and penetrating.
3. From a most shining, bright, Silver Colour, it becomes exceeding black.
4. From more, than it's native Fluidity, it becomes a consistent Powder.
5. A lasting, strong Fire being often repeated, it retains this Property.
6. It therefore does not depend upon a foreign Impurity of the Quicksilver, separable from it by Fire.
7. The Matter remaining in the Bottom of the Retort, from the Distillation of the Quicksilver, is red, shining, acrid, and no more like the black, arising from Concussion, than that Part which continued volatile.
8. Quicksilver is turned red by Fire, and black by shaking: It is therefore changeable in it's Colour.

9. Does it yield more black, if wrought upon in a less Quantity?

Exp. 3. The black Powder (*Op. 2*) being raised with a strong Fire from a Glass Retort, returns to pure Quicksilver.

Operation. I raised 3ij Gr. xxvj of the black Powder (*Op. 2*) with a strong, open Fire, from a clean Glass Retort, so that the Retort was hot for 2 Hours.

Effect. There were in the Receiver 3ij Gr. ij of a most pure, insipid, shining Quicksilver. There stuck here and there to the Sides of the Glass a small Quantity of Quicksilver, which I could not get up exactly. At the Bottom of the Retort there was a small, thin, fixed Spot, barely visible.

Coroll. 1.

Coroll. 1. Quicksilver 61 Times distilled, shaken, and turned into the above-mentioned Powder, returns by Fire alone to it's ancient Form.

2. From acrid and penetrating, it becomes very mild.
3. From being very black, it becomes bright and polished.
4. From a consistent Powder, it becomes very fluid.
5. After these 3 Operations, it remains the same, though it changes into various Shapes.
6. The acrid Power and Taste are wonderfully changed therein, by Motion alone, and by Fire alone.
7. In the mean Time there proceeds some little of fixed from the Quicksilver, by these Operations.

8. The black Substance was no Impurity, nor any Thing foreign, so separated from the Quicksilver.

Scholium. I put Quicksilver in conical Glass Cucurbits, with a plain Bottom, closed with an inverted, chemical, Glass Phial, and exposed it to a Fire of 180 Degrees for several Months. It became black, and afforded a black Powder, alike in every Respect. Hence I learned, that Fire and Shaking have the same Effect upon Quicksilver in this Degree.

Exp. 4. Quicksilver is changed by simple Distillation.

Operation. I distilled ℥xvii Amsterdam Weight of Quicksilver, bought of the Amsterdam Company, from a clean Glass Retort, with a Sand-Heat, into a Receiver filled with the clearest Water to the Height of 4 Inches, till none of the running Quicksilver remained in the Belly of the Vessel. I dried and purified the Quicksilver in clean, dry, filtering Paper: So that it might be perfectly dry, and clear from any accidental Impurity, and from the black, which comes over with the Quicksilver at every Distillation. Then I poured it into the same Retort, and distilled it again as before. I repeated the Operation 52 Times. At each Distillation there rose a red, shining Powder in the Retort.

Effect. A sharp, red, shining Powder, purging upwards and downwards, to the Quantity of ℥iv . The remaining Quicksilver weighed ℥xvj ℥v . Therefore ℥vj were lost. This could not be avoided: For something gets out through the Lute; and something black and a small Quantity of Quicksilver stick to the filtering Paper at every Exiccation. There is but a little lost in each Operation; but this being multiplied, amounts to a good deal. The Powder obtained was heavy, of a shining red Colour, very friable, of a very sharp, metallic, nauseous, penetrating Taste, hardly to be got out of the Mouth, disturbing the human Body long and much, and disposing it to Excretions. The Quicksilver thus obtained seemed more fluid than the common.

Coroll. 1. Quicksilver thus acted upon by the Fire, is changed near $\frac{1}{28}$ of it's Weight from a Fluid to a Powder.

2. From a shining Silver Colour to a shining red Colour.
3. From

Experiments concerning Quicksilver.

3. From a most insipid Taste, to a most sharp, horrid, metallic, penetrating Taste.

4. From being most mild, to a virulent, venemous acrid, disordering the Body, and causing Pain.

5. From volatile to more fixed, being no longer volatile with the same Degree of Fire that first brought it over.

6. The remaining Part becomes more fluid, the other similar.

7. Mechanical Motion and a small Fire give a black Colour to Quick-silver; a stronger Fire, with the Vessel shut, makes it red.

Exp. 5. I was desirous to know, what farther would happen to the Quicksilver, if it was urged by a Fire requisite to Distillation.

Operation. I distilled as before $\bar{3}xv \text{ } \bar{3}v$ of the Quicksilver remaining from *Operat. 4*, till nothing remained at the Bottom. When it was come out, I depurated and dried it, and always poured it again into the same Retort. I repeated this Operation 448 Times. The Quicksilver was now distilled full 500 Times. It always generated something red: It always rose more fluid and more pure. The last Times I made the Fire stronger, and then the red Powder seemed to be rather diminished than increased; perhaps being partly revived.

Effect. The Powder at the Bottom of the Retort weighed $\bar{3}j \text{ } \bar{3}v$ Gr. xxi : The Quicksilver remaining after 500 Distillations weighed $\bar{3}ix \text{ } \bar{3}v$: But in so many Distillations the Retorts happened sometimes to crack, and so some of the Quicksilver escaped, besides what was lost by so many Times purging and drying.

Coroll. 1. The Corollaries of *Oper. 2* and *4* are verified also in this Operation.

2. Quicksilver is very immutable in one Part.

3. But very mutable in another.

4. Perhaps it returns from it's changed Form to it's first Appearance.

5. And perhaps regenerating by a new Action of the Fire, it is again revolved to it's changed Form.

Exp. 6. The Property of Quicksilver, which turns it by Fire to this Powder, is hardly taken away from it by Distillation.

Operation. I distilled in a clean Glass Retort the most fluid, pure Quicksilver, remaining in the Weight of $\bar{3}x \text{ } \bar{3}v\bar{8}$, having made from it, by 501 Distillations, $\bar{3}ij \text{ } \bar{3}j$ Gr. lj ; so that all the Quicksilver passed over entirely into the Receiver. The Bottom of the Retort was as clean as if just taken out of the Furnace. But at the Edge of the Surface, where it had stood before Distillation in the Belly of the Retort, there was a thin, beautiful, fine red, shining Ring. When the Quicksilver was come over, I dried and purified it, and poured it again into the same Retort. I brought it over into the Receiver, and repeated the Operation 10 Times. At each Time there was made more of that red Powder; and that in no less Quantity than from the crude Quicksilver.

Effect.

Effect. A most shining vivid Quicksilver. A fine red, fixed Powder. The rest (as 2, 4, and 5) to Gr. vij.

Coroll. 1. The Mutability of Quicksilver into this Powder by Fire remains in it, after $\frac{1}{8}$ of it is turned to Powder.

2. It remains after 511 Distillations, each of which made some of that Powder, though no new Quicksilver was added.

3. That Powder therefore is hardly to be accounted an Impurity separable from the *Nucleus* of Quicksilver by Distillation.

4. Hence it is manifest, that it is thus changed by these Means; but it is not certain, that it is thus defecated.

5. Fire is not so united with Quicksilver, as the modern Chemists have asserted.

6. Diligence hardly teaches a constant Artist the Bounds, beyond which that Powder is no longer made.

7. If that Powder arises by Fire from the crude Sulphur of Quick-silver: This Distillation does not purge the Quicksilver from it.

Exp. 7. To examine the Powder produced by *Oper.* 2, 4, 5, and 6.

Operation. I put \mathfrak{z} ij \mathfrak{z} j Gr. l*j* of that Powder into a clean Glass Retort, covered with a Cruet of Clay tempered with Sand; I urged it by Degrees, till the Retort, set upon the naked Fire, grew hot with Plenty of Fire laid over it, in a Sand Furnace, for 3 Hours together.

Effect. There came out \mathfrak{z} j \mathfrak{z} ss of pure, revived Quicksilver from that Powder: At the Bottom of the Retort there remained \mathfrak{z} vijss of bright red Powder. Something stuck in the Neck of the Retort, and in the Glass Vessel applied to it's Neck. Something perhaps was dissipated by so large and long a Fire.

Coroll. 1. Quicksilver returns from the Powder, into which it had been converted by Fire.

2. Being revived, it recovers all it's former Properties, and loses those it had acquired. Quicksilver comes the same from the Powder.

3. The acquired Fixedness does not bear a great Fire.

4. But there is one Part in that Powder more fixed than the other: The latter still remains in the Form of Powder; the former returns into Quicksilver.

Exp. 8. To examine farther the Powder remaining from the preceding Operation.

Operation. I put \mathfrak{z} vij Gr. xxxvij of that Powder into a very clean Glass Retort, covered with a Coat of Clay and Sand, and committed it to a naked Fire, increased cautiously by Degrees; till at last the Retort being covered all round with Fire, grew quite hot. I kept it thus ignited 4 Hours.

Effect. The Quicksilver revived from this Powder, came over very pure to the full Quantity of \mathfrak{z} vij. At the Bottom of the Retort there were Gr. xv of a brown subtile Powder, fixed in so great and continued a Fire. There was a very thin broad Spot, of a very fine red Colour,

impressed on the Bottom of the Retort, and, as it were, penetrating into the Glafs.

Coroll. 1. Quicksilver is changed to the above-described Powder (2, 4, 5, 6, 7, 8) by Fire alone.

2. This Powder is turned to Quicksilver by Fire alone, only greater.
3. Thus a Serpent bites itself and dies.
4. It rises again more glorious after Death.
5. So long Labour, and so great a Fire being so long sustained, out of ℥xviij of Quicksilver there remained only Gr. xv fixed, in a Glafs so hot, as to be almost melted.

6. Silver, Gold, and other Metals, sought by this Art in Quicksilver, are hardly any Thing in Proportion to the Expence and Labour.

7. Only $\frac{1}{72}$ Part of the Powder thus fixed from Quicksilver remains fixed in this Fire: The rest returns to Quicksilver.

8. Are the lost Gr. xxij dispersed? Or is that Weight added by the Fire to the Quicksilver, and separated from it again by a greater Fire?

9. The Nature of Quicksilver is constant, simple, and not separable into dissimilar Parts by Distillation. Neither into fixed and volatile; nor into pure and impure; nor into impure and purified; nor into different Elements.

Exp. 9. I put Gr. xiiij of this last fixed Powder, in a Crucible, upon an open Fire before the Bellows. I blowed the Fire till the whole Crucible was totally ignited. I kept it so for $\frac{1}{4}$ of an Hour. The Powder remained fixed at the Bottom, but swoln like a Sponge and brown: Hence I learned, that the great Fixedness of this Powder is acquired by the Fire alone.

Exp. 10. I added, in the Crucible, a little Borax to this so fixed Powder, and blowed the Fire. It became one, friable, vitrescent Mass, fixed in this great Fire.

Exp. 11. I gave Gr. ij of that Powder, which had remained so fixed (8) to the Weight of Gr. xv , to a most skilful, sworn Assayer at *Amsterdam*, to examine it in the most accurate Manner with Lead, according to the Rules of Art. There remained nothing fixed at all. Therefore there is not any Gold or Silver in that Powder.

Exp. 12. Those Gr. xiiij , melted into a vitrescent Mass with Borax, were given together with Borax to a most skilful, sworn Assayer of *Amsterdam*, to examine, according to the Rules of Art, in Lead, with the greatest Accuracy. There remained nothing fixed from the whole Mass; and, consequently, nothing of Gold or Silver.

Coroll. 1. Quicksilver continues in the Fire, retaining it's immutable Nature.

2. It is simple, and not separable by Distillation into diverse Bodies.
3. It is fixed by the Fire, and seems changed in it's external Form.
4. Appearing thus, in various Parts, it acquires different Degrees of Fixedness.

5. But

5. But not one of these Parts acquired the Fixedness of Gold, or Silver, by so long and continual a Fire.

6. The fixing Cause is the Fire passing through the Glafs, and so changing Part of the Quicksilver, either by mere Action, or by uniting itself with the Quicksilver.

7. That Fire thus acting, through 511 Distillations, was not able, either by it's own Power, or by Conjunction, to change even the least Particle of it into Gold or Silver.

8. But from Quicksilver, thus fixed by the Fire, a greater Fire restores true Quicksilver; or the known Force of Lead makes it vanish from the Cupel.

9. It does not appear therefore, by these Experiments, that any known Metal is produced by Quicksilver and Fire, thus conspiring together: Those Gr. xij did flow when the Fire was blown; they did not stand in Lead; they were not dissolved with the Quicksilver into an Amalgama.

10. By these Experiments therefore Fire is not demonstrated to be the Sulphur of the Philosophers, fixing Quicksilver into Metals.

11. It is probable, however, that the Sulphur of the Philosophers is something very near it.

12. The fixed Part is not the Dreg of Quicksilver; nor it's crude, fetid Sulphur: It returns to it again.

13. The Depuration of Quicksilver from it's terrestrial Impurity, and aqueous Crudity, scarce seems to be so easy to be obtained from it by mere Distillation: Perhaps it is obtained by some more secret Operation.

14. Neither Gold nor Silver is made from Quicksilver by Fire. The Ignorant, and those who are given up to Imagination, are easy in Promises, and rich in Hope. Here Quicksilver remained Quicksilver.

15. We are safe from the fallacious Writings and Prescriptions of the Sophists, who promise to make such Things from Quicksilver in the short Space of a few Months: For in several Years there do not appear the least Signs of a first Beginning.

Exp. 13. Quicksilver detained under boiling Water, is not elevated from the Bottom of the Vessel.

Operation. I poured 3j of pure Quicksilver into a Glafs Urinal, which I filled with Rain-Water. I then set the Vessel upon a naked Fire. The Water boiled strongly for 8 Hours: But so that some Water always swam above the Quicksilver. Then the Quicksilver being weighed, was just 3j, without any Loss.

I poured the Dram of Quicksilver again into a clean, dry, Glafs Vessel. I fitted it within a Kettle, so that it could not stir. I filled the Kettle with Water, and took Care to make it boil for 8 Hours. This Vessel was cylindrical, open, 2 ½ Inches deep, and so placed, that the Water could not get into it. This being done, the Quicksilver weighed 3j, without any Loss.

I put pure Quicksilver into a Glass Cucurbit, and poured Water upon it; and setting it on an Alembic, boiled it a long Time, but none of the Quicksilver rose. I continued the Boiling till all the Water was driven away, and the Quicksilver remained dry at the Bottom of the Vessel, the Fire not being then increased. The Quicksilver presently rose to the Sides of the Cucurbit, and into the Capital: The Reason appears from what I have written in my Chemical Institutions concerning Water and Fire.

Exp. 14. Quicksilver may be changed by Art, so as to rise from the Bottom of the Vessel, by the Heat of Vinegar, before it boils.

Operation. I took an Amalgama made of half a Pound of Lead, and $1\frac{1}{2}$ Pound of Quicksilver in a Glass. It became a very black Powder. I put it into a Glass Cucurbit, 14 Inches deep, and poured upon it distilled Wine-Vinegar, made very pure by double Distillation. I took off the Phlegm by a gentle Distillation: Then I increased the Fire a little; but so that the Liquor did not boil at all. The Quicksilver rose into the Capital, together with the Phlegm, and from thence into the Receiver. I tried the same Thing other Ways: A Thing worthy of Speculation! of which I shall say no more at present. By a like Artifice I saw Quicksilver rendered so volatile, as to rise in my digesting Furnace, by a less Heat than that of a healthy Man, ascending along the Sides of the Vessel. Do you think it was then more pure? It was mixed with Metal, and very dry.

Exp. 15. Geber has written, that pure Quicksilver is heavier than Gold. I tried a long Time to learn whether it could be made more dense, and therefore more heavy than it is naturally. I began to attempt it by separating its lighter and more mutable Part, from the more ponderous Remainder, but could not. I afterwards endeavoured various Ways to defecate it; but it did not succeed. I found however some Things worthy of Observation. Examining a Mass of ʒij of the purest Gold hydrostatically in Rain-Water, defecated by a gentle Distillation, I found the Weight of it to be to Water as $19\frac{119}{100}$ to 1. The Quicksilver commonly sold, once distilled by a Retort, is to the same Water as $13\frac{17}{100}$ to 1. Quicksilver worked up with the purest Gold, and distilled some hundred Times, was to Water as $13\frac{55}{100}$ to 1. Quicksilver thus treated with the purest Silver, was to Water as $13\frac{58}{100}$ to 1. Quicksilver united with Lead, wholly turned into a Powder with it, and resuscitated by a strong Fire, was to Water as $13\frac{55}{100}$ to 1. Quicksilver distilled 511 Times, was to Water as $14\frac{11}{100}$ to 1. These Statical Weighings were made with exact Instruments, and the strictest Caution. I spent several Years in preparing Quicksilver for this Purpose. Nor do I know, that any one else has had regard to it. Many Corollaries might hence be drawn by proper Judges with mature Consideration. I shall mention a few.

1. If defecated Quicksilver becomes lighter, then it is rendered most defecated by Gold and Lead. By the Art of *Suchtenius* and *Philalethes*, it remains the same.

2. If defecated Quicksilver becomes heavier, then it is rendered most defecated by Silver, in Proportion to other Metals. But most of all by simple Distillation, by Conversion into red Precipitate, and Resuscitation therefrom.

3. Quicksilver may be rendered more dense by Silver and Fire.

4. Quicksilver may be rendered more dense by Fire, and most by Distillation. Is not this therefore the best Way to purify and perfect it?

5. Does Quicksilver deposit it's heaviest Part in Gold? Is this the Seed of Gold?

6. Does Quicksilver deposit it's heaviest Part in Lead? Is this the Seed of Gold?

7. Does Fire, boiling Quicksilver 511 Times, fixing, and resuscitating it, increase it's heaviest Part? How far can that be done? Can Quicksilver, by continuing the Operation, at last be condensed into the Weight of Gold? Would it then be quick Gold, or *Mercurius Philosophorum*? Let proper Judges examine.

2. *Exp.* 1. Pure Quicksilver, such as is commonly sold by the *Amsterdam* Company, digested a long Time upon the Fire, is not changed to a Metal. Part II. No. 443. p. 343. Oct. 1736.

Operation. This Quicksilver being distilled, left no Dreg. Afterwards being mixed with distilled Vinegar and Sea-Salt, and agitated for a long Time, it remained pure. I strained it through Leather, and put a Pound of it into a Matrafs with a long Neck, the Mouth of which I stopped with a Paper Cone, and covered it with another Paper well tied to the Neck of the Matrafs, so that no Dust could get into it, and at the same Time the Air could easily get in and out. I placed it in a Furnace with a continual Heat, which, by *M. Fahrenheit's* Thermometer, kept at above 100 Degrees of Heat from *Nov. 15, 1718, to May 23, 1734.* Then I found the Quicksilver fluid in this Matrafs, with a little black Dust upon the Surface. This Powder being rubbed in a Mortar, revived into Quicksilver. I put all this Quicksilver in Distillation in a clean Glass Retort, increasing the Fire toward the End, till the Retort was almost red-hot. There remained nothing at all in the Retort, and the Quicksilver came out without any sensible Alteration.

Coroll. 1. Fire to the Degree, and during the Time above-mentioned, changes nothing of the Fluidity, Volatility, or Nature of the Quicksilver put into a Vessel, where the Air comes freely: Nor is there any Separation made between the pure and impure.

2. Nor is there any sensible Generation of the least Quantity of Metal.

3. Much less of Silver or Gold.

4. Nothing

Experiments concerning Quicksilver.

4. Nothing of the Quicksilver was fixed by this Operation, continued for 15½ Years; nor did there appear the least Beginning of metallic Fixation, not even of Lead; which however, according to those who boast of knowing this best, ought to be the first Metal formed by this Operation.

5. This Experiment by no Means favours the Opinion of those, who affirm that Metals are formed from Quicksilver, as the Matter, and from Fire as the fixing Sulphur, united by Digestion.

6. It is very probable, that all similar Operations made with pure common Quicksilver, do by no Means answer to what is promised from them, since the small Quantity of black Powder already mentioned is lighter than the Quicksilver, on the Surface of which it swims, and very easily becomes Quicksilver again: See what was said in the preceding Article concerning a like black Powder obtained from Quicksilver by Motion only.

7. It does not appear, that Quicksilver can be changed in the Mines into any metallic Thing whatsoever, by the sole Action of the subterraneous Fire acting for a long Time, and in a Place to which the Air has a free Access: For Heat does not rise to above 70°, in Places where Veins of Metals are found. They say indeed, that 1000 Years are required to produce this Effect; but how can Men, who live so short a Time, be sure of this?

8. As to Sulphur, which the Alchemists have believed to be one of the Principles of Metals, and of which they say, that it unites the Elements of Quicksilver, in order to make a solid Body, and fixed to a Degree of Fire capable of rendering it fusible and malleable; this Sulphur, I say, seems to be quite different from the Matter of Light or Fire, though Fire alone is the only Means of producing this wonderful Union of this Sulphur with Quicksilver.

However in this Operation the Air was admitted freely to the Quicksilver, and it may be said, perhaps, that this is the very Thing that hinders this Action of the Fire; and the more, because the Alchemists say, that crude Air hinders the Philosophical Coction: This induced me to make the following Experiment.

Exp. 2. Quicksilver put in Digestion in a close stopped Vessel, during the Time mentioned below, does not produce any Metal.

Operation. I put pure Quicksilver into a conical Glass Vessel with a flat Bottom, such as the Assayers use in separating Gold and Silver, and exposed it to a Heat of 100 Degrees from Dec. 6, 1732, to July 8, 1733. The Vessel being constantly stopped, the Quicksilver did not undergo any remarkable Alteration; I put ℥vj of it into a Vessel like the former, and inserted the Neck of an inverted Phial into it's Mouth, without luting the 2 Vessels together; I exposed it 4 Days to a Sand-Heat so strong, that the Quicksilver began to rise, and this with an Intent to drive out any Moisture that might be lodged therein. When I saw that there was not the least Sign of Humidity, I luted the Place exactly,

exactly, where the 2 Vessels joined. I exposed the Quicksilver to a Sand-Heat, strong enough to rise and fall gently; I continued this Degree of Heat till Jan. 29, 1734: I found nothing at the Bottom of the Vessel but fluid Quicksilver, lightly covered with a fine, light, subtile, black Powder, nothing fixed, nothing precipitated, though the Degree of Heat was always near to that of boiling Water. Then I poured this through a very dry, clean, Paper Funnel, the lower Orifice of which would hardly suffer a Hair to pass. The Quicksilver came very clean through that little Hole, and there remained about the Sides, and about the Hole of the Funnel, a small Quantity of a black Substance, which being rubbed in a Mortar, turned again to Quicksilver. I distilled this Quicksilver thus depurated in a Glass Retort, with a Sand-Heat, and toward the End, with a Fire of Suppression; there remained nothing fixed at the Bottom of the Retort, the Quicksilver seemed a little more fluid than before, but not at all changed otherwise.

Coroll. The same Conclusions may be drawn from this as from the preceding Experiment; and if they are added to what I mentioned in the former Paper, it will plainly appear, that Quicksilver is immutable in it's own Nature by mechanical Motions, and by the above-mentioned Distillations and Digestions. From all this I conclude, that the Chemists may save themselves the vain Labour of repeating all these Operations, with an Intent to fix Quicksilver, or to change it into any other Body than what it is; I advise them also not to give Credit to ignorant Persons, abounding in vain Promises, among whom those are less to be blamed, who endeavour to try Experiments at the Expence of others.

I have laboured a long Time to know certainly, whether it is true, that Metals can be resolved by Art into Quicksilver, and into any other Principle; many Authors affirm it so distinctly, and in so many Places, that there seemed to be no Room to doubt of the Fact: I believed it upon the Credit of these Authors; but in order to be convinced of it by my own Eyes, I went to work upon Lead. The famous *Van Helmont* * says, "Lead, because of the Crudity of it's metallic Nature, such as sometimes Fire alone can destroy, may also, by the gross Parts of the fixed Salts, be divided into the Principles of which it is compounded, so as to suffer the crude Quicksilver to run." His Son *Francis-Mercury Van Helmont* † says, "When Lead is dissolved by Alkalies, and Salts, or Oil, which take in the Sulphur, and separate it from the Body, the Lead by this Means becomes changed into a volatile running Mercury, which can no more endure the Fire, as before, but is cold and running like Water, and without a metalline Form." *Joachim Becherus* affirms the same Thing, and answers for the Success of several Operations which he describes for this Purpose,

* *Potest. Medicam.* §. xl.† *Paradoxical Discourses*, Part ii. §. xxii.

Experiments concerning Quicksilver.

729
in his *Collectanea quingentorum Experimentorum*, from p. 310 to 333. Here follows in few Words what I have learned on this Subject, by a very long and tedious Labour.

Operation. I dissolved as much pure Ceruse, as could be dissolved, in Spirit of Nitre diluted with 6 Times it's Weight of Water; and filtered this Solution, which was very clear. This Liquor being put into a very clean Glass Vessel, and thickened by a gentle Heat, and afterwards being suffered to rest in a cool Place, there were formed Crystals in it, of which I took ℥xiv, and reduced them to Powder in a Glass Mortar with a Glass Pestle. I dissolved this Powder in very pure Rain-Water, and diluted this Solution with 3 Times as much Rain-Water; and then I poured gently and carefully another filtered and very clear Solution made with Sal Ammoniac and Rain-Water. The Mixture became as white as Milk, and the Lead precipitated immediately, as it happens to Silver dissolved in *Aqua fortis*, as soon as Sal Ammoniac is mixed with it. The precipitated Powder, which was as white as Snow, being washed in a great deal of Water, and then dried, was very insipid, and weighed ℥xviii℥. I put ℥vj of this white, dry Powder into a very clean Glass Urinal, and poured to the Height of 2 Fingers over this Powder a very strong Lee, composed of quick Lime and Pot-Ashes, which I kept several Years in a close-stopped Bottle. Afterwards I covered the Urinal with filtering Paper tied well about the Neck, and set in a Furnace of Putrefaction in a Heat of 96 Degrees. I left it there from *Feb.* 6, 1732, to *Aug.* 13 following, to try whether this Mixture, being exposed to the Air, would be altered by this Heat of Putrefaction. I found nothing but a white Mass, which being reduced to Powder, tasted of Salt. I put it into a Glass Retort, covered with a Lute composed of Clay and Sand; and urged it with an open Fire till it became red-hot, and continued it 3 Hours in the same State. There arose some white Soot in the Neck of the Retort, but no Quick-silver at all, and at the Bottom there remained a half vitrified brittle Matter, of an Ash-Colour. I reduced it again to a Powder of the same Colour, which I beat a long Time in a Mortar, with a Lee of fixed alkaline Salt and quick Lime, and dried it again by a slow Fire; I poured fresh Alkali upon it, and exposed it to a Heat of 96° from *Aug.* 18, 1732, to *Oct.* 15, 1733, beating it every Day in the Glass Mortar, in which it was, which was covered only with Paper, so that the Air had free Access. It was then a dry, white, acrid Powder, on which I poured some more Lee, and reduced it to a PASTE. I set it in Putrefaction as before, beating it often from the Day above-mentioned till *Feb.* 21, 1734; then it became a white, saline Mass, very near approaching to the Taste of Sea-Salt. After it was beaten and washed with Water, and dried very slowly, I found a very insipid, white Powder. I put it into a Retort, which I kept several Hours in the greatest Fire that the luted Glass could bear. *May* 20, 1734, no Quick-silver came out; the Neck of the Retort was stained of several Colours; the

the friable Mass, which remained at the Bottom, afforded also different Colours, disposed in *Strata*, and weighed $3v\ 3vj\ 8$; the Powder into which it was reduced by beating, was of a reddish grey Colour.

Scholium. In this Operation, the Lead at first was ceruse, that is penetrated and dissolved by the Vapour of the Vinegar, reduced to a white *Calx*, and then to a subtile Powder. It was then dissolved in diluted Spirit of Nitre, and so became a very clear Liquor, without Colour, and of a sweet Taste, in which the Lead was reduced and divided into most minute Parts. *Thirdly*, The dissolved Sal Ammoniac poured on, by expelling the Spirit of Nitre, substituted in it's Place a Spirit of Sea-Salt, and uniting itself intimately with the metallic Part of the Lead, disposed it, as much as possible, to facilitate the Separation of the Quicksilver from the metallic Part, according to the Opinion of all those who seem to have written best on these Subjects: For they ascribe the Power of separating Quicksilver from Metals principally to Sal Ammoniac and Sea-Salt. *Fourthly*, The Lime thus prepared, and put in Digestion 7 Months, with a very violent Alkali, seemed likely to make the Quicksilver appear, by absorbing the Sulphur of the Lead. But however, though a strong Fire was applied, yet it did not afford the least Quantity of Quicksilver. *Fifthly*, This Mass being strongly beaten for a long Time, and then mixed with a new and very strong Alkali, and digested for 14 Months, shewed not the least Appearance of Quicksilver. *Sixthly*, It was pounded again with new Alkali, and digested for 5 Months; so that after all these Operations, it was sufficiently exposed to the Action of the Alkali, to have Time to separate the sulphureous Part of the Lead, and for the Quicksilver, being disengaged from this Sulphur, to be driven out by the Force of the Fire. Nevertheless, after all this Labour, the very greatest Fire did not discover any Quicksilver.

It is plain therefore, that what Authors have boldly pronounced, concerning the Facility of extracting Quicksilver from Lead, is not confirmed by Experience. Lead, say those Authors, is the Metal that contains the most of Quicksilver, and is resolved most easily into Quicksilver by resuscitating Salts. Therefore it is more difficult in other Metals. Authors affirm, however, that it may easily be done, and prescribe Methods very little different from that which I have now related, by which I have learned, after all my Labours, that what they have promised, will not succeed. I very much question, whether the Assertions of these Authors are founded upon Observations. I rather believe, that they gave Way to their own Opinions, than consulted Experience. What has now been related, will serve at least to save the Reader the Trouble and Expence of repeating these Observations, and to hinder him from admitting easily these pretended Principles of metallic Knowledge.

Exp. 3. *Isaacus Holland* has written, that Quicksilver may easily be extracted from the Salt of Lead, made with distilled Vinegar: To

Experiments concerning Quicksilver.

make the Experiment, I prepared some Sugar of Lead with the best Litharge, and some distilled Wine-Vinegar: I calcined ʒij of it in an open Glass Vessel, with a slow Fire, continued from *June 6, 1734,* to *July 19* following. The white Powder thereby produced, was beaten very fine in a Glass Mortar with a Glass Pestle. It was beaten very quick and long, adding now and then some Lee, saturated with as much of a most violent fixed Salt as the Water could dissolve. I kept it in the same Mortar, covered with Paper, in a Heat continued from *July 21,* to *Nov. 27.* During this Time I took Care, as soon as the Powder was dry, to beat it again with fresh Lee. I kept it all that Time covered with Paper, in a Heat of 90 Degrees, drying, moistening, and pounding it alternately. The last Day I beat this white dry Substance into an impalpable Powder; and having put it into a luted Glass Retort, I carefully increased the Fire by Degrees, till the Retort was red-hot, and kept it in this State for 4 Hours. There did not appear even the smallest Globule of Quicksilver, either in the Receiver, or in the Neck of the Retort, at the Bottom of which there was found a very black, light Mass, in Form of Powder, of a burning alkaline Taste. *Nov. 28,* I set it on a Glass Plate in a Cellar, where it presently grew moist, and left it there till *Jan. 8, 1735.* This Substance was then increased in Bulk, all the saline Part being turned to Liquor by the Moisture of the Air, and the metallic Part being at the Bottom in Form of a black Powder. I dried it all together, both that which was melted, and that which was not; and this Mixture was very black. I put it again into a Glass Retort, and at last raised the Fire till it kept it red-hot for 4 Hours. There did not even now appear the least Sign of Quicksilver, either in the Receiver or Retort, at the Bottom of which there remained a grey Substance, of a hot fiery Taste, which immediately turned to Liquor, on being exposed to the Air.

In this Operation the Lead being dissolved and opened by pure Vinegar, and disposed so that it might be intimately penetrated by the Salt; being mixed and pounded with a liquid, caustic, fixed Alkali; being put in Digestion, put in Putrefaction, and exposed to a violent Fire; being dissolved by the Moisture of the Air during a Philosophical Month; lastly, being pounded, dried, and raised by a violent Heat, did not afford even the minutest Quantity of Quicksilver.

What are we to think now of this Matter, or of what has been advanced so boldly by idle, credulous Men, given up wholly to Speculation? They engage those who have more Application to Labour than Knowledge, in vain Labours and excessive Expences, and thereby render one of the finest Arts odious. Let others reap the Profit of my Labour and Expence, and spare their own.

Exp. 4. Having learned, by my own Experience, that the Salts called resuscitating, could not extract any Quicksilver from Lead by the Method just described, I was willing to try what Quicksilver itself could produce in this Case; especially as the Chemists call this Fluid the

Water

Water of Metals, in which they tell us Metals die and rise again, and become more beautiful than they were before. I melted ℥j of Lead in a very clean Iron Spoon, and at the same Time heated ℥iij of pure Quickilver in a like Spoon. I then poured the hot Quickilver upon the melted Lead; they mixed immediately, and formed a solid Mass, of a Silver Colour. I beat it, and when I had made it soft, I put it into a small warm Matrafs, which I stopped with a Cork, and placed in a digesting Furnace, in a Heat always equal to 84 Degrees, from Feb. 11, 1732, to Jan. 10, 1735. It was a soft Amalgama, yielding to the Pestle like Butter, growing black immediately on being shaken, and weighing ℥iv. The same Day I exposed it to a Sand-Heat in a clean Glass Retort, and at last to a Fire of Suppression, till the Sand was quite red, and that for 4 Hours; there came over ℥ij ℥vjss of Quickilver into the Receiver. There was at the Bottom, and in the Neck of the Retort, a red Powder, formed by the Quickilver in distilling, there was a little Quickilver in the Neck, and some Globules of pure Lead in Form of Powder; the whole weighed Gr. lii. Lastly, there was at the Bottom a solid Mass of Lead weighing ℥j wanting Gr. v, which made up the Value of the Globules of Lead; whence it appeared, that all the Lead remained, and that Gr. xliii of the Quickilver were dissipated. Those who have any Knowledge in these Affairs, will easily find the Cause of this Dissipation in the Causes already mentioned, especially if they consider, that in distilling, Part of this Quickilver remains fastened to the extended Surface of a great Receiver; and that another Part remains in Form of little Clouds on the Surface of the Water, which must always be put into the Receiver.

By this Operation I learned, that no Quickilver could be extracted from Lead, by a Digestion of the Quickilver with the Lead, continued for 3 Years, and by a most violent Distillation; also that Quickilver cannot by these Means be fixed in Lead: Because in the Distillation of Quickilver, there is always a small Quantity of it changed to a red Powder, which is fixed in the Fire in this Application; but the Weight of the Lead always remained the same.

Exp. 5. I performed the same Operation on an Amalgama made with ℥iij of Quickilver, and ℥j of good Tin, and exposed them to the same Degree of Heat during the same Time. Then I distilled them in the same Manner in a Glass Retort by the same Fire. I got from the Receiver ℥ij ℥iv of Quickilver; at the Bottom of the Retort there was a Powder, Part of which was fine, and composed of a small Quantity of fixed Quickilver; and the other grosser Part was black, and composed of small Parts like Tin. There was still a little Quickilver at the Bottom of the Neck of the Retort. All together weighed ℥ij Gr. v. At the Bottom was a solid Mass of Tin, weighing ℥j ℥j Gr. ix. The Loss was Gr. xlvi, of which I have given the Reason already.

It appears by this Operation, that Quickilver cannot be extracted from Tin; but ℥iij Gr. xiv, that is, about $\frac{1}{4}$ of the Quickilver were

united with the Tin, and so well fixed as not to be separated by a Fire that made the Sand red-hot, continued 4 Hours. There is a great Connection between *Jupiter* and *Mercury*, and *Sol* is in the middle between them*.

Exp. 6. I heated ℥x of Quicksilver, and poured it upon ℥ij of very good Tin, melted in a very clean Iron Spoon. I beat the whole into an uniform Amalgama, which being very hot and dry, I put into a clean, warm Glass Blottle, which I afterwards stopped. I placed it in a wooden Box, which I fastened to the Hammer of a Fuller's Mill, continually at work; and there it remained almost in continual Motion Night and Day from *Nov. 30, 1732, to Jan. 9, 1735.* Then I took out the Bottle, which was whole, and found fluid Quicksilver at the Bottom; and after a Rest of some Days, there was found a pretty hard Amalgama at the Top; the whole weighed exactly ℥xij . I distilled ℥xj ℥vij of this Amalgama in a luted Glass Retort, with an open Fire, increased at last, so as to keep the Retort red-hot for 2 Hours. There came out no more than exactly the same Quantity of Quicksilver that had been put in; it was very fluid, and there remained at the Bottom a Mass of Tin fixed to the Glass, with a little of a yellow Substance, that was in a Manner foliated. This Mass was fusible like Tin, with a moderate Fire; and then the Surface exposed to the Air was painted of different Colours. The Mass of Tin weighed ℥j ℥vjss , and there was also a little of the yellow Substance above-mentioned. It is certain therefore, that with the Help of a Motion continued for so long a Time, Quicksilver cannot dissolve Tin in such a Manner, that Quicksilver may be extracted from it, by a Distillation made with the strongest Fire.

Scholium. What I have observed in these 3 last Operations, is very singular, that the Quicksilver separated from the Lead or Tin by Distillation, was extremely liquid, and that being stirred in a clean, white, glazed earthen Pot, it soon stained the Surface of the Pot, and left a very black Spot there, sticking very hard. As soon as I had cleared away this Spot, by wiping it with a very clean dry Paper, there was presently formed another, and so several Times successively. This made me think it was owing to a fat Part of the Metal, which passed over in Distillation with the Quicksilver, remained fixed to it's Surface, and was then separated from it. To satisfy myself of this, I spread the Quicksilver upon very clean, dry Paper, and it left a slender black Mark wherever it had passed; and besides, the Surface of this Quicksilver was always covered with a very thin Skin, which seemed like Fat. Therefore, though by Distillations of Quicksilver often repeated, some Particles of other Metals may be united with the Quicksilver, it will not follow, that any of them are changed into Quicksilver.

* *Nov. Lum. Chem. Tract. 9.*

3. I bought at the public Shop of *Amsterdam* z iij s of the purest Gold that could be prepared by the assaying Art, and reduced it into small Masses, weighing each z s . I put these 5 into a clean Glass Retort, and poured upon them z xxxv of pure Quicksilver, once distilled. I then forced half the Quicksilver to rise from the Gold, which subsided at the Bottom under the Quicksilver. The Operation being thus performed, there came over z xij of Quicksilver into the Receiver; the Gold was now at the Bottom of the Vessel quite dissolved in the Quicksilver, in Form of a white, perfect Mixture, called Amalgama: Hence it appears, that Gold is dissolved by the mere Heat of boiling Quicksilver; and this seems the best Way of mixing them, which in Terms of Art is called amalgamating. The Quicksilver, which had come over, was well dried, and put upon the Residue in the Retort; I again expressed from it by Fire an equal Quantity of Quicksilver, which being dried, I poured again upon the Residue. This I repeated 50 Times. The last Time the Quicksilver came off pure. I beat the blackish Amalgama remaining at the Bottom of the Retort in a Glass Mortar with a Glass Pestle, the Water was turbid, and I poured it off. I washed it with fair Water, which again became muddy by beating. I did this 13 Days, when the Water no longer became foul, but the Amalgama became of a shining bright Colour, and the Water remained clear. This Powder, prepared by beating and washing, of a brown Colour, of an abominable metallic Taste, weighed Gr. lxxxiii. The Quicksilver and Gold weighed z xxxvj z vij . There were lost Gr. vii z iij s by the 50 Operations. This happened partly by the Dispersion of the volatile Quicksilver, partly by the Adhesion of it to the filtering Paper, in which it was dried, and into which it was received in Distillation.

I treated this very pure Amalgama 50 Times more after the same Manner. The Quicksilver now came pure the 50th Time, and there remained a brown Amalgama at the Bottom of the Vessel. Being beaten and washed as above for 13 Days, it yielded z j Gr. xliv of washed, brown, dried Powder. Then the purest Amalgama with the Quicksilver brought off weighed z xxxvj z iv : I lost by these 50 Operations z j Gr. xvi .

I again distilled this depurated Amalgama 50 Times after the same Manner. The Quicksilver came over pure, and there was a reddish Amalgama at the Bottom of the Retort. This being beaten and washed as before for 14 Days, gave z j Gr. ii of a brown Powder. I added the Quicksilver that came over to the pure Amalgama: They weighed together $\text{z xxiv z v Gr. xxiv}$. But at the Bottom of the Retort, whilst the Amalgama was poured off, there remained some of the Amalgama sticking to the Glass, so that I could not compute the Loss.

I treated the depurated Amalgama again in the same Manner 50 Times, distilling, beating, and washing it 14 Days: It yielded z j s Gr. iv of a brown Powder. The Amalgama was exceedingly bright, and
being

Part III. No.
444. p. 368.
Nov. and Dec.
1736.

being mixed with the pure Quicksilver brought over, weighed $\text{℥xxxv} \text{ ℥ij}$ Gr. xlvi after 200 Distillations.

I urged this Amalgama again 50 Times as before, and then beat it with Water for 16 Days. I obtained $\text{℥ij} \text{ ℥j}$ Gr. iv of a brown Powder. The shining white Amalgama with the Quicksilver weighed $\text{℥xxxv} \text{ ℥j}$ Gr. xlvi .

Having gone through this Labour, I perceived, that by 250 Distillations of Quicksilver from Gold thus performed, the Gold and Quicksilver afforded ℥j Gr. v of the described Powder: That there remained of Gold and Quicksilver $\text{℥xxxv} \text{ ℥j}$ Gr. xlvi : That there was lost $\text{℥j} \text{ ℥ij}$ Gr. ix .

When I considered this attentively, I began with Joy to suspect, that I had found the desired Method of purifying Quicksilver. I thought sometimes, that all this Powder was a mere fetid and foul Sulphur, which had stained the unspotted Virginitie of Quicksilver. I doubted whether I did not now see the Messenger of the Gods naked, and pure from the Bath of Fire and Water. This Rapture was a little moderated by the Remembrance of a like, but precipitate Joy, which had often vanished into Smoak. I was determined not to rest till I was satisfied of the real Truth. Therefore I distilled $\text{℥xxxv} \text{ ℥j}$ Gr. xlvi of that last purest Amalgama again 627 Times, drawing off constantly half the Quicksilver, and pouring it on again; I would not wash it any more with Water, but see what would become of it. The Matter used to grow dusky by this Operation, till at last it was almost black. I then covered the Glass with a Lute, that was able to bear the Fire, and not washing the black Amalgama, urged it with a very strong Fire, so that the Retort was red-hot full 3 Hours. There came over ℥xxx of the purest Quicksilver. On breaking the Vessel, I found at the Bottom ℥ijss of the most shining Gold, without any Dross. This I thought a sufficient Recompence for all my Labour.

I then took the Powder, which I had collected from 250 Distillations, and urged ℥vij Gr. lvii of it with a very strong open Fire, in a luted Retort, so that it was red-hot a long Time. From this Powder there came ℥vij Gr. xlvi of the purest Quicksilver. There remained at the Bottom of the Retort Gr. vi of a brown Powder.

I weighed the Quicksilver, which I had now distilled 877 Times, by the Art, Industry, and hydrostatical Ballance of my dear Friend the famous *'sGravesande*. It was to pure Water as $13 \frac{1}{2}$ to 1: So that the Density of the Quicksilver was not altered by all this Labour, nor freed from any lighter Part. I mention this, because I understand, that the Method mentioned in my first Paper, was not thought accurate enough. Give me Leave now to deduce some Truths from what has been said.

1. Gold dissolved by Quicksilver, and so often boiled and pounded with it, changed nothing of it's former Nature, lost nothing of it's proper Weight, and gained nothing.

2. Quick-

2. Quicksilver mixed with Gold, and separated from it again by Fire, was in Part changed to a brown, subtile Powder, of an abominable, metallic Taste, of a quite different Disposition from it's former Nature, and that constantly, even to 877 Times. But yet, by a stronger Fire, it returned to Quicksilver again, the same in every Respect, as far as Art could discover.

3. Therefore Fire and Gold do not by these Means separate from Quicksilver different Parts, Sulphur, Dross, or any Thing else: But only change it as to it's external Form, reducible however to it's pristine Appearance, the same in every Respect, not being altered even in it's specific Gravity.

4. Quicksilver and Gold by the Force of Fire presently change the Silver, shining of their Amalgama, to a brown Colour, and at last to a black: But the Silver Colour being restored to Quicksilver, and the yellow Colour to Gold, shew that this Colour does not demonstrate the Corruption of the Metals, but the Change in their Nature.

5. But if native Quicksilver can be purged by Gold and Fire, according to the Opinion of the Ancients, it must be performed by some other Operation.

6. The Hope of fixing Quicksilver with Gold, by the Action of Fire, falls to the Ground: Since no such Thing is so much as begun by so great a Labour in so long a Time, the last Distillation was as easily performed as the first.

7. Hence we have no Confirmation of the Opinion, that Fire can increase Metals or Quicksilver by concreting with them, or generate any Thing metallic; or form any durable Change of the Metal.

8. How constant, how simple are Gold and Quicksilver! If Gold was Quicksilver in it's first Origin, may we not justly say, either that the Quicksilver totally flew away by the Fire, or that it remained wholly fixed in it.

9. The great Promises of dissolving Gold by grinding it, either with Water or without, which have been made by two great Men in this Art, are not performed by these our Labours. It was a vain Hope: They avoided the difficult Labour, and hastened precipitately to idle Conclusions.

One Thing remained worthy of Inquiry; whether Quicksilver so often distilled from Gold by the Force of Fire had laid aside that Property, by which it is turned by Distillation into the Powder called *Precipitatum per se*? Therefore I distilled those ℥xx of Quicksilver 877 Times distilled from Gold, in a clean Glass Retort, by so great a Force of Fire, that none of the Quicksilver remained in the Glass after each Distillation, which I repeated 8 Times. At the Bottom of the Retort I found Gr. xii of a red, glittering, ponderous, mercurial Precipitate, of an abominable, metallic Taste. I am certain therefore, that even this Property is not taken away from Quicksilver by all this Labour.

An Examination of the Mexican Filtring Stone, and Comparison of it with other Stones, by Abr. Vater, M. D. & P. P. Soc. Imper. Nat. Cur. & Reg. Britann. & Boruss. Soc. No. 438. p. 106. July, &c. 1735.

XXI. Among the various Exoticks, brought from both *Indies*, with which our Age greatly abounds, the *Mexican* filtring Stone does not hold the lowest Place. It is so called, because it's porous Texture affords a Passage to Liquors, for which Cause large Pieces of it are hollowed in Form of Pots or Mortars, which are used to strain Liquors for drinking. It is imagined, that Liquors filtered through this Stone, are freed from all their Impurities, become more clear and pure, and conduce more to Health. Hence these Stones are highly esteemed in *Japan*, and are valued equally with Gold, because the *Japonefe*, who know nothing of the Stone, or other Diseases of the Kidnies, and prefer their Health far before the Goods of Fortune, are of Opinion, that those *Fungi* converted into Stone have a Power of prolonging Life, as may be seen more at large in *Valentini's* History of the filtring Stone, in his *Museum Museorum*, *Lib. I. Cap. 22.* This Sort of *Fungus* grows, as is there mentioned, to the Rocks in some Parts of the Gulph of *Mexico*, about 100 Yards under Water, and is hardened to Stone by the Air. I will not determine what we are to think of this Origin and Manner of growing of the filtring Stone, though it is very suspicious, and seems to have been invented, to make it be thought no vulgar Stone. *Lentilius*, *Ephem. Germ. Cent. iii, Obs. 176*, writes, that these Vessels are of 2 Sorts, some being of a dark grey Colour, like Slate, brought from *Canada*, and sold dear, others of a tophaceous Colour, and coming from *Italy*. *Le Clerc* testifies, in his *Physics*, that it is digged up *in agro Leodicensi*, and is much used in *Holland*. It was, no doubt, one of this Sort, of which a little Piece, about the Bigness of a Walnut, was sent me some Years ago by *Dr Rittmeyer*, of *Amsterdam*; with which however I was not able to make any Experiments. But after I had fixed it at the Bottom of a Tin Funnel, I made use of it to filtre Water, for the Sake of Curiosity. A little while ago the learned *Dr Ebrart* of *Memmingen* sent me a choice Collection of Fossils, among which was a *Tophus* remarkably porous, found about *Memmingen*, which, as he assured me, being immerfed in Water, sucked it up greedily. For as soon as the Surface of the Water is touched by it, the Pressure of the Air makes the Water rise immediately through it's whole porous Substance, as we find by Experience it does in Sugar, Salt, filtring Paper, and Sponge. Immediately I began to suspect, that perhaps this *Tophus* might be used instead of the *Mexican* Stone to filtre Water. In order to try this, I made a Hollow in a Piece of it, and poured Water therein, which I saw pass very fast through it's Pores. I then had a Mind to make Trial with other Stones, and accordingly took some tophaceous *Tubuli* of *Osteocolla*, and stopping one Extremity, poured in some Water, which in like Manner transfused very quickly through their porous Substance. I recollected, that I had a Sponge by me for several Years, which, when I lived at the *Caroline* Baths, I had laid in the Canal through which the hot Waters are brought to the Baths, where being incrufted by the Okre, which those Waters carry along with them,

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it degenerated to a *Tophus*. I hollowed this Sponge, and poured in some Water, which quickly ran through it. Having seen this, I determined to make Trial of the very *Tophus* of the Baths, of which I had a pretty large Piece, and accordingly gave it to a Mason, to form it into a Mortar, that I might see whether Water would pass through so dense and solid a Stone. My Expectation was answered, for the Water ran through in like Manner, but not so fast, because of the Thickness of the Stone. I now flattered myself, that by this Experiment, I had made some Discovery, that might serve to illustrate the Generation of the filtring Stone under Water: For as the *Tophus* of the Baths is gradually generated by those Waters depositing their Okre, in running through the Aqueducts, and dropping from them; I thought that the Sea, by shaking the Stones, deposited the salino-terreous Parts, from which this *Tophus* is generated by a successive Concretion, and grows to the Rocks, rather than sprouts from them, after the Manner of a stony Agarick, or *Fungus*. But because the Origin of this Stone, as we have seen already, is very doubtful, and it is not certain, whether it is taken from the Bottom of the Sea, or rather digged out of the Earth, I dare not affirm any Thing concerning it. But considering the remarkable Thickness of the *Tophus* of the Baths, notwithstanding which the Water passes through it, I had a Mind to try the same Experiment with the common Stone that we use in building Walls. The Event answered the Expectation, for a Mortar made of one of those Stones, serves me now instead of a *Mexican* filtring Stone, and the Water passes equally clear through it. The Water thus filtered, acquired indeed at first an earthy Taste, which ceased however by repeated Filtration, as the above-mentioned *Lentilius* observed of that filtring Stone. There is no Doubt, but that other Stones may perform the same, because even the hardest and most solid Flints, with which the Streets are paved, imbibe the Water, as we observe in a wet Season. But this is manifest, that the more solid and thick the Stones are, and the more narrow their Pores, with so much more Difficulty do the Waters pass through them.

But now to come to the Virtue ascribed to this filtring Stone, by which the Waters filtered through it are said to be freed from all Dregs and Impurities: For thus we read in the above quoted History in *Valentini's Museum*, that the Water filtered through it, though ever so clear at first, always deposits some Quantity of Dregs, and becomes sensibly lighter, purer, and much more fit to preserve Health, nay, that it may be longer kept fresh, and without freezing, or corrupting. If this was true, and Waters could thus be freed from all heterogeneous Parts, the filtring Stones could never be valued enough. For what conduces more to Health, than pure Water taken in Meats and Drinks? But vast Tracts of Land are deprived of this Benefit, where the Waters are salt, nitrous, vitriolic, and aluminous, and frequently infected by mineral Particles, which may give Rise to many Diseases. It seems very probable, that such Waters deposite those Impurities in passing through

the Filtre, because we see, and Experience witnesses, that Rivulets rising in sandy and gravelly Places, and passing through Beds of the same Earth, are much more clear and pure than other Springs. But those Waters do not owe their Purity to their having deposited their Impurities in passing through the Sand and Gravel, but their not having thence derived any. For we learn by Chemistry, that not only Salts, but by their Means other heterogeneous Corpuscles, earthy, sulphureous, and mineral, being dissolved in Water, and closely connected therewith, cannot be separated from it by Filtration. We see that the most solid mineral Bodies, Quicksilver, Antimony, Lead, and others, dissolved in Menstruums, penetrate through the Pores of the filtering Paper, which afterwards being abstracted from the Embraces of the Water, and disturbed from it's Interstices by Precipitation, are separated, and on being filtered again, remain in the filtering Paper. But some perhaps will object, that a thick, dense filtering Stone can do more than Paper. But the contrary is testified by Waters exuding and distilling in Mines and subterraneous Caverns from the very Rocks, which presently are petrified, whence the *Stalactites* arises. From this alone it is manifest, how little the most solid Stones, and consequently filtering Stones, conduce to the Depuration of Waters, and to the Separation of salino-terreous and mineral *Scoriae* dissolved in Water. I will not deny however, that turbid and muddy Waters may be rendered clear by being filtered through those Stones, because those Impurities are not dissolved in the Waters, and united with them, but only float upon them. But that Waters do not become otherwise more pure by this Method, I am satisfied by repeated Experiments made with the filtering Stone received from *Holland*, and also with the *Tophus* of the *Caroline* Baths, and with the common Stone, by straining the Waters of various Rivers and Springs through them, and examining their Gravity both before and after Filtration by the Hygrometer, but I have hardly found any sensible Difference. Those therefore, who do not enjoy the Blessing of pure and wholesome Springs, had better use Rain-Water, which is freed by Distillation from all Impurities, and so is the most clean and wholesome.

*An Account of
Coal-Balls
made at Liege,
by William
Hanbury, Esq;
F. R. S. No.
460. p. 672.
April, &c.
1741.*

XXII. In Pursuance of the Orders of the Society, I shall endeavour to give an Account of the factitious Coal made at *Liege*. But first I shall quote two Authors, who mention it in their Accounts of the Town of *Liege*.

The first is, *Le Curieux Antiquaire, ou Recueil géographique & historique, par le Sieur P. L. Berkenmeyer à Leide 1729, p. 182*, where he says, "This Bishoprick (*Liege*) has rich Mines of *Houille*, or Stone-Coal*, which the Inhabitants sell in the *Netherlands*, and by the Sale of it, they get above 100,000 Ducats per Annum.

* The common People call their Pit-Coal, *del Hoy*, or *de la Houille*; and the Mixture of Coal and Clay, *de Houchy*. C. M.

“ This Coal lights easily, and gives a great Heat: It is not there-
“ fore to be wondered, that Fire is reckoned amongst other Advan-
“ tages the *Liegeois* boast of: They say they have the best Bread, the
“ hardest Iron, and the hottest Fire: By this last they mean, *de la*
“ *Houille*, which, being once well lighted, casts the greatest Heat, if
“ it be wetted with Water.”

The second Book I shall mention is, *Les Delices des Pais Bas*, Vol. III. p. 243, where I find that this Town *Liege* is said to be “ the Hell of
“ Women, because they are obliged to work more here than in any
“ other Country. They draw the Boats, and carry on their Backs,
“ like Slaves, *les Hoilles*, and other Things; and these Women are called
“ *des Botresses*.”

In the Year 1628, by a printed Paper produced before you, it appears, that this Fuel was known in *England* at that Time; and if you will believe the Author of that Paper, it was discovered by *Hugh Plat* in 1594.

There is an Account of it printed in the *Essays* for the Month of *December* 1716, where it is proposed to be made with the black Ouse of the *Thames*, and for Four-pence *per* Bushel*.

I have used this Coal and Clay mixed upwards of 10 Years, and by Experience I find it to answer very well. It is a most excellent Fire for roasting, for heating of Irons, or warming a Room: I use it in my Kitchen, Laundry, Parlour, and Library.

The Method in which it is made at *Liege*, where I first saw it, and made some myself, is as follows:

Take $\frac{2}{3}$ of unctuous Clay, (such as Brewers use to bung their Vessels, in it there must be neither Sand, Gravel, or Stone)

And $\frac{1}{3}$ of Coal-Dust: Mix, and make them incorporate well together; cast them into round Balls, or Bricks, and you may put them on a Coal-Fire, and they will burn directly. But if they are made in Summer-time, and laid to dry for Use in Winter, they will light sooner.

Thus you have an hot, clean, lasting Fire, not at all offensive to the Smell.

The Dust is there the Refuse of the Mine, and may be here of the Coal-Merchant's Yard, so that this Fuel comes exceeding cheap.

Nor is it necessary to put so much Coal-Dust; for some Clay (particularly what I use myself in the Country) will do, if mixed $\frac{2}{3}$ Clay, $\frac{1}{3}$ Coal-Dust; and the true Proportion of the Mixture must be found by Experience; but it is always better to put in too much than too little Coal-Dust at first, because Men are too apt to be discouraged in making Experiments.

* It is mentioned also by *Ray*, in his *Observations Topographical*, &c. p. 58. *Lond.* 1673, 8^{vo}. J. M.

Concerning certain chalky tubulous Concretions, called Malm.

This Fuel is not only to be had at an easier Price, but it is likewise more durable.

How far it may be useful in Glafs-houses, Brewhouses, Salt-Works, &c. I must leave to the Consideration of the several Persons concerned in them.

I have heard, that at *Liege* they burn both Lime and Brick with it; but, as I never saw it done, I cannot affirm it.

Concerning cer-
tain chalky tu-
bulous Concre-
tions, called
Malm, by Mr
Turbevil
Needham.
No. 471. p.
634. Read
Dec. 22, 1743.

XXIII. This Bed of Malm lies in a Valley, at the Foot of a long Ridge of chalky Downs; extends from *Winchester*, where it begins, as I have been informed, almost due S, about 4 measured Miles; the Breadth not above $\frac{1}{4}$ of a Mile; and Depth, at a mean Computation, about 5 Foot. It is used in Manure for the same Purposes as Chalk is, but answers the Intent much better. It rises up in one continued Bed, almost to the Surface, where a thin Layer of common Earth but just hides it in all Places, where continual Cultivation has not superinduced a new Soil. Horsetail, and a Species of wild Trefoil, grows out of it very plentifully, especially the first, which sink their fibrous Roots to a considerable Depth in it: The whole Bed consists of separate detached Pieces, in the Nature of those which you have by you, and of several Dimensions, as those are, mostly long and tubular; some few round, with a small Cavity in the Centre, others quite flat, and some, as it were, excavated on one Side, as if the chalky *Lamine* had extended themselves round a Piece of Bark; but all of them hollowed within, agreeable to their exterior Shape, except very few. I believe it may be asserted, with some Confidence, that this Valley formerly was over-run with Wood, if not wholly, at least for some considerable Length and Breadth: Wild Boars Tusks, which are known by their Length; Stags Horns, and a Flint Knife, which have been found buried to some Depth, in the Malm, seem to evince as much. That Trees of considerable Dimensions have grown in it, is very evident; for in a Drain, which they have lately made to convey the Water from the main River to the adjacent Meadows, Trees of a vast Size may be seen, at 2 or 3 Feet Depth, in no small Number, retaining both Shape and Substance in some Measure, though much decayed, and not so compact and solid in those Parts, which have been exposed to the Water; these lie out of the Verge of this Bed of Malm, and are not consequently affected by it. Now I am much inclined to think, that these Trees, together with the rest of the Wood, might, by Age, and some Accident combining with it, have fallen; the uppermost might have served to bury the rest, and preserve them from a more immediate Decay, by cutting off their Communication with the exterior Air. Rains, in Process of Time, must have washed off from the adjacent Hills to some certain Distance, and deposited in the neighbouring Valley, but mixed with other heterogeneous Substances, as decayed Wood, Earth, &c. a Quantity of chalky Particles, sufficient to involve, by a continual Addition of new
Lamina,

Laminae, Roots, Trunks, Branches, Twigs, and the broken Extremities of Twigs; and tending continually to form Masses resembling the supposed Particulars. I do not now imagine, though I once thought so, that these chalky Particles have penetrated the Wood itself, and converted it into it's own Substance, in the Nature of ordinary Petrification, except here and there some few particular Pieces; but I rather suppose, that the Pieces of Wood have been invested continually by additional *Laminae*; that the first *Laminae* must have adapted itself to, and assumed the exterior Shape, whether smooth or knotty, of the included Wood; that the others have proceeded accordingly; that the Extremities have gradually rounded themselves; and that in the Interim, till they were wholly closed, the included Wood has been insensibly attenuated by the passing Moisture, and, Particle by Particle, either entirely, or in Part only, wasted away. And, though it may be objected against this Supposition, that some Pieces are entirely solid, as one of those two large Pieces is which you have by you, and has the Resemblance of white Thorn; yet these are but rarely found, and may very well be supposed to have been a Species of Wood of a more solid and durable Contexture; which might consequently withstand any considerable Attenuation by Water, long enough to permit the chalky Particles to penetrate, fix, and convert it into it's own Substance; while other Woods, less tenacious, insensibly waste, and are carried off by the insinuating Liquid, together with the chalky Particles, which they not only could not arrest, but prevented effectually, by a Blending and Interposition of their own Parts, from adhering to each other. The Reasons why I apprehend the Process of the whole to have been in the Manner described above, and answerable to my Supposition, are, *first*, the close Vicinity, I may almost say, Contact of the chalky Hills, upon which this Bed of Malm attends throughout the whole Line, and no farther. *Secondly*, That this Malm is an alkalizate Body, in a Degree something inferior to Chalk, as I found upon a Trial, some Time ago, by putting equal Portions of each into equal Quantities of double-distilled Vinegar, and measuring the Height of the Fermentation in a long cylindrical Glass. *Thirdly*, The Reasons, which I gave above, for supposing that this Valley formerly has been over-run with Wood. *Fourthly*, The Disposal of the several detached Pieces of Malm, which lie in all Manner of Directions. *Fifthly*, The Resemblance which they bear to Roots, Trunks, Branches, Twigs, &c. *Sixthly*, Some additional Observations, which I have made since my Return from *London*; and those, I think, are almost decisive. In the Hollow of some of the oblong tubular Pieces, which were closed at both Ends, upon breaking them open, I found the Remains of the included Wood attenuated to a mere Thread, which, though extremely tender, I could plainly discover to be Wood, both by it's exterior Appearance, as well as by rubbing in my Hand, in order to try if it would colour it, as decayed Wood, that has imbibed Moisture, will do. Within the *Laminae* of several, I found a fair Impression of Leaves, in
ne

no small Number, and with little Trouble: The Leaves I knew not, as not being very familiar in the vegetable World, though they appeared to me much to resemble white Thorn Leaves in their Shape, differing in this alone, that the Impression of the fore Part of the Leaf had many small indented Cavities, equal in Size to a Pin's Point, which had been formed by small Protuberances in the Leaf itself. Some Pieces I found quite flat, as if the chalky *Lamina* had involved a Chip, and the Cavity consequently went off insensibly less towards each Extremity. Others I found, whose Cavities at the Extremities were irregularly shaped, agreeable to the jagged Ends of broken Sticks. Some, in fine, I found excavated on one Side, and convex on the other, as if the *Lamina* had surrounded a Piece of Bark. These are the chief Observations which I have hitherto made, and which, I hope, are sufficient either to fix the Point where I have placed it, or to enable you to draw better Consequences. I cannot say, that I am so thoroughly satisfied with what I have advanced, as to judge it unquestionable; though I am sensible, that the finding of several Masses of Malm, the Structure of which is not reducible to, nor explicable by, this Scheme, is no Objection to it; because, as every one knows the Tendency which chalky Particles have to dispose themselves in *Lamina*; so these *Lamina* may involve Bodies of different Kinds, as Parts of the fibrous Roots of Weeds, small Seeds, or the like; may assume their Shapes, increase continually in Bulk, and insensibly raise the Height of the Bed, where they are first formed.

*Of the Nature
of Amber, by
John Ambrose
Beurer. No.
468. p. 322.
Read Jan. 27,
1742 3.*

XXIV. I absolutely deny, that Amber is the resinous Juice of a Tree, for the following Reasons. First it is not probable, that Amber should pass through the Earth into the Sea: For whence is that Passage? seeing the Trees are not very near the Sea.

Then this Resin can by no Means pass through the Earth like Water, or diffuse itself so copiously through it; if this was possible, it would rather grow stiff, and adhere to the Surface of the Earth.

Besides, the Heat of the Sun, however great and continual, can never produce such a Flood of Resins, as to fill several subterraneous Tracts: For the *Exudation* of Resins is made by Drops, the least Part of which reaches the Ground, the greatest Part adhering to the Bark of the Tree. Moreover, why is Amber often found on Mountains, and in Pits, where Trees were never planted? Lastly, the Arguments drawn from the Distillation of a vitriolic Acid with Turpentine do not prove what they were intended to prove, because though something bituminous is thence produced, yet it is not real Amber; for it wants the equal Mixture, Transparency, Elasticity, and Hardness. This may be more easily produced, and almost *Extempore*, by the Mixture of any distilled ethereal Oil centred with a vitriolic Acid, from which Mixture there presently arises something bituminous, but not Amber.

To me it seems probable, that Amber derives it's Origin, not from a Vegetable but a Mineral, that is, from a tender Bitumen (*Oleum Naphtæ*)

Naphlae) and an acid vitriolic Sulphur, which mixes itself in Form of Steam, and immediately grows hard. This is also proved by the fossil Amber; for wheresoever that is digged up, there are also found amongst the blue Clay, bituminous Wood, Coal, Vitriol, and often Allum. But the Amber, which is found in the Sea, is produced after the same Manner as that which is formed in the Mountains, being only washed out of the Earth by the beating of the Waves, and partly swallowed up by the Deep, and partly thrown up on the Banks.

I shall add but one Observation more, that as the vitriolic Acid, together with a Bitumen, produces the Form and Appearance of Amber; that Acid will quite dissolve it again, and leave it in the same State, without the Destruction of any constitutive Part, and reduce it's Hardness, Transparency, and Elasticity.

Nuremberg, Oct. 20, 1742.

XXV. That indefatigable Traveller *Cornelius le Bruyn*, among other Things worthy of Notice, relating to Natural History, mentions Oysters, of which not only the Valves, but even the Animals themselves were petrified within the Shells.

At first Sight, both his Account and Figures seemed suspicious, and delivered with more Confidence than Truth; but let us hear his own Words.

“ At some Miles from *Nicosia*, there is a Hill, which consists wholly
 “ of petrified Oysters.—The Shells are close shut, and when they
 “ are opened, there appears an Oyster on each Side, so well consumed,
 “ that one might say it was well engraved there. These Shells are also
 “ petrified, or turned to Stone.—I opened one—in the middle of
 “ which there was an Oyster quite entire, and at the same Time, as it
 “ were, engraved in the other Shell *.”

I did not wonder at the Shells being turned to Stone, but it seemed strange, that the animal Oyster should be petrified; nor did the Author's Reason of this *Phænomenon* appear to be sufficient.

“ When we take the Sand out of the first Shell, we see the Oyster,
 “ which is in like Manner consumed by Time, whence we must con-
 “ clude, that these Oysters have been alive there, and that the Water
 “ running out, the Sand has insensibly supplied it's Place, and that the
 “ Oyster, as it died, left the Print of it's Shape in the Shell.—Thus
 “ there are some of these Oysters, like those Stones in which we see a
 “ Fish.”

You will hardly understand what is meant by the Shape of the Oyster, a soft and corruptible Animal, being impressed on it's Shells, before the Shells themselves, by Nature hard, were turned into Stone; nor will you easily come into the Author's Opinion: That it should be possible for an Oyster to imprint it's Shape on the Shells, in like Manner as the

An Account of petrified Oysters, by Cornelius le Bruyn, illustrated by James Theodore Klein, F. R. S. & Sec. Rep. Dantzick. No. 459. p. 56. Jan. 1741.

* *Voyage, Tom. II. à Paris & Rouen, 1725, 4^{to}.*



Skeletons of Fishes leave their Impression in soft Earth, which is afterwards turned to a Stone, for the most Part flaky.

Therefore I thought it not amiss to explain this Account by Schemes of a *Lithostreum*, which I got whole out of a very hard Stone of the Mountain *Zijanken-Berg*, near *Dantzick*, in 1736.

But it must be mentioned before-hand, 1. That the figured Stones of *Dantzick*, containing many extraordinary vegetable and fossil Substances, especially of the Mountains *Hagels-Berg*, and *Zijanken-Berg*, are formed of Potter's Earth and Clay mixed with a little Sand, grey, and generally very hard; so that being beaten with an Iron Hammer, they fly asunder like the *Vitrum fissile Imperati*. 2. That they contain Abundance of Shells of *Cochlidæ* or *Conchæ*, very often entire, petrified, but very distinguishable by their natural Colours; sometimes, when the *Matrix*, as it is called, is less compact or hard, partly calcined, and partly petrified.

Now in the above-mentioned *Lithostreum*, if I mistake not, the same *Phænomena* will appear, which *le Bruyn* has endeavoured, however obscurely, to describe; wherefore I have taken Care to have an exact Draught of this *Lithostreum*, the Valves being opened with great Circumspection.

Fig. 46.

Fig. 46 represents the lower flat Shell, sticking tenaciously in a very hard Stone, of the Kind of the Rock Oysters; of which see *Lister de Cochl. Tit. xxvii, p. 182*, with the Hinge fluted on both Sides, or *a a*, furnished with *Ginglymi*. *b*, A manifest Footstep of a strong Tendon, by which the Animal, when alive, opens and shuts the Shells. I have suspected *c c* to be the Fins or Beard of the Oyster, of a light grey Colour, and of a very smooth Substance, distinguishing themselves from the Colour and Substance of the Stone; and this I was the more easily induced to believe, because the Fins of testaceous Fishes are naturally different in Colour and Substance from the other soft Parts.

Fig. 47.

Fig. 47 is the upper Valve, or Concavo-convex Shell, more so than the upper Valve of the Oyster, which is commonly brought to our Tables. Here again *a a* are the *Ginglymi*, and *b* the Antagonist Tendon.

Fig. 48.

Fig. 48 represents the Body of the Animal found in the Cavity of the Valves, where *a* shews the Footstep of the tendinous Process from Part of the Concavo-convex Shell: *b* the opposite Process of the flat Shell.

Thus the Form of the Animal remained entire; but the whole Substance of it was changed to a smooth, hard Clay. This perhaps is what *le Bruyn* meant, when he said, "In the middle - - - we see the Oyster entire, and at the same Time it looks as if it was engraven in the opposite Shell."

Fig. 49.

Fig. 49, the rest of the Bivalve, by which it appears, that the Shell was less ponderous than that of a common Oyster, smooth, and not guttered or furrowed.

Now

Now every Body knows, that in the inner Part of most Oysters, especially in the concave Valve, there is a Sort of Cistern, containing the Water which is greedily drawn in, closed with a thin shelly Plate, and from the Hinge generally equalling the whole Bed of the Animal; and I have learned by Experience, that this Cistern, when it is distinct from the hard Shell, is apt to deceive the Unskilful: For it has happened more than once, that one or another has pronounced the Cavity covered with a transparent Plate in fossil Oysters, to be the Figure of the Oyster rudely inscribed on either Shell.

Perhaps such a Shell of Mount *Nicesia* might impose upon *le Bruyn*, "That the Oyster has imprinted it's Shape on the Shell," when he boldly appeals to his Figure, "as may be seen in the Figure." Whereas even his Figure, considered attentively, shews nothing but the mere Shell, representing only an imaginary Shape of the Oyster. I could prove this Assertion by many Schemes, but one shall suffice.

Fig 50 represents a foreign Oyster with many *Ginglymi*, of *Zijanken Berg*. *Fig 50.* Now could any one take upon him to persuade us, that the Figure circumscribed by the Letters *a, b, c, d, e*, is the Form which the dying Animal impressed on it's Shell? When it appears to the Eye, that it denotes the above-mentioned Cistern, with only a small Part of the above-mentioned thin, testaceous Plate remaining, over-against the Letter *b*.

XXVI. The *Indian-Sand*, which is brought to *Holland*, is said to be chiefly gathered upon the Sea-shore in *Persia*; then it is boiled in Water, to free it from it's Saltness, and it is after this a black Powder, consisting of Grains of different Bigness; some of which have a very rough Surface, and others have one Part of their Surface something rough, and the other very shining: Their Figure is very irregular, like Grains of common *Sand*, only this *Indian-Sand* is smaller. These little Lumps have neither Taste nor Smell, and are friable, so as to be easily reduced to a very subtile Powder. It has some Parts which are strongly attracted by the Loadstone; and others so very inactive, as scarcely to seem to be magnetical: The strongest are the blackest; but the inactive ones are more shining, and more inclining to the Colour of Lead; these are in the greatest Quantity, and from them the others are got out by a Loadstone. Dr *Moulen* has examined several Ways such a Kind of *Sand* which is brought from *Virginia*, and described it in the *Philos. Trans.** I have examined the *Indian-Sand* another Way, of which I have given an Account in my *Physical Dissertations*, p 127; but a great deal still remained to be considered, and as there is a great deal more of this Substance of the lazy or inactive, than of the active or magnetic Sort, it was proper to try whether a magnetic Virtue might not be excited or increased in all of it; and after a few Trials I found the Thing to succeed. I suspected that there might perhaps be too

*Experiments
made on the
Magnetick
Sand, by Petrus
Van Muschen-
broek, M D.
F. R. S. Prof.
Math. and A-
stron. Utrecht;
No. 432. p.
297. Apr. &c.
1734.*

* See Vol. II. Chap. 3. §. xcvi.

great a Quantity of Sulphur adhering to the *Sand*, to suffer it to be turned into any metalline Regulus by a long Continuance in the Fire; therefore I toasted it in an open Crucible for two Hours with half the Quantity of Pot-ash; afterwards I washed away the Salt with Water, and the *Sand* remained much blacker than before, of which I found more than a Quarter endued with a greater magnetick Force. I do not scruple to attribute this Virtue to the Salt; because, though the Action of the Fire alone does increase the Force of the *Sand*, yet it does not give it near so much attractive Force.

Because common black Soap is made of Oil boiled with a Lixivium of Pot-ash, I had a Mind to try whether Soap might not do more than Salt alone in raising the Virtue in the *Sand*; so I mixed the *Sand* with an equal Quantity of Soap, which I first exposed to a gentle Fire in an open Crucible, to dry up the Soap which swells very much; then the Fire was increased for $\frac{1}{2}$ of an Hour, all the oily Substance wholly consumed, and the Matter in the Crucible was strongly fired; then afterwards boiling it in Water, and washing it well, I obtained a black *Sand*, which was all endued with a lively attracting Force. Very well pleased with this Success, I had a Mind to try whether I might raise a greater Force in it; wherefore I again roasted it with black Soap as before, and even a third Time; but no Addition was thereby made to it's Virtue: I find that staying too long in the Fire is as prejudicial as staying too short a Time; between $\frac{1}{2}$ an Hour and an Hour seemed to me the most proper Space of Time.

After, I added to the black Soap $\frac{1}{2}$ of Salt of *Tartar*, and mixed thereto an equal Quantity of *Sand*; which, when it had been exposed to a reverberatory Fire $\frac{1}{2}$ an Hour in a Crucible, I washed in Water; and then so great was the Virtue of the *Sand*, that if it did not exceed the former, at least it was equal to it.

Because I had observed the Oiliness of the Soap to conduce much to excite the Virtue in the *Sand*, I mixed Beef-Tallow with an equal Quantity of *Sand*, and having very well closed the Crucible, I exposed the whole Mass to a reverberatory Fire for 2 Hours, whereby the *Sand* became much blacker, and received a great deal of attractive Virtue: But that *Sand* became much more active which was burned 2 Hours with an equal Quantity of Pitch, as likewise very black, subtile, and very little shining: But when it was exposed a longer Time in the same Crucible, I observed it to be weaker; as also, when it was in the Crucible with the Pitch but $\frac{1}{2}$ an Hour, it scarce acquired any Virtue; so that there must be a determined Action of Fire to raise the Virtue in the *Sand*. Yet I could not raise a greater Virtue in the *Sand* than by the Means following, *viz.* mixing the *Sand* in the Crucible with equal Parts of Rosin, Pitch, Frankincense, and Rape Oil, and exposing it to a reverberatory Fire for an Hour, having first well closed up the Crucible. Between the black Coals of the oily Matter, there sticks a very black *Sand*, which leaps up swiftly to the Loadstone, as soon as it

Fig. 46.

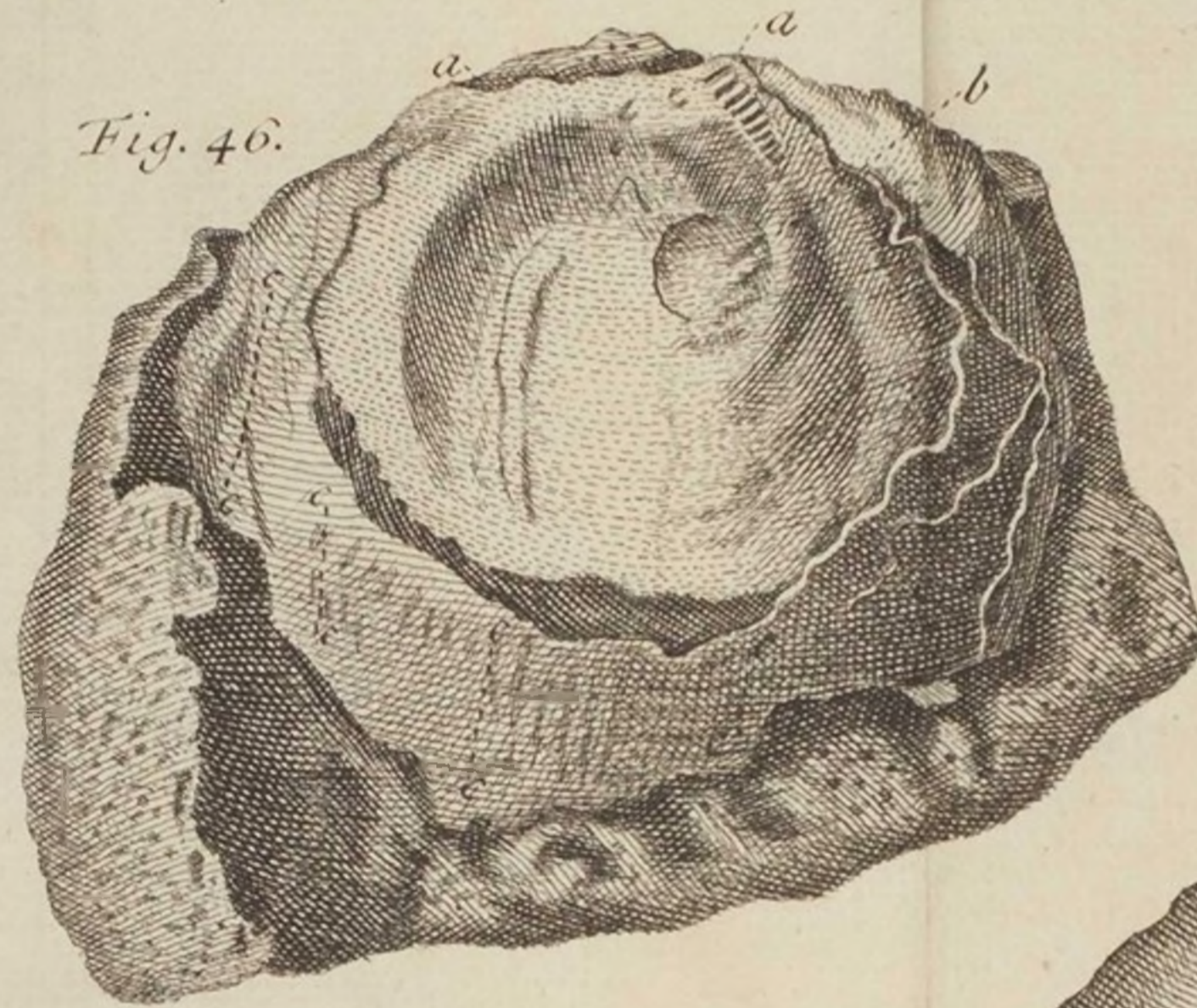


Fig. 50.



Fig. 48.



b.

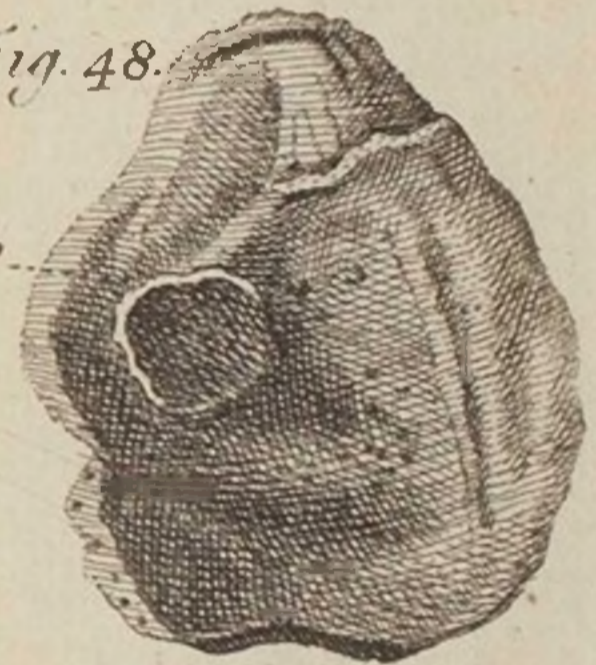


Fig. 47.

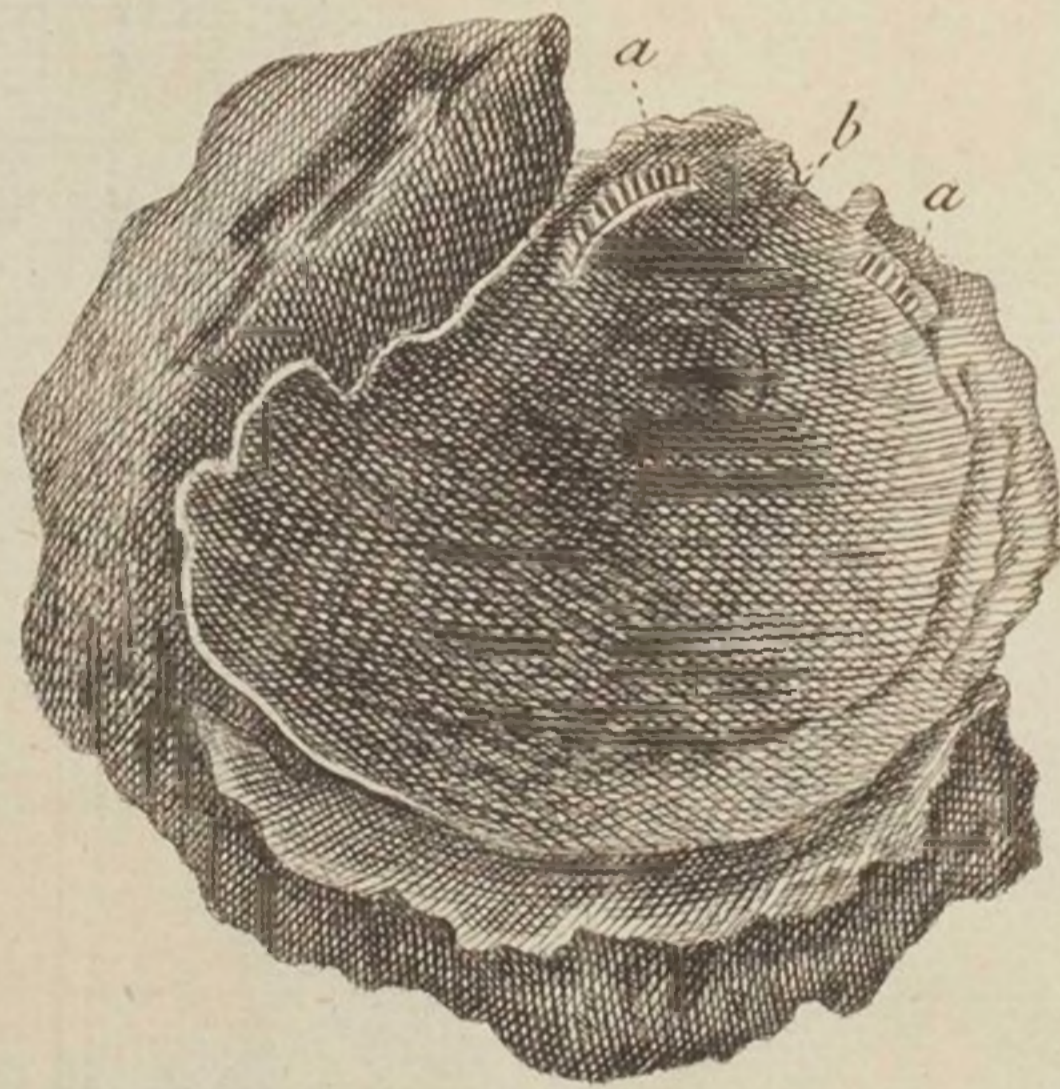
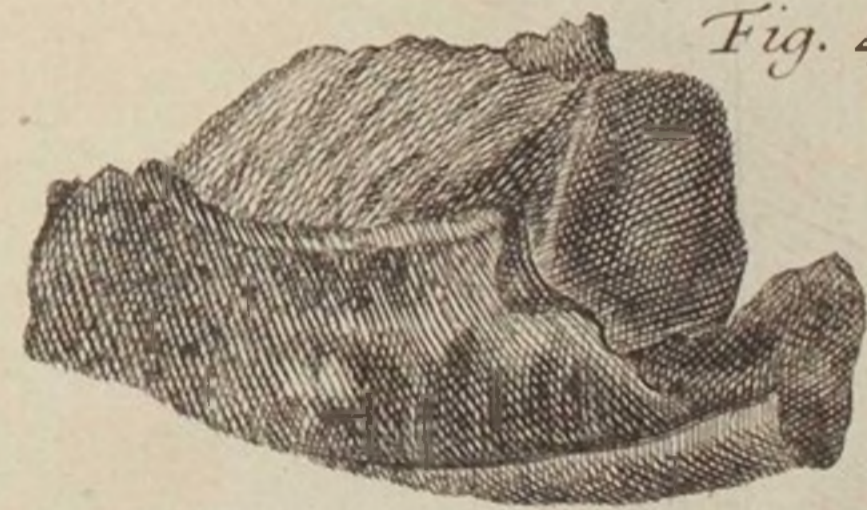
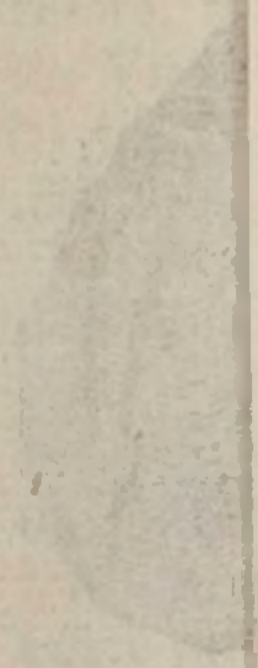
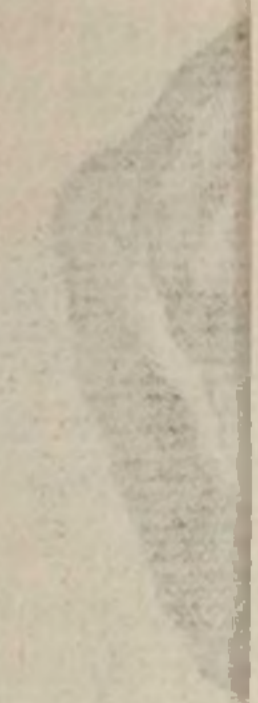


Fig. 49.



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A small handwritten mark or character, possibly a page number or a specific reference, located near the bottom center of the left page.

is brought near it. Then I considered whether the *Sand* did not acquire the greatest Force as it came nearer to the Nature of Steel, by burning it with the Bodies above-mentioned; and suspecting this, in order to try it, I put it among such Bodies as turn Iron into Steel, according to the Operations described by that great Experimenter *Monf. Reaumer*, in that excellent Book, entituled, *The Art of turning Iron into Steel*. I took therefore three Parts of *Sand*, two Parts of Chimney-Soot; and of Sea-Salt, powdered Charcoal, and Ashes, one Part each. Having accurately mixed all these Bodies together, they were exposed for six Hours in a close Crucible to a strong Fire; and then the whole Mass was boiled and washed in Water, then dried, and so received a great deal of attracting Force; but it was not near so active as that which was prepared with Soap, or in the Manner last described.

And now, what can this *Sand* be? Is it an imperfect Magnet, or subtile Powder of it, which when it is grown up into a greater Lump, makes the vulgar Loadstones? So I conjectured at first; but when I found by Experience that common Loadstones exposed to the Fire, according to some of the Methods above-mentioned, did rather lose of their Force than gain, I altered my Opinion; and now confess that I have not yet penetrated into the Knowledge of the Nature of this Matter.

Whatever it be, it is certain that there are several Kinds of this *Sand*, brought from different Countries of the Earth: For it is brought from *Persia*; some is brought from *Virginia*; there is another Sort in *Italy*, which is common enough at *Leghorn*, and this last is naturally very attractive: There are two Sorts found in the *Eber*, a River of *Hessia*; of which one is like the *Italian*, and the other consists of large Grains, almost as big as Hemp-Seed, but scarce having any Virtue. I have besides a very strong Sort, which I am told was got near old *Old Ragusa* in *Dalmatia*. No-body knows how many Kinds of this *Sand* there are: That Time, and the diligent Observations of Philosophers must hereafter shew.

Utrecht, Jan. 15, 1733, O. S.

C H A P. IV.

M A G N E T I C K S.

An Extract from the Journal Books of the Royal Society, concerning Magnets having more Poles than two; by John Eames, F. R. S. with some Observations by Dr Desaguliers on the same Subject.
No. 450. p. 383. Oct. &c. 1738.

I. **T**HE sagacious Dr *Halley*, in his Account of the Changes of the Variation of the magnetical Needle, upon the Hypothesis of the Earth's being one great Magnet having 4 magnetical Poles, tells us, that he had found two Difficulties not easy to surmount; the one was, that no Magnet he had ever seen or heard of, had more than 2 opposite Poles, whereas the Earth had visibly 4, if not more, &c. I find in looking over the Copy of the Journal-Book of this Society, Vol. II. an Article in the following Words:

July 20, 1664.

“ Mr *Ball* produced several Loadstones, and among them two *Terralla's*, whereof one seemed to have four Poles, with a Circle passing between them, of no Virtue at all. Some of the Company suggested, that it was probable this Stone consisted of two Stones, by Nature cemented together by a Piece that had no magnetical Quality in it.”

Query, Whether this Stone can be come at, to examine whether it be a single or double Stone? If single, whether the respective Poles were opposite?

An Account of some magnetical Experiments by J. T. Desaguliers.

In the Year 1715, trying some Experiments upon a very large weak Loadstone, I found that it had several Poles: Then I tried several other Loadstones, and often found 4 Poles in such as had been armed when I took off their Armour. In large coarse Stones I found sometimes 8, 9, or 10 Poles. This made me believe all Loadstones to have several Poles; but, when I tried my Lord *Paisley's* (since Earl of *Abercorn*) Loadstones, and other very good ones, I then found that homogeneous Loadstones had but 2 Poles; those that have more being only an Aggregate of magnetical and other Matter, which makes an heterogeneous Substance. Such is the Society's great Loadstone, for it has several Poles.

An Account of some magnetical Experiments made before the R. S. June 24, 1736, by the Rev. J. T. Desaguliers, LL.D. F.R.S. Ibid. p. 385.

II. 1. I took a Bar of Iron, of $\frac{1}{4}$ of an Inch Diameter (which having been 15 Years in an erect Position, had acquired a fixed Pole at Top, so that the End which had stood uppermost attracted the N. End of a Compass-Needle, and the other End the S. End of the Needle); and having suspended it by a String for the Space of $\frac{1}{2}$ a Year, it acquired a fixed S. Pole at that End, as well as it had done at the other in the Time of 15 Years, without diminishing the Virtue of the other End: So that both Ends of the Rod in any Situation attracted the N. End of the Needle of the Compass.

That Rods of Iron untouched, or which have not acquired a magnetick Virtue by their Situation, will with their upper End (whatever End of the Bar be held upwards) attract the N. End of the Needle, and the lower End

End of the Bar the S. End of the Needle, is a Truth known many Years ago, and mentioned in Dr *Brown's* Book of vulgar Errors.

2. It is well known, and has been often found by Experience, that an Iron Bar untouched by a Loadstone, will, with it's upper End, attract the N. End of the Needle of a Compass, when the said Bar is held upright, and the S. End of the Needle with it's lower End, when applied to it, still in a perpendicular Position, whatsoever End of the Bar be held up; unless the Bar has acquired a fixed Pole by having been long in a vertical Position. But if the Bar from a vertical be brought to an horizontal Position, the Needle will return into the Situation it had before, which was in the magnetical Meridian, the Bar being then at right Angles to it. Upon raising or sinking the End of the Bar which is farthest from the Needle, the one or the other End of the Needle will begin to move towards the Bar. Such a Bar has in itself no fixed magnetick Virtue; but if it had, it must be heated red-hot, and then cooled in an horizontal Position. A Bar thus prepared is fit to make the following Experiments, communicated to me by *M. du Fay*.

An Account of some magnetical Experiments made before the R.S. April 21, 1737, by the same. Ibid. p. 386.

Hold the Bar upright, and give it a Blow or two against the Ground with it's lower End; and that End will attract the S. End of the Needle, when the Bar is held horizontal, and at right Angles to the magnetick Meridian: The other End held horizontal in the same Manner, will attract the N. End of the Needle. Invert the Bar, and the Virtue of it will be lost by striking as many Blows with it against the Ground with the other End: Then strike another Blow or two, and the End which attracted the N. End of the Needle, will now attract the S. End, and so *vice versa*, the Position being still horizontal.

If the Blow be given against the Ceiling, or any horizontal Body, with the upper End of the Bar, the same Virtue will be communicated as before.

This will likewise happen, if the upper or lower End of the Bar be struck with an Hammer or Mallet; whether the Blow be given endwise, or at right Angles to the Bar: Nay, though it should be given in the middle of the Bar; the Position of the Bar at receiving the Blow being all that is requisite; for if you give the Bar only a Jerk or Shake in that vertical Position, it will receive the Virtue, as if there were in the Iron several Threads or Beards fixed at one End, as *M. du Fay* supposes, which the Blow or Shake laid all one Way, and which were placed the other Way by inverting the Bar, and then giving it a Shake or Blow.

N. B. When the Bar is placed horizontally, a Blow in the middle destroys it Virtue.

III. I formerly made Mention of a strange *Phenomenon* relating to the Sea-Compass, which I had frequently observed, when we were among the Ice in *Hudson's-Bay*; to wit, that the magnetick Virtue of the Needle was so far lost or destroyed, that it would not traverse as usual,

An Observation of the magnetic Needle being so affected by great Cold, that: even it would not

traverse; by
Capt. Chritto-
pher Middle-
ton, F. R. S.
No. 449. p.
310. Aug. &c.
1738.

even when the Ship was in a considerable Motion: And in my Voyage thither last Year, I observed our Compass would not move at all, any longer than the Quarter Master kept touching it. We had then much Snow on the Land, and many Isles of Ice around us, and the Sea not very smooth: I ordered one of the Compasses to be brought into the Cabin, but did not find it any better, till it had stood near the Fire about $\frac{1}{2}$ of an Hour, and then it began to traverse very well; I then ordered it to be placed in the Binnacle, and another to be brought into the Cabin, changing them alternately thus every half Hour, and found by this Means I could make them traverse as well as in any other Part of the World: I was obliged to continue this Practice, till we got near 100 Leagues from the Coast; but afterwards I had no Occasion for that Trouble. What should be the Cause of this wonderful *Phenomenon*, I am not able to conjecture, being certain the Compasses, as to their mechanical Structure, were very perfect, and answered very well both before and after, during the whole Voyage; there is never any Oil used to make them move easily, for in that Case it might often congeal, and stop the Motion of the Card: But whether the Cold of the Climate hath a Power to deprive the Needle of it's Virtue for a Time, or that the Friction is increased thereby to such a Degree, as it cannot be overcome by the Magnetism, I am not able to say; but the Fact is certain and surprizing.

April 20, 1738.

Magnetical
Observations
made in May,
June, and July,
1732, in the
Atlantic or
Western O-
cean; by Mr
Joseph Harris.
No. 428. p. 75.
April, &c.
1733.

IV. I some time since took Notice of the Imperfections of the common Azimuth Compass, and how ill adapted that Instrument is for the Purpose intended. I also gave the Description of a new Instrument, whereby I proposed to remedy the principal Objections to the former; and farther Experience has sufficiently confirmed me in what I have said. But I should be glad to have it determined by those who have convenient Opportunities of making Experiments of this Kind, what would be the properest Diameter and Weight for a Needle and Card, and what ought to be their proportional Weights to each other when taken separately: Regard being had that the Friction be no more than what is necessary to prevent the Card from being too much affected by the Motion of the Ship. Some Observations incline me to think, that a Sea-Card should not exceed 6 Inches Diameter, and that most of those generally used, are too heavy for nice Experiments, though they may be well enough adapted for common Purposes.

In *March* and *April*, 1732, the Variation at *Black-River* in *Jamaica* was very accurately observed to be from 6° to $6^{\circ} 5'$ Easterly.

Off the *Havanna* about $4 \frac{1}{2}$ Deg. Easterly.

The rest of the Observations I made, are expressed in the following Table.

| Latitude. N. | | Longitude from Lon- don, - W. | | Variation. | Latitude. | | Longitude from Lon- don, W. | | Variation. |
|-----------------|------|-------------------------------------|------|-----------------|-----------|------|-----------------------------------|------|------------------|
| Deg. | Min. | Deg. | Min. | Deg. | Deg. | Min. | Deg. | Min. | Deg. |
| 27 | 00 | 80 | 00 | 4 E. | 35 | 55 | 65 | 30 | 5 W. |
| 28 | 45 | 80 | 00 | 3 $\frac{1}{2}$ | 38 | 06 | 60 | 30 | 6 $\frac{1}{2}$ |
| 31 | 00 | 77 | 45 | 1 $\frac{3}{4}$ | 39 | 10 | 57 | 30 | 8 $\frac{1}{3}$ |
| 32 | 15 | 72 | 30 | 00 | 39 | 40 | 56 | 30 | 8 $\frac{1}{4}$ |
| 32 | 40 | 72 | 00 | 1 W. | 43 | 00 | 45 | 00 | 9 $\frac{1}{2}$ |
| 32 | 45 | 71 | 30 | 1 $\frac{1}{2}$ | 43 | 05 | 44 | 35 | 9 $\frac{1}{2}$ |
| 32 | 52 | 70 | 40 | 2 $\frac{1}{4}$ | 44 | 40 | 35 | 15 | 11 $\frac{1}{2}$ |
| 34 | 30 | 67 | 25 | 4 $\frac{1}{3}$ | 47 | 20 | 20 | 20 | 11 |

The Instrument I used was so easily managed, that unless the Sea was pretty rough, an Observation might be depended upon to about a Quarter of a Degree, had the Card performed to the same Exactness. But by comparing several Observations made under the like Circumstances, as to the Weather, it seems to me as if the Virtue of the Needle was not always of equal Strength. Sometimes several Observations would agree exceedingly well; at other Times the Card would stand indifferently any-where within a Degree or more of it's Meridian; and this I observed in several Cards. I found another Circumstance which surprized me much: The Card would sometimes differ about 2° from itself betwixt the Morning and Evening of the same Day; and this Difference would continue as it were regularly for several Days, then vanish for a Week or more, and afterwards would return and continue as before.

The Greatness of this Difference, and the near Agreement betwixt the Observations made in the same Forenoon, or Afternoon, amongst themselves, will not give me Room to suspect that it proceeded altogether from an Error in observing. I own I cannot account for it, but whatever be the Cause thereof, the Error was always the same Way; that is, the Westerly Variation in the Morning would be less than in the Afternoon. I carefully examined if this could be any Ways owing to the Instrument, or to any Iron near the Place where it was usually set for Observation; but I was fully convinced it could proceed from neither. I know not whether any such Observations as these have been made before; but I think it would not be unuseful, if those who have proper Instruments, and are sufficiently skilled, would communicate any Thing of this Kind that may occur.

It now appears that the Numbers in the foregoing Table cannot be strictly accurate; but I think the Error can scarce any-where exceed
half

Magnetical Observations.

half a Degree; for in most Cases several Observations were made pretty near together, of which I took a Medium, making Allowances according to the Circumstances attending each: And perhaps they are as exact as can be well expected from Sea-Journals. And there can be no sensible Error as to Longitudes, our Reckoning, when we made the Land, happening to fall out to a more than usual Exactness.

The Variation of the Magnetick Needle, as observed in three Voyages from London to Maryland, by Walter Hoxton. No. 454. p. 171. July, &c. 1739.

V. N. B. The Longitude is reckoned from the Lizard.

The first Voyage, 1732.

| Latitude. | | Longitude. | | Variation. | | |
|-----------|----|------------|----|------------|----|---|
| North. | | West. | | West. | | |
| ° | ' | ° | ' | ° | ' | |
| 39 | 53 | 27 | 16 | 12 | | } In Sight of the Island <i>Corvo</i> . Difference of Longitude from it 35' W. |
| 37 | 49 | 27 | 45 | 14 | | |
| 35 | 19 | 39 | 20 | 13 | | |
| 32 | 40 | 50 | 27 | 8 | | |
| 34 | 40 | 56 | | 6 | 30 | |
| 35 | 4 | 65 | | 4 | 28 | |
| 36 | 50 | | | 4 | 42 | } Distance from Cape Henry 7 Leagues. |
| | | | | 4 | 58 | |
| | | | | 4 | 47 | } In the Bay of <i>Chesepack</i> , 3 Miles below the Mouth of <i>Potomack River</i> . |
| | | | | | | |
| | | | | | | } Off the Mouth of <i>Potuxon River</i> . |
| | | | | | | |

Return.

| Latitude. | | Longitude. | | Variation. | |
|-----------|----|------------|----|------------|----|
| North. | | West. | | West. | |
| ° | ' | ° | ' | ° | ' |
| 36 | 11 | 56 | 20 | 9 | 22 |
| 34 | 52 | 53 | | 6 | 17 |
| 34 | 33 | 52 | | 6 | 15 |
| 34 | 45 | 51 | | 6 | 5 |
| 34 | 36 | 50 | | 6 | 23 |
| 36 | | 49 | 30 | 7 | 37 |
| 37 | 20 | 48 | | 9 | 23 |
| 38 | 4 | 48 | 20 | 10 | |
| 39 | 27 | 47 | 40 | 10 | 23 |
| 40 | 8 | 45 | 40 | 10 | 38 |

Magnetical Observations.

| Latitude. | | Longitude. | | Variation. | |
|-----------|----|------------|----|------------|----|
| North. | | West. | | West. | |
| ° | ' | ° | ' | ° | ' |
| 40 | 30 | 45 | | 13 | 4 |
| 42 | 32 | 42 | 20 | 11 | 43 |
| 42 | 40 | 42 | | 12 | 39 |
| 43 | 27 | 40 | 20 | 13 | 24 |
| 43 | 32 | 39 | 50 | 13 | 42 |
| 49 | 48 | 9 | | 16 | 30 |

The second Voyage, 1733.

| Latitude. | | Longitude. | | Sun's Alti- tude. | Variation. | |
|-----------|----|------------|----|-------------------------|------------|----|
| North. | | West. | | | West. | |
| ° | ' | ° | ' | ° | ' | |
| 48 | 12 | 3 | 18 | 31 | 18 | |
| 46 | 7 | 4 | 30 | 25 | 16 | 35 |
| 44 | 4 | 7 | | 22 | 16 | 22 |
| 42 | 17 | 9 | | 33 | 16 | 36 |
| 40 | | 12 | | 37 | 15 | 38 |
| 38 | 5 | 14 | 20 | 41 | 14 | 51 |
| 37 | 36 | 14 | 45 | 25 | 13 | 24 |
| 36 | 32 | 15 | 52 | 47 | 13 | 17 |
| 36 | 16 | 16 | 12 | 19 | 13 | |
| 34 | 2 | 21 | 51 | 35 | 11 | 34 |
| 34 | 4 | 23 | 18 | 27 | 9 | 51 |
| 35 | 6 | 30 | 33 | 21 | 10 | 28 |
| 35 | 12 | 31 | 38 | 20 | 9 | 48 |
| 34 | 23 | 31 | 22 | 32 | 10 | 23 |
| 33 | 34 | 32 | 25 | 20 | 8 | 18 |
| 30 | 19 | 31 | 26 | 23 | 7 | 12 |
| 29 | 17 | 31 | 11 | 24 | 6 | 45 |
| 32 | 24 | 37 | 55 | 25 | 6 | 39 |
| 32 | 50 | 38 | 35 | 25 | 10 | 36 |
| 32 | 11 | 40 | 23 | 30 | 11 | |
| 31 | 19 | 41 | 9 | 25 | 6 | 42 |
| 32 | 25 | 43 | | 26 | 5 | |
| 34 | 5 | 47 | 20 | 25 | 8 | 49 |
| 33 | 45 | 49 | 24 | 31 | 10 | 45 |
| 35 | 1 | 54 | 10 | 30 | 8 | 33 |
| 34 | | 54 | 4 | 41 | 5 | 54 |
| 33 | 41 | 54 | | 22 | 5 | 12 |
| 33 | 51 | 55 | | 23 | 6 | 35 |
| 34 | 59 | 60 | | 36 | 7 | 2 |
| 36 | 32 | 59 | 30 | 23 | 7 | 49 |
| 37 | 1 | 61 | 10 | 33 | 6 | 45 |

Magnetical Observations.

| Latitude. North. | Longitude. West. | Sun's Alti- tude. | Variation. West. |
|---------------------|---------------------|-------------------------|---------------------|
| ° / | ° / | ° | ° / |
| 37 5 | 66 22 | 44 | 5 25 |
| 36 53 | 66 40 | 30 | 4 45 |
| 36 36 | | 30 | 5 |

In the Soundings,
20 Leagues off
Cape Henry.

Return.

| Latitude. North. | Longitude. West. | Sun's Alti- tude. | Variation. West. |
|---------------------|---------------------|-------------------------|---------------------|
| ° / | ° / | ° | ° / |
| 38 9 | 57 40 | 24 | 11 |
| 38 48 | 55 50 | 25 | 10 |
| 42 13 | 43 48 | 29 | 14 |
| 44 21 | 33 17 | 19 | 14 26 |
| 45 46 | 28 17 | 23 | 15 45 |
| 49 51 | Off Plymouth. | | 13 27 |
| 50 20 | Off Portland. | | 13 |

The third Voyage, 1734.

| Latitude. North. | Longitude. West. | Sun's Alti- tude. | Variation. West. |
|---------------------|---------------------|-------------------------|---------------------|
| ° / | ° / | ° | ° / |
| 39 53 | 6 37 | 28 | 14 30 |
| 37 50 | 6 40 | 21 | 14 |
| 36 58 | 10 30 | 26 | 15 |
| 34 56 | 13 | 30 | 13 40 |
| 33 33 | 16 10 | 27 | 12 10 |
| 33 9 | 17 38 | 27 | 9 13 |
| 32 44 | 18 6 | 24 | 9 51 |
| 31 39 | 20 13 | 34 | 9 49 |
| 30 55 | 22 53 | 25 | 9 6 |
| 30 17 | 25 26 | 36 | 8 39 |
| 30 1 | 27 14 | 28 | 7 56 |
| 30 1 | 27 54 | 27 | 6 48 |
| 29 55 | 30 20 | 24 | 7 41 |
| 29 57 | 33 12 | 32 | 8 |
| 29 51 | 37 37 | 32 | 5 41 |
| 28 55 | 39 28 | 27 | 5 23 |
| 29 8 | 40 | 26 | 7 12 |
| 31 10 | 44 46 | 30 | 8 6 |
| 31 7 | 46 45 | 22 | 4 46 |
| 30 42 | 49 | 38 | 4 40 |



| Latitude. | | Longitude. | | Sun's Alti- tude. | Variation. | |
|-----------|----|------------|----|-------------------------|------------|----|
| North. | | West. | | | West. | |
| ° | ' | ° | ' | ° | ' | |
| 30 | 29 | 49 | 48 | 22 | 4 | |
| 30 | 31 | 52 | 10 | 25 | 4 | 49 |
| 30 | 18 | 53 | | 25 | 4 | 45 |
| 30 | 23 | 55 | | 25 | 4 | 22 |
| 30 | 58 | 57 | 30 | 22 | 4 | 52 |
| 37 | 9 | 68 | | 38 | 4 | 50 |

CHAP. V.

BOTANY.

I. THIS learned and ingenious Performance, in two Volumes in Folio, contains a Dedication to the Prince of Wales, a Preface, and 794 Pages.

In the Preface, the Author first lays down a Geographical Account of Switzerland, being situated from 46 to 48° in Lat. and 4° in Long. then mentions it's various and almost surprizing Degrees of Heat and Cold within the Space of a few Miles, arising from the different Arrangement of the Mountains: That it is in some Parts destitute both of Corn and Wood from the Intensity of the Cold; in others, where there are high Mountains to the N, and Openings to the S, the reflected Heat becomes so troublesome, that the Inhabitants are forced to desert the Towns, and take Shelter in the Woods; that in other Parts the Country is so extremely pleasant, that Tavernier himself, though he had travelled over great Part of the Globe, declared he never had observed any more beautiful. The Author then mentions, that the Plants produced in such Difference of Soils and Situations, must be very numerous; he accordingly met with not only many of the Plants of the warmer Parts of France, almost all the German ones, but even those of Lapland and Spitzberg. These Varieties have been collected in a short Time. You gather in the same Day, the Bistorts and Saxifrages which Martens collected in Spitzberg; the yellow Milfoil, Xeranthemum, E-pbedra, and other Ornaments of the Southern Part of France. The Progression between both Extremes is so regular, that in going from Bern to Grimsul, you pass first by Chestnut-Trees, and other Inhabitants of the warm Countries, then Vines, then Walnut-Trees, then Beeches and Oaks, then Firs, then Larch-Trees, then Pines, then barren Heaths producing Whortle-Berries and such like, then Rocks, and Plants a Span high, and last of all, beyond which Vegetation ceases, you meet with a Species of round-leaved Willow, not exceeding an Inch in Height,

An Account of a Treatise, (intituled, D. Alberti Halleri Archiatri Regii & Elect. Medicin. Anatomia, Botan. Prælect. &c. Enumeratio Methodica Stirpium Helvetiæ indigenarum. Qua omnium brevis Descriptio & Synonymia, Compendium Virium Medicarum, dubiarum Declaratio, novarum & rariorum uberior Historia & Icones continentur. Gottin-giæ, 1742, in Folio) extract-ed and trans-lated from the Latin by Wil-liam Watfon, F. R. S. No. 468. p. 369. Read Feb. 3, 1742-3.

and the *bairy Crow-Foot* of *Platerus*; beyond this District, the Tops of the Mountains are covered with Snow. This great Variety is not (as it must be in any other Part of the World) the Collection of many Provinces, but furnished within the Space of 17 Leagues; and would be still less, if in going from *Sedunum*, you ascend Mount *Sanetch*, whose Top is but 7 Leagues from *Sedunum* [or *Syon*].

The Author adds, that the Sides of the Mountains produce great Variety of Mosses and Fungus's, that the Pastures furnish an inexpressible Collection of Grasses, of which in this Book he mentions 220 Species. The following Kinds of Plants seem to be wanting in *Switzerland*, viz. the hotter Kind, such as *Thyme*, *Lavender*, and *Rosemary*; those very frequent in champain Countries; those which are produced in Bogs and putrid Soil; some of those peculiar to the North, and maritime Plants.

The *Alps* contain about 500 Species peculiar to themselves, all diverse, perennial most of them, biting, scented, and frequently with a white Flower; besides many Plants common to other Places.

The Author then proceeds to enumerate all the Botanists, who by their Journals and Publications have laboured to oblige the World with Histories and Descriptions of the almost inexhaustible Number of Plants, which the various Soil and Situation of this Country produces; and after having mentioned the Performances of these great Men, he gives some Account of his own Travels, and the Progress of his Botanical Studies; that he had gone through *Germany*, *Holland*, *France*, and *England*, and made very few Observations of the Botanick Kind, at least had preserved no Specimens of what he had seen; but upon his Arrival at *Basil* to attend the Lectures of *Bernoulli*, and study *Mathematicks* there, he was seized, as it were, by the Genius of the Place, where those great Writers the *Baubins* had lived, and were publick Professors; and whose Chair at that Time was very worthily filled by *Starbelinus*: That he began to collect, describe, and compile, with so great Hopes of Success, however remote, that he even attempted the Work before us, at a Time when he was scarcely acquainted with the more common Plants. A Work of this Kind had been begun by *John Gesner* of *Zurich*, a Descendant of the famous *Conrad Gesner's*, and a Friend of our Author's, for which Task he was very well qualified by his many laborious Researches; but at length his bad State of Health would not permit him to proceed in a Science, where he must not be confined only to his Closet, but climb up almost inaccessible Mountains, sometimes nearly perishing with Cold, and, possibly, in the same Day, almost stifled with Heat. This Gentleman not only sent our Author a great many Plants, but granted him whatever he had occasion for of his Collection, which consisted of a great Number of valuable Specimens, of which he alone was possessed.

Our Author specifies likewise, what Parts of the *Alps* have been looked over, and what remain hitherto unattempted; and then shews how

how large a Field is yet behind, for future Botanists to exercise their Genius upon; and that these Mountains have rather been cursorily passed over by Persons travelling over them to remote Places, often at an improper Season, than carefully examined; from whence it happens, that many not only of Mosses, but of the most perfect Plants, have either been omitted, or so negligently described, that it is impossible to reduce them to the Genus to which they belong. Add to this, that the *Fungus's*, and the very small Plants, such as the *Centunculus*, *Sedum tetrapetalon*, &c. were overlooked by the ancient Botanists, and seem to have been reserved for the Industry and Perspicuity of the *Vaillant's*, *Dillenius's*, and *Micheli's*, of the present Age. Our Author then candidly confesses, that although he had herborized upon many different Parts of this Country for 9 Years, he could by no Means promise a full and perfect Enumeration of it's Plants; for the Descriptions of the more ancient Writers, especially the Grasses mentioned by *Caspar Bauhin*, are so obscure, that it is scarcely possible to know many of them by those Means; that some Plants are inserted by Authors, which have occurred to no-body since their Time; that others, if not quite lost, he never could meet with, notwithstanding he travelled for that Purpose to the Places where they have been said to be found; which may in some Measure be owing to our Author's being short-sighted, from which Defect (he believes) he may, no doubt, have passed over some Plants, which he had been particularly in Quest of: That he had received some Specimens so ill preserved, as not to be able to discover their generical Marks; and, lastly, that it is almost impossible to save any Seeds of the Plants of the *Alps*, or see them in that State, on account of the Snows falling so early as the latter End of *August*, and Beginning of *September*, whereby the Mountains are covered, and rendered unpassable.

Surrounded with Difficulties, he despairs of perfecting his Catalogue, but hopes he shall have the Reader's Pardon, after he is apprised of the Means our Author took against them. First, he carefully marked out the Characters of all his Plants, the Day he collected them; for not being prejudiced in favour of any artificial Method, he looked over the Composition of the Flower with regard to it's Petals, *Calyx*, and Seed-Vessel, after the Manner of Professor *Boerhaave*, at a Time when nobody had considered the *Stamina* and *Tubes* as generical Notes: That he compared with his Plants the Botanical Writers of more than 2 Centuries, whose Names are mentioned at the End of the Preface, beginning in order of Time with *Brunfelsius*, and concluding with the late Work of Monsieur *Geoffroy*: That he had examined their Descriptions of Plants, and compared them with their Figures, and made himself a Pinax of the Plants of *Switzerland*, even to the present Time.

Our Author, in the Work before us, has never inserted a doubtful Plant, without mentioning his Scruple, nor any but what he himself has seen, without an Asterisk. He has added to the End of the Work, those

those which he could with but little Certainty refer to any Class; and, contrary to the Practice of some late Writers, he never enumerates a Variety, but regards Proportion as a Mark of specifick Difference, if ever a less Plant produces Flowers twice as big as a larger Plant of the same Species, and holds that Size when planted in Gardens, and continues the Difference to it's Posterity.

As to the Method and Order of this Work, our Author has been as short, and at the same Time as descriptive, as possible. He has given the Synonymes of most good Authors: He generally first affixes the Name the Discoverer gave it, unless a very improper one; and then proceeding usually as the Authors lived, sets down the Appellations of *Conrad Gesner*, *Cordus*, *Dodonæus*, *Lobel*, *Tabernemontanus*, *Hortus Aichstadiensis* of *Basil*, *Besler*, *Clusius*, *Caspar* and *John Baubin*, *Morison*, *Tournefort*, and others, who have lived since them, either as they have discovered a new Plant, or illustrated an old one with a new Description, Figure, or Character. With regard to Method, he says he might have disposed them alphabetically, followed *Boerhaave's* Method, or *Linneus's*, but was fearful of making unnatural Distortions; especially as he was not writing an universal History of Plants. He thinks it not at all proper to dispose Plants in the same Class, unless their Affinity is perfect; and lays it down as a Foundation, upon which alone a natural Method can be formed, that however different Plants may seem in one Characteristick, those should be placed together which agree in most others; and however alike they may be in one Point, that those be separated which differ in many others. The Neglect of this Axiom has made all Methods unnatural.

The Author then apologizes for giving new Names to some Plants, but he could not omit inserting some that were more expressive, and give them the Preference to old ones, that imported little or nothing, although they had the Sanction of Antiquity; but he scarce ever has changed the generical Names, because amongst Things that are in themselves indifferent, Custom should be always complied with; and as all generical Names are arbitrary, scarce any can be thought of to contain enough to distinguish the Plant by; but the specifick Name ought to be a short Definition and Compendium of it's nicest Differences: And although this may sometimes be thought too long, the Marks of Difference in many Kinds will not permit them to be contracted.

After he has acquainted the Reader with his Objections, and told his Reasons, he proceeds to that Part of his Work, which is intituled, *Nomina Scriptorum & Editionum*; and has given a Specimen of his great Erudition in a very laborious and learned History of almost all Botanical Authors, for more than 2 Centuries: He therein points out their Excellencies and Defects, shews which of them were Originals, and which Plagiaries; gives an Account of all their Publications and Editions, and deduces the Rise and Progress of Botany through all it's Stages, from the general Darknes of the 15th Century, to the nice Distinctions

Distinctions of the present Time. This may be esteemed a very valuable Performance. It may not be improper to exhibit from it, the different Characters of 2 Books in the Author's own Words, whereby some Judgment may be formed of the rest. First, mentioning *Clusii variorum Stirpium per Hispaniam observatarum*, he says, "Cordus was restored to the World in *Clusius*. He, with incredible Labour, collected the Plants of *Spain, Languedoc, England, the Alps, Austria, some Parts of Hungary*, and those about *Frankfort*: He afterwards drew them, and published their Figures very expressively, and with great Neatness. He alone doubled the Number of Plants before known, although indeed many have been attributed to him, which are concealed in the Works of *Cordus, Aretius, and Gesner*." Our Author afterwards, speaking of *Fabregou's Description des Plantes qui naissent autour de Paris*, says, "Nothing can be more audacious than this Writer; he often quarrels with good Authors, and obtrudes upon them long since dead, arbitrary Definitions proposed by himself. The Synonymes of his Plants, and the Definitions of his Species, are very much confused: He takes, with the utmost Impudence, the Names of *Vaillant and Tournefort*, but with ridiculous Alterations. Besides, to my great Abhorrence, he inserts a very great Number of Plants most certainly exotick, as growing about *Paris*; and, least any Thing should be wanting to spoil this Work, the typographical Errors are infinite."

Before I give an Account of our Author's System of Botany, it will be necessary to mention the different Parts of Plants, from which other Authors have formed theirs. *Conrad Gesner* was the first who discovered, that Plants might be distinguished into *Genera* from their different Manner of bearing Fruit, as appears by his posthumous Letters published by *Camerarius*; but *Cesalpinus* first reduced it into Practice. *Cesalpinus*, I say, *Ray, Herman*, whose Plan is much improved by *Boerhaave*, and *Knaut's* Systems, are formed from the Fruit; *Tournefort's*, from the Figure of the Flower; *Rivinus's*, which is followed by *Ruppinius*, from the Number and Equality of the Petals; *Magnol's*, from the *Calyx*; *Linneus's*, from the *Stamina, Pistillum*, and Sex of the Flower; and our Author, his principally from the Number and Disposition of the *Stamina*, and likewise from the Manner of Fruiting. I have, at the End of this Extract, abridged it according to the Order of the *Classes, Genera, and Species*.

Throughout the Body of this Work, our Author has ranged his Plants after this Method; and when he mentions a particular Plant, he first gives the generical Name, and it's Inventor; then lays down the Form of the Flower, and the Manner of distinguishing this Plant from others of the same Species; then quotes the Synonymes, then the Place of it's natural Growth, afterwards the Description of it's Root and Leaves; and lastly, collects all the Evidence on both Sides, with regard to it's Uses as a Medicine, or the contrary. I think it not improper
to

to give here Part of the History of one Plant, as a Specimen of the rest. The Author, speaking, p. 298, of *Veratrum*, or *white Hellebore* of the Shops, after mentioning the generical Name, Form of the Flower, 29 Synonymes of different Writers, the Place of Growth, and the Form of it's Root, says, " This Plant is universally agreed to be
 " hurtful, though *Brassavola*, p. 531. found some People hardy enough
 " to give ʒj at a Dose, without any Corrector; which Dose even *Welsch*
 " and *Herman* have allowed in Infusion to Dæmoniacks, also *Matthio-*
 " *lus*, p. 1222. with good Success, to Lunaticks. *Herman* in like
 " Cases gives the Root in Substance, from 15 to 30 Grains. Notwith-
 " standing which, we find in the *Ephemerides naturæ curios.* Anno 1^{mo}
 " Obs. 65. that ʒj has certainly produced Convulsions; and *Wepfer*
 " mentions a Dog killed with the same Dose, and *Fallopious de Purgant.*
 " likewise many strangled therewith. *Lentilius*, p. 868. takes Notice
 " of violent Vomitings occasioned by the Root's being given by Mistake,
 " instead of *Solomon's Seal*. The *Acta Hafn.* Anno v. Observ. 55. say,
 " that those most hardy Mortals, who live in the Northern Parts of
 " the World, and purge themselves with this Plant, receive great Mis-
 " chief in their Eyes therefrom, even sometimes to be followed by
 " Blindness. See also it's terrible Effects in the *Breslau Transactions*,
 " Anno 1725. Even amongst the Ancients, notwithstanding that both
 " Sorts of *Hellebore* were produced in *Anticyra*, the black was only
 " made use of in Purges, on account of the emetick Quality of the white.
 " See *Pausanias*, Lib. X. p. 623. *Alleyne* will scarcely admit it to be
 " safe given in Powder as a Sternutatory. But if the Juice of this
 " Plant, with it's full Powers, shall by any Method get into the Blood,
 " it is so quick a Poison, that the Animal immediately dies, if wounded
 " even in a slight Manner, and the Juice applied thereto. See *Crato*,
 " Epist. II. p. 226. *Matthiolus* found this Experiment true upon Hens.
 " See p. 1226. *Epistolar.* p. 219. And that the Putrefaction excited
 " thereby was so great, that the Flesh immediately was grown soft.
 " See *Arceus de Curand. Vuln.* Lib. I. p. 70. Nor does the Cause seem
 " to be obscure, seeing that the Roots, being chewed, fire the Mouth
 " and Throat, and pour forth a very sharp Liquor, not unlike that of
 " Lime. *Geoffroy de Mat. Medic.* Vol. II. p. 226. But *Conrad Gesner*,
 " in the Work published by himself, assures us, that his *Oxymel Ellebo-*
 " *ratum* may be given to ʒij without any Mischief, and that it is very
 " useful to promote the *Menses*, Expectoration, and Sweat."

This may serve as a Specimen of our Author's great Industry and Exactness; which he adheres to throughout the whole Work, where a Plant has by any, whether ancient or modern, medical Writer or Historian, been celebrated for medicinal Purposes, or it's Uses in the Art of Dying. His Descriptions are so exact, that it is almost impossible, that any Person, ever so little conversant with Botany, should mistake one Plant for another. His Figures, of which there are 24 Tables, are finely engraven, and with great Accuracy, as appears from comparing them

them with their Descriptions. His Method is very natural, and not difficult to comprehend when considered; though at first View it seems more so than Ray's, Tournefort's, or Boerhaave's: And indeed there have been already so many Botanical Systems, such warm Controversies among Authors, so many bad Names, such great Confusion, that as often as there appears a new System, it sends forth a Panick throughout the Botanical World; as it adds to the Number of Names already too great, and tends to the Discouragement of those who are desirous of being acquainted with Plants. But our Author's System being, as I said before, very natural, and as he gives but few new generical Names, and at the same Time when he gives his own, mentions those of most good Authors; these Considerations take off many Objections, to which some late Botanick Writers are liable. In the Work before us, the Author takes in only the Plants of Switzerland; but I believe his Plan may be extended to a general History, which, if executed with the same Accuracy as the present Work, cannot but be a most valuable Performance.

[Faint, mirrored text from the reverse side of the page, including botanical terms and classification numbers.]

Conspectus Methodi PLANTARUM D. Alb. Halleri.

- Plantæ,
- I. Sunt vel, flore staminibus & petalis destitutæ, semine solo donatæ; ut *Conserua*.
 - II.

| | | |
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| Staminibus veris & petalis destitutæ, flore aliquo & semine donatæ | } | <ol style="list-style-type: none"> 1. Staminibus omnino nullis, ut <i>Lichen</i>. 2. Staminum analogis corpusculis præditæ, ut <i>Musci</i>. 3. Epiphyllispermæ; ut <i>Osmunda</i>, <i>Polypodium</i>. |
|--|---|---|
 - III.

| | | |
|--|---|---|
| Petalis destitutæ, semine, flore, & veris staminibus donatæ, | } | <ol style="list-style-type: none"> 1. Staminibus coalitis a fructu remotis, coniferæ, ut <i>Larix</i>. 2. ——— a fructu remotis, Juliferæ; ut <i>Salix</i>. 3. Non Juliferæ, isostemones; ut <i>Rhamnoides</i>. 4. Meiostemones; ut <i>Alchimilla</i>. 5. Diplostemones; ut <i>Knarvel Raii</i>. 6. Polystemones; ut <i>Tithymalus</i>. 7. Aquaticæ varix; ut <i>Chara</i>, <i>Limnopence</i>. 8. Tristemones, flore plerumque bifolio; ut <i>Gramina</i>. 9. Graminibus adfines; ut <i>Cyperoides</i>. |
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 - IV.

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| Seminibus, flore, staminibus, & petalis, donatæ. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 2. Dicotyledones petalodæ. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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Diplostemones; ut <i>Oxys</i>, <i>Geranium</i>.</td> </tr> <tr> <td colspan="3" style="vertical-align: middle;"> <table border="0" style="margin-left: 1em;"> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 3. Ifostemones, </td> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 1. Placentiferæ, { </td> </tr> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 4. Meiostemones; ut <i>Ligustrum</i>, <i>Veronica</i>. 5. Staminiibus ad petala sesquialteris; </td> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 1. Vasculiferæ; ut <i>Evonymus</i>. 2. Flore fructui innato Gymnosperræ; ut <i>Umbelliferæ</i>. </td> </tr> <tr> <td colspan="3" style="vertical-align: middle;"> <table border="0" style="margin-left: 1em;"> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 6. Staminiibus ad petala duplis sesquiterciis; ut <i>Papilionacæ</i>. </td> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 1. Dipetalo; ut <i>Circea</i>. 2. Tetrapetaloide; ut <i>Asperula</i>. 3. Quinquéfido; ut <i>Opulus</i>. </td> </tr> <tr> <td colspan="3" style="vertical-align: middle;"> <table border="0" style="margin-left: 1em;"> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 7. Flore monopetalo, staminibus quatuor inæqualibus, </td> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 3. Flore circa fructum posito. 4. Cucurbitacæ; ut <i>Bryonia</i>. 5. Solanacæ; ut <i>Alkekengi</i>, <i>Solanum</i>. 6. Asperifoliæ; ut <i>Echium</i>, <i>Symphytum</i>. 7. Dicarpeæ; ut <i>Asclepias</i>, <i>Pervinca</i>. 8. Hexapetalæ; ut <i>Berberis</i>. </td> </tr> <tr> <td colspan="3" style="vertical-align: middle;"> <table border="0" style="margin-left: 1em;"> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 8. Floribus uni semini insidentibus congregatis; ut <i>Papposæ</i>, <i>Capitata</i>, <i>Corymbifera</i>. </td> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="vertical-align: middle;"> <ol style="list-style-type: none"> 1. 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II. The *Mangostans* is a Kind of pomiferous Tree, which grows in the *Molucca* Islands, the Fruit of which is one of the best in the World for eating.

Character. This Genus has it's Flower compleat, tetrapetalous, regular, hermaphrodite, containing the *Ovary*. It's *Calix* is monopetalous, divided into four Lobes, roundish on the Edges, and hollowed in the Shape of a Spoon. The *Ovary* is very near cylindrical, with a Tube upon it cut out in the Shape of a Rose, which covers it like a little Cap. The *Stamina* which surround it, are spherical at the Top, their Number is four Times that of the *Petala*. When these are gone off, the *Pistil* changes into a round Fruit, adorned with it's *Calix*, and it's Tube, cut into the Shape of a Star, with Rays squared at the Corners. It's *Cortex*, which is thick and brittle, encloses a Cavity filled with as many pulposus and juicy Segments as there are Rays in the Tube. These Segments are white, in the Shape of a Half-moon, sticking together, and containing each but one Grain of Seed; which latter is oblong, something flattened, resembling an Almond, wrapped up in a *Tunica*, which is covered with a hairy Coat of Fibres or Vessels, which, together with the Pulp, make up the *Parenckyma* of a Segment of the Fruit. The Leaves of the Tree are entire, smooth like those of the *Laurel*, and grow opposite to each other on the Branches. The Stem of the Tree grows up straight to the Top of it's Tuft, and it's Branches and Twigs come out opposite to one another like the Leaves.

I know but one Species of this Genus, which admits indeed of some Variation, but without any other Mark than what appears in the Fruit.

Mangostans *Garciae*, Clus. Bont. *Arbor peregrina Aurantio simili fructu.*
Clus. exot. 12. *Laurifolia Javanensis* C. B. Pin. 461.

Description. The *Mangostans* is a Tree of a very moderate Size. It does not grow above 3 Toises (about 18 Feet) high. It's Stem runs up straight to the Top of it's Tuft, like the Fir. This Tuft is regular, in Form of an oblong Cone, composed of many Branches and Twigs, spreading out equally on all Sides, without leaving any Hollow.

The Stem grows at Bottom to the Thickness of a Man's Thigh, or about 8 or 10 Inches in Diameter; it afterwards diminishes in Thickness by Degrees up to the Tuft. It's Wood is white, as long as the Tree is growing, but brownish when the Tree is cut down and dry. It's Bark is a little tender, and separates easily from the Wood; it is of a dark-grey Colour, and slit, or full of Cracks up the Stem, but on the Twigs it is more even and greener, resembling that of *Euonymus*, or Spindle-Tree.

The Branches grow out of them by Stories, and opposite to one another; those Stories cross each other obliquely, and not at right Angles. The Thickness of those Branches is always proportionable to that of the Stem at the Place where they come out of it: This Proportion is about 1 to 4, or 1 to 5. The Length of the inferior Branches

The Settling of a new Genus of Plants, called after the Malayans, Mangostans; by Laurentius Garcin, M.D. F. R. S. Translated from the French by Mr Zollman, F. R. S. No. 431. p. 232. Jan. &c. 1734.

of the Tuft is of 5 or 6 Feet, the others shorten as they come near the Top. The Distances of the Stories of the Branches are a little unequal, but where they are widest, they do not exceed the Length of the greatest Leaves, that is, 8 or 9 Inches.

The Twigs grow on the Branches in the same Order as those do on the Stem, that is, opposite to each other. The longest are commonly of the Length from one's Hand to the Elbow. The greater Twigs grow out to a certain Distance from the Stem, and the others which garnish the rest of the Branches, always grow less and less towards their Extremity.

The Branches and Twigs never divide themselves.

The Leaves are large, entire, beautiful, smooth, of a shining Green on the upper Side, and of an Olive Colour on the Back, pointed at their Extremities. The Rib which divides it's Extent into 2 equal Parts, is straight, and equally prominent on both Sides. From the Sides of this Rib there issue forth Fibres pretty small, and almost by Pairs, which extend themselves in Parallels, and bent a little Archwise quite to the Edge of the Leaf, where they unite themselves into a Thread, which forms there a Kind of Margin. The Mashies or Filaments of the Net are not very perceptible. The Size of these Leaves varies; the largest are 8 or 9 Inches long, but commonly 7. The Breadth of each Leaf is near equal to half it's Length, which Proportion is always the same in every Leaf. Their Pedicles are thick, short, and wrinkled, flat on the Inside, and raised in the Shape of an Ass's Back on the Outside, most frequently half an Inch long. They come out near, and on the Extremities of, the Twigs, opposite to each other like the Branches themselves. There appear seldom above 2 Pairs of Leaves on each Twig, and those that shoot out last always make up the Extremity of that Twig.

The Flower is 2 Inches in Diameter, pretty much like a single Rose. It is composed of 4 *Petala*, almost round, or a little pointed, of the Breadth of an Inch, or thereabouts, very thick, firm, fleshy, brittle, and somewhat hollowed into the Shape of a Spoon. Their greatest Thickness is near their Basis, of above a Line, which decreases by Degrees towards the Extremity. They entirely resemble the *Petal* of a Rose, except that instead of being indented like a Heart, they end gradually into roundish Points (as I said before). Their Colour is also like that of a Rose, except that it is deeper and less lively. The Basis, which is the thickest and firmest Part of it, is the whitest, and the most brittle.

The Pistil, or *Ovary*, is a round or almost cylindrical Body, five Lines thick, raised to the Height of four. The upper Part of this Pistil, that is to say, it's Tube, is cut in the Shape of a small Rose, covering the *Ovary* like a Cap. The Diameter of this Cap is of an equal Breadth with the *Ovary*, which it covers entirely, sticking very close

close to it. The Colour of the *Ovary* is a pale or whitish Green, and that of the Tube a White that is sullied or dirty.

The *Stamina* rise from the Base of the *Pistil*, they are whitish, round at the Tops, and raised to the Circumference of the Tube, applying themselves to the *Ovary*. They are 16 in Number; 4 for each *Petal*.

The *Calix* is of one Piece, expanded and cut into 4 Lobes down to it's Basis. These Lobes are thick, round, skinny, hollowed in the Manner of a Spoon, resembling also *Petala* of Roses not fully blown. They seem to cross one another like the *Petala*. The two upper Lobes are something larger than the lower ones; they are greenish on the Outside, and of a fine deep Red within, which makes them more agreeable to the Eye than the *Petala*; the Red of the upper ones is more lively than that of the lower ones. All these Lobes in short are hollower than the *Petala*; they do not cover those latter farther than half Way their Height. This *Calix* encloses all the Parts of the Flower. It is supported by a Pedicle of 7 or 8 Lines long, it's Thickness being commonly of $\frac{1}{3}$ of it's Length. This Pedicle is green, and constantly comes out of the End of a Twig above the last Pair of Leaves.

The Fruit is round, of the Size of a middling Orange: It's Bigness however varies very much, from $1\frac{1}{2}$ Inch to $2\frac{1}{2}$ Inches Diameter. The Top of it is covered with a Sort of Cap embossed, cut out in the Shape of a Rose, or a Star with Rays squared off, of a Finger's Breadth, or sometimes of an Inch in Diameter. The Rays of this little Rose are most frequently 6 or 7 in Number, but seldom of 5 or 8. These Rays, by being thus squared, form together a Kind of *Polygon*: This is the Part which had served for the Tube to the *Ovary*.

The Body of this Fruit is a *Capsula* of one Cavity, composed of a thick Shell, brittle, a little like that of a *Pomegranate*, but softer, thicker, and fuller of Juice. It's Thickness is commonly of 3 Lines: It's outer Colour is of a dark-brown Purple, mixed with a little Grey and dark Green; the inner Colour, that is to say, on the Inside of the Case, is of a Rose Colour. It's Juice is purple. Last of all, this Skin is of a styptick or astringent Taste, like that of the *Pomegranate*; nor does it stick to the Parts of the Fruit it contains. The inner Part of this Fruit is a furrowed Globe divided into Segments, much like those in an Orange, but unequal in Size, which do not adhere to each other. The Number of these Segments is always equal to that of the Rays of the Tube which covers the Fruit. The fewer there are of these Segments, the bigger they are. There are often in the same Fruit Segments as big again as any of those that are on the Side of them: Which will be easily seen in the Figure I have given of it.

These Segments are white, a little transparent, fleshy, membranous, fibrous, full of Juice like Cherries or Raspberries, of a Taste of Strawberries and Grapes together. Each of the largest Segments encloses a Grain of Seed of the Figure and Size of an Almond stripped of it's Shell, having a Protuberance on one of it's Sides, which is nothing else
but

A new Genus of Plants, called Mangostans.

but it's Navel. This Grain is covered with two small Skins, the outermost of which serves for a Basis to the Filaments and Membranes of which the Pulp is composed. The Substance of these Grains comes very near to that of Chesnuts as to their Consistency, Colour, and astringent Quality. The *Calix* always remains sticking to the Fruit, to which it serves for an Ornament, and when half dried up, it is of the Colour of the *Pomegranate-Shell* on the Outside. It covers about $\frac{1}{2}$ Part of the Circumference of the Fruit.

Remarks. *Garcias*, *Clusius*, and *Bontius*, are the first Authors who have made mention of the *Mangostans*; but they have left us only indifferent Descriptions, and so short ones, that it is not possible to form from them a sufficient Idea for discovering it's Characters. The first of those Authors was ill informed, when he was told the Fruit of it was yellow. *Clusius* has spoken of it under 2 different Names, without apprehending that it was one and the same Plant. The Figure which he has given of the Fruit, and which he calls *Arbor peregrina Aurantio simili fructu*, though ill done, yet represents it enough to know it again. If in that Figure the Fruit appears little in relation to the Twig which supports it, this can be for no other Reason, but because he received from the *Indies* some of that Fruit which had been gathered before it's State of Perfection, and after it drew his Figure. And hence it is, that the Fruit being shrunk up and imperfect, he found nothing in it but a few shrivelled Grains, which were not much larger than those of a *Fig*.

It is surprizing however, that the most delicious Fruit of all the *Indies*, and which yields to none of the best in *Europe*, is that which of all has been hitherto least known. But as I have often eaten of it, and found it as excellent as it is reputed in the Countries where it is cultivated, I resolved to examine it's Genus, to settle it's Characters, and to give a Description of it, which might make it better known for the future to Botanists, and other curious Persons.

This Tree originally grows in the *Molucca* Islands, but for some Years past it has been transplanted into the Isle of *Java*, and some few at *Malacca*, in which Places it thrives very well. It's Tuft is so fine, so regular, so equal, and the Appearance of it's Leaves so beautiful, that it is at present looked upon at *Batavia* as the most proper for adorning a Garden, and affording an agreeable Shade; yet there have been but few *Europeans* in the *Indies* who have made use of it for this Purpose, because they were unacquainted with it. They employed other Trees which did not near come up to it as to Usefulness and Beauty.

Travellers who make mention of it's Fruit, always speak of it with great Encomiums. *Linschooten* is the only one who, after having given a Description of several *Indian* Fruits in his own Way, thought it needless to describe the *Mangostans*, as well as some others, because, says he, they are little valued. Probably he never saw it, but upon Enquiry took upon Credit what some Person or other told him, who
knew

knew nothing of it besides the Name, and confounded it with others which are little esteemed.

There are few Grains to be met with in this Fruit that are good for planting, for most of them are but abortive.

Sometimes this Fruit is found spoiled within, which may be known by yellow Spots appearing on some of the Segments. Some People scruple then to eat them, but others make no Difficulty about it. It is certain however, that they are not so good, especially if the Spots are considerable. I observed that this Corruption proceeded from the Juice in the *Capsula*, which being spoiled by the Sting of some Insect, and thereby becoming yellow, and spreading over the Segments of the Fruit, infected them with that Colour, and thereby changed them. This Wound is so small, and so hard to be discovered, that one often is left in a Doubt whether there be any at all.

One may eat a great deal of this Fruit without any Inconvenience, and it is the only one which sick People may be allowed to eat without any Scruple. It is very wholesome, refreshing, and more cordial than the Strawberry.

It's Shell has the same Virtue as that of the *Pomegranate*; at *Batavia* they make an Infusion and a Tincture of it against Loosenesses, and chiefly against Dysenteries. The Wood is good for nothing but firing.

In the *Mem. de Math. & de Phys. de l'Acad. R. des Sc. de Paris*, 1692, Page 435, *Amst.* Edit. there is a short Description of the *Mangostans* by Father *Beze*, which is pretty good; but as he took the *Calix* for the Flower, it is plain he observed it not until after the *Petala* were fallen off. His Description is too short and defective for determining from thence alone the true Characters of this Genus.

Fig. 51. The Flower as it appears in the Inside and Outside. *a.* The four *Petala* of the Flower. *b.* The four Lobes of the *Calix*. *c.* The Tube. *d.* The *Pedicle*. Explanation of the Figures.
Fig. 51.

Fig. 52. The *Calix* as it appears in the Inside with the *Pistil* and the *Stamina*: *e.* The End of the *Pedicle* of the Flower, which supports the *Calix*. Fig. 52.

Fig. 53. A *Petal*, as it appears on the Back, separated from the Flower: *f.* It's Basis, which is the thickest, the firmest and the most brittle Part. *g.* Four *Stamina* belonging to the *Petal*, arising from the Basis of it, and of the *Pistil*. Fig. 53.

Fig. 54. The entire Fruit seen from the Side of the *Calix*, or the *Pedicle*. *b.* The *Calix*. *i.* The *Pedicle*. *k.* A Part of it's Tube. Fig. 54.

Fig. 55. The same, seen from the Side of the Tube, which is cut out in the Shape of a small Rose: *l.* The Tube, which always sticks fast to the Fruit. *m.* The *Pedicle*, and Part of the *Calix*. Fig. 55.

Fig. 56. The Fruit cut into two Halves, containing 6 Segments: *n.* The Segments good to eat, whereof some commonly are larger than the others. *o.* The *Calix*. *p.* The *Pedicle*. Fig. 56.

Fig. 57.

Fig. 57.

Fig. 57. A separate Segment of the Fruit, in the Shape of a Half-moon, containing a Grain.

Fig. 58.

Fig. 58. A Grain or Seed separated from the Segment, the Coat whereof is covered with Filaments, which formed the *Parenchyma* of the Segment.

Fig. 59.

Fig. 59. A Leaf of the Tree which bears the *Mangostans*, with it's Fellow cut off near the Bottom, supported by a Piece of it's Twig.

Botanical Observations, exhibiting accurate Descriptions of some Plants, by Paul. Henry Gerard Moehring, M. D. No. 454. p. 211. July, &c. 1739.

III. 1. *Salicornia ramis clavatis, squamis articulorum adpressis.*

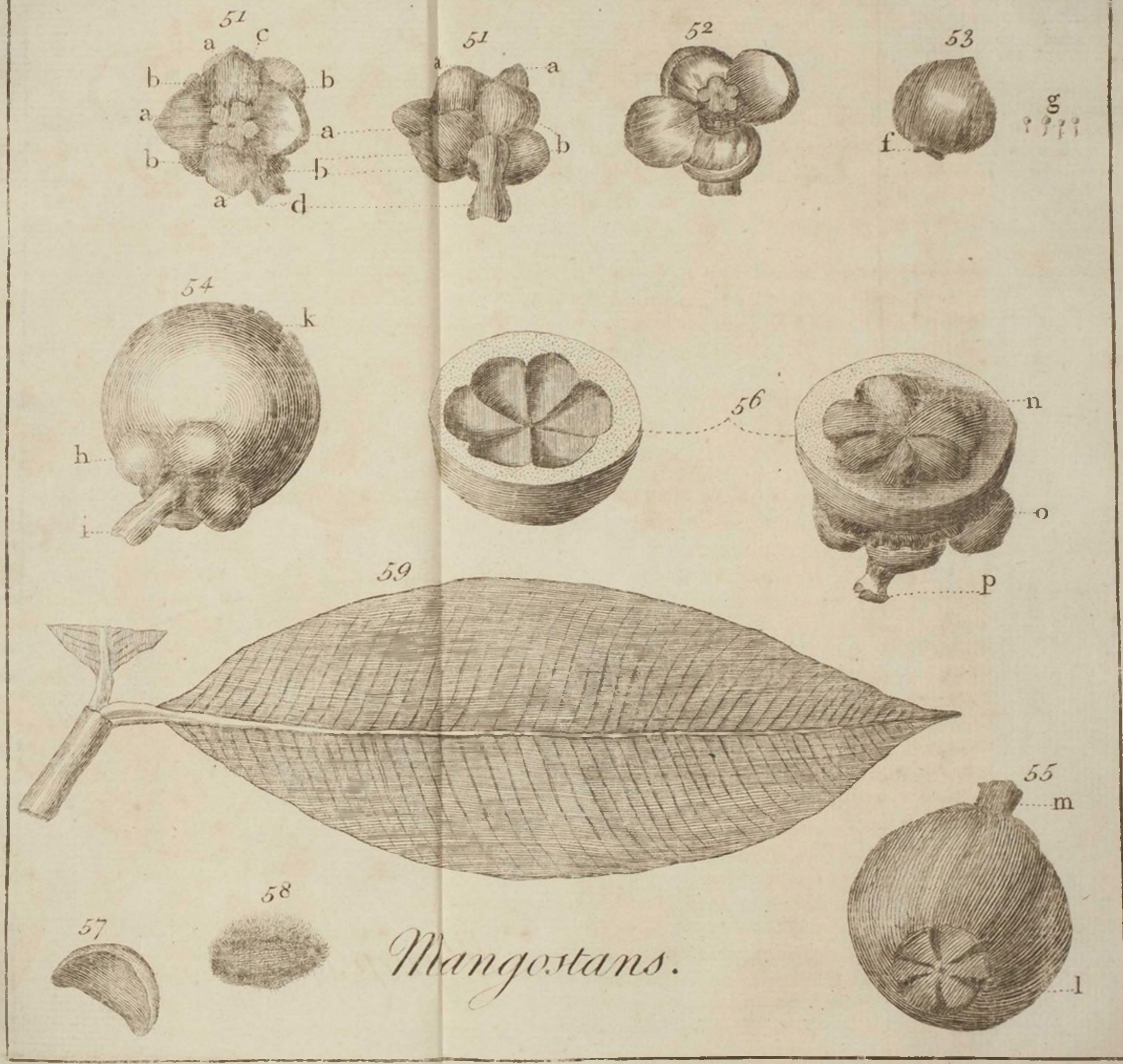
It is an annual Plant, succulent in all it's Parts, 8 or 9 *Rhinland* Inches, seldom a Foot high. The Root is fibrous: The Stalk is branched, a little flatted, woody, and wrinkled at the Root, succulent above, smooth, without Leaves, having Clubs proceeding alternately from auricular, squamous Productions, forming Sheaths, and flatted close to the primary Stalk; they are from $\frac{1}{2}$ to $1\frac{1}{2}$ *Rhinland* Inches long, the extreme one being longer than the rest.

The Fructification consists of 3 little Flowers, of the Form of a birectangular spherical Triangle, with the base Convex upwards, and disposed alternately. It sits upon each Joint of the Branches, which is squamous, denticulated, and something acute, the Indentation serving for a Receptacle of the whole Fructification, and inclosing the lowest *Stamina*. The Empalement is a squamous Production of the Stalk, forming one Plane with it, when it withers. That of the upper, and as it were intermediate Flower, is rhomboidal, the inferior rectilinear Angle being acute, the upper curvilinear one obtuse: That of the 2 lower, or, if you please, lateral Flowers is triangular, the Base being a little broader.

It has no *Corolla*. There are 2 *Stamina*, placed opposite above and below the *Germen*, fixed to it's Base, and coming out of the Opening of the Empalement: The first rises up, and when that falls, the under one comes out; whence all the Botanists have ascribed but one *Stamen* to it. The *Filamenta* are like Threads, and lie within the Empalement. The Summits are oblong, erect, appearing out of the Empalement, doubled, so that at the first nice Inspection they represent a small quadrangular Body, hollow without, having their Sides rolled inwards longitudinally, with a Filament or Chive of equal Length, adhering to the Top of it on both Sides, and covering it closely, having their Base shut up for the most Part within the Cavity of the Empalement. A great Quantity of the genital *Farina* falls into that Cavity.

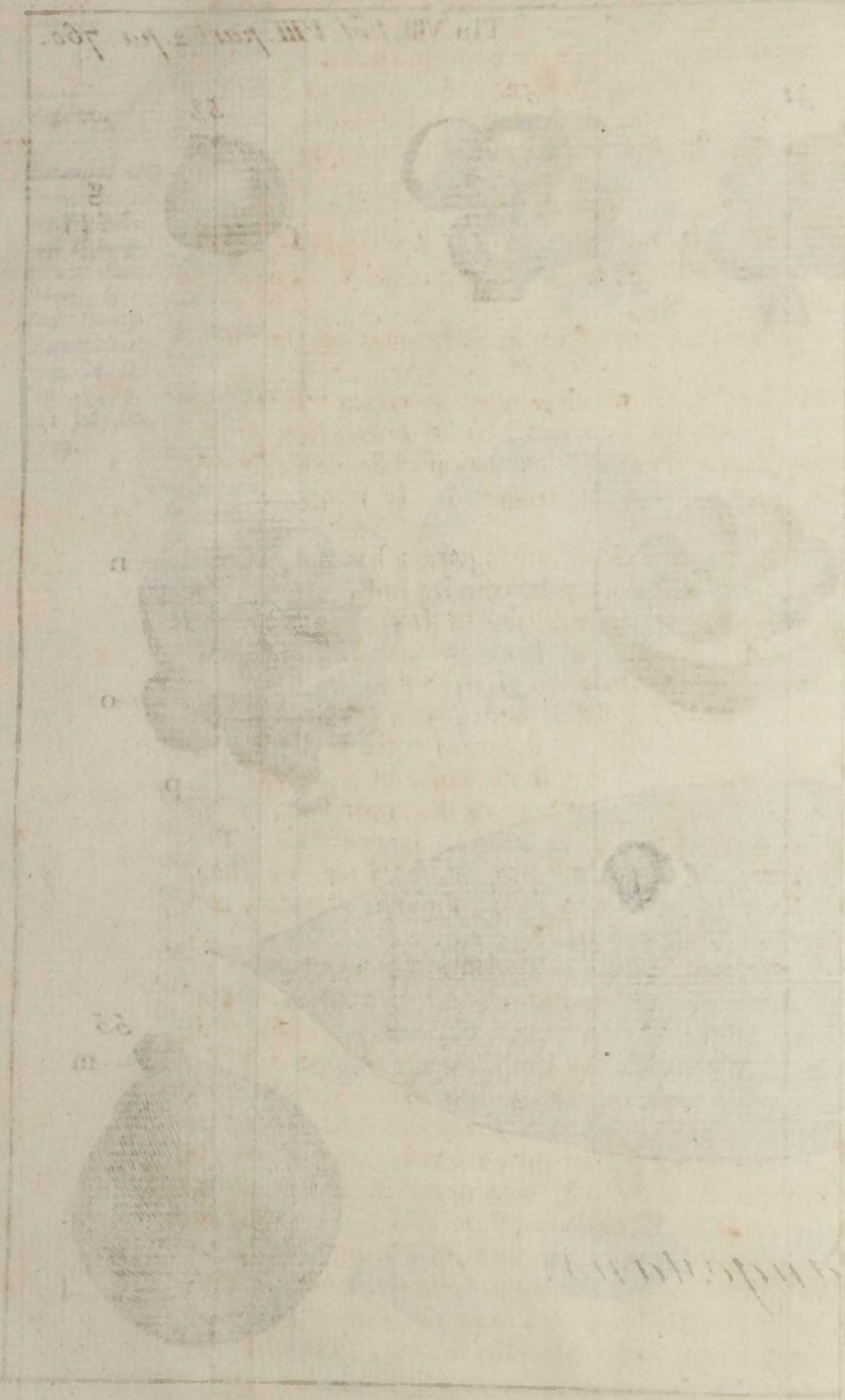
The *Pistillum* is a roundish, pointed Bud, placed between the Chives, and hid within the Empalement, of the same Length with the Chives. It has no Style. It's *Stigma* is capillary and acute.

The *Pericarpium* is a Vessel blown up like a Bladder, of an acuminate oval Shape, exactly resembling the Hood of the *Polytrichum Dillenii*, only more swelling downwards, and hid within the Empalement. It has one Seed, of a flat oval Shape, placed horizontally in the Vessel, furrowed



Mangostans.

The ... of ...



furrowed from the Base to the Middle, and fixed to the Rib of the Stalk by a very small Pedicle.

Observations. *a.* It grows commonly on the Shoar of the N. Sea, where the Soil is a fat Clay, such as we call *Schlick*, and sometimes sprinkled with the Salt Water. But as soon as the Earth is banked in, and deprived of the Nourishment of the Sea Salt, it disappears in a Year's Time.

b. It is used in Sallads, having a cooling Taste.

c. It flowers in *August*, and ripens it's Seeds in *Sept.* and *Oct.* The young Plants come up in *April*, and the Beginning of *May*. The Seed-Leaves are round, oblong, and succulent.

d. Therefore, in *Linnaeus's Systema Sexuale*, it belongs to the *Dian-dria Monogynia*.

e. There is another Species, of which a dried Specimen was sent me from *Salzdahl* in the Dutchy of *Brunswick*, by *Dr Franc. Ern. Bruckman*; it is very different from ours, and may be called *Salicornia, ramis imbricatis pyxidatis, squamis articulorum extantibus*. It seems to have been mentioned by several Authors.

f. Lastly, it appears, that the Genus of *Salicornia* has not hitherto been explained with sufficient Accuracy by any Botanist, witness *Linnaeus's* Fragment, in his *Charact. Gener. Plant. & Hort. Cliffort.* where he relates only the imperfect Sketches of *Tournefort* and *Magnol*.

2. *Verbascum foliis cordatis crenatis acutis glabris: floralibus ternis.*

It is a biennial Plant, flowering the second Year. It's Stalk is 7 or 8 Feet high, generally single, sometimes branched at the Bottom, very long, upright, round, covered with very short Hairs, of a lively Green, full of Leaves toward the Bottom, but towards the upper Part, where the Flowers begin to break forth, it is set with small *Foliola*. The Leaves of the first Year, and the lower ones of the Stalk, are sessile, half embracing the Stalk, ending in a Point, smooth, crenated, and indented, the Indentations being unequal.

The *Floralia* are 3, pointed, small, the middle one being twice or thrice as long as the lower one. The Flowers are generally 4 out of the same Bosom; one at the Top of the Stalk, the rest suffocated. The *Pedunculus* is much shorter than the Empalement, thick and single. The Empalement as in *Linnaeus*, cut into 5 at the Base; the Divisions being pointed and hairy. The *Corolla* as in *Linnaeus*. The Chives are pointed, the 3 upper ones being shorter than the rest, hairy all round: The 2 lower ones $\frac{1}{2}$ longer than the rest, bent upwards, and woolly in the middle of the inner Side. The *Summits* of the 3 shorter Chives are flat, plain, and sexangular, lying upon them in a triangular Form; those of the 2 longer Chives lie in a rectangular Figure, being also flat, plain, and sexangular. The *Pistillum* is a roundish Bud. The Style like a Thread, bending, a little longer than the Chives. The *Stigma* as in *Linnaeus*.

The *Pericarpium* is a sub-globous Vessel, having 2 Furrows from the Bottom to the Top, and divided into 2 Cells, &c. as in *Linnaeus*. The external Covering of it is an upright Empalement, embracing the Fruit. The Seeds are numerous, oblongo-quadrangular, truncated, most minutely wrinkled, and small. The *Receptacula* as in *Linnaeus*.

Observations. a. Therefore as to most of the Parts of Fructification, it is very like the fifth *Verbascum* of *Linnaeus*, *Hort. Cliff.* p. 55. In the rest it differs.

b. The Petals are yellow, their Nails being spotted with Purple. The Chives are purple within: Their Down is partly purple, and partly white.

c. The Seeds were sent me by my Friend Dr *Linnaeus* in 1738, under the Title of *Verbascum e Virginia*; and produced the Plants now described. They seem to want only housing in the Winter.

d. The Flower is open all the Morning the whole Summer.

e. Therefore the *Verbascum annuum, foliis oblongis sinuatis obtusis glabris Linn. Hort. Cliff.* 55. would be better named *Verbascum foliis oblongis sinuato-crenatis obtusis glabris, florali unica*: The chief specific Difference of which is, that it has but one floral Leaf, ovato-acuminated; one Flower; a very long *Pedunculus*, like a Thread, three Times as long as the Empalement; and a plain expanded Empalement under the Fruit.

3. *Senecio foliis pinnatifidis lacinulatis: Laciniis omnibus laxis patentissimis linearibus acutis. Jacobaea altissima, foliis Erucae Artemisiæve similibus & æmulis Rup. Jen.* 142.

The Stalk is as tall as a Man, round, or very slightly angular, slender, and smooth. The Leaves are alternate, pennatifid, smooth, with the Segments linear, very wide, loosely lacinated, sharp at the Point, set on a linear Rib: They are of a deep green Colour, something paler at the lower Part.

The Rays of the Flower are yellow, and rolled back; the Leaves of the Empalement are pressed to the rest at the Base.

Observations. a. I have called this Plant a *Senecio* according to *Linnaeus Gen. Plant.* 647.

b. It differs therefore in Species from *Linnaeus's Senecio foliis pinnatolyratis, lacinulatis Hort. Cliff.* 406.

4. *Illecebrum Lin. Coroll. Gen.* 947. *Rupp. Jen.* 79. *Corrigiola Dillen. Giff. Supp. Append.* 167.

The Empalement consists of 5 thick, erect, compressed Leaves, hollow on the Inside at the Top, and enduring. It has no *Corolla*. The *Stamina* consist of 5 Chives triangular and pointed, shorter than the Fruit within the Empalement, and round, erect, single Summits. The *Pistillum* is a sharp oval Bud, shorter than half the Empalement. It has no Style. The *Stigma* is single, turgid, and obtuse.

The *Pericarpium* is a very thin, oval, membranaceous Vessel, acuminated on each Side, single, univalve, gaping at the Top, and covered by

by the Empalement. It has one very large, shining, oval Seed, acuminated on each Side.

Observations. a. Therefore it belongs in *Linnaeus's Systema Sexuale* to the *Pentandria Monogynia*, and will be placed conveniently after *Achyranthis*, Genus 94.

b. I have discovered these Characters by 3 Years Observation of the Plant, which grows plentifully with us in moist sandy Places, where it spreads itself on the Ground.

5. *Ruppia foliis linearibus obtusis.*

The Plant swims upon the Sea Water; is bending, and perennial.

The Root is ramose, sending forth Bunches of Leaves; the Body of it is round, jointed, creeping, brown, solid, about the Thickness of a Pigeon's Quill, or something thinner; the Fibres are capillary and single, coming only out of the Joints, 1 or 2 Inches long, and whitish.

The Stalks resemble those of Grass, and come each out of a Branch of the Root; they are flat, loosely jointed, smooth, very weak, bending, floating, and on the Reflux of the Water lying on the Sand, sending forth compound Branches out of every sheathed Joint, in an alternate Order.

The sheathing Leaves are alternate, linear, vertically obtuse, longitudinally Parallelograms, smooth, mucous, deep Green, and with their Base fixed to the Joints of their Stalks, cover their Branches, and with their Leaves, like Daffodils. Toward the Extremity of each Branch, 2, 3, or 4 Leaves, placed parallel, are inclosed in one Sheath.

In most of the sheathed Leaves, which are longer than the Stalk itself, the Fructifications are hidden in the lower Half, within a compressed Opening. Above and below the Line of Fructification, there is a Joint, furrowed transversly, distinguishing it from the *Petiolus* below, and from the rest of the Leaf above.

The Empalement is an universal Covering, a Sheath supplying the Place of a *Spalva*, in the lower Half of the Leaf; it opens in the middle of it's Length, and one Side wraps a little over the other.

The *Spadix* within the *Involucrum* is membranaceous, white, flat, obtuse, the Sides being a little rolled up longitudinally, the middle having a slight *Carina*, looking toward the Back of the *Involucrum*, in Length $\frac{1}{2}$ of the *Involucrum*, or little longer, never reaching the End of it, inclosing from 9 to 13 Fructifications in 2 Rows.

It has neither *Corolla* nor Chives. The Summits are solitary, concealed within the Sheath before blowing, ovato-oblong, a little pointed on each Side, ascending obliquely, and adhering in 2 Rows lengthwise to the *Spadix*, in such a Manner, that one *Pistillum* seems to receive sometimes one, sometimes two Summits in the same Plane; but there is really one *Pistillum* to each *Summit*, sometimes hidden, and sometimes appearing. But being unfolded during the Time of flowering, by their lateral, elastick, membranaceous, transparent, expanded Wings, they are bent into the hollow Form of a Boat, the Keel being downwards,

and are so put over the *Pistilla*, that the Cavity of the *Involucrum* being opened, their under Part rises horizontally upwards, and they appear in Form of little Boats lengthwise outwards. The Body of the Summits is yellow, and has a *Mucus* upon it, which may easily be wiped off.

The *Pistillum* is a Bud, within the *Involucrum*, oblong, a little larger at the Base, where it is fixed to the *Spadix*. The Style within the *Involucrum* is simple, filiform, bending upward, enduring, after flowering parallel with the *Spadix*, and a little crooked. There are 2 very thin, capillary *Stigmata*, separated from each other, stretched horizontally without the *Involucrum*, soon withering and disappearing; so that the dusky ferrugineous Spot remaining may easily persuade any one, that there is but one *Stigma*.

The *Pericarpium* is a thin, membranaceous, cylindrical Husk, obtuse at the Base, having a Style at the Stop, being a little longer than the Style, parallel with the *Spadix*, free at the Base; fixed to the *Spadix* at the End of the Style, by Means of a very short little Pedicle.

In each Husk there is a single, cylindrical Seed, obtuse on both Sides, very nicely striated on both Sides, and white.

Therefore it belongs in *Linnaeus's Systema sexuale* to the *Gynandria Monandria*, but not at all to the *Gynandria Polyandria ejusd. ibid.* In the *Fragment. meth. nat. Linn. p. 506. Classum Plantar.* to the 48th Order, to which also *Naias* and *Zanichellia* seem to belong. In *Royen's System*, to the *Palmae spatha bifida*. See his *Flor. Leyd. Prodr. p. 9.*

It grows in the Salt Water, at the Island *Wangeroogen*, and other Islands situated in the Bay of the Northern Ocean, called *Wadt*. When the Tide comes in, it floats upon the Water; but when the Tide is gone out, it lies upon the tenacious Clay, in which it's Root is fixed.

It is a Wonder, that a Plant so common in maritime Places, the Leaves of which, in *Aug.* and *Sept.* are cast upon the Shoar in great Abundance, has never been either described or figured, unless perhaps by an *English* Botanist. It seems to belong to the *Genus* of *Ruppia*, if the Character of it, as given by *Linnaeus*, only from a dried Specimen, as the Mark † denotes, but a little enlarged. Should it rather be a new *Genus*?

6. *Hippuris* Linn. Gen. 1.

It has neither Empalement nor *Corolla*.

The *Stamen* is one thick, pointed Chive, deciduous, of near the same Length with the Summits, and sitting on the Bud. The Chive is double, bisulcated in each Segment behind, a little longer than the Bud and Chive, thick and fleshy.

The *Pistillum* is an oblong Bud below the Chive. It has one thin, filiform, erect Style, with the Point bending outwards, rising within, by the Side of the Chive, from the Top of the Bud, longer than the Chive, and withering. The *Stigma* is very sharp-pointed.

It has no *Pericarpium*; but one, oblong, naked Seed, containing a small Kernel in a hard Shell.

Observations. 1. It flowers in June and July, and perfects it's Fruit in Aug. and Sept. It grows plentifully in fossis Feveranis, near Embden in East-Friezland, &c.

2. There is a Variety with red Chives, which is more plentiful; and another with whitish herbaceous Chives, which is more rare.

3. Therefore those Margins described by Linnæus under the Empalement are really Summits, as appears evidently by a good Glass.

Fig. 60. The Flower seen at the fore Part, that the Filamentum or Chive may appear. a. The Chive. b b. The Summits seen on the fore Part.

Fig. 61. The Flower seen on the back Part, that the Pistillum may appear. c c. The Summits seen on the back Part, to shew the Furrows. d d. The Germen or Bud. e. The Style with it's Stigma.

Fig. 62. The Seed. f. The Seed almost ripe. g. The Stile withering, bent above the Seed.

IV. "Whether the Scurvy-grass of Greenland be the same Species, as to it's external Appearance, with the common Scurvy-grass of England? And, having no acrid Taste while growing in Greenland, doth it, being brought growing in Earth from Greenland, gradually acquire an acrid Taste, as it is brought into a warmer Climate?"

S I R,

London, Dec. 16, 1730.

I communicate this as Matter of Truth, and not Hypothetick, viz. that the Scurvy-grass in Greenland, equally the same with ours in England, as to the Figure of the Plant, and all it's Appearance to the Eye, changes it's Nature much, as it approaches the Sun; for in that Climate, it's principal Quality, the volatile Salt; is neither pungent nor perceivable; but to the Taste, the whole Plant is entirely as insipid as the Colwort or Beet. So by my Endeavour, I preserved some Plants with their natural Earth, and brought them to London alive; and I observed the remarkable Change produced by the Sun's Heat on them; for the saline Matter in Greenland, which certainly was analogous to a fixed Salt, became, in a Month's Time, almost to the same Volatility as that which naturally grows in England.

This I make mention of, in case other Gentlemen, who have had the same Opportunity, have been remiss in their Curiosity.

David Nicolson.

V. The Tree from which the Jesuits Bark is cut, grows in Peru, and is found most commonly in the Provinces of Loxa, Ayavaca, and Quenca, which are situated between two and five Degrees of S. Lat. This Tree is tall, and has a Trunk rather bigger than a Man's Thigh, tapering from the Root upwards, has no Boughs or Branches till near it's Top, which grow as regular as if lopped artificially, and with the Leaves form exactly the Figure of a Hemisphere: It's Bark is of a blackish Colour on the Outside, and sometimes mixed with white Spots, whence commonly

Explanation of the Figures drawn by a good Microscope.

Fig. 60.

Fig. 61.

Fig. 62.

A Query proposed to such curious Persons as use the Greenland Trade, occasioned by the annexed Letter from Mr David Nicolson, Surgeon, to Dr Mortimer, Sec. R. S. No. 456. p. 317. Jan. &c. 1740.

An Account of the Peruvian or Jesuits Bark, by Mr John Gray, F. R. S. now at Cartagena in the Spanish West-Indies; extracted from some Papers

given him by
Mr William
Arrot, a
Scotch Surgeon,
who had gathered it at the
Place where it
grows in Peru.
No. 446 p. 81.
July, &c.
1737.

commonly grows a Kind of Moss, called by the Spaniards, *Barbas*; it's Leaves resemble much the Leaves of our Plum-Tree, of a darkish green Colour on their upper or concave Side, and on their lower or convex Side, reddish: It's Wood is as hard as our common *English Ash*, and rather tough than brittle.

There are 4 Sorts of the Bark of this Tree, to which the Spaniards give the following Names, *viz.* *Cascarilla colorada*, or reddish Bark; *amarylla*, yellowish; *crespilla*, curling; and *blanca*, whitish: But Mr *Arrot* could only find two different Sorts of the Tree, and he believes that the other two Sorts of the Bark are owing to the different Climates where it grows, and not to a different Species of the Tree. The Bark called *colorada* and *amarylla*, is the best, and differs from the *blanca* in this, that the Trunk of the former is not nigh so big as that of the latter, the Leaves as described above; whereas those of the *blanca* are larger, and of a lighter green Colour, and it's Bark has a very thick spongy Substance, whitish on the Outside, and is so tough, that it requires the Force of an Ax to slice it from the Tree: It is true, indeed, it is as bitter when cut down as the best Sort, and has then the same Effect in intermitting Fevers; but when dry and long kept, turns quite insipid and good for nothing: And it is to be observed, that both Sorts have a much surer and quicker Effect in Cures when green, than when dry. As the bad Sort is in great Plenty, and the best very scarce and hard to be come at, large Quantities of it are cut yearly, and sent with a little of the fine Bark to *Panama* for *Europe*.

The Tree of the *crespilla* is the same with that of the *amarylla* and *colorada*, but grows in a cold frosty Climate; by which Means the Bark is not only altered in it's Quality, but is also whitish on the Outside, though Cinnamon-coloured within, and ought in Medicines to be rejected. This Sort and the *blanca* grow plentifully in the Province of *Ayavaca*, 50 Leagues from *Piura*, and 62 from *Payta*, a Port in the *South-Sea*; as also in *Cariamango*, *Gonsonama*, and *Ximburo*, whence they commonly send it to *Payta*, and there sell it as the best. The *blanca* likewise grows in the Province of *Quenca*, and in the Mountains of *Caxamarea*: But the true and genuine fine *Jesuits Bark*, which is of a reddish or yellowish Colour, is only found from 5 to about 14 Leagues round the City of *Loxa*, in the Province of *Loxa*, called generally by the Spaniards, *Provincia de las Calvas*. This City is situated between two Rivers, that run into the great River *Marannon*, or of the *Amazons*, and lies about 100 Leagues from *Payta*, and in a direct Line about 110 Leagues S E from *Guayaquil*, though by the common Road near 200. The Places about *Loxa*, where this fine Sort is found, are, *La Sierra de Caxanuma*, *Malacatos*, *Yrutasinga*, *Yangana*, *Mansanamace*, *La Sierra de Boqueron*, and a Place called *Las Monsas*.

The Bark-Trees do not grow all together in one Spot, but intermixed here and there with many others in the Woods; it happens, indeed, sometimes, that Clusters of them are found together, though
at

at present they are much scarcer than in former Times, a great many of the fine large Bark-Trees having been entirely cut down, that their Bark might the more easily be sliced off.

The Soil where the best Sort thrives, is generally in red clayey or rocky Ground, and very frequently on the Banks of small Rivers descending from high Mountains.

That this Tree flourishes and bears Fruit at the same Time all the Year round, is certainly owing to the almost uninterrupted Rains, that fall in those high Mountains where it grows, which continue with little or no Intermission: Although about 3 or 4 Leagues down in the low Country, where it is excessive hot, there are wet and dry Seasons, as in other hot Countries, the Rains beginning in *December*, and ending in *May*; this Season the *Spaniards* who live there call *Temporal*, and it is general all thereabouts; whereas what they call *Paroma*, is a cold rainy Season, that lasts in all the mountainous Places of these Countries from *June* to *Nov.* but especially in the City of *Loxa* and Places adjoining, where Mr *Arrot* has passed 25 or 30 Days without seeing the Sun once, and felt the Air so extremely cold, that he was obliged always to be wrapped up in his Cloak, and to be in continual Motion to keep himself warm. Such excessive Cold so near the Line, appears to *Europeans* incredible; but many Places in these Latitudes are so, by their Situation and Vicinity to high Mountains.

The properest Season for cutting the Bark is from *Sept.* to *Nov.* the only Time in the whole Year of some Intermission from Rain in the Mountains. Having discovered a Spot where the Trees most abound, they first build Huts for the Workmen, and then a large Hut wherein to put the Bark, in order to preserve it from the Wet; but they let it lie there as short Time as possible, having before-hand cut a Road from the Place where the Trees grow, through the Woods, sometimes 3 or 4 Leagues, to the nearest Plantation or Farm-house in the low Country, whither, if the Rain permits them, they carry the Bark forthwith to dry. These Preparations made, they provide each *Indian* (they being the Cutters) with a large Knife, and a Bag that can hold about 50 Pounds of green Bark: Every two *Indians* take one Tree, whence they cut or slice down the Bark, as far as they can reach from the Ground; they then take Sticks about half a Yard long each, which they tie to the Tree with tough Withs at proper Distances, like the Steps of a Ladder, always slicing off the Bark, as far as they can reach, before they fix a new Step, and thus mount to the Top, the *Indian* below gathering what the other cuts: This they do by Turns, and go from Tree to Tree, until their Bag is full, which, when they have Plenty of Trees, is generally a Day's Work for one *Indian*. As much Care as possible must be taken that the Bark is not cut wet; should it so happen, it is to be carried directly down to the low Country to dry; for otherwise it loses it's Colour, turns black, and rots; and if it lie any Time in the Hut without being spread, it runs the same Risque: So that while the

Indians:

Indians are cutting, the Mules (if the Weather permits) ought to be carrying it down to the Place appointed for drying it, which is done by spreading it in the open Air, and frequently turning it.

Mr *Arrot* had the Curiosity to send above 50 *Seroons* from the Woods to the City of *Loxa*, where he put it into a large open House, and dried it under Cover, never exposing it either to the Sun or Night Air, imagining that the Sun exhaled a great many of it's fine Parts, and that the Night Air, or *Serene*, was very noxious to it; but he found the Colour of the Bark thus cured, not near so bright and lively as that dried in the open Air. He is of Opinion, that a very short Time will put an End to this best Sort, or, at least, it will be extremely hard to be got, by reason of it's Distance from any inhabited Place, the Impenetrability of the Woods where it grows, and the Scarcity of the *Indians* to cut it, who, by the *Spaniards* hard Usage and Cruelty, are daily diminishing so fast, that in a very few Years their Race in that Country will be quite extinct.

Mr *Arrot* says, that the small Bark which curls up like Sticks of Cinnamon, (and which in *England* is much esteemed, as being cut off the Branches, and therefore reckoned better and more effectual in curing Fevers) is only the Bark of the younger Trees, which, as it is very thin, curls in that Manner; and that the Bark of the Branches would not compensate the Trouble and Expences of cutting. He also told me, that after the Bark is cut off any Tree, it requires at least 18 or 20 Years to grow again; which is directly contrary to what Dr *Oliver* says*. He added besides, that it's Fruit is no Ways like a Chesnut, as the Doctor informs us in the same Paper; but rather like a Pod, which incloses a Seed somewhat like a Hop-seed, and that he had sent some of them to *England*.

He could not tell me by what Artifice or Stratagem the *Jesuits* have got this Bark to be called after them, if not that they carried it first into *Europe*, and gave themselves out as the first Discoverers of it's Virtues: But he assured me, that the current Opinion at *Loxa* is, that it's Qualities and Use were known by the *Indians* before ever any *Spaniard* came among them; and that it was by them applied in the Cure of intermitting Fevers, which are frequent over all that wet unhealthy Country.

A Catalogue of Plants observed in the Tyrol Alps at the beginning of Sept. by Balthazar Ehrard, M.D. No. 458. p. 51. Sept. &c.

VI. *Acetosa lanceolata, Alpina, rotundi folia* N. Round-leaved Sheeps-Sorrel of the Alps.

Acini pulchra species J. B. 3. 260. Broad-leaved *Austrian* wild Basil.

Cacalia tomentosa C. B. 198. Woolly strange Colts-Foot.

Cardamine Alpina Clus. Pannon. Alpine Ladies-Smock.

Caryophyllata Alpina Chamædryos folio Boerb. 45. Mountain Avens, with Germander Leaves.

Cotoneaster J. B. 1. 73. Dwarf Medlar.

* Vol. IV. Part ii. Chap. 5. §. 14.

Crataegus folio subrotundo, serrato, subtus incano Tourn. 633. The white Beam-Tree.

Daucus montanus, multifido longoque folio C. B. Mountain Lovage, with a long, divided Leaf.

Diospyros J. B. 1. 75. *I. Myrtomelis Gesneri.*

Doria quæ Jacobæa Alpina C. B. Prod. 66. Alpine Doria.

Erica arborescens, floribus luteolis vel herbaceis J. B. 3. 356. Besome Heath.

Horminum luteum glutinosum C. B. 238. Yellow Clary, or Jupiter's Distaff.

Larix folio deciduo conifera J. B. The Larch-Tree.

Chamærhododendros Alpina villosa T. 604. Hairy Mountain Cistus.

Quinquefolium album 1. Clus. White-flowered Mountain Cinquefoil.

Pinaster Alpinus pumilio Clus. Pannon. Dwarf Mountain Pine.

Sedum minus flore luteo J. B. 694. The most ordinary yellow Prick-madam, or Stone-crop.

Siler montanum minus Boerb. 52. Small narrow-leaved Sermountain.

Vitis Idæa foliis oblongis albicantibus C. B. 470. Bilberry with long hoary Leaves.

Gallium saxatile supinum, molliore folio A. R. P. 1714. Supine Rock-Ladies Bedstraw, with a softer Leaf.

VII.

N^o 436. p. 1. — — — — — Ann. 1733. 551. *Abrotanum mas, angustifolium, majus* C. B. 136. Common Sothernwood.

— — — — — 552. *Abrotanum mas, angustifolium, segmentis foliorum tenuissimis.* Sothernwood with very fine Segments.

N^o 440. p. 173. — — — — — 1734. 601. *Absinthium insipidum, Absinthio vulgari simile* C. B. 139. Wormwood without Scent.

— — — — — 602. *Absinthium maritimum album* Ger. emac. 940. *Absinthium Romanum* Offic. Lond. *ramulis expansis.* English Sea Wormwood.

— — — — — 603. *Absinthium maritimum, ramulis & capitulis erectis.* Sea Wormwood with upright Branches and Heads.

— — — — — 604. *Absinthium maritimum, fruticosius: ramulis erectis; tenuissime divisis foliis.* Shrubby Sea Wormwood, with upright Branches, and finely divided Leaves.

N^o 445. p. 1. — — — — — 1735. 651. *Abutilon Althæodes; flore carneo, fructu globoso.* Hort. Elt. T. 1. Yellow

A Catalogue of Plants presented to the R. S. by the Comp. of Apothecaries of London, pursuant to the Direction of Sir Hans Sloane, Bart. by Mr Isaac Rand, Apothecary, F. R. S.

A Catalogue of Plants.

- Mallow resembling Marsh-Mallow, with a Flesh-coloured Flower, and a globose Fruit.
- N^o 447. p. 143. Ann. 1736. 701. *Abutilon, Lavatera flore, fructu cristato.* Hort. Elt. 3. Yellow Mallow, with a *Lavatera* Flower, and a crested Fruit.
- N^o 471. p. 620. — 1740. 901. *Acanthus sativus, vel mollis Virgilii* C. B. 383. Brank-ursine, or Bear's-Breech.
- — — — — 902. *Acanthus aculeatus* C. B. 383. Prickly Brank-ursine.
- — — — — 903. *Acanthus spinis mitioribus* Pluk. *Almagest.* 6. Brank-ursine with milder Prickles.
- N^o 457. p. 406. — 1739. 851. *Acarna major, caule folioso* C. B. 379. The greater Fish-thistle with winged Stalks.
- N^o 452. p. 1. — 1737. 751. *Acetosa Ægyptia, roseo seminis involucro, folio lacero,* Lippi. *D. Shaw Phyt. Afr. Spec.* N^o 5. Egyptian Sorrel, with a Rose-coloured Covering to the Seed, and a jagged Leaf.
- — — — — 752. *Adiantum nigrum, radice prælonga, arbores annosas perreptante.* Grif. Virid. Lusitan. *Filicula Lusitanica, Polypodii radice* T. *Inst.* 541. Black Maiden-Hair of Portugal, with a Polypody Root.
- — — — — 753. *Admirabilis Peruviana, flore rubro* Clus. *rar. Plant. Hist. Lib. V. p. 89.* Sloane Cat. Jam. 91. Marvel of Peru, with a red Flower.
- N^o 456. p. 291. — 1738. 801. *Adonis Hellebori radice, Buphtalmi flore* H. L. Bat. Fennel-leaved black Hellebore.
- N^o 431. p. 199. — 1732. 501. *Alkekengi Americanum, foliis sinuatis hirsutum.* a D. Houston. Hairy American Winter Cherry, with sinuated Leaves.
- N^o 447. p. 143. — 1736. 702. *Alysson Alpinum hirsutum luteum* T. *Inst.* 217. *Leucoium luteum aizoides montanum.* Column. 2. 62. Yellow Alpine *Alysson*, with hairy Leaves.
- — — — — 703. *Amygdalus sativa* C. B. 441. The Almond-Tree.

- N^o 453. p. 1. Ann. 1737. 754. *Androsenem maximum frutescens*
C. B. 280. Tutlan, or Park-Leaves.
- N^o 456. p. 291. — 1738. 802. *Anonis Alopecuroides, mitis, annua,*
purpurascens H. *Elt.* 28. Purple,
annual, mild, Fox-tail Rest-harrow.
- N^o 445. p. 1. — 1735. 652. *Anonis Americana supina, Medica-*
ginis facie; siliquis latis, planis. Su-
pine, American Rest-harrow, like
Moon-trefoil, with broad, plain Pods.
- N^o 447. p. 103. — 1736. 704. *Anonis Caroliniana, ramosissima, e-*
recta; floribus albis, laxe spicatis; si-
liquis inflatis. Upright, branched
Rest-harrow of Carolina, with loose
Spikes of Flowers, and inflated
Pods.
- N^o 436. p. 1. — 1733. 553. *Anonis flore minimo; siliquis crassis,*
in foliorum alis sessilibus. *Ononis lutea,*
sylvestris, minima Colum. *Ecpb.* 104.
Small yellow Rest-harrow.
- N^o 471. p. 620. — 1740. 905. *Anthora* Off. *Aconitum salutife-*
rum, sive Anthora C. B. Salutory
Wolfs-Bane.
- N^o 431. p. 199. — 1732. 502. *Antirrhinum angusti folium, majus,*
peregrinum, ruberrimo flore H. *Reg.*
Par. Large, narrow-leaved Snap-
dragon, with red, deep Flowers.
- N^o 471. p. 610. — 1740. 904. *Antirrhinum angusto folio, Linariae*
eleganter variegato, flore rubro, riçtu
luteo Boerb. Striped Snap-dragon.
- N^o 431. p. 199. — 1732. 503. *Antirrhinum arvense, majus, Ita-*
licum, majore flore, ex albo purpu-
rascente. Great Italian, Field Snap-
dragon, with a purplish white Flower.
- — — — 504. *Aparines folio anomala; vasculo*
seminali rotundo, multa semina minu-
tissima continente Sloane *Cat. Jam.*
p. 50. *Hist. Tab.* 7. f. 4.
- N^o 471. p. 620. — 1740. 906. *Aphata* Park. *Lathyrus luteus, an-*
nuus, foliis Convolvuli min. *Mor.*
Yellow Vetchling.
- N^o 440. p. 173. — 1734. 605. *Apium dulce, radice rapacea* D.
Jussieu. Sweet Parsley, with a Tur-
nep Root.
- — — — 606. *Apium Macedonicum* C. B. 154.
Petroselinum Macedonium *Officin.* Ma-
cedonian Parsley.

- N^o 440. p. 173. Ann. 1734. 607. *Apium Pyrenaicum Thapsiæ facie*
T. Inst. 305. Pyrenean Parsley, with
the Face of Deadly-carrot.
- — — — — 608. *Apium Thapsiæ facie, majus & elatius. Apium petraeum, sive montanum album* J. B. *Parisiensium*. Greater Parsley, with the Face of Deadly-carrot.
- — — — — 609. *Apium Thapsiæ facie, medium*. Middle Parsley, with the Face of Deadly-carrot.
- N^o 431. p. 199. — 1732. 505. *Apocynum Americanum, Euonymi folio, flore ex albo virente.* a D. Houston. American Dogs-Bane, with a Spindle-Tree Leaf, and a greenish white Flower.
- N^o 452. p. 1. — 1737. 755. *Aralia Canadensis* T. Inst. 300. *Panaces κάρπιμον sive racemosa, Canadensis* Cornut. 74. Canada Berry-bearing Angelica.
- N^o 445. p. 1. — 1735. 653. *Aristolochia rotunda, flore ex purpura-nigro* C. B. Round Birthwort.
- N^o 440. p. 174. — 1734. 610. *Asclepias albo flore* C. B. Pin. 303. *Asclepias, sive Vincetoxicum multis, floribus albicantibus* J. B. 2. 138. *Vincetoxicum* Dod. Pempt. 407. Swallow-wort.
- — — — — 611. *Asclepias angustifolia, flore flavescente* H. R. Par. Narrow-leaved Swallow-wort, with yellow Flowers.
- — — — — 614. *Aster Americanus, latissimo, aurito, & serrato folio, floribus albidis, umbellatim dispositis.* An Aster Canadensis, *foliis imis amplioribus cordatis & serratis* D. Sarrazin. *Ac. Reg. Par. 1720?* American Starwort, with a very broad, eared, and serrated Leaf, and white Flowers, disposed in Umbels.
- — — — — 615. *Aster Americanus, præcox, angustifolius, parvo albente flore.* Narrow-leaved, early, American Starwort, with a small, whitish Flower.
- — — — — 613. *Aster annuus, foliis variis, flore amplo, peramene purpureo.* *Kiang-sita Sinensis* D. Jussieu. *Aster Chenopodii*

- podii folio, annuus, flore ingenti speciosus.* Annual Starwort with various Leaves, and a fine purple Flower.
- N° 440. p. 174. Ann. 1734. 616. *Aster Novæ Angliæ, Linariæ foliis, Chamæmeli floribus* Par. Bat. 96. *New-England Starwort*, with Toad-flax Leaves.
- — — — — 612. *Aster ramosus, annuus, Canadensis* Tourn. Inst. 482. Branched, annual Starwort of Canada.
- — — — — 617. *Aster Virginianus, latifolius, præcocior, purpurascente parvo flore* Park. Theat. *Asteriscus latifolius autumnalis* Cornut. 64. The earlier broad-leaved purplish *Virginian Starwort*.
- N° 431. p. 199. — 1732. 506. *Asteriscus annuus, Lusitanicus, odoratus* Boerb. Ind. Alt. 105. *Portugal sweet-smelling, annual Asteriscus.*
- N° 456. p. 291. — 1738. 803. *Asteriscus Coronæ Solis flore & facie* H. Elt. 42. *Asteriscus* with the Flower and Face of Sun-flower.
- N° 431. p. 199. — 1732. 507. *Astragalus humilis, Ornithopodii foliis, villosis, siliquis propendentibus, brevibus, in spicam congestis.* Low Liquorice-vetch, with hairy Leaves of Birds-foot-trefoil, and short, hanging Pods, gathered into a Spike.
- N° 457. p. 406. — 1739. 852. *Astragalus, perennis, hirsutus, Alopecuroides, Galegæ foliis, floribus luteis.* Hairy, perennial, Fox-tail Liquorice-vetch, with Goat's Rue Leaves, and yellow Flowers.
- N° 452. p. 1. — 1737. 756. *Astrantia major, corona floris candida* T. Inst. 314. *Black Masterwort*, with a white Flower.
- — — — — 757. *Astrantia major, corona floris purpurascente* T. Inst. 314. *Black Masterwort* with a purplish Flower.
- N° 445. p. 1. — 1735. 654. *Atriplex Halimoides, latifolia, dentata.* Broad-leaved indented Orrach.
- N° 457. p. 406. — 1739. 853. *Baubinia non aculeata, folio subrotundo, bicorni, floribus albis* D. Houston. *Baubinia* without Prickles, with a roundish, two-horned Leaf, and white Flowers.

N° 431.

A Catalogue of Plants.

- N^o 431. p. 1. Ann. 1732. 508. *Betonica Calpensis, longiore folio.*
An *Betonica rubicundissimo flore, Montis aurei H. R. Par?* Long-leaved
Betony.
- — — — — 509. *Betonica major Danica Park. Theat.*
615. Great Betony of Denmark.
- N^o 452. p. 1. — 1737. 758. *Betonica Orientalis, folio angustis-*
simo & longissimo, spica florum crassiori.
T. Cor. 13. Oriental Betony, with
a very narrow, long Leaf, and a
thick Spike.
- N^o 431. p. 199. — 1732. 510. *Betonica purpurea C. B. 231.*
Wood Betony.
- N^o 457. p. 406. — 1739. 854. *Bidens Americana, flore albo ra-*
diato; foliis inferioribus trilobatis, su-
perioribus subrotundis, acute crenatis.
American *Bidens*, with a white, ra-
diated Flower, and various Leaves.
- N^o 431. p. 199. — 1732. 511. *Bidens Americana, graminifolia &*
ramosissima. Hieracium fruticosum, an-
gustissimis, gramineis foliis, capitulis
parvis. Sloane Hist. Vol. I. 255.
Tab. 249. f. 3. Branched, Grass-
leaved, American *Bidens*.
- — — — — 512. *Bidens Americana, trifolia & quin-*
quefolia; flore albo, amplo, radiato.
An *Bidens trifolia, Americana, Leu-*
cantemi flore. T. Inst. 462? Tri-
foliated, and quinquefoliated Ame-
rican *Bidens*, with a large, white,
radiated Flower.
- N^o 447. p. 143. — 1736. 705. *Bidens Americana, triphylla; flore*
barbulis latis, albis radiato. Trifo-
liated American *Bidens*, with a Ray
of broad, white Semiflorets.
- — — — — 706. *Bidens Americana, triphylla; flore*
luteo, capite folioso. An *Bidens Ca-*
nadensis latifolia, flore luteo T. Inst.
461? Trifoliated American *Bidens*,
with a yellow Flower, and a leafy
Head.
- N^o 452. p. 2. — 1737. 759. *Bidens Americana, triphylla, foliis*
angustis, acutis. Chrysanthemum Vir-
ginianum, folio acutiore, lævi, trifo-
liato; seu Anagyridis folio. H. Ox.
111. p. 21. Trifoliated American
Bidens,

Bidens, with narrow, sharp-pointed Leaves.

N^o 457. p. 406. Ann. 1739. 855. *Bidens latifolia, hirsutior, semine angustiore, radiato* H. *Elt.* p. 51. Broad-leaved, hairy *Bidens*, with a narrow, radiated Seed.

— — — — — 856. *Bidens scabra, flore niveo, folio Panduræformi* H. *Elt.* p. 54. White flowered, rough *Bidens*.

— — — — — 857. *Bignonia Americana, Fraxini folio, flore amplo phæniceo.* T. 164. Scarlet Trumpet-Flower.

— — — — — 858. *Bignonia Americana, Fraxini folio, minor; flore coccineo.* Small Scarlet Trumpet-Flower.

N^o 471. p. 620. — 1740. 907. *Brassica campestris, persoliata, alba* C. B. Coddled Thorow-wax.

N^o 436. p. 1. — 1733. 551. *Bupthalmum Creticum, Corulæ facie, flore albo* Breyn. *Cent.* 1. f. 75. Camomile-like Ox-Eye.

N^o 447. p. 143. — 1736. 707. *Bupleurum arborescens, Salicis folio* T. *Inst.* 310. *Seseli Æthiopicum frutex* Dod. 312. Shrub Hartwort of Ethiopia.

— — — — — 708. *Calamintha, Pulegii odore, sive Nepeta* C. B. 228. *Calamintha Officin.* Lnd. Field Calamint.

— — — — — 709. *Calamintha vulgaris, vel Officinarum Germaniæ* C. B. 228. Common Calamint.

— — — — — 710. *Calcitrapoides-procumbens, Cichorii folio, flore purpurascete.* D. D'Isnard. *Mem. Ac. Reg. Anno 1719.* Procumbent *Calcitrapoides*, with a Succory Leaf, and a purplish Flower.

N^o 457. p. 407. — 1739. 859. *Calendula minor arvensis* H. L. Bat. Small Field Marigold.

— — — — — 863. *Camara Americana, foliis parvis, subrotundis; floribus foliolis intercep- tis.* *Camara* with small, roundish Leaves; and little Leaves between the Flowers.

— — — — — 864. *Camara Americana, Salviæ foliis, mucronatis; floribus luteis.* *Camara* with pointed, Sage Leaves, and yellow Flowers.

N^o 457.

N^o 457.

- N^o 457. p. 407. Ann. 1739. 861. *Camara Americana, Urticæ folio, floribus miniatis.* Nettle-leaved *Camara*, with scarlet Flowers.
- — — — — 860. *Camara Americana, Urticæ foliis latioribus, spinosa, floribus miniatis.* Prickly Nettle-leaved *Camara*, with broader Leaves, and a scarlet Flower.
- — — — — 862. *Camara Americana, Urticæ foliis minoribus, flore vario.* Nettle-leaved *Camara*, with a various Flower.
- N^o 447. p. 144. — 1736. 711. *Campanula Canariensis, Atriplicis folio, tuberosa radice.* T. Inst. 109. Canary Bell-Flower, with Orach Leaves, and a tuberose Root.
- N^o 452. p. 2. — 1737. 760. *Campanula pentagonia, perfoliata,* Morif. H. Ox. 11. 457. Perfoliated Bell-Flower.
- N^o 447. p. 144. — 1736. 712. *Campanula pratensis, flore conglomerato* C. B. 94. Little Throatwort, or Canterbury Bells.
- N^o 445. p. 1. — 1735. 655. *Canella alba, cujus cortex est Cortex Winteranus Officin. Lond. Arbor baccifera, laurifolia, aromatica, fructu viridi, calyculato, racemoso* Sloan Hist. Jam. T. 191. f. 2. Winter's Bark, or wild Cinnamon-Tree.
- — — — — 656. *Cannabina Cretica fructifera* T. Cor. 52. Fruit-bearing *Cannabina* of Candy.
- N^o 471. p. 620. — 1740. 908. *Cannabis sativa alba* Off. Hemp.
- N^o 457. p. 407. — 1739. 865. *Caprifolium Germanicum* Dod. Dutch Honey-Suckle.
- N^o 431. p. 200. — 1732. 513. *Cardamine annua, glabra, parvo flore, foliis vix sinuatis.* Smooth, annual Ladies-Smock, with a small Flower, and Leaves hardly sinuated.
- — — — — 514. *Cardamine Sicula, foliis fumariæ* T. Inst. 224. Sicilian Ladies-Smock, with Fumitory Leaves.
- N^o 456. p. 291. — 1738. 804. *Carduus galactites* J. B. III. 54. J. Baubinus's Milk-Thistle.
- N^o 447. p. 144. — 1736. 713. *Carduus humilis alatus, sive Carduus Mariæ annuus; folio lituris obscuris notato* H. C. Boerb. Ind. alt. 136. Annual Milk-Thistle, with obscure Streaks.

- N° 456. p. 291. Ann. 1738. 805. *Caryophyllata Alpina lutea* C. B. 322. Yellow Alpine Avens.
- N° 431. p. 200. — 1732. 515. *Cassia herbacea, Pseudoacaciae foliis a D. Collinson. Cassia Marylandica; pinnis foliorum oblongis, calyce floris reflexo* Martyn. *Hist. Plant. rar. Dec. III. N° 1.* Cassia of Maryland, with oblong Lobes, and a reflexed Empalement.
- N° 471. p. 620. — 1740. 911. *Cassida Alpina supina magno flore* T. Cor. Supine, Mountain Skull-Cap, with a large Flower.
- N° 452. p. 2. — 1737. 761. *Cassine vera perquam similis, Arbuscula Phillyreae foliis antagonistis. Ex Provincia Caroliniensi.* Pluk. *Mantiss. p. 40. Phytogr. Tab. 381. Fig. 3.* The Cassioberry Bush.
- N° 471. p. 620. — 1740. 909. *Centaurium majus foliis in plures lacinias divisis* C. B. Off. Great Centory.
- N° 452. p. 2. — 1737. 763. *Cepa Ascalonia* Matthiol. 556. Eschalottes.
- — — — — 762. *Cepa fissilis* Matthiol. 555. Ciboule.
- N° 456. p. 291. — 1738. 806. *Chamaelæa tricoccus* C. B. 46e. Widow-Wail.
- N° 431. p. 200. — 1732. 516. *Chamæmelum trimestre, nudum, capitulis minimis.* Naked Camomile, with very small Heads.
- N° 457. p. 407. — 1739. 866. *Chenopodio-morus media, foliis argute dentatis.* Middle Mulberry-Blite, with sharp-pointed Leaves.
- N° 456. p. 291. — 1738. 807. *Chenopodium Ambrosioides, folio sinuato* T. 506. Oak of Jerusalem.
- — — — — 808. *Chenopodium Ambrosioides Mexicanum* T. 506. Mexican Oak of Jerusalem.
- N° 452. p. 2. — 1737. 764. *Chenopodium Ambrosioides Mexicanum fruticosum.* Shrubby Mexican Oak of Jerusalem.
- N° 457. p. 407. — 1739. 867. *Chenopodium Botryos folio, subtus candicante. Atriplex sylvestris* II. Tab. Icon. 407. Goose-Foot, with an Oak of Jerusalem Leaf, hoary underneath.

A Catalogue of Plants.

- N^o 457. p. 407. Ann. 1739. 868. *Chenopodium folio laciniato, majus.*
Pes Anserinus Fuchsi. Great Goose-
 Foot, with a jagged Leaf.
- — — — — 869. *Chenopodium folio sinuato, candi-*
cante T. 506. *Atriplex sylvestris* Tab.
 Icon. 406. Common wild Orache.
- — — — — 870. *Chondrilla Sonchi folio, flore luteo*
palescente T. 475. Ivy-leaved Let-
 tuce.
- N^o 452. p. 2. — 1737. 765. *Christophoriana Americana proce-*
rrior, & longius spicata Dillen. H. *Elt.*
 Tab. 67. Tall American Herb Chri-
 stopher, with long Spikes.
- N^o 431. p. 200. — 1732. 517. *Chrysanthemoides osteospermon, A-*
ffricanum, arboreum, foliis Populi al-
bæ Boerb. Ind. alt. 104. African
 hard-seeded Tree Chrysanthemum, with
 Leaves like the white Poplar.
- N^o 436. p. 1. — 1733. 555. *Cicer sativum* C. B. 347. Chiches,
 or Chich-Pease.
- N^o 457. p. 407. — 1739. 871. *Cirsium arvense, repens, folio vix*
sinuato, in aculeum abeunte. Creep-
 ing Field gentle Thistle, with a
 Leaf scarce sinuated, ending in a
 Prickle.
- N^o 447. p. 144. — 1736. 715. *Cistus ladanifera, Cretica, flore pur-*
pureo T. Cor. 19. Large sweet Cistus,
 or Rock-Rose from Crete.
- N^o 456. p. 291. — 1738. 809. *Clinopodium Americanum, Salica-*
riæ foliis, perforatis, Pulegii odore.
 American Field Basil, with Willow-
 wort, perforated Leaves, and a
 Smell of Penny-Royal.
- — — — — 810. *Clinopodium Menthæ folio, incanum*
& odoratum H. *Elt.* Tab. 74. Hoary,
 sweet-smelling Field-Basil, with a
 Mint Leaf.
- N^o 471. p. 620. — 1740. 910. *Clinopodium Orientale, hirsutum,*
foliis inferioribus Ocimum, superiori-
bus Hissopum referentibus T. Cor.
 Hairy oriental Field-Basil, with the
 under Leaves like Basil, and the
 upper like Hyssop.
- N^o 447. p. 144. — 1736. 714. *Clinopodium Virginianum, angusti-*
folium; floribus amplis, luteis, pur-
pureo

- puro maculatis, &c.* Pluk. *Phyt. Tab.* 24. *Fig. 1.* Narrow-leaved Field-Basil of *Virginia*, with large yellow Flowers, spotted with Purple.
- N° 440. p. 174. Ann. 1734. 618. *Cnicus cæruleus, humilis, Montis Lupi* H. L. Bat. Low blue Distaff-Thistle.
- N° 431. p. 200. — 1732. 518. *Cnicus Creticus, Atractylidis folio & facie, flore candidissimo* T. Cor. Candy, white-flowered Distaff-Thistle.
- N° 456. p. 291. — 1738. 811. *Cnicus Hispanicus, arboreus foetidissimus.* T. 451. Stinking, Spanish, Tree Distaff-Thistle.
- N° 471. p. 620. — 1740. 913. *Cochlearia minor rotundifolia nostras Raii* Syn. The lesser round-leaved Scurvy-Grass.
- — — — — 912. *Colutea vesicaria* C. B.* Bastard Sena.
- N° 452. p. 2. — 1737. 766. *Commelina angustifolia procumbens.* Procumbent, narrow-leaved Commeline.
- N° 436. p. 1. — 1733. 556. *Convolvulus Americanus, minor; Polygoni subhirsuto folio; flore parvo, ceruleo, patente.* Small American Bindweed, with a hairy Knot-grass Leaf, and a small open Flower.
The *Vistnu Glandi* Hort. Malab. 11. p. 131. *Tab. 164.* comes near it.
- N° 436. p. 1. — 1733. 557. *Convolvulus major, rectus, Creticus, argenteus* Mor. *Hist. 2. p. 11.* Silver, upright, great Bindweed of Candy.
- — — — — 558. *Convolvulus ramosus, incanus, foliis Piloselle* C. B. 294. Hoary, branched Bindweed, with Mouse-Ear Leaves.
- N° 431. p. 200. — 1732. 519. *Corchoro affinis, Chamædryos folio; flore stamineo; seminibus atris, quadrangulis, duplici serie dispositis* Sloane *Cat. Jam. p. 50. Hist. Tab. 94. f. 1.*
- N° 447. p. 144. — 1736. 716. *Cotyledon Afra; folio crasso, lato, laciniato; flosculo aureo.* Boerb. *Ind. alt. 288.* African Navel-wort, with
5 1 2 a thick,

A Catalogue of Plants.

- a thick, broad, jagged Leaf, and a golden Flower.
- N° 456. p. 292. Ann. 1738. 814. *Crocus albus, variegatus; fundo floris flavescente.* White, variegated *Crocus*, with a yellowish Bottom to the Flower.
- — p. 291. — — 812. *Crocus vernus, latifolius, flavus* C. B. Yellow, broad-leaved Spring *Crocus*.
- — p. 292. — — 813. *Crocus vernus, latifolius; flore albo, purpuro-violacea basi* C. B. 66. Broad-leaved Spring *Crocus*, with a white Flower, and a violet purple Base.
- N° 471. p. 621. — 1740. 914. *Crotolaria Americana, frutescens, flore luteo, ramulis alatis, folio mucronato* Ind. Hort. Chel. Shrubby *American Crotolaria*, with a yellow Flower, winged Branches, and a pointed Leaf.
- N° 457. p. 407. — 1739. 872. *Cruciata nova, Romana, minima, muralis* Col. Ecph. 295. Small, *Roman, Wall Cross-wort*.
- N° 447. p. 144. — 1736. 717. *Cupressus Virginiana Tradescanti* Catal. 106. *Cupressus Virginiana, foliis Acaciae deciduis* H. L. B. 107. *Virginian Cypress*.
- N° 457. p. 407. — 1739. 873. *Cynoglossum Virginianum, flore minimo, albo* Banisteri Pluk. Alm. 126. *Virginian Hounds-Tongue*, with a very small, white Flower.
- N° 452. p. 2. — 1737. 767. *Dalea Dni Millar, inventoris.*
- N° 456. p. 292. — 1738. 815. *Delphinium Platani folio, Staphyzagria dictum* T. 428. *Louse-wort*.
- N° 471. p. 621. — 1740. 917. *Delphinium sive consolida regalis, flore roseo.* Tourn. *Rose-coloured Lark-Spur*.
- N° 452. p. 2. — 1737. 768. *Dentaria bulbifera* Lob. Icon. 687. *Bulbiferous Tooth-wort*.
- N° 445. p. 1, — 1735. 657. *Digitalis Acanthoides, Canariensis, frutescens; flore aureo* Hort. Amst. 11. p. 105. *Shrubby Canarian Fox-glove*, with a golden Flower.
- N° 452. p. 2. — 1737. 769. *Digitalis minima, Gratiola dicta* H. Ox. Part. 11. 479. *Gratiola Centauroides*

- tauroides* C. B. 279. Hedge-Hyffop, or Water-Hyffop.
- N° 447. p. 144. Ann. 1736. 718. *Doria Ægyptia, annua; foliis trilobatis, ferratis.* Annual Egyptian *Doria*, with ferrated, trilobated Leaves.
- — — — — 719. *Doria parva, annua; foliis angustis, leviter ferratis.* Small, annual *Doria*, with narrow, lightly ferrated Leaves.
- N° 431. p. 200. — 1732. 520. *Doria, quæ Jacobæa Africana, frutescens; Lavendulæ folio, latiori H. Amst. 2. 141.* Shrubby *Doria*, with a broad Lavender Leaf.
- N° 456. p. 292. — 1738. 816. *Doronicum Plantaginis folio C. B. 184.* Plantain-leaved Leopards Bane.
- N° 471. p. 621. — 1740. 916. *Doronicum Romanum Off.* Common, or broad-leaved Leopards Bane.
- — — — — 915. *Dracocephalon Americanum Breyn. Prod.* American Dragons-Head.
- N° 447. p. 144. — 1736. 730. *Echinopus Græcus, tenuissime divisus, & lanuginosus, capite minori cæruleo. T. Cor. 34.* Woolly Globe-Thistle, with finely divided Leaves, and a small blue Head.
- N° 436. p. 1. — 1733. 559. *Eleagnus Orientalis, angustifolius; fructu parvo, Olivæformi, subdulci T. Cor. 53.* *Ziziphus alba Clus. Hist. 29.* The white Jujube-Tree.
- N° 452. p. 2. — 1737. 770. *Elichrysum angustissimo folio T. Inst. 452.* *Stæchas citrina tenuifolia, altera, sive Italica J. B. 111. 155.* The narrowest-leaved eternal Flower.
- N° 471. p. 621. — 1740. 918. *Ephemerum Virginianum Tradescanti flore purpureo Park. Parad.* Tradescant's Virginian Spider-wort, with a purple Flower.
- N° 452. p. 2. — 1737. 772. *Eruca sylvestris Ger. Eruca sylvestris, tenuifolia, perennis, flore luteo J. B. 11. 861.* Fine-leaved, perennial Rocket, with a yellow Flower.
- — — — — 773. *Eruca Bellidis folio Mor. H. Ox. P. 11. 231.* Daily-leaved Rocket.
- N° 440.

A Catalogue of Plants.

- N^o 440. p. 174. Ann. 1734. 619. *Eruca Tanaceti folio* H. R. Par. Tansey-leaved Rocket.
- N^o 456. p. 292. — 1738. 817. *Eryngium cœruleum, albis maculis notatum* H. Ox. 111. 165. Blue E-
ringo, marked with white Spots.
- N^o 457. p. 407. — 1739. 874. *Eryngium maritimum* C. B. 386. Sea-Holly, or Eringo.
- N^o 456. p. 292. — 1738. 818. *Eryngium montanum, Amethystinum* C. B. 386. Amethyft Eringo.
- N^o 457. p. 408. — 1739. 875. *Eryngium vulgare* C. B. 386. *Eryngium campestre* Dod. 730. Common Eringo.
- N^o 431. p. 200. — 1732. 521. *Eupatoriophalacron Americanum; Hyperici foliis; semine adunco.* a D. Houston. American *Eupatoriophalacron*, with St. John's Wort-leaves, and a hooked Seed.
- N^o 471. p. 621. — 1740. 919. *Eupatorium Americanum, herbaceum, Melissæ folio, villosum* Houst. Herbaceous, American Hemp-Agrimony, with a Baum Leaf, and hairy.
- N^o 452. p. 2. — 1737. 774. *Eupatorium cannabinum* C. B. 320. *Eupatorium Avicennæ* Officin. Common Hemp-Agrimony, or Dutch Agrimony.
- — p. 3. — — — 775. *Eupatorium folio oblongo, rugoso; caule purpurascete* T. Inst. 456. Canada Hemp-Agrimony, with a long, rough Leaf, and purplish Stalk.
- N^o 445. p. 1. — 1735. 658. *Eupatorium Virginianum; Salviæ foliis longissimis, acuminatis, perfoliatum* Pluk. Phyt. T. 87. Fig. 6. Perfoliated, Virginian Hemp-Agrimony, with very long and pointed Sage-Leaves.
- N^o 440. p. 174. — 1734. 620. *Fagopyrum Americanum, angustifolium, procumbens; caulibus lappa-ceis.* Procumbent narrow-leaved American Buck-Wheat, with prickly Stalks.
- N^o 452. p. 3. — 1737. 776. *Fagopyrum erectum; seminibus ad angulos dentatis, spicatum nascentibus.* Ex Russia. Upright Russian Buck-Wheat, with Seeds indented at the Angles, and growing in Spikes.

- N^o 440. p. 174. Ann. 1734. 621. *Fagopyrum vulgare scandens*. T. Inst. 511. Black Bindweed.
- N^o 471. p. 621. — 1740. 920. *Ferula major, seu fœmina Plinii* Mor. Umb. Fennel-Giant.
- N^o 445. p. 1. — 1735. 659. *Ficoides, folio parvo, ensiformi; purpureis floribus, ad caulium extremitates fere umbellatim nascentibus.* An *Mesembryanthemum falcatum*, minimum, &c. Hort. Eltb. 288. Fig-Marygold, with a small Sword-fashioned Leaf, and purple Flowers, growing in a Sort of Umbells at the Extremities of the Stalks.
- N^o 452. p. 3. — 1737. 777. *Ficus Orientalis, foliis in lacinias angustas profunde incis. The large white Turkey Fig.*
- N^o 447. p. 144. — 1736. 721. *Filicula, quæ Adiantum nigrum Officinarum. Adiantum foliis longioribus, pulverulentis; pediculo nigro* C. B. 355. Common black Maiden-Hair, or Oak-Fern.
- — p. 145. — — 722. *Filix saxatilis, foliis tenuioribus & acutioribus. Adiantum nigrum, pin-nulis Cicutariæ divisura* D. Bobart. Raii Syn. 11. 50. Black Maiden-Hair, with finely divided Leaves.
- — — — — 723. *Filix saxatilis, caule tenui fragili* Raii Syn. Ed. 11. 50. Pluk. Phyt. 180. f. 5. Stone-Fern, with a thin, brittle Leaf.
- N^o 471. p. 621. — 1740. 921. *Fraxinella flore albo, sive Dictamnus albus* Off. White Dittany, or Fraxinella.
- N^o 436. p. 1. — 1733. 560. *Fraxinus florifera, botryoides* Mor. H. Reg. Bles. Flowering Ash.
- N^o 431. p. 200. — 1732. 522. *Frutex Virginianus, trifolius; Ulmi samaris* D. Banister. Pluk. Almag. 159.
- — — — — 523. *Fumaria Africana, vesicaria, scandens* Par. Bat. App. *Cysticapnos Africana, scandens* Boerh. Ind. 310. African, climbing, Bladder-Fumitory.
- N^o 452. p. 3. — 1737. 779. *Fumaria bulbosa, radice cava; major* C. B. 143. Great bulbous-rooted Fumitory, or Hollow-root.

A Catalogue of Plants.

- N^o 452. f. 3. Ann. 1737. 780. *Fumaria lutea* C. B. 143. Yellow Fumitory.
- — — — — 778. *Fumaria officinarum* & *Dioscoridis* C. B. 143. Common Fumitory.
- — — — — 781. *Fumaria sempervirens* & *florens*, flore albo Boer. Ind. 130. Ever-green Fumitory, with a white Flower.
- N^o 471. p. 621. — 1740. 922. *Fumaria siliquosa sempervirens* Cornuti. Ever-green American Fumitory.
- N^o 471. p. 621. — 1740. 923. *Galega quinquefolia*, floribus parvis, rubris. Houston. Five-leaved Goat's-Rue, with small, red Flowers.
- N^o 452. p. 3. — 1737. 782. *Galeopsis patula segetum*, flore purpurascens T. Inst. 185. *Sideritis arvensis rubra* Park. Narrow-leaved All-heal, or Iron-wort.
- N^o 447. p. 145. — 1736. 724. *Garidella foliis tenuissime divisis* T. Inst. 655. *Nigella Cretica*, folio Fœniculi C. B. 146. Fennel-Flower, with very finely divided Leaves.
- N^o 440. p. 174. — 1734. 622. *Genista tinctoria* Ger. emac. 1136. Greenweed, or Dyer's Weed, or Woodwaxen.
- — p. 175. — — 623. *Genista tinctoria maxima Austriaca* D. Boerhaave. The greatest Austrian Woodwaxen.
- N^o 445. p. 2. — 1735. 660. *Geranium Africanum*, arborescens, flore dilute coccineo; *Malvæ folio minore*. Arborecent Cranes-Bill of Africa, with a pale scarlet Flower, and a small mallow Leaf.
See Hort. Elth. Tab. 125. f. 152.
- N^o 471. p. 621. — 1740. 924. *Gingidium Rawolfii*, foliis Fœniculi C. B. Fennel-leaved Pick-tooth.
- N^o 445. p. 2. — 1735. 661. *Gramen Americanum*; spica echinata; majoribus locustis Schol. Bot. American Grass, with an echinated Spike, and greater Locusts.
- — — — — 662. *Gramen arundinaceum*, Halepense; *Tragopogonis folio* D. Bobart. Reed-Grass of Aleppo, with a Goat's Beard Leaf.
- — — — — 663. *Gramen miliaceum*, Americanum, latifolium; panicula parva, laxa. An *Gramen miliaceum Americanum*, majus,

- pus, panicula minore Pluk. Alm. 176?*
 Broad-leaved American Millet-grass,
 with a small, loose Spike.
- N° 445. p. 2. Ann. 1735. 664. *Gramen paniceum, spica simplici, levi Raii Syn. Ed. 11. p. 249.*
 Panick-grass, with a single, smooth Ear.
- — — — — 665. *Gramen paniceum, spica aspera C. B. 8.*
 Rough-eared Panick-grass.
- — — — — 666. *Gramen paniceum, spica divisa C. B. 8.*
 Panick-grass, with a divided Spike.
- — — — — 667. *Gramen paniceum Jamaicense, spica divisa nitida. Jamaica Panick-grass,*
 with a neat, divided Spike.
- N° 440. p. 175. — 1734. 624. *Granadilla flore albo, fructu reticulato Boerb. Ind. 82.*
 White Passion-Flower, with a reticulated Fruit.
- N° 436. p. 2. — 1733. 562. *Granadilla folio tricuspidi, latiori; flore minimo. An Granadilla folio tricuspidi; flore parvo, flavescente T. Inst. 240?*
 Passion-Flower, with a three-pointed Leaf, and a very small Flower.
- — — — — 561. *Granadilla Hispanis Flos Passionis Italis Col. in Recch. 889.*
 Three-leaved Passion-Flower.
- N° 440. p. 175. — 1734. 625. *Granadilla oblongo acuminato folio, flore purpureo. An Granadilla folio oblongo, serrato, flore purpureo D. Houston?*
 Purple Passion-Flower, with an oblong, acuminate Leaf.
- N° 471. p. 621. — 1740. 925. *Harmala Off. Ruta quæ dici solet Harmala J. B.*
 Wild Rue.
- — — — — 927. *Hedysarum clypeatum, flore suaviter rubente Hort. Eyst.*
 French Honey-suckle, with a delicate red Flower.
- N° 431. p. 200. — 1732. 524. *Hedysarum triphyllum, Canadense Cornut. 44.*
 Three-leaved Canada French Honey-suckle.
- N° 447. p. 145. — 1736. 725. *Heleniastrum Americanum, latifolium, serratum.*
 Broad-leaved, serrated, American Heleniastrum.
- N° 445. p. 2. — 1735. 668. *Helleborus niger hortensis, flore viridi C. B. 185.*
 Bears-Foot.
- N° 471. p. 621. — 1740. 926. *Herba Paris Off. Herb Paris.*



A Catalogue of Plants.

- N^o 452. p. 3. Ann. 1737. 783. *Hernandia, amplo Hederæ folio, umbilicato* Plum. Nov. Gen. 6. *Nux vesicaria oleosa, foliis umbilicatis, ex Insula Barbadosi* Pluk. Phyt. 208. Fig. 1. Jack in a Box.
- N^o 447. p. 145. — 1736. 626. *Hieracium Chondrillæ folio, hirsutum* C. B. 127. Rough-leaved, yellow Devil's Bit.
- N^o 471. p. 621. — 1740. 928. *Hieracium hortense, floribus atropurpureis* C. B. Golden Mouse-Ear, or Grim the Collier.
- N^o 431. p. 201. — 1732. 525. *Hieracium medio nigrum, Bæticum, minus*. Park. Theat. 792. Smaller Spanish Hawkweed, with yellow and black Flowers.
- — — — — 526. *Hieracium medio nigrum, Bæticum, latifolium, amplo flore*. Broad-leaved Spanish Hawkweed, with a large yellow and black Flower.
- N^o 456. p. 292. — 1738. 819. *Hyoscyamus albus major, vel tertius Dioscoridis & quartus Plinii* C. B. 169. White Henbane.
- — — — — 821. *Hyoscyamus luteus, minor frutescens*. Small, shrubby, yellow Henbane.
- — — — — 820. *Hyoscyamus major, albo similis, Umbilico floris atropurpureo*. T. Cor. 1. Great Henbane, like the white, but with a dark purple Bottom to the Flower.
- N^o 452. p. 3. — 1737. 784. *Hypericum Androsæmum dictum* J. B. *Androsæmum alterum hirsutum*. Colum. Ec. 75. Tulsan-St John's Wort.
- N^o 436. p. 2. — 1733. 563. *Hyssopus rubro flore* C. B. 217. Red flowered Hyssop.
- N^o 431. p. 201. — 1732. 527. *Jacobæa Asra, folio Botryos Boerb.* Ind. alt. 99. African Ragwort, with an Oak of Jerusalem Leaf.
- N^o 457. p. 408. — 1739. 877. *Jacobæa foliis ferulaceis*. Ragwort, with ferulaceous Leaves.
- N^o 471. p. 621. — 1740. 929. *Jacobæa maritima* C. B. Sea Ragwort.
- N^o 431. p. 201. — 1732. 528. *Jacobæa Pannonica prima* Cluf. Hist. 21. *Senecio incanus, pinguis* C. B. 131. Cotton Groundsel, or strong-scented Groundsel.

N^o 436.

- N^o 436. p. 2. Ann. 1733. 564. *Jasminum Azoricum, trifolium*; flore albo odoratissimo H. Amst. 1. p. 159. Three-leaved Azorian Jasmine, with very sweet, white Flowers, or Ivy-leaved Jasmine.
- N^o 456. p. 292. — 1738. 822. *Jasminum humilius, magno flore* C. B. 398. Spanish, white, or Catalonian Jasmine.
- — — — — 823. *Iris tuberosa, folio anguloso* C. B. 40. Tube-rose Iris, with an angular Leaf.
- N^o 431. p. 201. — 1732. 529. *Ketmia Afra, vesicaria*; foliis profundius incisus, vix crenatis Boer. Ind. 272. African Bladder Ketmia, with deeply cut Leaves.
- — — — — 530. *Ketmia vesicaria, Africana* T. Inst. 101. African Bladder Ketmia.
- — — — — 531. *Ketmia vesicaria vulgaris* T. Inst. 101. Common Bladder Ketmia.
- N^o 436. p. 2. — 1733. 565. *Lachryma Job. Clus. Hist. ccxvi.* Job's Tears, or Reed-Millet.
- N^o 440. p. 175. — 1734. 626. *Lapathum Ægyptiacum, annuum, Pariotariæ folio, capsula seminis longius barbata* H. Pisan. Annual Ægyptian Dock, with a pellitory Leaf, and a long Beard to the Seed.
- — — — — 627. *Lapathum aquaticum, folio cubitali* C. B. 116. Great Water Dock.
- — — — — 628. *Lapathum hortense, rotundifolium, sive montanum* C. B. 115. Bastard Monk's Rhubarb, or great round-leaved Dock.
- — — — — 629. *Lapathum rotundifolium, maximum, q. Rhaponticum* Officin. Rhapontick.
- — — — — 630. *Lapathum sativum* Dod. q. Patientia Officin. Monk's Rhubarb, or Garden Patience.
- N^o 457. p. 408. — 1739. 878. *Lappa major, ex omni parte minor, capitulis parvis, eleganter reticulatis* Pluk. Alm. Small Burdock, with reticulated Heads.
- — — — — 877. *Lappa sive Bardana major, flore albo* H. Ox. 111. 147. Great Burdock, with white Flowers.
- N^o 456. p. 292. — 1738. 824. *Laserpitium angustifolium, majus, segmentis longioribus, & indivisis* H. Ox.

- Ox. 111. 321. Great, narrow-leaved Laserwort, with longer and undivided Leaves.
- N° 456. p. 292. Ann. 1738. 825. *Laserpitium foliis latioribus; semine crispo & verrucoso* H. Ox. 111. 320. Laserwort with broader Leaves, and a curled and warty Seed.
- — — — — 826. *Laserpitium humilius, Paludarii folio, flore albo* T. 325. Dwarf Laserwort, with a Smallage Leaf, and a white Flower.
- — — — — 827. *Laserpitium lobis angustioribus, & dilute virentibus, conjugatim positis* H. Ox. 111. 321. Laserwort with narrower, and pale-green Lobes, placed by Pairs.
- — — — — 828. *Laserpitium lobis angustioribus, longioribus & dilute virentibus, plurifariam divisis* Pluk. Phyt. Tab. 198. f. 6. Laserwort with narrow, long, pale-green Leaves, variously divided.
- — — — — 829. *Laserpitium, lobis minimis, trifidis, seminum alis fere planis*. An *Laserpitium angustiore folio, umbella concava, & contracta*. Pluk. Phyt. Tab. 199. Laserwort with very small, trifid Lobes, and the Wings of the Seeds almost plain.
- N° 471. p. 621. — 1740. 930. *Lathyrus perennis latifolius* C. B. Pease everlasting.
- — — — — 931. *Lathyrus sylvestris Dodonæi* Park. The other great wild *Lathyrus*, or everlasting Pease.
- — — — — 932. *Lathyrus siculus, flore odorato, magno* Boerh. Ind. 159. Sicilian everlasting Pea, with a large, sweet-smelling Flower.
- N° 456. p. 293. — 1738. 830. *Lavandula angustifolia* C. B. 21. *Lavandula Officinarum*. Narrow-leaved or small Lavender, or Lavender Spike.
- — — — — 831. *Lavandula latifolia* C. B. 216. *Spica Nardus Germanica* Trag. The most common or broad-leaved Lavender.

- N° 456. p. 293. Ann. 1738. 832. *Leonurus minor, Capitis Bonæ spei vulgo Boerb.* 180. Lesser Lion's Tail from the Cape of Good Hope, with a Cat-mint Leaf.
- N° 431. p. 201. — 1732. 532. *Lepidium humile, incanum arvense* T. Inst. 816. *Arabis sive Draba* & *Nasturtium Babylonicum* Lob. Ic. 224. Hoary, dwarf Dittander.
- N° 457. p. 408. — 1739. 879. *Lilac Ligustri folio* T. 602. Lilac with Privet Leaves, falsely called the Persian Jasmine.
- N° 431. p. 201. — 1732. 533. *Limonium lignosum, Gallis viduum* Boccon. Rar. 35. Woody Sea-Lavender.
- N° 456. p. 293. — 1738. 833. *Limonium minimum, flagellis tortuosis, nostras.* The least Sea-Lavender, with twisted Branches.
- — — — — 834. *Linaria annua, angustifolia; flosculis albis, longius caudatis* Triumph. Narrow-leaved, annual Toad-Flax, with white Flowers, and long Spurs.
- N° 447. p. 145. — 1736. 727. *Linaria bederaceo folio, glabro; seu Cymbalaria vulgaris.* T. Inst. 169. Round-leaved Toad-Flax.
- — — — — 728. *Lingua Cervina minima; folio obtuso, undulato & serrato.* An *Lingua Cervina, angustifolia, lucida; folio serrato* H. Reg. Par.? Small Harts-Tongue, with an obtuse, undulated, and serrated Leaf.
- — — — — 729. *Lingua Cervina maxima; undulato folio, auriculato per basin* H. Reg. Par. Great Harts-Tongue, with an undulated Leaf, eared at the Base.
- — — — — 730. *Lingua Cervina minor, crispa uno pediculo trifolia* H. Reg. Par. Pluk. Phyt. 248. f. 2. Small, trifoliated Harts-Tongue.
- — — — — 731. *Lingua Cervina Officinarum.* C. B. 353. Common Harts-Tongue.
- N° 436. p. 2. — 1733. 566. *Lotus hæmorrhoidalis, humilior & candidior* T. Inst. 403. Lower and whiter, hemorrhoidal Birds-Foot Trefoil.

N° 431.

N° 431.

- N^o 431. p. 201. Ann. 1732. 534. *Lotus Lybica Dalechampii* Lug. 509. Birds-Foot Trefoil of Lybia.
- — — — — 535. *Lotus minor, glabra, foliis longioribus & angustioribus.* Hort. Edin. Small, smooth Birds-Foot Trefoil, with longer and narrower Leaves.
- — — — — 536. *Lotus pratensis, major, glabra* D. Vaillant. Bot. Par. Great, smooth, Meadow Birds-Foot Trefoil.
- N^o 437. p. 2. — 1733. 567. *Lychnidea Caroliniana; floribus quasi umbellatim dispositis; foliis lucidis, crassis, acutis.* Martyn. Hist. p. 10. *Lychnidea* of Carolina with umbellated Flowers, and shining, thick, sharp-pointed Leaves.
- N^o 471. p. 621. — 1740. 933. *Lychnis multiplex, flore purpureo* C. B. Double red Campion, commonly called Double red Bachelor's Button.
- N^o 452. p. 3. — 1737. 785. *Lycopersicon Galeni* Ang. Apples of Love.
- N^o 457. p. 408. — 1739. 880. *Lysimachia annua, minima; Polygoni folio* T. 142. Small, annual, Loose-strife, with a Knot-Grass Leaf.
- N^o 431. p. 201. — 1732. 537. *Lysimachia Canadensis, lutea; folio Jalappæ* D. Sarrazen. Yellow Loose-strife of Canada.
- N^o 456. p. 293. — 1738. 835. *Matricaria vulgaris, seu sativa, caulibus rubentibus* H. L. Bat. Common Feverfew, with reddish Stalks.
- N^o 436. p. 2. — 1733. 568. *Marrubium album vulgare* C. B. Pin. 230. White Horehound.
- — — — — 569. *Marrubium album, angustifolium peregrinum* C. B. Pin. 230. Narrow-leaved Candy Horehound.
- — — — — 570. *Marrubium album, latifolium peregrinum* C. B. Pin. 230. Broad-leaved white Horehound.
- N^o 440. p. 175. — 1734. 631. *Medicago annua, Trifolii facie* T. Inst. p. 412. Annual Moon-Trefoil.
- — — — — 632. *Medicago maritima, trifolia, annua, polycarpus, fructu toroso, non spinoso,* D. Micheli Hort. Pis. p. 110. Annual, Maritime Moon-Trefoil, with a smooth Seed.

- N^o 431. p. 201. Ann. 1732. 538. *Melissa Americana, graveolens a Domino Houston.* Strong-smelling American Baum.
- N^o 456. p. 293. — 1738. 836. *Menispermum Canadense, scandens umbilicato folio* Ac. R. Sc. 1705. Climbing Canada Moon-Seed, with an umbilicated Leaf.
- — — — — 837. *Menispermum umbilicato folio, mucronato, ad basin non sinuato.* Moon-Seed with an umbilicated, pointed Leaf, not sinuated at the Base.
- — — — — 838. *Menispermumhederaceo folio.* Moon-Seed with an Ivy Leaf.
- N^o 457. p. 408. — 1739. 881. *Mentha angustifolia spicata* C. B. 227. Spear-Mint, or Hart-Mint.
- — — — — 882. *Mentha angustifolia, altera, rugosior, spica hirsuta.* Rough Spear-Mint, with a hairy Spike.
- N^o 436. p. 2. — 1733. 571. *Mentha hortensis prior* Fuchs. Hist. 288.
- — — — — 573. *Mentha hortensis verticillata, Ocimi odore* C. B. Pin. 227. *Mentha quarta* Dod. Pempt. 95. Red Mint.
- — — — — 577. *Mentha Piperitis* Off. Lond. *Mentha spicis brevioribus & habitioribus, foliis Menthae fuscae, sapore fervido Piperis Raii* Syn. Ed. 3. p. 234. Pepper Mint.
- — — — — 572. *Mentha prima* Dod. Pempt. 95.
- N^o 471. p. 621. — 1740. 934. *Mentha rotundifolia, odore Menthae Romanae, verticillis minimis* Rand. Round-leaved Mint, with very small Whorls.
- N^o 436. p. 2. — 1733. 574. *Mentha sylvestris, rotundiore folio* C. B. Pin. 227. Horse-Mint, or round-leaved wild Mint.
- — — — — 575. *Mentha sylvestris, rotundiore folio, purpureo flore* Bot. Monsp. Round-leaved Horse-Mint, with a purple Flower.
- — — — — 576. *Mentha sylvestris, spicata, latifolia, hirsuta.* Hairy, broad-leaved, spiked wild Mint.
- N^o 457. p. 408. — 1739. 883. *Mentha verticillata, longiori acuminato folio, odore aromatico.* Whorled Mint,

A Catalogue of Plants.

- Mint, with a long pointed Leaf, and an aromatic Smell.
- N^o 471. p. 621. Ann. 1740. 935. *Menthastrum* Off. *Menthastrum spicatum*, folio longiore candicante J. B. Long-leaved Horse-Mint.
- — p. 622. — — 936. *Millefolium purpureum vulgare* Raii. Purple common Yarrow, or Milfoil.
- N^o 445. p. 2. — — 1735. 669. *Millieria, amplis scrophulariæ foliis, maculatis.* Milleria, with large, spotted, Fig-wort Leaves.
- N^o 431. p. 201. — — 1732. 539. *Millieria Parietariæ folio, capitulis congestis, planis.* D. Houston. Milleria, with Pellitory Leaves, and plain Flowers, heaped together.
- — — — — 540. *Millieria Scrophulariæ amplo folio, floribus laxè spicatis.* D. Houston. Milleria, with a large Fig-wort Leaf, and Flowers in loose Spikes.
- N^o 436. p. 3. — — 1733. 578. *Molucca levis* Dod. Pempt. 92. Smooth Molucca Baum.
- — — — — 579. *Momordica vulgaris* T. Inst. p. 103. Male Balsam-Apple.
- — — — — 580. *Momordica Zeylanica pampinea fronde, fructu longiori* T. Inst. p. 103. Pandi Pavel. Hort. Mal. 8. 17. Balsam - Apple of Ceylon, with a Vine-Leaf, and a longer Fruit.
- N^o 445. p. 2. — — 1735. 670. *Myosotis hirsuta minor* T. Inst. 245. Small, hairy, Mouse-Ear Chickweed.
- N^o 447. p. 145. — — 1736. 732. *Nerion floribus rubescentibus* C. B. 464. Oleander or Rose-Bay.
- N^o 445. p. 2. — — 1735. 671. *Nicotiana major angustifolia* C. B. 170. Narrow-leaved Tobacco.
- — — — — 672. *Nicotiana major, angusto, longoque folio, caulem fere amplectente.* Tobacco with a long, narrow Leaf, almost embracing the Stalk.
- — — — — 673. *Nicotiana latifolia major; albo flore.* Ex Insula Tobago. Broad-leaved Tobacco, with a white Flower.
- N^o 431. p. 202. — — 1732. 543. *Nigella angustifolia, flore majore, simplici, ceruleo* C. B. Narrow-leaved Fennel-Flower, with a large, single, blue Flower.

- N^o 471. p. 622. Ann. 1740. 937. *Nigella arvensis carulea* C. B. Wild, horned Fennel-Flower.
- N^o 431. p. 202. — 1732. 542. *Nigella, flore minore, simplici, candido* C. B. 145. Fennel-Flower with a small, white, single Flower.
- — p. 201. — — 541. *Nigella Orientalis; flore flavescente; femine abato, plano.* T. Cor. 19. Oriental Fennel-Flower, with a yellow Flower, and a flat winged Seed.
- N^o 445. p. 2. — 1735. 674. *Nummularia major, lutea* C. B. 309. Money-wort, or Herb Two-pence.
- N^o 457. p. 408. — 1739. 884. *Oldenlandia humilis, Hyssopifolia* Plum. N. G. 42. Dwarf Hyssop-leaved Oldenlandia.
- N^o 436. p. 3. — 1733. 581. *Omphalodes pumila verna; Symphyti folio* T. Inst. 140. Low, vernal Venus Navel-wort, with a Comfrey-Leaf, or lesser Borage.
- — — — 582. *Onagra Bonariensis villosa, flore mutabili* Hort. Elt. 297. Tab. 219. Hairy Tree-Primrose, with a changeable Flower.
- N^o 447. p. 145. — 1736. 733. *Orchis galea & alis fere cinereis* J. B. 11. 735. The Man Orchis.
- N^o 471. p. 622. — 1740. 938. *Ostrys Americana fructu Lupuli.* Ind. Hort. Chelf. American Hop Hornbeam.
- N^o 457. p. 408. — 1739. 885. *Oxys lutea, Americana, procumbens.* Procumbent, American, yellow Wood-Sorrel.
- N^o 471. p. 622. — 1740. 939. *Parietaria Polygoni folio, canescens.* Hoary Pellitory, with a Knot-Grass Leaf.
- N^o 447. p. 145. — 1736. 734. *Parnassia palustris & vulgaris* T. Inst. 240. Gramen Parnassi, albo simplici flore. C. B. 309. Grass of Parnassus.
- N^o 436. p. 3. — 1733. 583. *Paronychia Hispanica* Clus. Hist. clxxxii. Silver scaly-headed Mountain Knot-Grass.
- N^o 445. p. 2. — 1735. 675. *Pastinaca sylvestris, latifolia, Austriaca* D. Boerhaave. Austrian wild Parsnep.
- N^o 440. p. 175. — 1734. 633. *Persicaria perennis, repens, latifolia.* Broad-leaved, creeping, perennial Arsmart.

A Catalogue of Plants.

- N^o 457. p. 408. Ann. 1739. 886. *Pervinca vulgaris, angustifolia* T.
120. Narrow-leaved Periwinkle.
- — — — — 887. *Petasites major & vulgaris* C. B.
197. Butter-bur, or Pestilent-wort.
- — — — — 888. *Petasites major, floribus albis, spica
bipedali* D. Bobart. *Petasites major,
floribus pediculis longis insidentibus* R.
Syn. 111. 179. Butter-bur, with
Flowers on long Pedicles.
- — — — — 889. *Petasites minor, folio Tussilaginis*
Mor. H. Reg. Bles.
- N^o 452. p. 3. — 1737. 786. *Petiveria Solani foliis; loculis spi-
nosiss* Plum. Nov. Gen. 50. *Verbena
aut Scorodoniae affinis, anomala, flore
albido; calyce aspero; allii odore.*
Sloane Cat. Fam. 64. Guinea Hen-
Weed. Hist. 1. 172.
- N^o 457. p. 408. — 1739. 890. *Phlomis acuminato, viridi, splen-
dente folio; flore purpurascente, cau-
libus villosis.* Sage-Tree, or Jeru-
salem Sage, with a shining, green,
pointed Leaf, a purple Flower, and
hairy Stalks.
- — — — — 891. *Phlomis Hispanica, fruticosa, can-
didissima, flore ferrugineo* T. Inst. 178.
White, shrubby Spanish Sage-Tree,
or Sage of Jerusalem.
- — — — — 892. *Phlomis Narbonensis, Hormini so-
lio, flore purpurascente* T. Inst. 178.
Narbonne Jerusalem Sage, with a
clary Leaf, and purplish Flower.
- N^o 436. p. 3. — 1733. 584. *Phytolacca Americana majori fructu.*
T. Inst. 299. *Solanum magnum Vir-
ginianum rubrum* Park. Theat. 347.
Virginian Poke, or Pork Phycick.
- — — — — 586. *Phytolacca Americana, minor, bacca
monopyrena. Solanoides Parisiensium.*
Small American Nightshade, with
one Seed in a Berry.
- N^o 457. p. 409. — 1739. 893. *Phytolacca fructu monopyreno, ma-
jore, folio longiore, glabro.* American
Nightshade, with a large Berry, and
one Seed, and a long, smooth Leaf.
- N^o 476. p. 3. — 1733. 585. *Phytolacca Mexicana, baccis sessili-
bus* Hort. Elt. 318. Mexican Night-
shade, with sessile Berries.

- N^o 457. p. 409. Ann. 1733. 894. *Pilosella major, umbellifera, macrocaulos. Floribus est flosculosis* Col. *Ecpb.* 248. Great umbelliferous Mouse-Ear.
- N^o 456. p. 293. — 1738. 839. *Pinus Halepensis; foliis tenuibus, late virentibus.* Aleppo Pine, with slender, bright green Leaves.
- — — — — 840. *Polium erectum minus angustifolium.* An *Polium Hispanicum tenuifolium, flore albo, capitulo breviori* T. 207. Small, narrow-leaved, upright Poley-Mountain.
- N^o 447. p. 146. — 1736. 737. *Polygonatum latifolium, flore majore, odoro* C. B. 303. Solomon's Seal, with a large, sweet-smelling Flower.
- — — — — 738. *Polygonatum latifolium vulgare* C. B. 303. Common Solomon's Seal.
- — — — — 739. *Polygonatum majus, vulgari, simile* J. B. 111. 529. The greatest Solomon's Seal.
- — p. 145. — — 735. *Polypodium Cambro-britannicum; pinnulis ad margines laciniatis* Rait *Syn. Ed.* 11. p. 35. Laciniated Polypody of Wales.
- — p. 146. — — 736. *Polypodium murale, pinnulis serratis* *Petiver Bot. Hort.* Wall Polypody, with ferrated Leaves.
- N^o 471. p. 622. — 1740. 940. *Polypodium sensibile* *Munting. Hist.* Sensitive Polypody.
- N^o 456. p. 293. — 1738. 841. *Populus nigra, folio maximo; gemmis Balsamum odoratissimum fundentibus* *Cates. Hist. Tab.* 34. Large-leaved, odoriferous black Poplar.
- N^o 447. p. 146. — 1736. 740. *Prenanthes Americana, folio lato, bipennem militarem referente; flavescente flore.* American Prenanthes, with a broad Leaf, and a yellowish Flower.
- N^o 471. p. 622. — 1740. 941. *Pseudo-Dittamnus verticillatus odoratus* C. B. Sweet-smelling bastard Dittany.
- N^o 445. p. 3. — 1735. 676. *Psyllium angustifolium, perenne.* *Psyllium majus supinum* C. B. 191. Perennial, narrow-leaved Flea-wort.

- N^o 445. p. 3. — 1735. 677. *Psyllium majus, erectum, angustifolium, annuum.* Great, upright, narrow-leaved, annual Flea-wort.
- — — — — 678. *Psyllium Dioscoridis, vel Indicum, crenatis foliis* C. B. 191. Indian Flea-wort, with notched Leaves.
- — — — — 679. *Psyllium majus, erectum, latifolium, annuum.* *Psyllium majus, erectum* C. B. 191. Annual, broad-leaved, upright, great Flea-wort.
- N^o 436. p. 3. — 1733. 587. *Ptarmica Orientalis, Santolinæ, folio flore minori* T. Cor. 37. Oriental Sneezwort, with a *Santolina* Leaf, and a smaller Flower.
- N^o 440. p. 175. — 1734. 634. *Pulegium angustifolium* C. B. 222. *Pulegium Cervinum* Offic. Hart Penny-royal.
- — — — — 635. *Pulegium angustifolium flore albo* H. Reg. Par. Hart Penny-royal, with a white Flower.
- This Plant is almost 3 Times as big as the preceding.
- — — — — 636. *Pulegium latifolium* C. B. 222. Penny-royal, or Pudding-Grass.
- — — — — 637. *Pulegium latifolium erectum.* Upright, broad-leaved Penny-royal.
- N^o 447. p. 146. — 1736. 741. *Pulegium minimum, Scrypylli facie.* The least Penny-royal, with the Appearance of Mother of Thyme.
- N^o 431. p. 202. — 1732. 544. *Pulmonaria calyce vesicario.* Lungwort, with a Bladder-like Empalement.
- N^o 452. p. 3. Ann. 1737. 787. *Pyrethrum Officinarum.* *Pyrethrum flore Bellidis* C. B. 148. *Chamamelum specioso flore, radice longa, servida* D. Shaw. *Phyt. Afric. Spec.* N^o 138. Pellitory of Spain.
- — — — — p. 4. — — — — 788. *Pyrethrum frutescens Canariense, Leucanthemum Canariense, foliis Chrysanthemi, Pyrethri Japone* T. Inst. 666. Shrubby *Pyrethrum* of the Canary Islands.
- — — — — 789. *Rapuntium Americanum, flore dilute cæruleo* A. Reg. Par. American Rampion, with a pale, blue Flower.

- N^o 436. p. 3. Ann. 1733. 588. *Rapuntium Trachelii folio, flore purpurascete Plum. Cat. p. 5.* Rampion with a Throat-wort Leaf, and a purplish Flower.
- N^o 452. p. 4. — 1737. 790. *Rapuntium Virginianum, foliis oblongis, floribus parvis cæruleis; spica longissima, laxa.* Virginian Rampion, with oblong Leaves, small blue Flowers, and a very long, loose Spike.
- — — — — 791. *Reseda alba J. B. III. 467.* Great, white Bastard Rocket.
- — — — — 792. *Reseda crispa Gallica Bocc. Rar. 76.* Curled Bastard Rocket.
- N^o 436. p. 3. — 1733. 589. *Ricinoides Americana, Alni folio, oblongo. A D^{mo} Houston. An Ricinoides Americana Castaneæ folio Plum. Cat. p. 20.* American Physick-nut, with an oblong Alder-Leaf.
- N^o 445. p. 3. — 1735. 680. *Rosa moschata flore pleno C. B. 482.* Musk-rose, with a double Flower.
- N^o 457. p. 409. — 1739. 895. *Rosa Pimpinellæ folio, Scotica, flore eleganter variegato. Rosa Ciphiana Sibbald Scot. Illust.* Striped Scotch Rose.
- N^o 445. p. 3. — 1735. 681. *Rosa rubra, plena, spinosissima, pedunculo muscoso Boerb. Ind. alt. 252.* Moss Rose.
- N^o 457. p. 409. — 1739. 896. *Rosa sylvestris, Virginiensis.* Wild Virginian Rose.
- N^o 445. p. 3. — 1735. 682. *Salicaria Hyssopi folio latiore T. Inst. 253.* Grass-Poly, small Hedge-Hyssop.
- N^o 447. p. 146. — 1736. 742. *Salvia Africana frutescens; folio Scorodoniæ; flore violaceo H. Amst. 2. 181.* Shrubby African Sage, with a Wood-Sage Leaf, and a Violet coloured Flower.
- N^o 456. p. 293. — 1738. 842. *Saxifraga rotundifolia alba C. B. 309.* White Saxifrage.
- — — — — 843. *Saxifraga verna, annua, humilior T. 252. Sedum tridactylites testorum C. B.* Rue Whitlow-Grass.

A Catalogue of Plants.

- N^o 445. p. 3. Ann. 1735. 683. *Scabiosa capitulo globofo, foliis in tenuiffimus lacinijs divifis* C. B. 271. Field-Scabious, with Leaves cut into very fine Segments.
- — — — — 684. *Scabiosa capitulo globofo major* C. B. 270. *Scabiosa minor Matthioli*. Great Scabious, with a globofe Head.
- — — — — 685. *Scabiosa capitulo globofo, major, acutiore folio, tenuiter diffefto*. Great Scabious, with a globofe Head, and a sharp-pointed Leaf, cut into very fine Segments.
- — — — — 686. *Scabiosa capitulo globofo, tenuifolia, pediculis florum prælongis*. An *Scabiosa capitulo globofo minor* C. B. Scabious, with a globofe Head, fine cut Leaves, and very long Pedicles to the Flowers.
- — — — — 687. *Scabiosa peregrina, rubra; capitulo oblongo* C. B. 270. *foliis integris*. Red Scabious, with an oblong Head, and entire Leaves.
- N^o 436. p. 3. — 1733. 590. *Scabiosa ftellata, Orientalis; flofculis marginalibus fimbriatis*. Starred, oriental Scabious, with the marginal Flowers fimbriated.
- N^o 440. p. 175. — 1734. 638. *Scorpioides Bupleuri folio* C. B. Pin. 287. Prickly Caterpillars.
- — p. 176. — — 639. *Scorpioides filiqua crassa Boelii* Ger. *Emac. App.* 1627. Caterpillar with a thick Pod.
- — — — — 640. *Scorpioides filiqua ftriata, minus afpera*. Smoother Caterpillar, with a ftriped Pod.
- — — — — 641. *Scrophularia flore luteo* C. B. 236. Yellow flowered Figwort.
- — — — — 642. *Scrophularia folio Urticæ* C. B. 236. *Scrophularia peregrina* Cam. *Hort. Icon.* 43. Nettle-leaved Figwort.
- — — — — 643. *Scrophularia Lamii folio* D. Bobart. Figwort with an Archangel Leaf.
- — — — — 644. *Scrophularia nemorenfis; folio Urticæ rugofa; flore atro-punicante* H. C. Boer.

- Boer. *Ind. alt.* 234. Figwort, with a rough Nettle Leaf, and a dark-red Flower.
- N^o 440. p. 176. Ann. 1734. 645. *Scrophularia Orientalis, foliis Cannabinis* T. Cor. 9. Oriental Figwort, with Hemp-Leaves.
- — — — — 646. *Scrophularia saxatilis lucida, Laferpitii Massiliensis foliis* Bocc. Mus. 166. Shining, Rock Figwort, with the Leaves of Laferwort of *Marseilles*.
- — — — — 647. *Scrophularia Scorodoniae folio* Mor. *Hist. Ox.* 482. Figwort, with a Wood-Sage Leaf.
- N^o 457. p. 409. — 1739. 897. *Senecio Americanus, folio hastato, nitide serrato.* American Groundsel, with a hastated Leaf, neatly serrated.
- N^o 471. p. 622. — 1740. 942. *Senna Italica, five foliis obtusis* C. B. Italian Senna.
- N^o 456. p. 293. — 1738. 844. *Serratula Marilandica, foliis glaucis, Cirsiï instar denticulatis* H. *Elt.* 354. Saw-wort of *Maryland*, with glaucous, indented Leaves, like *Cirsium*.
- N^o 431. p. 202. — 1732. 545. *Sherardia nodiflora; Stæchados serratae foliis* D. *Vaillant*. *Sherardia* flowering at the Joints, with the Leaves of serrated *Stæchas*.
- — — — — 546. *Sherardia repens, nodiflora, subrotundo folio* D. *Houston*. Creeping *Sherardia*, flowering at the Joints, with a roundish Leaf.
- — — — — 547. *Sherardia spicata, annua; flore cæruleo; foliis angustis, & serratis* D. *Houston*. Annual, spiked *Sherardia*, with a blue Flower, and narrow, serrated Leaves.
- N^o 471. p. 622. — 1740. 943. *Sideritis Romana, utriculis spinosis* H. L. *Bat.* Roman Iron-wort, with prickly Empalements.
- N^o 447. p. 146. — 1736. 743. *Sinapi Hispanicum pumilum album* T. *Inst.* 227. Dwarf, white, Spanish Mustard.

A Catalogue of Plants.

- N^o 431. p. 202. Ann. 1732. 548. *Sinapisrum Americanum, spinosum; flore carneo; foliis trifidis & quinquefidis* D. Houston.
- N^o 447. p. 146. — 1736. 744. *Sium aromaticum, Sison Officinarium* T. Inst. 308. *Sison quod Amomum Officinis nostris* C. B. 154. Bastard Stone-Parsley.
- N^o 457. p. 409. — 1739. 898. *Sium umbellatum repens* Ger. Emac. 256. Creeping Water-Parsnep.
- N^o 445. p. 4. — 1735. 693. *Solanum Americanum, glabrum, acinis puniceis, majoribus.* Smooth American Nightshade, with great, red Berries.
- N^o 457. p. 409. — 1739. 899. *Solanum fruticosum, Africanum, Lauri foliis.* Shrubby, African Nightshade, with Bay-Leaves.
- N^o 452. p. 4. — 1737. 793. *Solanum fruticosum, bacciferum* C. B. 166. Tree Nightshade.
- N^o 445. p. 4. — 1735. 694. *Solanum Guineense; fructu Cerasi nigri forma & magnitudine* D. Jusseu. Nightshade of Guinea, with a Fruit of the Form and Size of a black Cherry.
- — p. 3. — — 688. *Solanum hortense; sinuatis foliis; acinis saturate virentibus.* Garden Nightshade, with sinuated Leaves, and dark-green Berries.
- — — — — 689. *Solanum nigricans, hortensi simile, elatius, Virginianum, flore foris purpurascete.* Blackish Virginian Nightshade, like the common one, but larger, with a Flower purplish on the Outside.
- — — — — 690. *Solanum nigricans, hortensi simile, minore flore & fructu.* Ex Insula Tobago. Blackish Nightshade, like the common one, with a smaller Flower and Fruit. From the Island Tobago.
- — — — — 691. *Solanum Officinarum; acinis luteis* C. B. 166. Common Nightshade, with yellow Berries.
- — p. 4. — — — 692. *Solanum Officinarum; acinis puniceis* C. B. 166. Common Nightshade, with red Berries.
- N^o 431. p. 202. — 1732. 549. *Spergula quæ Alsine saxatilis & multiflora; capillaceo folio* T. Inst. 243. Many-

- Many-flowered Rock Chickweed,
with a capillaceous Leaf.
- N^o 436. p. 591. Ann. 1733. 591. *Spermacoce verticillis tenuioribus*.
Hort. Elt. Tab. 277. f. 259. Sper-
macoce with slender Whorls.
- N^o 456. p. 294. — 1731. 645. *Stramonium; foliis subrotundis, &*
denticulatis. Thorn-Apple with
roundish, sinuated, and indented
Leaves.
- N^o 436. p. 3. — 1733. 592. *Symphoricarpos; foliis alatis Hort.*
Elt. 371. Tab. 278. Symphori-
carpos with winged Leaves.
- — p. 4. — — — 593. *Tanacetum Africanum, arborescens,*
foliis Lavendulae, multifido folio. Hort.
Amst. 2. p. 201. African, arbores-
cent Tansey, with Lavender Leaves,
and a multifid Leaf.
- — — — — 594. *Telephioides Græca, humifusa; flore*
albo T. Cor. 50. Greek, procumbent
Telephioides, with a white Flower.
- N^o 445. p. 4. — 1735. 695. *Teucrium Hispanicum, latiore folio*
T. Inst. 208. Spanish Tree- Ger-
mander, with a broader Leaf.
- N^o 456. p. 294. — 1738. 846. *Thapsia latifolia villosa C. B. 348.*
Broad-leaved, hairy *Thapsia.*
- N^o 471. p. 622. — 1740. 944. *Tblaspi Off. Tblaspi arvense, sili-*
quis latis. Treacle - Mustard, or
Penny-cress.
- — — — — 943. *Tblaspi arvense, minus, luteum Park.*
Small, yellow Treacle-Mustard.
- N^o 445. p. 4. — 1735. 696. *Tblaspidium Apulum, spicatum T.*
Inst. 215. Spiked Apulian *Tblas-*
pidium.
- N^o 452. p. 4. — 1737. 794. *Tblaspidium fruticosum; Leucoidii*
folio; semper florens T. Inst. 214.
Tblaspi fruticosum, Persicum, foliis
Keiri, flore odorato Zanon. 196. Ever-
flowering shrubby *Tblaspidium,* with
a Wall-Flower Leaf.
- N^o 447. p. 146. — 1736. 745. *Tilia Caroliniana; foliis acumi-*
natis. Carolina Lime - Tree, with
pointed Leaves.
- N^o 436. p. 4. — 1733. 595. *Tithymalus Americanus, ramosissi-*
mus; Ocimi minoris folio. Branched
American Spurge, with a Leaf like
small Basil. From Dr Houston.

Catalogue of Plants.

- N^o 440. p. 176. Ann. 1734. 648. *Tragopogon gramineo folio, suave-rubente flore.* Col. 291. Grass-leaved Goat's Beard, with a fine red Flower.
- — — — — 649. *Tragopogon luteum, foliis gramineis; caule purpurascete* Boer. Ind. Alt. p. 90. Yellow Goat's Beard, with grassy Leaves, and a purplish Stalk.
- N^o 452. p. 4. — 1737. 795. *Trichomanes sive Polytrichum Officinarum* C. B. 556. English black Maiden-Hair.
- N^o 436. p. 4. — 1733. 596. *Turnera frutescens Ulmi folio* Plum. Nov. Gen. p. 15. Broad-leaved Turnera.
- N^o 436. p. 4. — 1733. 597. *Turnera Lycopi folio; flore ampliore. Cistus Urticæ folio, flore luteo; vasculis trigonis* Sloan Hist. Vol. I. Tab. 127. Fig. 4 & 5. Narrow-leaved Turnera, with a large Flower.
- N^o 452. p. 4. — 1737. 796. *Turritis vulgaris ramosa* T. Inst. 224. *Pilosella siliquata* Thalii Tab. vii. Codded Mouse-Ear.
- — — — — 797. *Turritis Leucoid folio* T. Inst. 224. Treacle Wormfeed.
- — — — — 798. *Turritis Leucoid folio; floribus amplioribus.* Treacle Wormfeed, with larger Flowers.
- — — — — 799. *Ulmaria* Clus. Hist. cxcviii. *Barba Capræ floribus compactis* C. B. 164. Meadow-sweet.
- — — — — 800. *Ulmaria floribus in longas spicas congestis* Boerh. Ind. Alt. 295. *Barba Capræ floribus oblongis* C. B. 163. Goat's Beard, with Flowers in long Spikes.
- N^o 471. p. 946. — 1740. 946. *Urtica pilulifera Parietariæ foliis* Hort. Reg. Paris. Spanish Marjoram.
- — p. 622. — — 947. *Valerianella semine stellato* C. B. Corn-Sallet, with a starred Seed.
- N^o 445. p. 4. — 1735. 697. *Verbena Americana, humilior; Urticæ longiori folio; spica sere simplici; flore albo.* Low American Vervain, with

- with a long Nettle Leaf, an almost single Spike, and a white Flower.
- N^o 445. p. 4. — Ann. 1735. 698. *Verbena Americana*; *spica multiplici laxa*. An *Verbena Caroliniana*; *Melissæ folio aspero Hort. Elth. 407*. American Vervain, with a manifold loose Spike.
- N^o 456. p. 294. — 1738. 847. *Verbena Bonariensis altissima*; *Lavendulæ Canariensis spica multiplici H. Elt.* Tall Vervain, with a manifold Spike.
- N^o 445. p. 4. — 1735. 699. *Verbena Lusitanica, latifolia, procerior T. Inst. 200*. Taller, broad-leaved Portugal Vervain.
- — — — — 700. *Verbena peregrina, foliis Urticæ Dod. Mem.* Foreign Vervain, with Nettle Leaves.
- N^o 447. p. 146. — 1736. 746. *Veronica Cymbalariae folio, verna T. Inst. 145. Alsine Hederulæ folio C. B. 250*. Ivy Chickweed, or small Henbit.
- — — — — 747. *Veronica flosculis oblongis insidentibus; Chamædryos foliis alternis H. L. Bat. 622*. Germander Speedwell, with alternate Leaves, and Flowers on long Stalks.
- — — — — 748. *Veronica mas supina & vulgatissima C. B.* Male Speedwell, or Fluellin.
- N^o 436. p. 4. — 1733. 598. *Virga aurea major, foliis glutinosi & graveolentibus T. Inst. 484*. Great golden Rod, with glutinous, strong-smelling Leaves.
- N^o 456. p. 294. — 1738. 848. *Virga aurea Marilandica, cæsia, glabra H. Elt. 414*. Smooth, glaucous golden Rod of Maryland.
- — — — — 849. *Virga aurea Novæ Angliæ, lato, rigidoque folio Par. Bat.* New England golden Rod, with a broad, stiff Leaf.
- N^o 447. p. 146. — 1736. 749. *Virga aurea, seu Solidago procerior, Americana; caule multiplici Pluk. Phyt. 235. f. 5*. Tall, American golden Rod, with a manifold Spike.
- — — — — 750. *Virga aurea Virginiana annua Zanon. 205*. Annual golden Rod of Virginia.

- N^o 436. p. 4. Ann. 1733. 599. *Virga aurea, Ulmi folio, Virgiana. Virga aurea, Americana, aspera, foliis brevioribus serratis Hort. Elt. 411. American, rough golden Rod, with short, serrated Leaves.*
- N^o 456. p. 294. — 1738. 850. *Virga aurea vulgaris latifolia J. B. 11. 1062. Common golden Rod.*
- N^o 436. p. 4. — 1733. 600. *Vitex foliis angustioribus; Cannabis modo dispositis C. B. Pin. 475. The chaste Tree.*
- N^o 431. p. 202. — 1733. 550. *Volubilis Americana, Bryoniae folio; hirsutia lappacea obsita, a D. Houston. Gronovia scandens, lappacea, pampinea fronde Houston. Martyn. Hist. Plant. rar. Dec. iv. N^o 8. Climbing, rough Gronovia, with a Vine Leaf.*
- N^o 457. p. 409. — 1739. 900. *Vulneraria erecta, annua flore subrotundo, leviter crenato. Loto effinis, Coryli folio Dod. Mem. Upright, annual Wound-wort, with a roundish Leaf, slightly crenated.*
- N^o 471. p. 622. — 1740. 949. *Vulneraria flore purpurascente Tourn. Wound-worth, with a purplish Flower.*
- — — — — 950. *Vulneraria pentaphyllos Tourn. Antbyllis leguminosa, vesicaria Hispanica Park. 1094. Five-leaved Wound-wort.*
- — — — — 948. *Vulneraria rustica J. B. Antbyllis leguminosa Raii Syn. Kidney-Vetch, or Lady's Finger.*
- N^o 440. p. 650. — 1734. 650. *Xeranthemum flore simplici, purpureo, minore T. In. 499. Smaller Sneezwort.*

N. B. Part of this Catalogue containing the Plants numbered from 901 to 950, was drawn up, after the Death of Mr Rand, by Mr Joseph Miller, Apothecary, Hort. Chel. Praef. & Praelec. Botan.

Some Experiments concerning the Impregnation of the Seeds of Plants, by James Logan, Esq; No. 440. p. 192. Jan. &c 1736.

VIII. As the Notion of a Male Seed, or the *Farina Fæcundans*, in Vegetables is now very common, I shall not trouble you with any Observations concerning it, but such as may have some Tendency to what I have to mention. And, first, I find from Miller's Dictionary, that M. Geoffroy, from the Experiments he made on *Mayze*, was of Opinion, that Seeds may grow up to their full Size, and appear perfect to the Eye, without being impregnated by the *Farina*, which possibly, for ought I know, may in some Cases be true; for there is no kind of Varieties in Nature: But in the Subject he has mentioned, I have Reason

Reason to believe it is otherwise, and that he applied not all the Care that was requisite in the Management.

When I first met with the Notion of this Male Seed, it was in the Winter Time, when I could do no more than think of it; but in the Spring I resolved to make some Experiments on the *Mayze*, or *Indian Corn*. In each Corner of my Garden, which is 40 Foot in Breadth, and near 80 in Length, I planted a Hill of that Corn, and watching the Plants when they grew up to a proper Height, and were pushing out both the Tassels above, and Ears below; from one of those Hills, I cut off the whole Tassels, on others I carefully opened the Ends of the Ears, and from some of them I cut or pinched off all the filken Filaments; from others I took about $\frac{1}{2}$, from others $\frac{1}{3}$, and $\frac{1}{4}$, &c. with some Variety, noting the Heads, and the Quantity taken from each: Other Heads again I tied up at their Ends, just before the Silk was putting out, with fine Muslin, but the fuzziest or most nappy I could find, to prevent the Passage of the *Farina*, but that would obstruct neither Sun, Air, or Rain. I fastened it also so very loosely, as not to give the least Check to Vegetation.

The Consequence of all which was this, that of the 5 or 6 Ears on the first Hill, from which I had taken all the Tassels, from whence proceeds the *Farina*, there was only one that had so much as a single Grain in it, and that in about 480 Cells, had but about 20 or 21 Grains, the Heads, or Ears, as they stood on the Plant, looked as well to the Eye as any other; they were of their proper Length, the Cores of their full Size, but to the Touch, for want of the Grain, they felt light and yielding. On the Core, when divested of the Leaves that cover it, the Beds of Seed were in their Ranges, with only a dry Skin on each.

In the Ears of the other Hills, from which I had taken all the Silk, and in those that I had covered with Muslin, there was not so much as one mature grown Grain, nor other than as I have mentioned in the first: But in all the others, in which I had left Part, and taken Part of the Silk, there was in each the exact Proportion of full Grains, according to the Quantity or Number of the Filaments I had left on them. And for the few Grains I found on one Head in the first Hill, I immediately accounted thus: That Head, or Ear, was very large, and stood prominent from the Plant, pointing with it's Silk Westward directly towards the next Hill of *Indian Corn*; and the *Farina*, I know, when very ripe, on shaking the Stalk, will fly off in the finest Dust, somewhat like Smoak. I therefore, with good Reason, judged that a Westerly Wind had waisted some few of these Particles from the other Hill, which had light on the Sides of this Ear, in a Situation perfectly well fitted to receive them, which none of the other Ears, on the same Hill, had. And indeed I admire that there were not more of the same Ear than I found impregnated in the same Manner.

As I was very exact in this Experiment, and curious enough in my Observations, and this, as I have related it, is truly Fact, I think it may reasonably be allowed, that notwithstanding what M. *Geoffrey* may

have

have delivered of his Trials on the same Plant, (as I am positive, by my Experiment on those Heads, from which Silk was taken quite away, and those that were covered with Muslin) none of the Grains will grow up to their Size, when prevented of receiving the *Farina* to impregnate them, but appear, when the Ears of Corn are disclosed, with all the Beds of the Seeds, or Grains, in their Ranges, with only a dry Skin on each, about the same Size as when the little tender Ears appear filled with milky Juice before it puts out it's Silk. But the few Grains that were grown on the single Ear, were as full and as fair as any I had seen, the Places of all the rest had only dry empty Pellicles, as I have described them; and I much question whether the same does not hold generally in the whole Course of Vegetation, though, agreeable to what I first hinted, it may not be safe to pronounce absolutely upon it, without a great Variety of Experiments on different Subjects. But I believe there are few Plants that will afford so fine an Opportunity of observing on them as the *Mayze*, or our *Indian Corn*; because it's Stiles may be taken off or left on the Ear, in any Proportion, and the Grains be afterwards numbered in the Manner I have mentioned.

The Discovery of a perfect Plant in Semine, by Mr Henry Baker. No. 457. p 448. July. Sc. 1740.

IX. Since the ancient Supposition of *equivocal Generation* has been rejected, for a more reasonable Belief, that every Thing proceeds from Parents of it's own Kind, Numbers of curious People have busied themselves in Search of Experiments, whereby to demonstrate the Truth of the latter, and consequently the Falsity of the former Opinion. For this Purpose the *Animal* and *Vegetable* Worlds have been examined, and such Analogy found between them, as proves convincingly, that their *Generation* and *Increase* are brought about in a Manner pretty much alike. The animal and vegetable *Semina* are found to be alike the *Rudiments* of their future Offspring; and both alike require only a proper Repository to preserve them from Injuries, and proper Juices to advance their Growth, and bring them to Perfection.

Glasses (which the Moderns have so much improved) are the Means whereby these Secrets in Nature are discovered to us. The Eye, assisted by a good Microscope, can distinguish plainly, in the *Semen masculinum* of Animals, Myriads of *Animalcules* alive and vigorous, though so exceedingly minute, that it is computed 3000 Millions of them are not equal to a Grain of Sand, whose Diameter is but $\frac{1}{750}$ Part of an Inch: And the same Instrument will inform us beyond all Doubt, that the *Farinae* of Vegetables are nothing else but a Congeries of minute *Granula*, whose Shapes are constant and uniform as the Plants they are taken from. And as the Seeds of Plants are found, by repeated Experiments, to be unprolific, if the *Farina* be not permitted to shed, it has been supposed, that all it's *Granula* contain *Seminal Plants* of their own Kind.

The *Growth* of Animals and Vegetables seems to be nothing else but a gradual Unfolding and Expansion of their Vessels by a slow and progressive Insinuation of Fluids adapted to their Diameters, until, being stretched

stretched to the utmost Bounds allotted them by Providence at their Formation, they reach their State of Perfection, or, in other Words, arrive at their full Growth. If this be granted, the Consequence must be, that all the Members of a perfect Animal *exist* really in every *Animalcule* of the *Semen animale masculinum*, and all the Parts of a perfect Plant in every *little Grain* of the *Farina Plantarum*, however minute either of them may be.

According to this *Theory*, it is supposed by some, that, in *Animals*, the *Semen* of the Male being received into the *Matrix* of the Female, some of the *Animalcules* it contains in such Abundance, find an Entrance into the *Ovaria*, and lodge themselves in some of the *Ova* placed there by Providence as a proper *Nidus* for them. An *Ovum*, becoming thus inhabited by an *Animalcule*, gets loosened in due Time from it's *Ovarium*, and passes into the *Matrix* through one of the *Fallopian Tubes*. The Veins and Arteries that fastened it to the *Ovary*, and were broken when it dropped from thence, unite with the Vessels it finds here, and compose the *Placenta*: The Coats of the *Ovum*, being swelled and dilated by the Juices of the *Matrix*, form the *Chorion* and the *Amnion*, Integuments needful to the Preservation of the *little Animal*, which, receiving continually a kindly Nourishment from the same Juices, gradually stretches and enlarges it's Dimensions, becoming then quickly visible with all the Parts peculiar to it's Species, and is called a *Fœtus*.

In *Plants*, say they, (which are incapable of removing from Place to Place, as *Animals* can) it was requisite a *Repository* for their *Farina* should be near at Hand to prevent it's being lost; and accordingly we find, that almost every Flower, producing a *Farina*, has likewise in itself a proper *Ovary* for it's Reception; where the *Ova* thereby impregnated are expanded by the Juices of the *Parent Plant* to a certain Form and Bulk, and then, becoming what we call *ripe Seeds*, they fall to the *Earth*, which is a natural *Matrix* for them.

According to the above Supposition, a *ripe Seed*, falling to the *Earth*, is in the Condition of the *Ovum* of an *Animal* getting loose from it's *Ovary*, and dropping into the *Uterus*: And, to go on with the Analogy, the Juices of the *Earth* swell and extend the Vessels of the *Seed*, as the Juices of the *Uterus* do those of the *Ovum*, till the *Seminal Leaves* unfold and perform the Office of a *Placenta* to the Infant included Plant; which, imbibing suitable and sufficient Moisture, gradually extends it's Parts, fixes it's own Root, shoots above the Ground, and may be said to be born.

Others disapprove of this *Hypothesis*, and insist that no *Animalcule* can possibly enter the *Ovum animale*, nor any Particle of the *Farina* get into the *Embryo* of a *Seed*: But, say they, in *Animals*, either the finest Part of the *Semen* is taken in by the Vessels of the *Vagina* and *Uterus*, circulated with the Fluids, and carried into the *Ovaria*, and even into the *Ova*, by the Vessels that run thither; or else, Fecundation is occasioned by a *subtile Spirit* in the *Semen masculinum*, which passes the
Uterus,

The Discovery of a perfect Plant in Semine.

Uterus, enters the *Ovaria*, pervades the Female *Ova*, actuates and enlivenes the *seminal Matter* in them contained, and produces all the various Symptoms of Conception: In Plants too, say they, the same is effected by penetrating *Effluvia* from the *male Semen*, or *Farina*.

This Account of animal and vegetable Generation is intended to introduce a Discovery, which may possibly some Way lead to a greater Certainty about it.

Amongst numberless Inquirers, whom the Opinion, that every Seed includes a real Plant, has set at work to open all Kinds of Seeds, and try by Glasses to find evident Proofs thereof, I have not been the least industrious: But after repeated *Experiments*, in every Manner I could think of, and with the utmost Nicety in my Power, I began to despair of ever attaining an ocular Demonstration of it. If by moistening the Seed it began to vegetate, I could indeed discern the *seminal Leaves*, and the *Germen* or *Bud*, whence the future Plant should arise; but was able to go no further, unless I waited till the Moisture gradually extending it's Vessels made the little *Root* shoot down, the *Stalk* rise up, and the *minute Leaves* expand, and bring themselves to View. This, however, was not the Thing I sought for: But, some Days ago, mere Accident, when I thought nothing about it, favoured me with a Discovery I had so often searched after to no Purpose.

Fig. 63.

Endeavouring with a fine Lancet to dissect a Seed of the *Gramen tremulum*, with Intention to examine the several Parts of it with a Microscope, imagining I might find somewhat curious in the Contexture of it's Husk, the Edges of which I observed to be transparent, I opened it the long Way exactly in the Middle, and took Notice of something exceeding small between the two Sides, which I had separated. I stuck the Point of the Lancet into it, with no other Design than to take it up, and place it in the Microscope to see what it might be; which I had no sooner done, than, to my great Surprize and Joy, I found the Lancet had fortunately opened a membranous Case, that included a *perfect Plant*, arising from a double Root in the Basis of it's said Case, with 2 Stems of an equal Height, each whereof had many Leaves upon it, like the Grass from whence it was produced. This was a Sight I little expected to meet with; and being aware how much Imagination has frequently had to do with microscopical Observations, I distrusted my own Eyes, and examined it every Way I could contrive, to prevent being deceived; but in all Positions I found it a Reality. Wherefore having secured it between two Pieces of *Isinglass*, together with the Cases that inclosed it, I afterwards cut open a great many Seeds of the same Sort, in Hopes I might be able to separate one of these *minute Plants* entirely from it's *Theca*; which at last I successfully effected.

Fig. 65, 66.

A Seed

- Fig. 63. A Seed of the *Gramen tremulum* entire, of the natural Size. *An Explanation of the Figures.*
 Fig. 64. The same magnified.
 Fig. 65. A Seed of the *Gramen tremulum* dissected, viz. A. One Lobe or Side of the Seed. B. A membranous Case containing a minute Plant, which arises with 2 Stems bearing many Leaves from it's Radicle in the Basis of the said Case: This Case lies between the two Lobes, and, before it is opened, seems to be the Germen of the Seed. C. A Piece of the Case cut off in opening. Fig. 63.
 Fig. 64.
 Fig. 65.
 Fig. 66. A. A Lobe of the Seed. B. The minute Plant extracted from it's Case, that it's Root and Branches may be seen to better Advantage. Fig. 66.
 C. The Case whence the minute Plant was taken.

X. In the Edition which *Boerhaave* and *Gaubius* have given us of *Swammerdam's Biblia Naturæ, sive Historia Insectorum*, in Dutch and Latin, 2 Vol. in Fol. printed at *Leyden* 1737, and 1738, we have an Epistolary Dissertation on the Seed of the Male Fern, together with a very curious Cut, representing the Seed-Vessels, their Mechanism, and the Seed, as viewed by a good Microscope, inserted at the End of the said History. The Cut I have attempted, with my unskilful Hand, to draw as well as I could; and, possibly, it may help you to conceive of the Form of what it is designed to represent, in some Measure. *Concerning the Seed of Fern, by the Rev. Mr Henry Miles. No. 461. p 770. Aug. &c. 1741.*

The Author, I find, claims to himself the having first discovered the Seed of Fern, in his Dissertation, at the Beginning: "You rightly judge" (says he to his Friend) "me to have been the first," &c. *Boerhaave* says, that he shewed them to the Botanick Professor at *Leyden*, Anno 1673, and that he had drawn the Figures of them. But I find *Dr William Cole* sent an Account of the Seeds of divers of the Plants called *Dorsiferous*, to *Dr Robert Hook* *, in a Letter dated September 30, 1669, and gives a pretty just Description of the Seed-Vessels, and the Manner in which they grow, and intended a Delineation of the Figures. *Swammerdam's* great Piety, which shines conspicuously throughout his Work, teaches me, in Charity, to conclude, he spake what he thought to be true; and, possibly, he might have made the Discovery many Years before the Time when he shewed the Seeds to the Professor. However, I am humbly confident of this, (after numberless Trials made with all Kinds of Microscopes, and in all Positions, and with different Lights) that *Swammerdam's* Account is just and accurate in every Point. I have viewed the several Kinds of Fern, *Englifo Maiden-Hair*, other Sorts of *Maiden-Hair*, *Wall-Rue*, *Harts-Tongue*, and find the Seed-Vessels of the same Form in all, some little Difference being between some of them in the Size only; and in the Manner of their being inserted on the Back of the Leaf, with the Numbers in

* Who was the first *Englishman* that discovered the Seed of the Fern by the Help of a Microscope.

various Plants, there is a more considerable Difference. I observe, where you have fewer Seeds, you have more of a Sort of *Fungus*, or Tubercule, very like what is called *Jews-Ears*, which seems to me designed to shelter the Seeds, which grow, as under Covert, round about them. In the Female Fern, and *English Maiden-Hair*, the whole Surface of the Leaf on the Inside seems covered, so the Seeds guard one another in some Measure, though in these I find, after the Seed-Vessels are shaken off, small Membranes here and there on the Surface, a little curled, looking as if they had been raised with the Edge of a sharp Penknife, from the Skin of the Leaf, not altogether unlike the Pieces of Skin we are wont to raise in trying a Penknife on one's Hand.

Fig. 67, 68,
69, 70.

The Plant which I have attempted a Figure of, with it's Seed-Vessels, &c. is the *Filix mas Dodonæi*; on the Inside of the Leaves of which are usually seen several Spots placed in a regular Manner, of a Light-brown, or Ruffet. In this Plant the principal Part of these Spots is the *Fungus* before-mentioned, around which the Seed-Vessels are inserted*.

The Seed-Vessels consist of a Stalk, by which they are inserted into the Leaf, as *cc*, of a springy ribbed Chord *ee*, having a great Number of annular Ribs, exactly resembling the annular Cartilages in the *Aspera Arteria*; and I know nothing in Nature so aptly resembling this Chord, as the *Aspera Arteria* of a small Bird, as a *Robin* or *Nightingale*, &c. This Chord incircles the globular membranaceous Pod, wherein the Seed lies, adhering to it, and dividing it into two Hemispheres. The Pod *ff* is, in Appearance, composed of a fine whitish Membrane, somewhat like that which lines the Inside of a Pea-Shell. The Seeds, *k*, are irregular in Shape, and in the Surface of them, a little resembling a Sort of Net-work, which I have endeavoured, in my rude Manner, to mimick.

Fig. 70.

In viewing this admirable Production of Divine Wisdom in this Plant, I use a single *Lens*, and no deep Magnifier, that I may have the Advantage of the Light falling on the Objects. I throw a Quantity of Seed-Vessels on a circular Plate of Ivory; and, if the Plant be newly gathered, (the proper Time is about the Beginning of *September*) I often have the Pleasure of seeing the Seed-Vessels burst; the

* Whereas I have mentioned, that a Sort of *Fungus*, of a light brown Colour, grows over the Seed-Vessels of the *Filix mas*; this is to be understood to have that Appearance, when the Seeds are full ripe, and the Vessels containing them are prepared to burst: For I have since viewed them, soon after they begin to appear, and also when the Seed-Vessels are nearly grown to their full Size; at which Times the said *Fungus* is a fine Membrane of a bright Green, entirely covering the Tuft of Seed-Vessels like a Cap, and closely adhering to the Surface of the Leaf of the Plant: But when the Seed-Vessels are arrived at Perfection in Size, and able to bear being exposed, it begins to recede from the Leaf, and to hang over them in Form of an *Umbrella*; and as they grow ripe, it gradually changes brown, and curls up a little, making the Appearance first-mentioned.

Tooting, January 24, 1744-5.

Fig. 60.



Fig. 61.



Fig. 62.



Fig. 63.



Fig. 64.



Fig. 65.



B



C



Fig. 66.

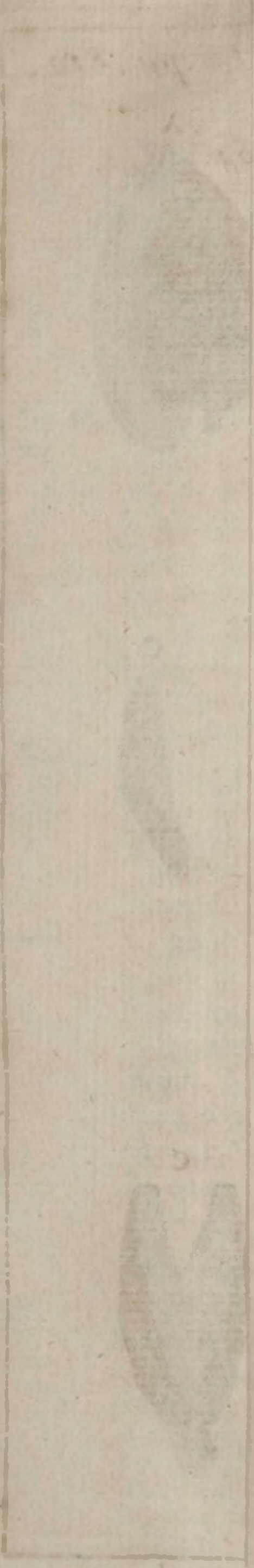


B



C





Motion of which at that Time may be seen by a good Eye unassisted. But, when I happened to light of a Pod not thoroughly crisp, I have had the Satisfaction of seeing the gradual Procedure of the bursting of the Vessel, in order to the scattering the Seed, in the following Manner: First, the Chord breaks, and by expanding rends the *Folliculum* or Pod in two Parts: By going on to expand itself, as it departs from a Curve, and approaches to a right Line, it rends itself away from the globular Pod *gradatim*, till it be wholly discharged from it; when, as there can be no further Resistance made to the Chord in expanding itself, it naturally gives a sudden Jerk (which in this Case is very gentle); and thereby the Seeds are shed on the Surface of the Plate, in the same Manner as if you were to cast some Grains of Corn out of a Bowl on the Plane of a Table-board: This I have several Times seen with unspeakable Pleasure; but where the Vessel is more crisp, the Motion of it in bursting wholly escapes the Sight, flying away with great Violence beyond the Field which the *Lens* takes in. Sometimes I have observed the Pod to be 10'', sometimes 20'' in bursting; in which Time you may have a distinct View of the Procedure. I would add, that I have more than once seen the Pod broke in the Side by some Accident, as at *l*; and the Seed lodged within, while the Chord has been whole, and still embraced it.

One might have the Opportunity of seeing this curious Piece of Divine Mechanism to greater Advantage, if I could find a Way to get the Seed-Vessels from the Leaves in a less rude Manner than by rubbing them; for they will not easily be discharged from the Leaves, (for I believe they continue a Month after the Seeds are dispersed) so as to collect any Number of them together, and this Method buries them. When I have been attempting this, they fly about like exceeding fine Vapour or Smoke, and are very troublesome to one's Hands, &c. by getting into the Pores like *Cowidge*.

Fig. 71, 72, is a Representation of a small Piece of the Leaf of *Harts-Tongue* magnified, taken from Dr *Grew's* Anatomy, or History of Plants, Plate 72, referred to Book IV. Page 200. I was surprized to see that Cut so little resembling the true Figure: Indeed the Doctor says it was a cloudy Day when he viewed the Object; and I am sure he had no just Notion at all of the Spring which embraces the Pod, as to it's Texture; for it is by no Means spiral, or like a Screw; nor do the Seeds grow in that regular Manner, as represented in the Figure.

Whatever Use may otherwise be made of this Discovery, a moral one naturally presents itself to us, *viz.* to admire the infinite Wisdom and Skill of the wonderful Creator: For what thinking Mind can help being struck with Astonishment, when he considers the *Seed-Vessels* of a coarse Plant so minute as to fly about in the Air like a Vapour, but a little Remove from being invisible to a naked Eye, framed with such

curious Mechanism, containing a great Number of Seeds, too fine to be kenned by the acutest Sight without the Help of Glasses!

Tooting, Oct. 29, 1741.

Explanation of
the Figures.

Fig. 68. A Branch of the Plant.

Fig. 69. The Seed-Vessels.

Fig. 70. The Seeds.

$\alpha \alpha$. A Branch of the Male Fern.

$\beta \beta$. Refer to the Leaves, on the Back-side whereof, the Excrescencies, like Jews-Ears, grow, around which grow the Seed-Vessels.

$c c$. The Stalks of the Seed-Vessels.

d . A Shoot from the Stalk, producing sometimes another Seed-Vessel on the same Stalk.

$e e$. The springy Chord, embracing the Pod, which contains the Seed.

$f f$. The Pod.

g . The Pod with a Crack or Clink in it, to represent it's being about to be divided into two Hemispheres.

$h h$. The Chord expanded, approaching a right Line.

$i i$. The two Hemispheres, when the Pod is divided in two.

k . The Seeds.

l . Seeds in the Pod, the Membrane being broken and turned up.

Deptford, Oct. 31, 1743.

Concerning the
Seeds of Mush-
rooms, by Mr
Roger Picker-
ing, V. D. M.
No. 471. p.
593. Read
Nov. 10,
1743.

XI. 1. I was always of Opinion, that Mushrooms had their Seeds, as well as others; and attributed the not discovering it hitherto, to the Shortness of this Plant's Duration, and to it's succulent and loose Contexture, whereby it is liable to immediate Putrefaction from the least Alteration of Weather. I could no otherwise account for the Method made use of by the *Italians*, who make Mushroom-Beds in their Cellars, with a Mixture of fine Mould, and the Parings of Mushrooms laid upon Dung; and that of our Gardeners, who water their Beds with Water, wherein such Parings are soaked; but by supposing, that their Success was owing to minute Seeds lodged and retained in such Parings, and washed off by such Infusions. So also, as to the Mouldiness of old Dung and Thatch, which the Gardeners are very fond of in making their Mushroom-Beds, I apprehended, that this Mouldiness was not the nutritive Juice or Salt proper for the Production of this Plant, but the Mushroom itself in it's early and inceptive State. The late warm Rains have enabled me to reduce my Conjectures to a Certainty. In short, I have not only discovered, that this Mouldiness is a Collection of little Mushrooms adhering to each other by minute Fibres; or, as the Gardeners in other Cases call them, Runners; but I have had the Happiness to discover and preserve the Seed of Mushrooms.

I had prepared for my Observations, by ordering the Gardener to make a Mushroom-Bed, in a well-sheltered Place, after the usual Manner; which was finished about six Weeks ago, but has not yet worked; and had

had charged him to let me know, if any occasionally sprung up in any Part of the Ground. Accordingly, about *Wednesday*, last Week, he informed me, that a great Plenty had appeared above-ground, among the Asparagus, and on the Grass-Walks, as indeed I expected, because on *Tuesday* in the Night there had fallen $\frac{10}{32}$ of a Cubic Inch of Rain, which, together with an unusual Height of the Thermometer, for the Season, made it the most suitable Weather for Mushrooms. I immediately chose out the most promising Plants, which I covered with Bell-Glasses, where there were several together, and the single Plants with little Hand-Glasses, which I had had made for the Preservation of Wall-Fruit.

Oct. 28, at Noon, I carefully gathered about a Dozen Mushrooms, of the esculent Kind, from under the Glasses; choosing such as gradually differed from each other in the Colour of their Gills, from a faint Peach-bloom Colour, to a deep Purple; flattering myself, that as I had hereby got the Mushroom, in it's several States, secured by these Glasses from the Injury of the Weather, I should be able to discover the Seed.

With these I gathered several Mushrooms of another Kind, commonly known by the Name of *Champignons*; which also I had secured under Glasses. With these I began, and soon found, what I suspected to be the Case, that the Gills, as they are called, are no other than *Capsulae*, or Pods for the Seed; for with one of the lower Magnifiers, and a fine Penknife, I could easily divide them from adhering to each other. This encouraged me to apply directly to the larger Sort of Mushrooms; and accordingly I fixed upon one of a deep Flesh-colour, which I looked upon to be, by it's Colour, in it's Prime. I began with one of the Gills carefully separated from the Head, or Stool, without bruising; but could discover nothing in it like Seeds, except that, here and there, there were some globular dark Spots, appearing, through the fifth Magnifier, about the Size of very small Pin-heads: But when I endeavoured, with a fine Brush, to wipe off any Thing, to fix it upon a Talck, the lightest Touch reduced it to Water. Upon this, I had recourse to a thin, but tough Filament, which was situated upon the Stalk or Stem of the Mushroom, in an exact Distance from the Head of the Mushroom, and the Mark, which the Earth round about the Stem had made. Upon this Filament appeared a fine downy Substance of a lively Brown, resembling the Down upon a Moth's Wing, but much finer. I could brush off some of this upon white Paper, without reducing it to Water; but, not having the new Apparatus for opaque Objects, (which is the only one I am without) there was nothing that appeared bold or sharp enough for me to depend upon. I had then recourse to a fine Talck in a Slider, and brushed off some of this brown Dust upon it; and, after I had applied the second Magnifier, I was gratified with the first Sight of the Seed of Mushrooms; for I then discovered a Multitude of round, regular, transparent Bodies, bearing the
same

same Appearance as the *Farina* of Flowers. I then applied the highest Magnifier, through which they appeared very bold, of the Size of a moderate Pin's Head.

I have endeavoured to draw a Sketch of the Mushroom, &c. in it's just Proportion.

Fig. 73.

a. Is the Mushroom in which I discovered the Seed in it's natural Size.

b. The Filament upon which the Seed was discovered, being, as I apprehend, a wise Provision of Nature, to prevent the Wind's Power over such minute Bodies as the Seeds are; for, by being placed at an exact Distance between the Head of the Mushroom, and the Ground, it secures the Seed before the Wind's Power can affect it, unless the Wind be high; and, by another easy Fall, enables it to lodge itself safely in the Ground. c. The Part of the Stem underground, from which the Fibres shoot, upon which the little Mushrooms, marked d, grow, appearing at first but like a white Mouldiness.

Fig. 74.

a. b. Animalcules of the Maggot, or Fly-kind, found in the Head and Stems of Mushrooms in a decaying State.

Fig. 75.

The Seed of the Mushroom, as it appears through the first Magnifier.

P. S. I had forgot to mention under the Article *b.* Fig. 73. that the thin Filament is that to which the Edges of the Head of the Mushroom adhere, while it is, what is commonly called, a Button, and from which it separates by expanding into a Flap.

P. S. Since I wrote the above, I have met with Sig. *Micheli's Nova Genera Plantarum*, wherein I find the Observations which I have made upon Mushrooms, though entered upon without any Hint or Direction from him, or any other Writer, pretty near the same with his. I think it therefore a Piece of Justice, due to him, and to the Reading and Judgment of Mr *Watson*, candidly to allow the first Discovery of the Seeds of Mushrooms to that *Italian* Botanist. It fully satisfies my little Ambition to have had the Honour of shewing them the first to the *Royal Society of England*.

N. B. I thought proper to print the Rev. Mr *Pickering's* Paper on the Seeds of Mushrooms, together with Mr *Watson's* Remarks upon it; because Sig. *Micheli's* Book, being printed at *Florence*, is not in many Peoples Hands here; and, as that is in *Latin*, I thought it would not be disagreeable to our Gardeners to have an Account of this Discovery in *English*: Besides, it is but doing Justice to Mr *Pickering's* Diligence in searching into the Works of Nature, since he was so fortunate as to succeed in a Discovery which had eluded many curious Botanists, and that without having taken any Hint from *Micheli*. C. M.

Fig. 67.

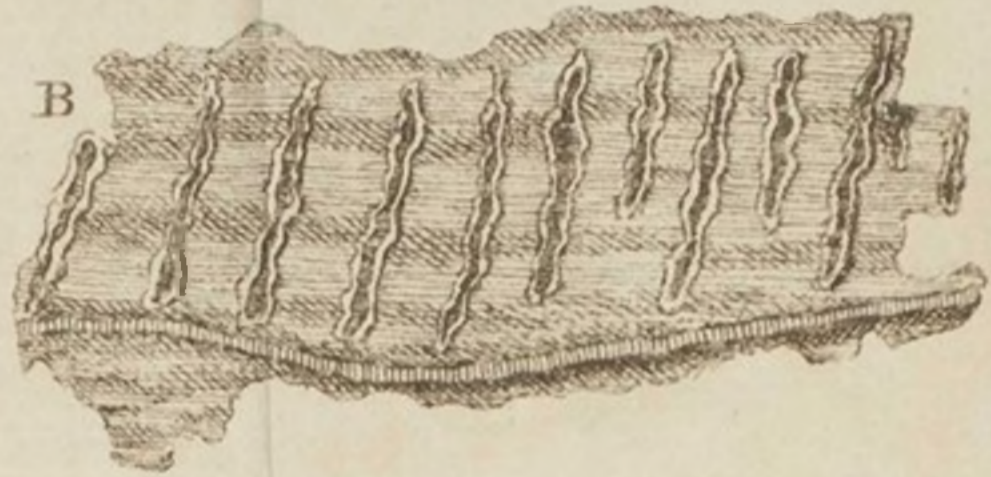


Fig. 72.



Fig. 71.

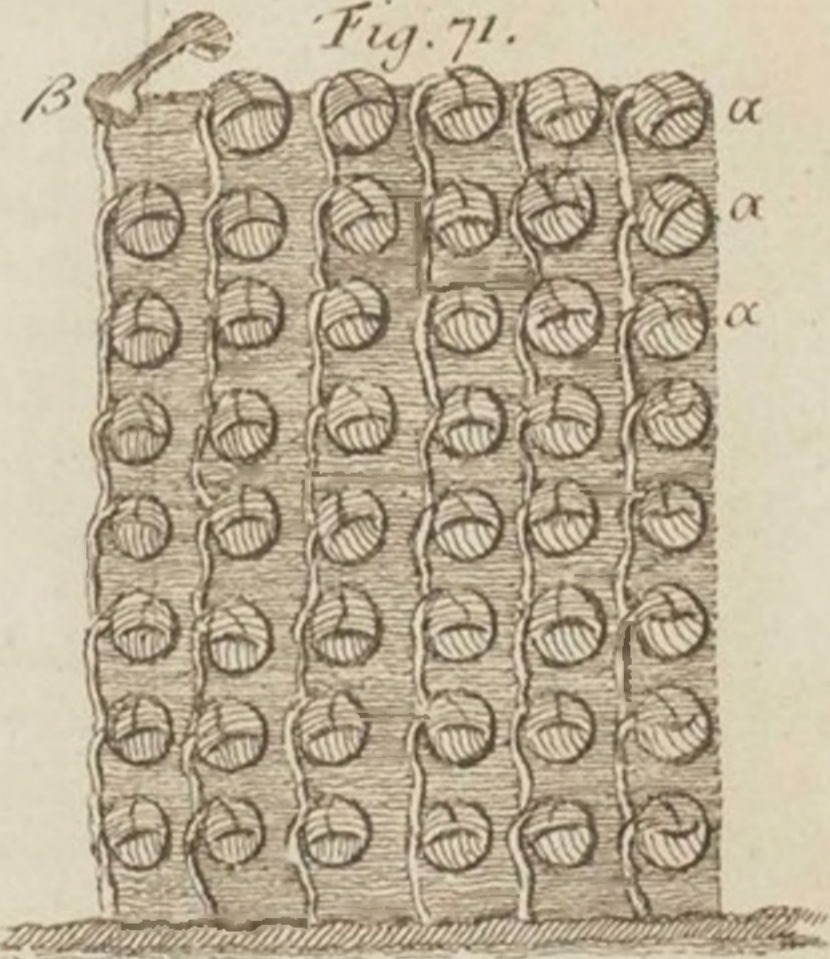


Fig. 68.



Fig. 69.



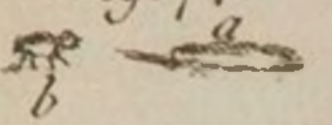
Fig. 70. k



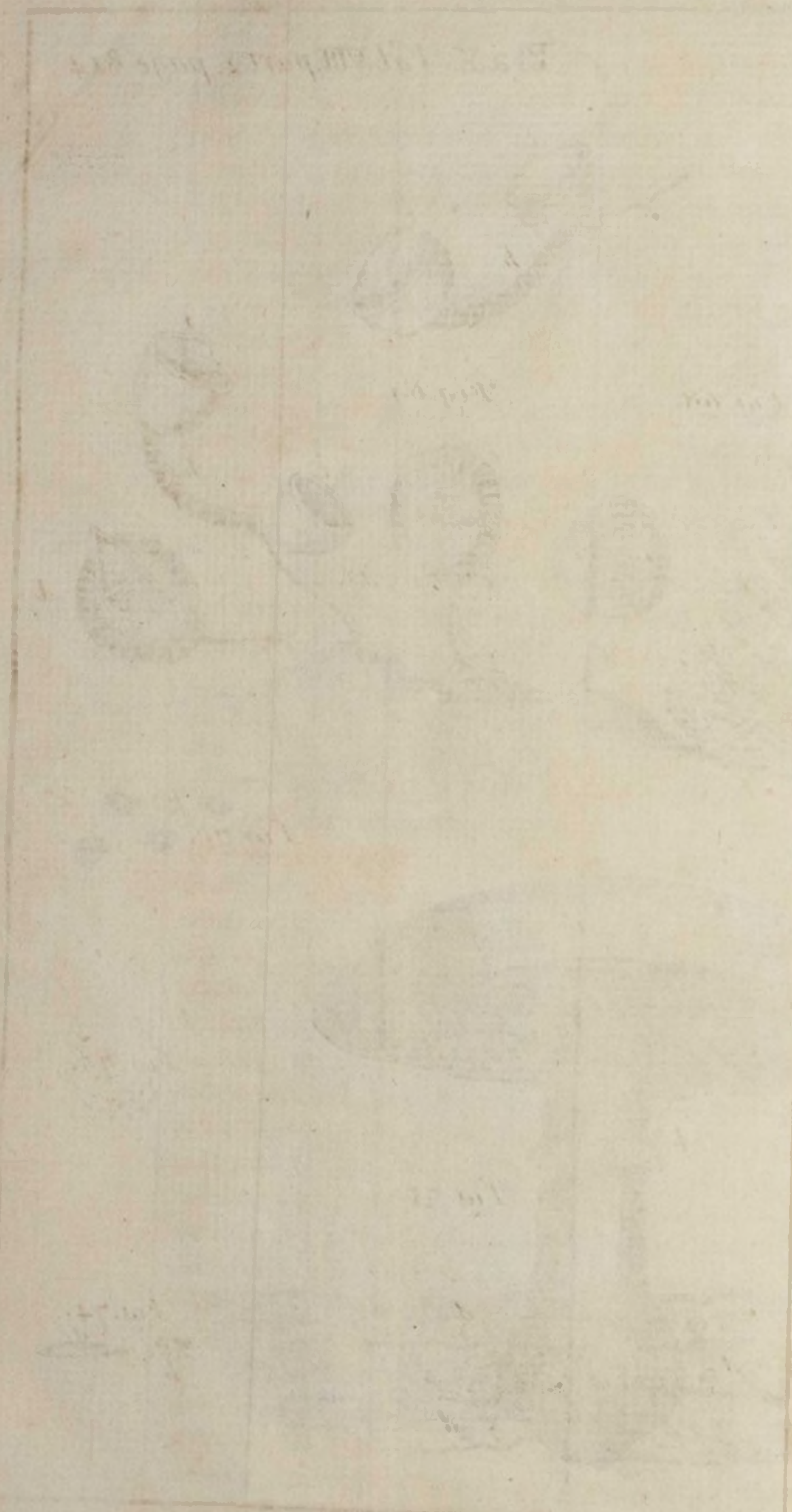
Fig. 73.

Fig. 75.

Fig. 74.



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in almost all Plants, whose Seeds are produced sparingly, or are difficult to be saved, Nature abundantly makes up that Deficiency by the great Increase of their Roots, whereby their Species may easily be propagated; as is manifest in Mushrooms, Potatoes, Crocus's, Golden-rods, Starworts, and above all in the *Corona Solis, flore parvo, tuberosa radice*, of M. Tournefort, vulgarly called *Jerusalem Artichokes*, the Seeds of which, from the Shortness of our Summer, having never as yet ripened in *England*. I shall only add, that although many Species of Mushrooms are eatable, and some of them better flavoured than the common Sort, the Gardeners only propagate that Sort with red Gills, called, by Way of Excellence, *Champignon*, a Name given by the *French* to all Sorts of Mushrooms; but some descriptive Word is added to them, whereby they may be distinguished from this. The Method of propagating Mushrooms according to the usual Practice, *viz.* from their Suckers, was first mentioned by *La Brosse*, in his Treatise *De la Nature des Plantes*, and afterwards by M. Tournefort in the Memoirs of the *Academy of Sciences*, Anno 1707, Page 72.

Nov. 17, 1743.

*Microscopical
Observations
on the Farina
of the red
Lily, by Mr.
Turbevil
Needham.
No. 471. p.
639. Read
Dec. 22, 1743.*

XII. Upon viewing an Infusion of the *Farina Fecundans* of the *Lilium rubrum flore reflexo* in common Water, I thought I perceived some Alteration in several of these minute Bodies, as if the outward Shell or Husk had, at a small lateral Orifice, shed a long Train of Globules adhering to each other, and enveloped in a filmy Substance. I, immediately upon this, applied some fresh *Farina*, adapted my Microscope before-hand, with the Tip of my Brush dropped a small Globule of Water upon the Object, and in a few Seconds, I plainly perceived a Rope of exceeding small Globules to be ejaculated with some Force from within, and contorting itself from one Side to the other, throughout the whole Line, during the Time of Action, which does not last above a Second or two, and is to be expected from a few only of these farinaceous Globules. These emitted Particles are very different from the small Globules of Oil, with which the *Farina* of the Lily abounds; for these diffuse themselves equally on all Sides, while those, on the contrary, go off in one continued Train, like the ejected Pulp of a roasting Apple; and are involved in a filmy Substance, as the Eggs of some aquatick Insects are. I have since chosen the *Farina* of a Pompion to repeat this Experiment upon, which is not of an oily Nature; and, upon account of it's Size, may be conveniently observed with the second Magnifier, where I have the Advantage of a larger Field. I viewed some few of these also out of the many farinaceous Globules, which were within the Area of my Microscope, with the same Success, and yet greater Pleasure: For I could plainly perceive, during the Time of Action, by two or three lucid Specks in the Centre of the Globule, which continually shifted their Places, an intestine Commotion within the farinaceous Corpuscle, and a stronger Ejaculation of the emitted Particles.

Particles. Mr Chambers says in his Dictionary, that no Alteration has been observed upon the Infusion of the *Farina* in Water: But this, I apprehend, is owing to the Observer's not being ready with his Microscope, and present at the Time of Action, which is almost instantaneous; and as the Orifice, at which these Particles emerge, is but small, it produces no very sensible Alteration in the Globule itself.

Paris, Oct. 24, 1736. N. S.

XIII. Having, with the Assistance of the Microscope, viewed the *Smut of Corn*, I observed the Stalks were all spotted and pricked with small Burnings: Now as the *Smut* happens after a fine Rain, followed by a bright Sun-shine, the Cause of this Evil is, that the Focus of those very small Drops is just near them, and on the Stalk that supports them: Wherefore the Sun's Rays, collected in this Point, must there burn; which dries up the Stalk, and prevents the Ear from graining.

The second Remark is on the Corn that grows up into Ears, the Grains of which are for the most Part full of Meal, quite black. With the Microscope I saw, all round or above these black Grains, small long Bodies, rolled up, and having each a Pedicle; which I found to be the Flowers, that could not reach their due Form, or come forth and ripen; so that the Grain, being deprived of this Help, could not develop it's Germ, and produced only a black Meal, for want of the unfolding of certain Vessels.

The third Remark is, the Reason that invites *Thrushes* or *Starlings* under the Legs of black Cattle grazing in a Pasture. Not being able to get near them, I observed them at a Distance with a good Glass. I saw all these Birds thrust their Head and half their Body down into the Grass, in such Manner that their Tails remained erect in the Air, as that of a *Duck* upon diving; which makes me think, that those Birds seek after Worms in the Earth; and that they gather about the Cattle, because as they are large Animals, upon trampling on the Ground, they oblige such Worms to come forth, as happen to be pressed under the Weight of their Hoofs.

XIV. Upon opening lately the small black Grains of smutty Wheat, which they here distinguish from blighted Corn, the latter affording nothing but a black Dust, into which the whole Substance of the Ear is converted; I perceived a soft white fibrous Substance, a small Portion of which I placed upon my Object-Plate: It seemed to consist wholly of longitudinal Fibres bundled together; and you will be surprized, perhaps, that I should say, without any the least Sign of Life or Motion. I dropped a Globule of Water upon it, in order to try if the Parts, when separated, might be viewed more conveniently; when, to my great Surprize, these imaginary Fibres, as it were, instantly separated from each other, took Life, moved irregularly, not with a progressive, but twisting Motion; and continued so to do for the Space of 9 or 10 Hours, when I threw them away. I am satisfied they are

Concerning the Smut of Corn, by the Abbe Pluche to Dr Mortimer, Sec. R. S. Translated from the French by T. S. M. D. F. R. S. No. 456. p. 357. Jan. 1740.

Microscopical Observations on Worms discovered in smutty Corn, by Mr Turbevil Needham. No. 471. p. 640. Read Dec. 22, 1743.

a Species of aquatick Animals, and may be denominated Worms, Eels, or Serpents, which they much resemble. This, if considered, will appear to be something very singular: But I have since repeated the Experiment several Times, with the same Success, and gratified others with a Sight of it.

Twisford, Aug. 11, 1743.

An Observa-
tion on the Du-
plicature of all
Skeletons what-
soever prepared
from green
Leaves, by Sa-
muel Christian
Hollman,
Prof. Log. and
Metaph. in the
new University
of Gottingen.
No. 461. p.
789. Aug. &c.
1741.

XV. From the first Time of my seeing those Skeletons of Leaves, which seem to have been first prepared by the diligent *Ruyfch*, and those which were prepared by the celebrated Professor *Vater*; I was struck with great Admiration, and a strong Desire to obtain the Method of performing an Operation, which gives so much Light into this stupendous Work of the great Creator. I made many Trials on the Power of a slow Fermentation and Putrefaction with some Success, when I was informed by my learned Friend, that the whole was to be done by Putrefaction, which I afterwards found more fully explained in the *Commercium Liter. Physico-Medicum*, printed at *Norimberg*. I now went on securely, and prepared not only Skeletons of several Leaves, but also both Cuticles, which strongly adhere on each Side of every Leaf, and separated them easily, and dried them with such Success, as to shew all their Dimensions. Hitherto I had only performed what had been already observed and described in the above-mentioned Papers: But soon afterwards an Accident happened, which perhaps has never yet occurred to any of the Dissectors of Leaves. Whilst I was busy in preparing a Leaf, which did not answer my Expectation, I threw it away, torn as it was, into a Vessel that stood by to receive what I rejected, and went to work upon something else. But soon after I had a Fancy to examine the torn Parts of the rejected Leaf by a Microscope. This Labour proved not to be vain. I discovered, not without Wonder, that the Parts, which lie very closely one upon another, were now separated by that violent Laceration of the most tender Fibres, and were in a most distinct Manner visible separately; and so that there was a Duplicature to be observed of all the *Fibrillæ*, both great and small, of the torn Leaf. I was in Doubt at first, whether that violent Laceration had produced any Thing in that Part of the Leaf, contrary to it's natural Constitution; and whether this Duplicature of all the *Fibrillæ* was rather owing to the Force applied, than the Work of Nature; but this Doubt soon vanished: For after I had tried, in other Skeletons of Leaves which were at Hand, and not yet dried, whether the fine Fibres, of which they are constituted, would suffer themselves to be parted without much Force; I found, in Leaves now brought to that State of Putrefaction, that each Cuticle adhered to the Leaf only at the very Edge; and that after the Separation thereof, that Matter of the green Leaf lying under it, being now dissolved by Putrefaction, went off of it's own Accord. I found also, that the Pedicle separated no less into two Parts of it's own Accord, and upon taking off the Cu-
ticle,

ticle, began to open; and that upon gently pressing these Parts separately with the Finger, and pulling them gradually asunder, there was a certain peculiar and separate Net of very subtile Fibres annexed to each of them, which very easily parts from the other, and has each Divarication, and, as it were, Ramification of Fibres, so exactly answering to the Divarications of the other Net, and lying so closely upon them, that they seem to make but one Net, before their Separation. When I had succeeded thus in several, I observed besides, in others, which were reduced to mere Skeletons, and afterwards in Leaves which were a long Time macerated in Water, to facilitate the Separation of the smallest Nets from each other, but chiefly at their very Points, that those Nets parted gradually from each other of their own Accord; and I plainly perceived, that when they were gently moved about in very clear Water, they were actually parted asunder. I therefore held such a Skeleton with a Finger of one Hand under Water to the Bottom of the Basin; and endeavoured at the same Time, with the other Hand, to raise the upper Net, that parted spontaneously, by Means of a Penknife, till I found I could do it gently with the Fingers; and then I pressed the under one with another Finger to the Bottom of the Vessel, holding it fast there, and so endeavoured gently to pull one Net from the other, beginning at the Point of the Leaf. This also succeeded at last, and here I observed the same Distribution of all the Divarications and Distributions of both Nets to answer exactly to each other.

When I had thus found these Nets in every Skeleton to part from each other of their own Accord, I no longer doubted, whether the Force, which I had used before, was the Work of Art, or of Nature; and was now sufficiently convinced, that every Skeleton naturally consists of such a double Net of Fibres. But I was afterwards still more confirmed in my Opinion, when I observed by the Microscope, that in one Net the Divarication of the Fibres, both great and small, was hollow like a Gutter, and in the other convex, and that in such a Manner, that the Concavities were exactly fitted to the Convexities, and received them so accurately, as to resemble simple Fibres, and not to shew the least Sign of Duplication. This is easily perceived, in the Leaves I made use of, even by a Microscope of middling Goodness. Nor will any one find it difficult to discover the same, provided he first understands the Art of making the Skeletons themselves, and suffers the Leaves to come to the just Degree of Putrefaction, and performs the whole Operation in a Vessel not above 6 or 8 Lines deep, and filled with clear Water.

Fig. 76 exhibits a naked Skeleton of a Leaf, prepared by me after *Fig. 76.* the Manner above-mentioned, in which no Division has been attempted.

Fig. 77 shews one partly divided, and after this Separation laid upon *Fig. 77.* the Water in such a Manner, that the Parts of the Pedicle are purposely turned a little to the opposite Side; that so each Divarication of both

Nets may be seen the better, and thus that whole Skeleton is afterward dried. By this it appears very distinctly, that every Divarication of one Net is answered by just as many, and in the same Order, in the other, and that not one of them is destitute of it's Companion.

Fig. 78.

Fig. 78 represents a Skeleton of a Leaf, divided in such a Manner, beginning from the Pedicle, that one of the Nets may be raised as far as they are separated, the other Parts still sticking close, and seeming but one Net, by which the Duplication is visible to any one.

Fig. 79.

Fig. 79 shews a Skeleton divided from the Point toward the Pedicle, so that each *Lamella* may be separated from the other; but the Parts near the Pedicle are left without any Separation.

Fig. 80.

Fig. 80 is a Leaf, where one Side only, next the Pedicle, is divided; so that one Net may be raised from the other, and one Side is left in it's natural State and Situation.

Fig. 81.

Fig. 81 represents not only the Nets separated from each other, but both Cuticles also, which are so extremely delicate, that the least Puff of Breath will injure them.

Fig. 82.

Fig. 82 shews no Duplication of the Fibres, but only the Cuticles both of the Leaf and Pedicle, and the Division of the Pedicle into two Parts, to which the Nets closely adhere, one being convex, and the other concave.

Some Conjectures on the Use of the Duplication of the Fibres of Leaves, by the same. Ibid. p. 796.

XVI. I suppose it generally known by those, who are at all conversant in the Study of Nature, that most of the ligneous Fibres in Plants, and such as are analogous to them, consist of many minute *Tubuli* and *Canaliculi*, by which the nutritious Juice is conveyed from the extreme *Fibrille* of the Roots to the most distant Parts, being propelled and protruded by it's moving Principle, whatsoever that is. Whosoever knows this, can hardly be ignorant, that those smallest *Fibrille*, of which the Stalk or Pedicle of Leaves consists, are only an Elongation and Continuation of those smallest *Canaliculi*, and constitute a peculiar Kind of Bundle of them, by which the nutritious Juice is transmitted to the other Parts of the Leaf, and distributed through them; and afterwards unfolded by various Divarications and Ramifications through the whole Plane of the Leaf, and recede more and more from each other, but are again wonderfully inosculated, in many Places, by various *Anastomoses*, and so constitute together a Kind of coherent Net of *Fibrille* and smallest Tubes. This may easily be observed by the naked Eye, or by a tolerable Microscope. Nor can I imagine any one, that is at all versed in Natural Philosophy, to be ignorant, that in the last Century many very famous Men came into the Opinion, that the nutritious Juice circulates in Plants, as well as in Animals; and that many Experiments have been made to confirm it, before the *Royal Societies* of *London* and *Paris*. Therefore, when I intend to speak of the Duplication of Leaves, and their smallest *Fibrille*, I look upon this as a Thing commonly known.

Now.

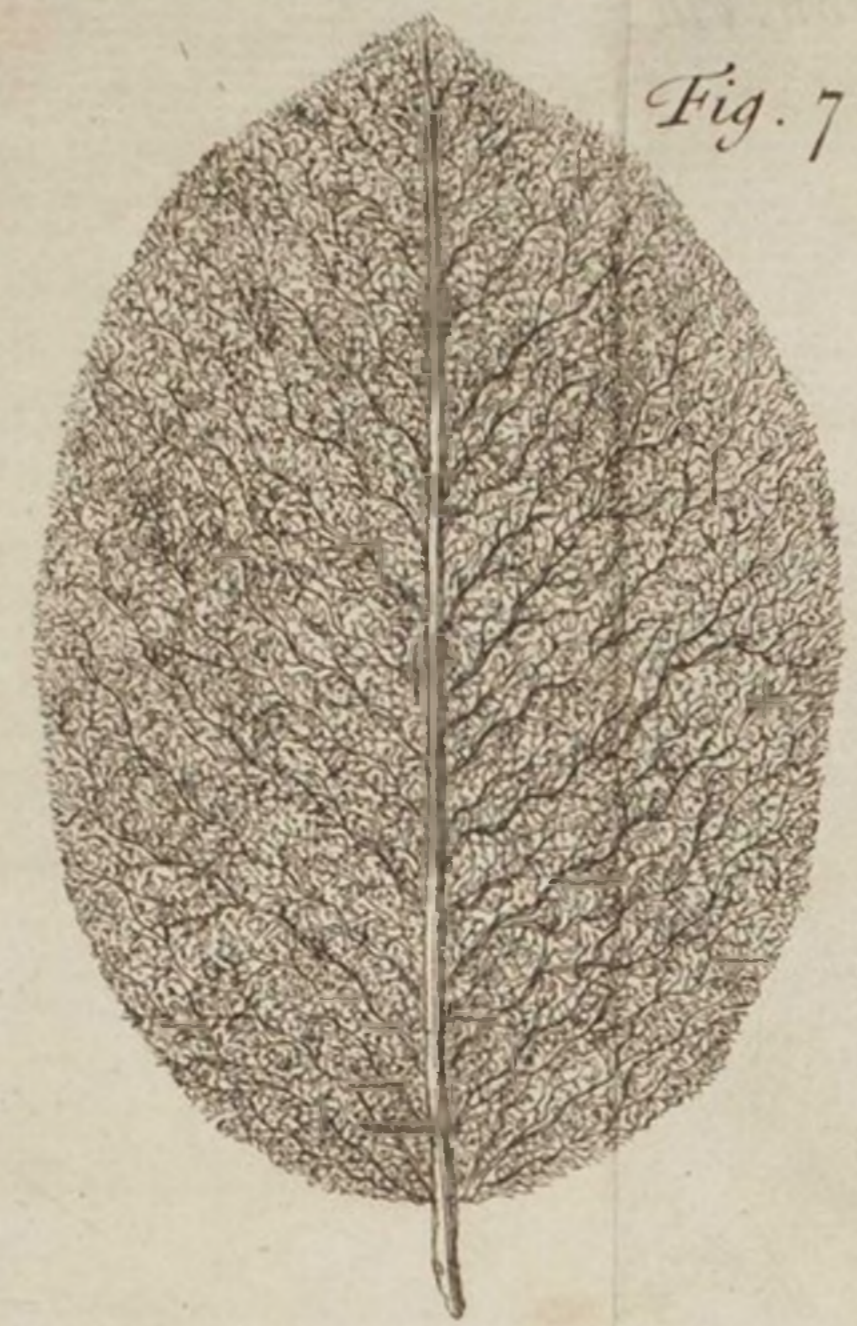


Fig. 76.



Fig. 77.



Fig. 78.



Fig. 79.

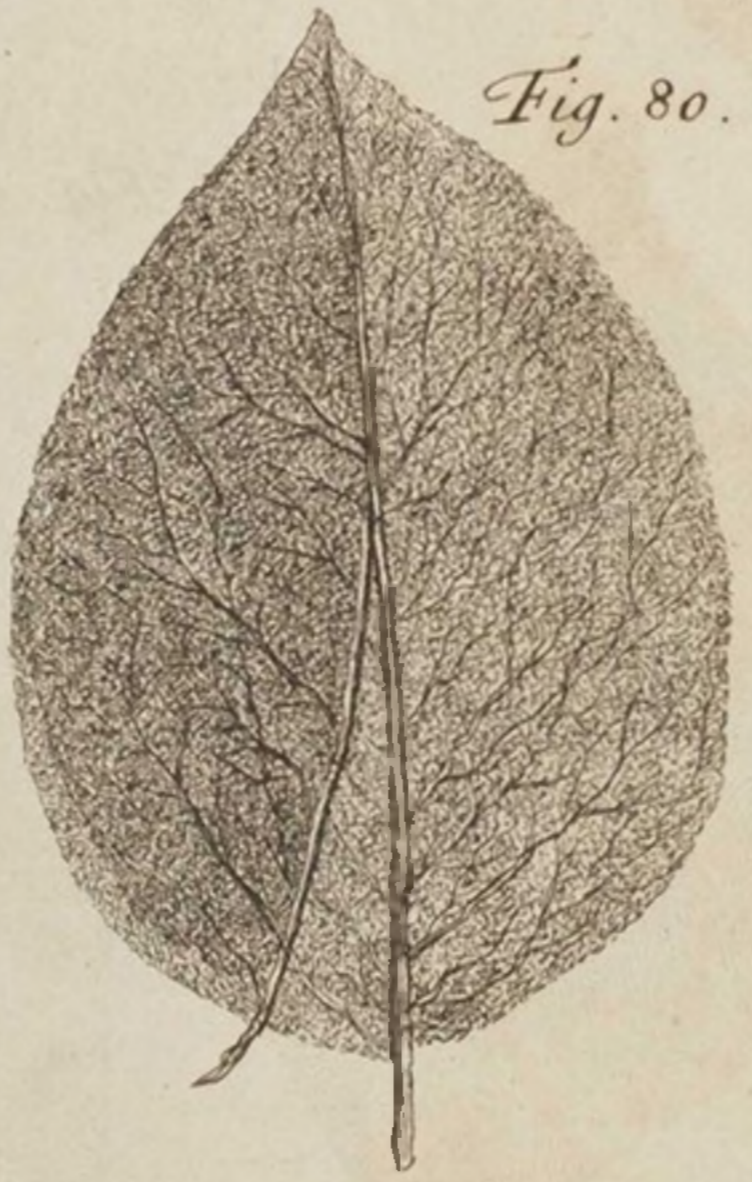


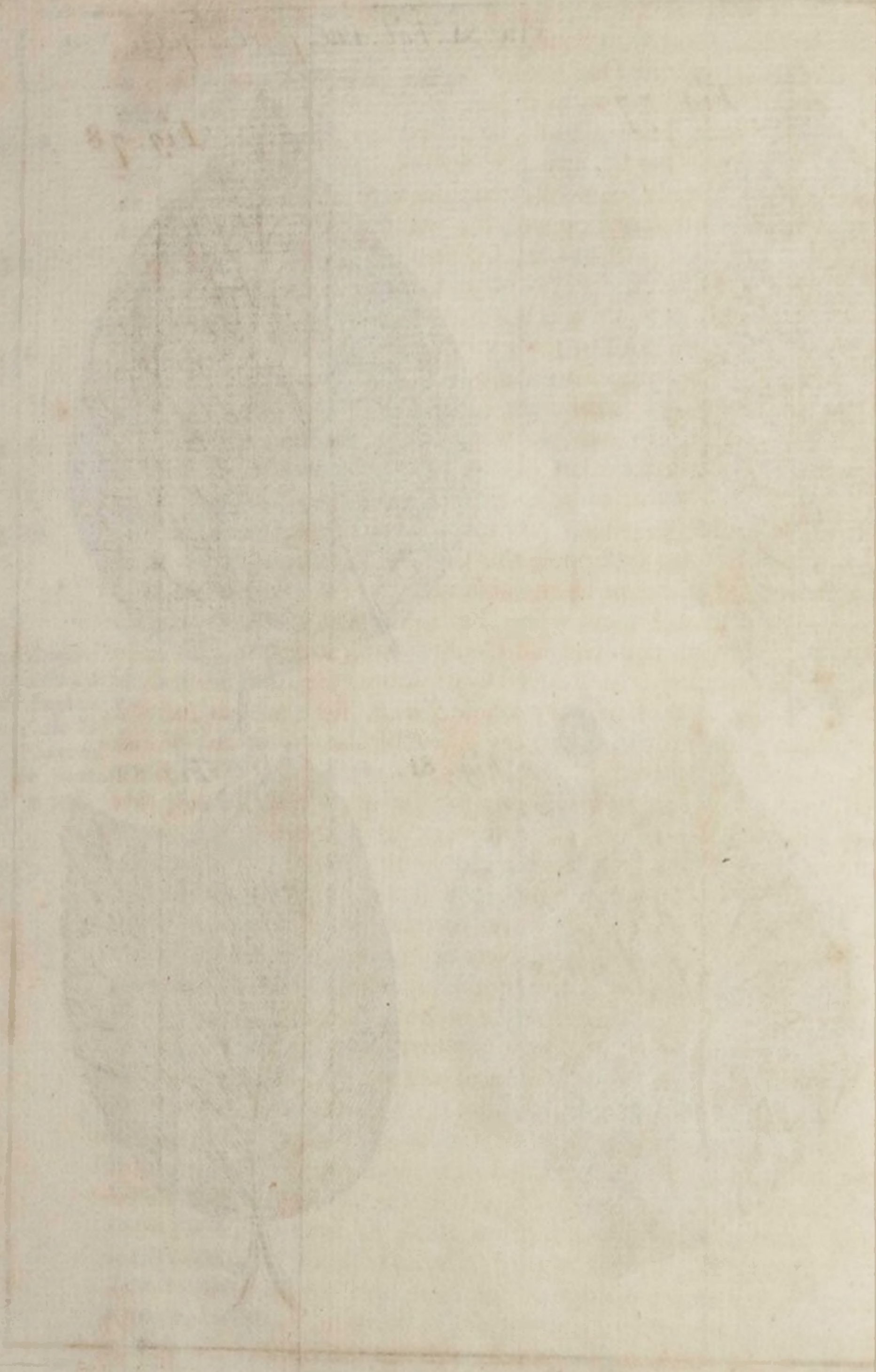
Fig. 80.



Fig. 81.



Fig. 82.



Now it cannot be imagined, that there should be a stronger Argument, to convince those who doubt of the Circulation of the nutritious Juice in Plants, than this Duplication of the Net-work in all Sorts of Leaves. For if the Fibres of that Net are so many little Tubes, by which the nutritious Juice ascends into the Leaf, and is distributed through it, of which hardly any one doubts, and the Duplication is such as has been already demonstrated, the very minutest having it's Companion exactly corresponding with it; nothing can seem more manifest, than that one Side performs the Office of Arteries, and the other of Veins. Thus they are always found to accompany one another in animal Bodies; and therefore one Kind of them serves to carry the nutritious Juice from the Root to the Extremities, and the other to carry it back from the Extremities to the Root; and thus this circulatory Motion is performed by this different Kind of Tubes in Vegetables.

This is not a Place to inquire, what Truth appears to me to be in this Opinion of the Circulation of the Juice in Plants, much less to examine what is still farther to be considered about the Experiments that have already been made; which perhaps I may take another Opportunity of doing. But let us suppose this Circulation to be settled past all Doubt; yet this Duplication by me observed, does not favour this Opinion quite so much as I could wish: For in the first Place, it does not seem evident enough, and past all Doubt, that the *Fibrillæ* of every Net considered separately, and their Divarications, are Ramifications of the whole *Tubulus*, and of so many whole *Tubuli*, since in such *Fibrillæ*, cut or broken transversely, no Orifices and Inosculation of any *Tubuli*, such as are easily observed in the Fibres of any Sort of Wood, cut transversely or horizontally, could ever yet be discovered by me, even with the Assistance of the best Microscopes. Perhaps therefore, whilst the convex Part of one Net, is received in the Bosom of the concave one, and strictly embraced thereby, some small and only insensible Cavity is left between them, which serves to transmit the nutritious Juice; and thus the Divarications of both Nets being mutually conjoined, perform the Office of *Tubuli*. But if, notwithstanding what has been said, we should grant, that all the *Fibrillæ* of both Nets are so many entire and perfect *Tubuli*, by each of which any nutritious Juice is transmitted, and distributed through the Substance of the whole Leaf; yet I do not think, that it can hence be inferred, that the *Tubuli* of one Net perform the Office of Arteries, and those of the other that of Veins, and so that the nutritious Juice is circulated in these *Tubuli* of the Nets: For I have observed two Things principally in the above-described Preparation of Leaves, which do not seem at all to favour this Opinion.

1. I have discovered, that the smallest *Fibrillæ* of both Nets, seated and terminated in the extreme Edge of the Leaf, can much more easily be separated from each other, and recede, as it were, of their own Accord, than those which are more remote from the Edge; though each Cuticle adheres most closely on each Side at the Edge; and though it

has already receded of it's own Accord, from both Nets of the Leaf, through it's whole Circumference; yet here it must be carefully dissected with a Knife, if we would have one *Lamella* depart from the other: Which seems to be a most evident Argument, that the Extremities of the *Fibrilla* of both Nets do not cohere at the Edge of the Leaf, and bend like Arteries to their Veins, since those most subtile Tubes ought most strictly to cohere, especially in this Place. 2. This also is worthy of Observation, which I have found not seldom to happen; that when one Surface of a Leaf swimming upon the Water, during the Time of Putrefaction, has risen a little out of the Water, this very Surface being less thrust under the Water than the other, and being all covered with Putrefaction, has been made fit for the Preparation of a Skelēton, it has with more Difficulty let go it's Cuticle, and suffered the greenish Parts, placed between the *Lacune* of the Net, to be washed off by the Water, than the other Surface of the same Leaf. When this therefore has happened, I have sometimes observed by the Microscope, that the lower Net of the same Leaf, with regard to the Situation and State of Putrefaction, has been deprived of all the green Pulp, sticking between it's Divarications and *Lacune*, whilst it was closely fixed and interwoven between the Divarications and *Lacune* of the lower Net; which may easily be observed by any one, who will apply himself to this Subject. Since therefore it is thus evident, that this subtile green Pulp, which lies close under each Cuticle of every Leaf, and generally comes in great Part away of it's own Accord, after due Putrefaction is no less distinguished into two *Lamelle*, and as many *Strata*, of which one intimately and closely interwoven with the one, and the other with the other Net of the Leaf; it seems also to be very evident, that one Net serves to generate one Surface of the Leaf, and the other to do the same to the other.

Since therefore the Use of that Duplication in the Skeletons of all Leaves is manifest, let me add some other Things belonging to this Argument, the first of which chiefly concerns the Generation of that greenish Pulp, which lies on each Side between the *Lacune* of both Nets. It is manifest to me, from several Observations and Experiments, that it is produced from the nutritious Juice in Vegetables, that being concreted, it acquires the Form of Bladders; whence it has been described under the Name of *Utriculi* by good Writers. It appears from the Pith of all Trees, from their green Bark, from the Stalks of most Flowers that rise immediately from the Ground, from those which are protruded from Trees, and from the other common Leaves of all Plants whatsoever, in which the utricular and vesicular Figure may generally be seen by the naked Eye. Now it is manifest from Experience, that when any viscid Liquor, or such as is impregnated with saline and oily Parts, is driven through narrow Tubes by an Agitation of the Air, it is always expanded into fewer or more Bladders at the Extremities of those Tubes, which is known even by our Childrens playing

ing with the Soap suds. But since it appears from the Anatomy of Plants, that their solid Parts and Fibres commonly constitute their smallest *Tubuli* and *Canaliculi*, which run from the *Fibrilla* of the Root to the utmost Ends of the Leaves in the more perfect Plants; and as it is no less manifest, that the nutritious Juice is propelled to the Ends of the Leaves, by no other Force than that of the Gravity and elastick Power of the Air incumbent on the *Fibrilla* of the Roots; it is very probable, that the nutritious Juice, being propelled by the Power of the Air through the most narrow *Tubuli* of Plants, to their very Extremities, is expanded into some very small Bladders, and after the insensible Transpiration of the aqueous Parts consolidates, and retains that vesicular Form, and that so this vesicular and utricular Substance is formed in Plants. From this most simple Theory, in my Opinion, may almost all the *Phænomena* relating to the Nutrition of Plants, as well as those which have already been observed by the learned and judicious Dr. *Halas* receive some Light, as I shall prove more fully at another Time. By these Means it seems to me, that the green, and the vesicular and utricular Substance in Leaves, may exude from the smallest *Tubuli* of every Net, and their Extremities, and adhere to those smallest *Tubuli*, and there be gradually hardened between the Cuticles, and so with those *Tubuli*, from which it is protruded, and in a Manner interwoven with their *Lacunæ*, form at last a common and continuous Expanse in the Net of every Leaf. But the Cause of the Divarication of the *Tubuli* from each other, cannot at present be explained at large, though it might be understood from the same Fundamentals. But because that green Pulp is of a far more tender and soft Substance than the *Tubuli* of the Nets; it is more easily destroyed also by Putrefaction, whilst the *Tubuli* of the Nets remain yet entire, and unhurt by that Putrefaction, and may be distinctly perceived to be entirely denudated.

This Observation furnishes me with another, not unworthy to be mentioned. The figured Stones, which represent the Figures of various Plants, even of such as are exotick, with all their Ramifications, which are the most tender and subtile of any Thing in Nature, have caused me to doubt, whence their Figures could arise in those Stones. Great Quantities of Stones are digged up in the Mountains about *Gottingen*, for building Houses, and paving the Streets, which besides petrified Shells, Sea-Stars, *Cornua Ammonis*, and such like, between the Joints of the Shells, nay, and upon the very petrified Shells themselves, have Delineations of Shrubs so fine, that the naked Eye cannot discover all their Parts; and it may well be questioned, whether any Plant in the World has such delicate Branches. But after the Preparation of those Skeletons, and the making of that Observation, that the green Pulp is more easily corrupted than the *Tubuli* of the Nets, the whole Doubt vanished. For those delicate Shrubs, delineated in Stones or petrified Bodies, seem to be only the Nets of Leaves remaining after the Putrefaction of the other Parts, and imprinting their Form on the

soft Mass, which afterwards is hardened to Stone. This Opinion will appear probable to any one, who will take the Trouble of comparing the Net-work of Leaves and these Shrubs together.

Concerning the Vegetation of Melon-Seeds 42 Years old, by Martin Triewald, F. R. S. Captain of Mechanics, and Military Architect to the King of Sweden. No. 464. p. 415. Read May 20, 1742.

XVII. Secretary *Hærens*, of this Place, having a large Collection of natural Curiosities, amongst which he has likewise collected a great Number of foreign Seeds, and finding he had *Melon-Seeds* that were laid up in a Paper in the Year 1700. I was curious to try if they had retained their vegetative Quality, and accordingly the 21st of Feb. last, I planted myself 24 of them in a separate Hot-bed, of which I had 21 good Plants, which, after they were planted in a new-made Hot-bed, shewed Flowers before they began to branch themselves, and their Branches were very narrow, yet produced early and plenty of good *Melons*. This Experiment shews not only how long *Melon-Seeds* retain their vegetative Quality, but likewise that good *Melon-Seeds* cannot well be too old. I know it is no new Thing to make use of old *Melon-Seeds* rather than new, but I never heard of any Body trying so old as these.

Stockholm, Nov. 16, 1741.

Concerning the wonderful Increase of the Seeds of Plants, e.g. of the Upright Mallow, by Mr Joseph Hobson. No. 468. p. 320. Read Jan. 27, 1742-3.

XVIII. Observing here a large Plant of the common *Upright Mallow*, which I thought must have a large Number of Seeds, I had the Curiosity to count them. The Seeds being disposed in Rings, I counted those which were upon the principal Stems, and there were upon

| | First. | Rings. |
|---|--------|-----------|
| The _____ | 1 — | 1100. |
| | 2 — | 1058. |
| | 3 — | 888. |
| | 4 — | 874. |
| | 5 — | 753. |
| | 6 — | 744. |
| | 7 — | 732. |
| | 8 — | 587. |
| | 9 — | 466. |
| | 10 — | 465. |
| | 11 — | 378. |
| | 12 — | 355. |
| | 13 — | 344. |
| | 14 — | 341. |
| | 15 — | 210. |
| | 16 — | 180. |
| Upon many odd small Stems _____ | | 724. |
| Rings in all _____ | | 10199. |
| Multiply by Seeds in one Ring _____ | | 12 Seeds. |
| Number of Seeds _____ | | 122388. |
| Allow for two large Stems destroyed _____ | | 7612. |
| Seeds in all _____ | | 130000. |

I then

I then counted the Seeds in several particular Rings, and found them commonly 14 in each, but have confined myself to multiply the Rings by 12, which is moderate, yet makes the Number of Seeds amount to 150000, allowing 7612 Seeds for two large Stems cut down and destroyed, a moderate Allowance, considering two of the Stems alone contain each above 1000 Rings: Some of these Stems were above 2 ½ Yards high. I have to add, that this Plant was a Seedling last Year, transplanted out of the Fields on the End of a sloping Strawberry-Bed; and I counted the Rings in the Middle of last July, when it had Thousands of Flowers upon it, which, with Thousands that must still succeed, might very probably produce more than 50000 Seeds* more, considering 1000 Rings contain 12000 Seeds and more; and if we multiply the Number of Rings actually counted, by 14, the Number of Seeds contained in one Ring, instead of 12, we shall have an Addition of 20000 Seeds; all which, added together, amount to 200000, the possible Increase of one Seed.

Macclesfield, Sept. 1, 1742.

XIX. About 3 Years since, seeing some *Bulbous Roots* set in Glasses filled with Water in a Shop Window, and being told they would flower in that Manner, I immediately tried a couple of *Hyacinths*, which blowed very prettily the next Spring: It pleased me much to see that we could have such Things in a close Room in Town, without the Help of a Garden to produce them, having lately come out of the Country, and being a Lover of Flowers; wherefore I began to think if I could contrive a Method to make a Pot-full blow together, with a Mixture of several Sorts of Flowers with a Variety of Colours, it would be an Improvement.

Experiments and Observations on Bulbous Roots, Plants, and Seeds growing in Water, by Mr William Curteis. No. 432. p. 267. April, &c. 1734.

The next Year, I took a couple of common penny Garden Pots, and stopped the Holes at the Bottoms with Corks; and painted the Pots, and puttied the Corks, that no Water could filtrate through them; then had a couple of Boards cut to fit the Tops of the Pots, bored with seven Holes at equal Distances, to place my Bulbs in, and likewise as many small Holes for placing of Sticks, to tie the Stems of the Flowers to; I then planted *Hyacinths*, *Narcissus's*, *Tulips*, and *Junquils*, and filled the Pots with Water up to the Board, so that the Bulbs stood only upon the Water, where they blowed very well, and made the best Appearance, as I thought, I had ever seen, beyond any Flower-Pot that could be dressed by gathered Flowers. After the Bloom was over, their Leaves looking green, I set them out in my little Garden, thinking any Thing that looked green, and made a tolerable Figure, agreeable in a London Garden; and not depending on the Bulbs again to be of any Service to be preserved, I let them stand till toward Midsummer, and took no farther Care, but now and then giving them fresh Water as it

* Even supposing many of the Flowers to produce no Seed.

Observations on Bulbous Roots, Plants, and Seeds growing in Water.

perspired or evaporated, and when the Rains filled the Pots, I emptied them down to the Boards again; but the Bulbs shrinking, some of them slipped through the Holes down to the Bottom of the Pot, and about Midsummer, when their Leaves began to grow yellow, I went with a Design to pull them up and throw them away, I was surprized to find that the Bulbs, which were buried in the Water, were grown firm, and too large to be drawn back through the Holes, being sound and fit for blowing the next Year, and increased in Off-sets.

This occasioned me the next Year (which was the last) to try another Experiment of blowing my Bulbs under Water, which I found answered beyond what could be expected, for they rather out-do those that grow in the Ground, in the Strength of their Stalks, the Clearness of their Blossoms, the lasting of their Bloom, and likewise the Difference of their Seasons, which may be so managed, according to the Warmth of the Rooms they are kept in, as to have the same Sorts in Flower from *Christmas*, till the natural Time of their Bloom in the open Ground, which is *March* and *April*.

But finding it very troublesome to keep the Boards fixed under Water, I thought Lead might answer the Purpose better; whereupon, I got some Sheet Lead, of about four Pounds to the Foot, cut fit to my Pot, and made Holes in it proportionable to the Bottoms of my Bulbs, and likewise small Holes to fix Sticks for the Support of the Leaves and Stems of the Flowers; I put a little coarse Sand in the Bottoms of my Pots, thinking it would support the Sticks, and keep them steady; but when I came to make use of the Sticks, the Sand gave way; I then made false Bottoms with Lead, and cut Holes opposite to those at the Top, which answered my Purpose. Upon taking up the Bulbs to put in these false Bottoms, I found the Sand had corroded the Fibres, and changed them all like Ironmould, that I thought they were spoiled; but rinsing them in two or three Waters, it came clear off, and on fixing my false Bottoms, and placing the Bulbs in their Holes, and filling them up with fresh Water, they recovered, and never changed again in the clear Water, but thrived and put forth their Flowers very kindly, although by the Experiments which I had tried, before I could fix them right, I had often planted and transplanted them. But I found afterwards, that Glass Jarrs of the Form as represented in the Plate, were the most convenient, both for seeing the Progress the Roots made, and for knowing when they want to be cleaned.

Fig. 83.

At *Fig. 83* is represented one of these Glass Jarrs, containing the following Flowers.

- | | | |
|-------------------|---|---------------------|
| 1. Golden Sun, | } | <i>Narcissus's.</i> |
| 2. Bosselman, | | |
| 3. Keyfers Jewel, | } | <i>Hyacinths.</i> |
| 4. Pulchra, | | |
| 5. Janus, | | |

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At *Fig. 84* is represented the Profile or Section of the same Jarr. *Fig. 84.*
a. The Sticks to tie up the Leaves and Stems of the Flowers. *b.* The upper Lead with Holes to support the *Bulbs* and Sticks. *c.* The under Lead with Holes to support the Sticks steady.

By several Experiments on dried Bulbs, and those that were taken fresh out of the Ground, I find the dried ones do best; for those taken growing out of the Ground, being full of Moisture, will not so soon, upon changing their Element, be acquainted with a new one; the Fibres they had struck in the Ground, always rot, and they must make new ones in the Water, which makes them require a long Time before they can recover themselves enough to flower. The Bulbs will not rot, yet they will not be so strong as those put in the Water when dry; which fill themselves with Moisture by Degrees: Therefore, when I plant my Bulbs, I set them at first on the Top of the Water; for I found by two or three Experiments, that those planted under Water did not push out their Fibres so soon, nor so strong, as those set upon the Water; the Reason of which I take to be, that they were filled with Water too soon, whereas those set upon Water attracted it by Degrees, and so made both the Fibres and the Bulbs grow stronger; and then about 5 or 6 Weeks after planting them, as the Fibres push out, I by Degrees fill the Water higher and higher, till the whole Bulb is covered, and so keep them till the Bloom is over, and the Season for drying them returns.

One Observation surprized me, *viz.* two of my *Hyacinths* were mouldy, which Mould cankered and eat Holes through several of their Coats or Scales; this I picked and cleaned several Times, but still it spread farther and farther; but soon after they were covered with Water, I could perceive them heal by Degrees, till they became perfectly sound, and blew their Flowers as kindly, as those that had continued perfectly sound.

By another Experiment, I tried what Bulbs would do if kept all the Year under Water: I left in Water a *Narcissus*, an *Hyacinth* of *Peru*, and several *Junquils*, that were planted in *October*, 1732; which are now as sound and strong, as those I took out and dried, and promised fair for a Bloom; I observed that their old Fibres did not rot, till they were ready to push out new ones.

Another Observation seems worthy of Notice; one of my double *Hyacinths*, commonly called *Keyser's Jewel*, brought two Pods of Seed to Maturity; which I have blowed for 14 or 15 Years successively in the Ground, and could never find them make any Thing towards seeding; and I have reason to think that several other Bulbs would have seeded, if I had taken timely Care of them, but did not perceive it till too late.

Mr *Miller* intimates*, that Bulbs set in Glasses grow weaker, and should be renewed every Year with fresh ones; but I observed by this Way of raising them under Water, that at their taking up, they are as large, and some of them stronger than when they were planted, and if they be dried at the proper Season, will produce a second Year as well as fresh ones.

I planted likewise *Ranunculus* and *Anemone Roots*, which grew and shot up the Stems of their Flowers very strong, but the Buds of the Flowers were blasted, which I am apt to think happened from their being crowded too much, having no Convenience to give them free Air enough.

I also planted *Auriculas* and *Pinks*, the *Pinks* flowered, but the *Auriculas* were not strong enough; they are still both of them growing, and I am in Expectation they will blow the next Season.

I have tried also several Shrubs, as *Roses*, *Jasmines*, and *Honeysuckles*; which all grew, and struck out fresh Fibres, and the *Rose-Tree* made six strong Buds for Blossoms, but accidentally setting them out in a hot Sun-shiny Day in *April*, they were all scorched up, that they came to nothing; I observed, that strong Suckers cut off 2 or 3 Inches under-ground, without any Fibres, grew the best.

By another Experiment, I was willing to try what the succulent Plants would do in this Way; I took a Leaf of the *Opuntia*, or *Indian Fig*, and laid it by to dry for 3 Weeks or a Month, till it had lost all it's Moisture, and was nothing but a dried Skin; I then planted it in Water in the beginning of *July*, and tied it to a Stick that was fixed in one of my Leads, and filled the Pot so, that the Bottom of the Leaf was $\frac{1}{4}$ of an Inch in the Water; in about a Month's Time the Leaf filled, struck out Fibres, and put forth a fresh Leaf, which is now growing, and has made as much Progress as such a Plant would do in the Earth, in the same Space of Time: I had no Opportunity of trying other succulent Plants.

Dr *Mortimer* told me he had placed Beans upon Water, which blossomed and podded: This put me upon trying the Experiment with them, and likewise Pease at the same Time. I planted 6 Beans in a Pot, and fixed Sticks in it to support their Stems as they grew; they bloomed as freely as those which are planted in the Ground, but did not pod so well, having not above a Pod or two on each Plant, which came to Perfection, and ripened their Seed; but this might happen for want of a little more Experience; the Pease which were of the dwarf Sort, drew a little too much, and only put out three or four Blossoms at the Extremity of their Tops, but every Blossom brought a Pease-cod, and ripened it's Seed.

This Growth of the Beans and Pease made me imagine, that other Seeds would succeed in the same Manner, knowing they would chip

* See Vol. VI. Part ii. Chap. 5. §. xxi. 2.

Directions for planting Bulbous Roots in Water.

sowed in the Ground, yet transplanted from Water they will take as freely to the Earth as if raised in it.

I do not know but from the foregoing Experiments in Water, we may come at a better Way of planting in the Earth, especially some Roots, which are apt to rot in the Ground, as *Anemones*, *Ranunculus*, and *Hyacinths*; from an Observation I have frequently made, but never before took Notice enough to improve it, which is, that I have often seen a Bulb dropped by Chance upon the Ground, strike out Fibres stronger and more numerous than those planted in their usual Depth of Earth would do. The Use I would make of this Observation, is, that when I plant my Bulbs, I take out the Earth of the Bed, I design to plant, as deep as the Bulbs or Roots are to stand when planted, and place my Bulbs on the Surface, till the Moisture of the Earth shall have attracted their Fibres, and they begin to shoot up their Plume, and then by Degrees I cover them over to the Thickness of Mould, that they should stand in, by which Means they will be in no Danger of rotting after they have got strong Fibres; for when we plant these Bulbs or Roots, it is generally either too wet, or too dry; if it be a wet Season, the Bulbs are too soon saturated with Moisture, which rots them; and if it be too dry, they lie so long, before they can attract Moisture enough to make them vegetate, that they grow mouldy, and are rendered dry and hard as a Piece of Stick, so that the first Rain infallibly rots them.

N. B. These Experiments were made without the Benefit of any Sun, all my Windows having a *Northern* Exposition.

As these Experiments have opened a new Scene of Knowledge in the vegetable World, and may be of great Use in Natural Philosophy, and particularly improve the Art of Gardening; 'tis to be hoped the Curious will carry on the Inquiry as they have Leisure and Opportunity.

Directions for planting Bulbous Roots in Pots or Glasses of Water.

When the Leaden false Bottoms are fixed down tight, within 2 or 3 Inches from the Bottom of the Pots (which is only designed to hold the Sticks steady that are to support the Leaves and Stems of the Flowers) lay on the Lead, which is to support the Bulbs, placing the notched Part opposite to that in the false Bottom, as near as the Sticks when placed will suffer it; then place your Bulbs in each Hole, and fill in Water up to the Lead, which will then touch the Bottom of the Bulb, and as the Water evaporates or perspires, keep it filled to that Height, till the Bulbs have struck their Fibres pretty strong into the Water, which may be in a Month or 6 Weeks; then fill in Water about $\frac{1}{2}$ an Inch above the Lead, and by Degrees as the Fibres strengthen, and the Plume or Head sprouts, fill it higher and higher till the Bulbs be entirely buried under Water, which must be continued till the Season for drying them returns.

But you must observe at the planting the Bulbs to clean them very well from any Foulness they may have at their Bottoms, by scraping them

them with the Point of a Knife, till the sound Part of the Bulb appears, and likewise clear them of all their loose Skins, and even the brown Skin, till they appear white; which otherwise will discolour and foul the Water that should be kept as clear as possible; and for this Reason, the Notches in both the Leads are contrived, that upon shifting all the Water out of the Pots, if there happens to be any Sediment, by shaking the Pots once or twice as it is poured off, all the Foulness may come with it; but this shifting of the Water need not be done but once or twice in a Winter, or whenever you see Occasion by the Discolouring or Foulness of it; and at the same Time it will be necessary with a Painter's Brush to clean off all Sliminess that will adhere to the Sides of the Pots and Bulbs, and rince them well, by pouring Water on them at a little Distance: By this Method they may be kept perfectly clean; at any Time when the outward Skins of the Bulbs loosen and begin to decay, clear them off, which otherwise would occasion Foulness; and whenever you see Dust swimming on the Surface of the Water, fill the Pot full, and let it run over, which will carry it all off, and then pour off the Water to it's usual Height.

N. B. Plant Bulbs of equal Bigness, at least in Height, together in the same Pot, that they may have the same Benefit of the Water; therefore I plant *Narcissus* and *Hyacinths* and Bulbs of that Size together; *Tulips* and *Junquils*, &c. by themselves; and *Crocus* and *Snow-drops*, &c. by themselves.

Bargor-Court, Shoe-Lane,
Decemb. 19, 1733.

Bury St Edmund's, Nov. 1, 1738.

XX. Having met with a Paragraph in the History of the Works of the Learned for July last, in which the Author takes Notice of a Passage in the *Philos. Trans.**, relating to some Vegetables said to have great Virtue for the Prevention of that terribly Malady called the *Hydrophobia*, viz. the *Lichen cinereus terrestris*, and an Herb called, *Stellaria*, or *Star of the Earth*; as to the latter of which, at least, I apprehend there must have been a Mistake, though an involuntary and unavoidable one, through the Defect or Confusion of the Memoirs made use of. I have endeavoured to get some further Light into the Affair, by a Conversation with Dr S. Dale of Braintree, who fully concurs with me in his Sentiments, as to the Subject of this Letter. In his well-furnished Botanick Library, I met with several Things which are *Desiderata* in my own much meaner one, that greatly contributed towards the Elucidation of what has been strangely obscured by an odd and unaccountable Complication or Accumulation of Mistakes, grounded upon Narratives in which there seem to me to be diverse Inconsistencies, and Misrepre-

Concerning the
Virtues of the
Star of the
Earth, Coro-
nopus, or Bucks-
horn Plantain,
in the Cure of
the Bite of the
mad Dog, by
Mr Thomas
Steward,
V. D. M. No.
451. p. 449.
Dec. 1738.

* See Vol. IX. Part iii. Chap. 5. §, xiii. 1.

sentations of Matters of Fact, through Inadvertency or Lapse of Memory, or Anachronisms, by which my once very dear Friend and kind Correspondent, Mr *Ray*, (whose Name and Memory must ever be precious to all Lovers of solid Learning) was himself led into a Mistake (and became the innocent Occasion of leading others into the same) about the last-mentioned Vegetable, which he took to be *the Star of the Earth*, mentioned by *Grey*, as a sovereign Remedy against the Bite of a mad Dog; but was afterwards convinced, that it was not so, as will evidently appear from what follows, in which I have done what in me lies to get to the Bottom of the Matter, and to extricate it out of that Maze in which it has pretty long lain hid, by the Help of the best Clue that I could possibly find.

Having made the Study of Botany the agreeable Amusement of my younger Years, I was very much puzzled with what I met with in the Appendix to the 2d Volume of the general History of Plants, compiled by the reverend and learned Gentleman but now mentioned, concerning the *Spanish Catch-fly*, which he there affirms (p. 1895.) to be *the Star of the Earth*, so famous for the Prevention of the *Hydrophobia*; whereas I always (before I read this Assertion in Mr *Ray*) took the *Coronopus*, or *Bucks-horn Plantain*, to be the true *Star of the Earth*, and do still believe it so to be, for the Reasons that will occur to you in the Sequel.

Being desirous to know what Grounds Mr *Ray* had for ascribing such Virtue to the *Catch-fly*, I wrote a Letter to him, dated so long ago as Dec. 1, 1698, in which I requested of him to tell me what his Sentiments were at that Time upon this Subject. My Words were these, viz.

“ I desire to know your Opinion concerning that Herb, which *Grey*
 “ calls *Star of the Earth*, and affirms to be very efficacious for the Bite
 “ of a mad Dog. There seem to be 2 Plants mentioned under this
 “ Name, viz. *Plantago foliis laciniatis*, *Coronopus dicta*, and *Lychnis*
 “ *viscosa flore muscosa, sive Sesamoides Salamanticum magnum*. The first is
 “ highly esteemed in *Norfolk*, and is commonly used with good Success.
 “ The latter is known but by few, and I have never known any that
 “ have used it. But in your *Appendix* to your general History, you
 “ affirm on the Authority of Dr *Hulse*, that this is the Plant so much
 “ extolled by *Grey*: And in your *Synopsis*, you mention nothing of the
 “ Virtues of this Herb, and have referred the Praises which you be-
 “ stowed on it, to the *Coronopus*. I would know therefore, whether
 “ you have altered your Opinion, and whether you now think that
 “ Dr *Hulse* was mistaken about this Plant. For my own Part I am in
 “ great Doubt about it. *Grey* himself mentions no other Name, for
 “ the Plant which he so highly magnifies, but *Star of the Earth*; nor
 “ has he added any Description, or characteristic Note, by which it
 “ may be known to others. I cannot imagine, how Dr *Hulse* should
 “ know with so much Certainty, that *Grey* meant the above-mentioned
 “ *Lychnis*.

“ *Lychnis*. I very much question whether that *Lychnis* is endowed with such Virtues, and earnestly intreat you to remove my Scruples.”

To this Inquiry that good communicative Gentleman condescended to return the following free and ingenuous Answer.

“ As to your pertinent Question concerning the Plant called *Star of the Earth*, the Case stands thus: King *James* sent to the *Royal Society* a Sample of a Plant dried, which was sent him for that which cured his Dogs when bitten with a mad Dog, and by the Name of *the Star of the Earth*. This Plant not being well dried and preserved, none of the *Royal Society* knew certainly what to make of; so they sent it to me, who, upon careful Examination of it, found it to be the *Sesamoides Salamanticum Magnum*; whereupon Dr *Hulse* sending me that Observation out of *Grey*, concerning the Use of the Plant called *the Star of the Earth*, I thought I had Ground enough to attribute the Virtue of curing the *Hydrophobia* to the *Sesamoides Salamanticum*, not imagining that any would dare to abuse a sovereign Prince, by sending him a false Plant. But afterwards, considering that the *Coronopus* was, for it's Resemblance to a Star, called *the Star of the Earth*, and that it was noted for such a Virtue, but the *Sesamoides* was neither like a Star, nor by any so called, nor described to have such a Quality; I concluded, that the Plant which *Grey* meant, was the *Coronopus*, and not the *Sesamoides*, and that we had been abused by a false Plant sent to King *James*, for *the Star of the Earth*.”

This Account from Mr *Ray* himself fully satisfied me, that the *Bucks-horn*, and not the *Catch-fly*, was the true *Star of the Earth*. But as to the curing of King *James's* Hounds, I suspect that Mr *Ray* was misinformed as to that Matter, and am now almost persuaded, that there was never such a Thing; for I cannot but observe, that there is a most perplexing Inconsistency between the two Extracts which have been given from the Journal-Books of the *Royal Society*, relating to this Matter of Fact. The Words are these*:

“ Nov. 16, 1671, Sir *R. Moray* exhibited a certain Plant, (which by Mr *Ray* is called *Lichen cinereus terrestris*) said by Sir *R. M.* to be very good to cure Dogs bitten by a mad Dog; his Royal Highness having caused it to be given to a whole Kennel of Dogs bitten by a mad one, which were all cured, except one of them, to whom none of it was given. The Specimen was kept in the Repository.”

Query, Whether it be there still?

“ Afterwards, viz. March 1671-2, Sir *R. M.* mentioned, that a whole Kennel of Dogs belonging to his Royal Highness, were bitten by a mad Dog, and had been lately cured by an Herb called *Stellaria*, or *Star of the Earth*. This Plant is the *Lychn. visc. flore muscoso*, C. B. in English, Spanish *Catch-fly*: See these *Transactions*, N^o 187, where is a Receipt to cure mad Dogs, wherein this Plant is a principal

* See Vol. IX. Part iii. Chap. 5. §. xiii. 1.

The Virtues of Coronopus, for the Bite of a mad Dog.

“Ingredient, which Receipt, communicated by Sir R. Gourdon, was
“there published by his Majesty’s special Command, An. 1687.”

Now here are two very different Accounts from the same Person, relating to the same Thing. In the first, Sir R. M. speaks of the Cure as performed by the *Lichen*; in the second, in less than half a Year after the other, he mentions it as done by the *Stellaria*. Now it seems utterly improbable, that the Kennel of Hounds should be twice bitten, and cured by a different Plant in so short a Space: And indeed (as I hinted before) my present Opinion is, that the Hounds were never bit by a mad Dog at all, but that the whole Story has been founded upon an older one, of which there is Mention made in that Book written by T. de Grey, Esq; called, *The Expert Farrier*, in the 2d Edition of which, in 4^{to}, published in 1652, among other Cures for the Bite of a mad Dog, he prescribes this which follows, p. 160.

“Take the Herb which groweth in dry and barren Hills, called *the Star of the Earth*; you must give it three Days together. The first
“Time you must gather three of these Herbs, with all the whole
“Roots; and wash them clean, and pound them well; which done,
“give them to your Horse in Milk, Beer, Ale, or White-wine, but
“be careful the Horse takes all the Herbs and Roots: If you will,
“you may make up these Herbs and Roots in fresh or sweet Butter,
“which will do as well. The second Day, give your Horse five of
“these Herbs and Roots, as before; and the third Day, give him
“seven. Do this punctually, and you may be well assured your Horse
“will be perfectly cured; for albeit, I myself have never tried this
“Medicine, yet I do know, the Party of whom I had this Cure, hath
“cured much Cattle of all Sorts therewith. I myself can say thus
“much of this Receipt, that I knew it cure a whole Kennel of Hounds
“of a Gentleman’s, one Beagle excepted, which they did not suspect
“to be bitten, which indeed was bitten; so he fell mad and died, but
“all the rest escaped. Another Time, a Gentleman’s Son of my Acquaintance was unfortunately bitten, who was cured by the Party who
“taught me this Receipt; and this young Gentleman (who was then a
“Boy of 10 Years old) was so far spent with the Rancor of the Disease, before this Man took him in Hand, as that his Head began to
“be addle, and he to talk very idly; yet he cured him, so as he lived
“and did well, and is at this Hour living, and a very proper and handsome Man, &c.”

Thus far *de Grey*. Now, Sir, I am apt to think, that any one who considers what he says about the Kennel of Hounds, will be ready to conclude, that these were what Sir R. M. mistook for the Duke of York’s Dogs, as seems plain from the remarkable Circumstance of the one Beagle that had none of the Plant given him, mentioned in both the Stories. So strangely may Errors arise, and be multiplied, by jumbling the Ideas of different Things together in the Minds and Memories of Men, how wise and learned soever. So far as I can find, all the

the Concern King *James* had in this Affair, was his sending a Plant to the *Royal Society*, which his Huntsman recommended as an excellent Remedy for the Bite of a mad Dog; and it seems to me very likely, that the Huntsman might have met with this Story in *Grey*, and told it to his Master, and this he might tell to Sir *R. M.* and it may be, the Man, to set out the Virtues of the Medicine the more, might tell the Duke, that several of his own Hounds were cured by it, whether it were really so or not. None of these Suppositions are impossible, nor, in my poor Judgment, very improbable.

To make this dark Affair appear in a still clearer Light, let me desire you to compare and consider the following Extracts. In a Letter to Mr *Ray* from Mr *Aubry*, published by Mr *Derham*, and dated *Aug. 5, 1691*, there is this Paragraph, *p. 250.* “ King *James* sent by Sir ———
“ *Garden* (I suppose it should have been *Gourdon*) to the *Royal Society*,
“ a Plant called *Star of the Earth*, with the Receipt made of it, to
“ cure the Bite of a mad Dog, which is in *Transactions*, N^o 187.” This refers to a Receipt communicated by Sir *R. Gourdon*, by his Majesty’s Command, and in which there is Mention of *the Star of the Earth*, and to which this *N. B.* is added, “ The Plant in this Receipt,
“ and which is the chief Ingredient, is known among Botanists by the
“ Name of *Sesamoides Salamanticum* of *Parkinson*, or *Lychnis viscosa*,
“ &c. of *Baubine*, *Anglicè Spanish Catch-fly*. It grows plentifully about
“ *Thetsford*, &c. *Vide Raii Cat. Pl. Angl. & Hist. Pl. Tom. 2^{do}, inter*
“ *Lychnides.*” This seems grounded upon what Mr *Ray* was afterwards persuaded to be a Mistake.

The next Thing I shall beg your Attention to, is a Letter from Sir *Hans Sloane*, to Mr *Ray*; prior indeed in Time to the former, being dated *June 1, 1687*, in these Words: “ Sir, I send you inclosed the
“ Specimen of a Plant growing on *New-market Heath*, and in *Surrey*,
“ known by the Name of *the Star of the Earth* in those Parts. It is
“ particularly taken Notice of on the Account of it’s extraordinary and
“ admirable Virtue, in curing the biting of mad Dogs, either in Beasts
“ or Men. One of his Majesty’s Huntsmen having proved it a great
“ many Times, gave the King his Way of using it, which was an
“ Infusion in Wine with Treacle, and one or two more Simples. His
“ Majesty was pleased to communicate it to *Gresham College*, to the
“ *Royal Society*; and no-body knowing the Plant by that Name, some
“ there present confirming it’s Use in some Parts of *England* in that
“ Disease, the Herb being as little known here as if it came from the
“ *Indies*, I told the Society, I would let you have the best Specimen
“ of it, which I question not is known to you. If you please to give your
“ Sentiments, you will extremely oblige, &c.” To this Mr *Ray* returned the following Answer: “ Sir, I received your Letter with the
“ Specimen inclosed, which seems to me to be the *Sesamoides Salaman-*
“ *ticum Magnum* of *Clusius*, or *Lychnis visc.* &c. of *Baubine*, which I
“ have observed to grow plentifully upon *New-market Heath*, &c. I

The Virtues of Coronopus, for the Bite of a mad Dog.

“wonder it should have such a Virtue as you mention, but it seems it is well attested. Dr *Hulse* writes to me, “he finds it in *Grey’s Farrier.*” This seems pretty evidently, to refer to the same Plant mentioned by *Auory*, and this surely was the Plant, that not being well dried and preserved, the Society could not tell what to make of, and which Mr *Ray* found to be the *Sesamoides*, which he then thought was the Plant that *Grey* called *the Star of the Earth*; but upon further Consideration, he was firmly persuaded, that the *Coronopus*, and not the *Sesamoides*, was the Plant intended by *de Grey* (for so his Name ought to be written): And indeed, to me there seems to be the greatest Probability, if not absolute Certainty, of this latter Opinion; for the *Sesamoides* was a Plant so little known in *Grey’s* Time, that the Botanists who were contemporary with him, took it for a Plant that was wholly a Stranger in *England*, as may be seen in *Johnson* upon *Gerard* and in *Parkinson*, and the Manner of giving it, as directed by *Grey*, viz. first three, then five, and then seven Plants, Roots and all, speaks it to be a small Herb, such as is the *Coronopus*, and not such a large one, with a big, sticky or woody Root, as the *Sesamoides*. This I am very sure of, that in *Norfolk*, my native Country, (and which, if I mistake not, was *Grey’s* also) the *Coronopus* is called *the Star of the Earth* (and among other Names given it by *Dodonæus*, this of *Stellaria*, and *Stella Terræ*, is one, p. 95, of the *English* Translation; and he describes it as lying spread upon the Ground like a Star; and *Gerard* gives the same Description of it, and *Parkinson*, in his *Theatrum*, yet more fully, p. 501, viz. that the Leaves lie round about the Root in Order one by another, thereby resembling the Form of a Star, and therefore called *Herba Stella*; by which Name, among others, it is called by *Cæsalpinus*, *Lobel*, &c. But whoever met with the Name *Stellaria*, or *Stella Terræ*, among the *Synonyma* of the *Sesamoides* in any Botanick Writer before Mr *Ray*, who afterwards retracted it, as has been fully proved?) In that Part of *Norfolk* where I was born, not far from *Norwich*, towards the Sea-Coast, where the *Bucks-horn* Plantain grows abundantly, there was great Use made of it when I was but a Lad, and always with good Success, so far as ever I could hear. One Story I can tell of my own Knowledge, which may seem too trifling to mention, were it not to shew the Efficacy of the Simple. About 40 Years ago, when I lived at a Place called *Debenham* in *Suffolk*, a Person unknown to me, having heard that I knew an Herb that was good against the Bite of a mad Dog, sent to desire a Sample of it, with Directions how to use it; and some Time after I had half a Dozen fine Chickens brought me. I asked whence they came? It was answered from such a one (the Name I have now forgot). I said I did not know him: To which the Reply was, That it was the Man to whom I had sent the *Plantain*, which had saved the Lives of half a dozen Hogs of his, that had been bitten by a mad Dog; and he thought the least he could do, was to send me half a dozen Chickens as a Token of his Gratitude. After all, I will not be positive, that the

Lychnis,

Lychnis, or *Catch-fly*, is not good *contra morsum Canis rabidi*; but I am confident that it is not the true *Star of the Earth*.

You see I have taken a good deal of Pains to trace this Matter through all it's intricate Meanders. I have been forced, indeed, to deal pretty much in Guesſes and Conjectures, which I am not very fond of; but as the Case ſtands, it could not well be avoided: And I ſhall be glad, if by this Means we may be got (as I hope we are) near the Truth, which is the Thing I aim at in this long Purſuit; and I have rode more than 50 Miles in this wet Winter Season, (though *ferè Septuagenarius*) in order to diſentangle it from the Confuſion and Contradiſtion in which it has been involved. If any Doubt ſhould be made with reſpect to my Integrity, or Exactneſs in the Extract I have given you from Mr *Ray's* Letter, the Original is ſtill in Being, and ſhall be produced, if deſired.

As for the *Liverwort*, I can ſay nothing from my own Knowledge; but by the Account of it's Virtues given by *Dampier*, (which he took for a Kind of *Jew's-Ear*, but which Sir *Hans Sloane* with great Reaſon affirmed to be the *Lichen cinereus terreſtris*) I cannot doubt but it is a potent Remedy, of which I preſume there may have been ſeveral ſucceſſful Experiments made, ſince thoſe made by *Dampier's* Uncle, which are very conſiderable. And it may be King *James* might have ſome of his Hounds cured by this *Lichen*, after he came to the Crown, and might then ſend a Specimen thereof alſo to the Society.

P. S. A Friend of mine lately informed me, that there was a wonderful Cure performed upon a Woman in this Country, ſeveral Years ago, who had been bitten by a mad Dog, and in whom the evident Symptoms of the *Hydrophobia* appeared, who yet was ſaved, by God's Bleſſing, upon the Uſe of a Powder given by the Direction of the *Lady Brook* (a Perſon of Eminence formerly in *Suffolk*). It ſeems the Powder went by the Name of *The Lady Brook's Powder*, and was generally ſuppoſed to be chiefly, if not only, the *Coronopus* dried and pulverized: And I muſt own, that I have at preſent ſuch an Opinion of the great Virtue of this Simple, that till I have ſome convincing Evidence of it's having failed, I can ſcarce avoid looking upon it as a Specifick *contra morsum canis rabidi*; and I heartily wiſh, for the Sake of ſuch as ſhall at any Time happen to fall under ſo terrible a Miſfortune, that it may be proved by Experience ſo to be.

XXI. From my Childhood, till within about 12 Years paſt, I uſed, almoſt conſtantly, upon taking Cold, to be ſeized immediately with an Inflammation in the Throat, attended with great Swelling, Throbbing, and Soreneſs: And notwithstanding Bleeding and Purging, together with the Aſſiſtance of Gargles, Linctus's, and all the other Methods generally made uſe of in ſuch Caſes, it moſt commonly would take it's Courſe; that is, in about a Week or 10 Days Time, it

Some Obſervations concerning the Virtue of the Gelly of black Currants, in curing Inflammations in the Throat. By Henry Baker, would

F. R. S. No. 459. p. 655. Jan. 5. 1741. would suppurate and break, a considerable Quantity of fetid Matter would be discharged, and then I soon recovered. During it's Continuance, I was unable to swallow any Thing but warm Liquids, and even those not without much Difficulty and Pain; but upon it's breaking, I found immediate Ease.

This Disorder attacking me 5 or 6 Times a Year, and sometimes oftner, afforded but too frequent Opportunities of experiencing, that all the common Methods did me no Good at all; but, on the contrary, made my Uneasiness last the longer, by retarding the Suppuration: Which often determined me to leave it wholly to Nature, with the Assistance only of warm Broths and Gruels.

But, about 12 Years ago, I became acquainted with a learned and ingenious Clergyman, the Rev. Mr *Washbourne*, Vicar of *Edmonton*, and one of the Canons of *St Paul's*; who told me, that from many Experiments on himself and others, scarce ever failing of Success, he could almost assure me of a certain Cure, if, as soon as ever I should perceive any Swelling or Soreness in the Throat begin, I would swallow, leisurely, a small Quantity of the Juice of *black Currants** made into a Gelly; or, if the Gelly could not be got, a Decoction of the Leaves in Milk, or even of the Bark (if it should happen in Winter) used by the Way of Gargle, would prove, he said, a Specifick for all inflammatory Disorders of the Throat.

Though I had no great Faith, I resolved to try this easy Remedy: And, as soon as *black Currants* could be got, caused a Quantity of their Gelly to be made: Nor was an Occasion of trying it long wanting, when, to my great Surprize and Joy, I found it's Effect beyond any Thing I could imagine; for in 2 or 3 Hours the Inflammation and Swelling entirely vanished, and my Throat remained as easy as if nothing at all had happened.

From that Time till very lately, for a dozen Years together, this Medicine has never failed me once: But has, on numberless Trials, taken away this Disorder from me in a few Hours. It has likewise had the same good Effect on many of my Friends, to whom I have at different Times recommended it, so that several of them are never now without it in their Houses.

* *Ribes nigrum*, Raii *Hist. Plant.* Vol. II. p. 1486. SQUINANCY BERRIES: *Angina utiles* [baccas] esse nomen Anglicum arguit.

Dale in *Pharmacologia sua* in 4to, p. 293, (ait) *Ribes nigra* in *angina* commendatur.

John Aubrey, Esq; F. R. S. in his *Miscellanies*, printed at London, 1721, in 8vo, p. 63, says, that a Gentlewoman had her sore Throat cured by a Pultels of *blue Currants*.

The Efficacy of the Gelly of *black Currants*, in curing sore Throats, has been long known among several good Women, who give away Medicines in the Country; yet it has been hitherto so overlooked by Physicians, as not to be ordered to be kept in the Apothecaries Shops; and even the *Rob* or Gelly of *Elder-berries*, which comes up to this next in Virtue, although ordered, is kept but in few Shops. C. M.

I have frequently prescribed the Syrup or Gelly of *black Currants*, for Inflammations of the Throat, with good Success. Most of the Apothecaries in *Chelsey* keep it in their Shops. J. M.

But a Disappointment I lately imagined I had met with from this Medicine, is the Reason of my laying before you the following Fact.

Upon taking Cold, about ten Weeks ago, I was seized with an Inflammation in my Throat, attended with Soreness, and throbbing Pain; on which I applied to my old Remedy, but without the usual Success; for though I took it several Times a Day, for 2 or 3 Days together, the Disorder grew continually worse, and the left Side of my Throat was so violently inflamed and painful, and swelled to such a Degree, that I was not able to swallow even Liquids without Abundance of Trouble. In short, it exactly resembled the sore Throats I used to be afflicted with before my Knowledge of this Medicine; and therefore I gave it up to take the same Course it was accustomed to do formerly.

After about a Week, when I had good Reason to believe there was a considerable Collection of Matter, and I expected it every Hour to break, I was called by Business to a Relation's House at *Tottenham*, in *Middlesex*; where, being scarce able to get down a single Dish of Tea, my Friends (who have been long acquainted with the Virtues of *black Currant Gelly*) inquired wherefore I had not applied to my usual Remedy: I told them that I had, but to no Purpose at all; which I knew not how to account for, unless, mine being above two Years old, Time had destroyed it's Virtue. They said they had lately made some; and immediately fetched a Glass of it, which they persuaded me to make use of.—I took 3 or 4 Spoonfuls of it, rather through Civility, than from any Hope of it's doing Good, at a Time when I every Moment expected and wished it to break.

In about an Hour's Time, as I sat by the Fire-Side, I perceived a Sort of disagreeable putrid Smell, which I did not mind at first, supposing it something accidental: But, finding a Continuance or rather an Increase of it, I began to examine what it might be owing to; and was convinced, after I had changed my Place, that it proceeded from myself, and was really the Smell of my own Perspiration, which I found so much increased, as to become almost a Sweat. At the same Time, fancying my Throat a little easier, I took some more of the Gelly.

I came to *Tottenham* about 5 in the Afternoon, and began with the Gelly about 6. At Supper I with some Difficulty got down a little Gruel; and when I went to Bed, drank some Linseed-Tea, sweetened with Syrup of Mulberries. I soon got to sleep; but, waking after some Hours, found myself in a gentle breathing Sweat, attended with the same unpleasant putrid Smell. The Swelling in my Throat was, however, sensibly diminished, and the Soreness much abated: At which being rejoiced, I took a Mouthful of the Gelly that stood by my Bed-side, and composed myself to sleep again. A gentle Sweat continued during the whole Night; and, in the Morning, the Swelling, to my great Amazement, was quite reduced, and the Soreness so inconsiderable, that about 10 I eat some Toast with Chocolate, and by Dinner-

time

Mischiefs arising from eating Seeds of Henbane.

time had no more Remains of any Disorder, than if it had never been.

I am very certain the Swelling was not discharged by breaking; for had it broke, even in my Sleep, I must have found some ill Taste in my Mouth at waking: Whereas I was not sensible of any disagreeable Taste at all, but the Smell before-mentioned was greatly offensive to me, whenever I put my Nose into the Bed.

During the whole Time I have been speaking of, that is, for about 17 Hours, I made Water but once only, and then in a small Quantity: The Colour of it was very high, and it soon threw down an exceeding thick Sediment, as did all I made for 2 Days afterwards, though gradually clearing up more and more.

I shall not presume to offer any Opinion as to the Manner this Medicine operates, but leave it to be considered by more proper Judges; only permit me to observe, that were the Virtues of Simples diligently inquired into, we might perhaps discover more ready and certain Cures for some Distempers than what we know at present. The barbarous *Negroes*, merely by Trials and Observations, have been able to find out both Poisons and Counterpoisons, on which (if our Accounts of them be true) they can depend with Certainty: And we know, that the Savages in *America* have discovered by the same Means, and generously taught us, the medicinal Effects of their *Ipecacuanha*, *Contrayerva*, *Peruvian Bark*, and some other Simples, which are almost infallible in curing the Disorders of the Climate where they grow: Nor is it improbable, that every Country may produce Remedies for the Diseases of it's Natives.

An Account of
Symptoms a-
rising from eat-
ing the Seeds of
Henbane, with
their Cure, &c.
and some occa-
sional Remarks,
by Sir Hans
Sloane, Bart.
P. S. R. No.
429. p. 99.
July, &c.
1733.

XXII. In the Year 1729, a Person came to consult me on an Accident that befel four of his Children, aged from 4 $\frac{1}{2}$ to 13 $\frac{1}{2}$ Years, upon eating some Seeds they had gathered in the Fields, near *Pancras Church*, which they mistook for Philberts. He brought one of the *Capsules* with him: I instantly knew it to be that of the *Hyosciamus niger*, vel *vulgaris*, C. B. (or the common Henbane) which bears some gross Resemblance to the Husk of a Philbert; and the Seeds are like those of the Poppy. The Symptoms that appeared in all the four were, great Thirst, Swimmings of the Head, Dimness of Sight, Ravings, and profound Sleep; which last, in one of them, continued two Days and Nights.

I ordered them all to be bled, blistered in several Places, and afterwards purged with a Medicine composed of *Elect. lenitiv. Ol. amygd. dulc. flor. Sulph. & Syr. flor. Persicor.* which operated both by Vomit and Stool: And by this Method they perfectly recovered.

The *Delirium* occasioned by these Seeds differs from the common, and in some Measure agrees with that produced by the *Dutroa*, a Species of *Stramonium*; and by the *Bangue* of *East-India*, a Sort of Hemp: And they are all different from that Kind of Disorder caused by the rubbing with a certain Ointment made use of by Witches (according to *Lacuna*, in his Version and Comments upon *Dioscorides*) the Effect
of

of which (as he was told) is to throw the Persons into deep Sleep, and make them dream so strongly of being carried in the Air to distant Places, and there meeting with others of their diabolical Fraternity; that when they awake they actually believe, and have confessed, that they have performed such extravagant Actions.

On this Occasion I beg Leave to give an Instance of the great Virtues of Henbane-Seeds in the Tooth-ach. Some Years ago, a Person of Quality tormented with this racking Pain, had an Empyrick recommended to him; his Anguish obliging him to submit to any Method of procuring Ease: The Quack conveyed the Smoke of burning Henbane-Seeds, by Means of a Funnel, into the hollow Tooth, and thereby removed the Pain: But at the same Time there dropped some Maggots from the Tooth (as he pretended) into a Pail of Water placed underneath for that Purpose; which was very surprizing to the Beholders. Being told the Story, I procured one of the Maggots, and sent it wrapped up in Silk to Mr *Leeuwenboek*, at *Delft* in *Holland*, where it arrived safe and alive. Upon Examination, he found it to be entirely like those bred in ordinary rotten Cheese: Wherefore, he got some of these latter, and carefully fed them, and that I had sent, on the same Cheese, and they were all, according to the usual Methods of Nature, turned into small *Scarabæi*; so that there appeared not the least Difference between them either when Maggots or *Scarabæi*, both being returned me from *Holland*.

Upon the whole, though the Smoke of the Henbane-Seeds cured the Tooth-ach, it is highly probable the Maggots had been conveyed thither, and let drop into the Water by some Slight of Hand; seeing, by Means of some such unjust Dexterity, Empyricks daily acquire Reputation from a Medicine, which from the Prescription of an honest Physician would be taken little Notice of.

XXIII. The 26th of last Month, I was called to a Cottage very near *Toucy*; where I was surprized to find 9 Persons together, all having the true Symptoms of being poisoned; with this Difference, that some were speechless, and shewed no other Signs of Life than by Convulsions, Contortions of their Limbs, and the *Rifus Sardonicus*; all having their Eyes starting out of their Heads, and their Mouths drawn backwards on both Sides; others had all the Symptoms alike. However, 5 of them did now and then open their Mouths, but it was to utter Howlings: And whenever they expressed articulated Words, it seemed as if they would prophesy. One, for Example, said, in a Month my Neighbour will lose a Cow: Another, in a little Time you will see the Crown-Pieces of Sixty-pence at five Livres. [100 *d.*] Among these nine Persons there was a Woman 5 Months gone with Child, a Child of 2 Years; four Boys of 9, 12, 15, and 18; and three Girls of 15, 17, and 19 Years of Age, who had all three the Misfortune of the Green-sickness upon them at that Juncture of Time. The Madness of all these Patients was so complete, and their Agitations so violent, that in

*Concerning the
Poison of Hen-
bane Roots, by
Dr Patouillat,
Physician at
Toucy in
France. Trans-
lated from the
French by T.S.
M.D. F.R.S.
No. 451. p.
446. Dec.
1738. Dated
February 9,
1737.*

order to give one of them the Antidote, I was forced to employ six strong Men to hold him, while I was getting his Teeth asunder, to pour down the Remedy: And as they could not all be watched at once, one of the Boys got away, and ran to a Pond 100 Paces from the House, into which he leaped; but as he was seen, he was soon taken out.

It was vain to examine those Wretches concerning the Nature of the Poison they had taken, as they were quite senseless. Happily the Father of the Family, by being absent, was free from this Misfortune. Of him I learned, that digging his Garden the preceding Day, he had found several Roots resembling common *Parfnips*; and having carried them home for *Parfnips*, they were boiled in the Soop; and the unlucky Mistake was not apprehended, till the Children were in this dreadful State. He described to me the Plant, which he thought he had taken for *Parfnips*; whereupon I went into the Garden, in order to find and know what it was; but as it had no Leaves, I was obliged to derive the Knowledge of it from the Roots; and soon knew it to be the *Henbane*, which is a very strong Poison; and so much the more dangerous, as the Patients could give no Account of their Ailments, nor of the Quality of the Poison they had taken.

To the Boys I gave the *Tartar. Sibiati*. in so large a Dose, that the oldest took 45 Grains, and the others in Proportion.

For the Woman, I had Recourse to *Theriaca* in a triple Dose; not thinking it safe to give her the Emetick, on account of her Pregnancy. I gave the same Remedy to the Child, by reason of its Tenderness.

To the Girls, besides the *Theriaca*, which they took in very large Doses, (having made use of $\frac{3}{4}$ of it) I gave warm Milk, wherein I dissolved *Salt of Rue*. The next Day I visited the Patients, and found them in a quite different Condition; for they had all recovered the Use of their Reason, but remembered nothing of what happened.

All this Day, every Object appeared double to them, that is, upon looking at a Man, a Beast, or a Tree, they saw two.

I returned to see them the next Day, and found that the Symptoms were removed; but were succeeded by another altogether as surprizing, to wit, all Objects appeared to them as red as Scarlet. This last Symptom ceased gradually on the third Day, and since that Time they have made no Complaint.

The Case of a Man who was poisoned by eating Monks-hood, or Napellus, communicated to the Royal Society by Mr Vincent Baccus, Surgeon,

XXIV. On Monday Night last, Feb. 5, 1732, about ten, I was called in Haste to John Crumpler, a Silk Weaver, in Spital-Fields; when I came into the Room, I found him lying on the Bed, his Head supported by a By-stander, his Eyes and Teeth fixed, his Nose pinched in, his Hands, Feet, and Forehead cold; and all covered with a cold Sweat, no Pulse to be perceived, and his Breath so short as scarce to be distinguished: Enquiring into the Case, I was told that he had been very well all Day, and about 8 had eaten a very hearty Supper of

of Pork, and a Sallad dressed with Oil and Vinegar; and though he was very merry at his Meal, he began immediately after to find an Indisposition: I asked of what the Sallad was composed? and was answered, that there were in it nothing but common Sallad Herbs, all which they bought at a Stall in the Market, except some Celery, which they had picked out of their own Garden. Suspecting that he had been eating some poisonous Herb, I asked if he found in the Beginning of the Disorder any Inclination to vomit? They said, no; but that when he found his Illness come upon him with great Violence, he believed himself to be poisoned, and forthwith drank a large Quantity of Oil, not less than a Pint in all, and after that he loaded his Stomach with Carduus-Tea till he vomited; and though he threw up the greatest Part of his Supper, yet the Symptoms still increased, which made them send for me; but before I could get to him, Things were come to the Extremity above-described. Having nothing at Hand but a Tea-spoonful or two of Spirit of *Hartshorn*, I forced open his Teeth with the Handle of a Spoon, and as his Head was reclined, I poured the Spirit into his Mouth, which a little roused him, and first set him a coughing, and next a vomiting; I took the Advantage of the little Sense that was returned, and continued plying him with Carduus-Tea until he had vomited several Times more, but I could not hinder his Swooning often between the Times of reaching, though I gave him after each 40 or 50 Drops of *Sal Volatile & Tinctur. Croc. aa. p. æ* (which I had sent for) in a Glass of Wine; he at length began to find a Working downwards, as he afterwards expressed himself, which was followed by a Stool; after which he vomited 2 or 3 Times more, and then said his Head was so heavy, and his Strength and Spirits so exhausted, though his Stomach and Bowels were much easier, that he must needs lie down: His Pulse was then a little returned, though very much interrupted and irregular, sometimes beating two or three Strokes very quick together, and then making a Stop of as long, or a longer Time than the preceding Strokes altogether took up. Having observed that what he had last vomited was little more than the pure Carduus-Tea, I then gave him a Draught made of *Aq. Epidem. Ther. Androm. Conf. Alkermes, &c.* and gave Orders to make him some Sackwey to drink between whiles, sometimes alone, and in case of great Faintness with some of the above-named Drops. It being near one o'Clock, I left him, and calling to see him on *Tuesday* in the Forenoon, found him much amended: He had lain awake, though still, an Hour or two after I left him, but being very cold and chilly, had a great deal of Covering laid on him, and then found a kindly Warmth come over his Limbs, which was succeeded by a moderate Sweat, and then a quiet Sleep of 4 or 5 Hours, from which he awaked very much refreshed; and when I was there, was capable of answering the Questions I asked him; I mean with regard to Strength; for his Senses had never failed him but during the Swoonings. I wanted to see some of the Sallad, but was told that

F. R. S. No.
432. p. 287.
April, 1734.

they had eaten all that they picked, and the rest was thrown upon the Fire, so that nothing could be seen but the Celery, which being the Produce of their own Garden, the Boy who gathered it the Evening before, was ordered to fetch some more of the same; he presently brought a Specimen, which I took to be the common *Monks-hood* of our Gardens, called by *Morison* in his *Præhud. Botan. Aconitum Spicâ Florum pyramidali*. But that this Company may be more certain, I have brought a Specimen of the Plant taken from the same Place this Morning, which the Boy says is of the same Kind which he gathered before, and the Patient upon biting it, declares to have the same Taste which he perceived on *Monday*. But it may be observed, that it was not then so much shot up into Leaves as it is now: I desired him to give me an exact Account of what Alterations he found in himself after the eating it, and how they came on: He said the first Symptom was a Sensation of a tingling Heat, which did not only affect his Tongue, but his Jaws, so that the Teeth seemed loose; and his Cheeks were so much irritated, that the People about him, nay even his Looking-Glass could scarce persuade him but that his Face was swelled to twice it's proper Size; this tingling Sensation spread itself farther and farther, until it had taken hold of his whole Body, especially the Extremities; he had an Unsteadiness in the Joints, especially of the Knees and Ancles; with Twitchings upon the Tendons, so that he could scarce walk a-cross the Room, and he thought that in all his Limbs he felt a sensible Stop or Interruption in the Circulation of his Blood, and that from the Wrists to the Fingers Ends, and from the Ancles to the Toes, there was no Circulation at all; but he had no Sickness or Disposition to vomit until he took the Oil, &c. Afterwards his Head grew giddy, and his Eyes misty and wandring, next a Kind of humming or hissing Noise seemed continually to sound in his Ears, which was followed by the Syncopes above recited.

There supped with him two Women the same Night; one of them happened to have a Dislike to Celery, and therefore laid aside all that she took for such; the other having before been out of Order, and was not then perfectly recovered, eat but sparingly, but took this supposed Celery along with the other Herbs, and felt, and complained of all the same Symptoms, but in a less Degree than the Man had done. She would not be prevailed on to vomit, but only took the Cordial-Draught above described. I saw them both this Morning, the Man is quite well, but the Woman is still out of Order.

They say that there was not put into the whole Sallad, more than what grows upon one of these Roots.

XXV. At *Lisminy* in *Westmeath*, a Girl of 18 Years old, very well and healthy, took a Quantity, less than two Spoonfuls, of the first Runnings of the *Simple Water of Laurel-Leaves*; whereupon within half a Minute she fell down, was convulsed, foamed at the Mouth, and died in a short Time; nor was there any Swelling on her Body.

Concerning the
Poison of Lau-
rel-Water, by
John Rutty,
M.D. No 452.
p. 63. Jan. &c.
1739. Dated
Dublin, May
17, 1732.

XXVI. In

XXVI. In the Year 1727, a Beech-Tree was felled near Elbing, for the domestick Use of John Maurice Mæller, then Post-Master of Elbing, now Secretary of his native City. The Trunk being sawed into Pieces, one of these, three Dantzick Feet six Inches long, cleft in the House on the 30th of June, discovered several Letters in the Wood about one Inch and a half from the Bark, and near the same Distance from the Centre of the Trunk. The Hearer having at one Stroke unfolded such a Prodigy, and believing there was Witchcraft at the Bottom of it, ran in all possible Haste for his Master: But this Gentleman, well instructed in sound Philosophy, gave Orders to preserve the Pieces of Wood, and had them brought to my Study, at the same Time communicating to me the History, and his Sentiments thereon.

An Account of Letters found in the Middle of a Beech, by J. Theod. Klein, Secretary of Dantzick, F. R. S. Translated from the Latin by T. S. M. D. No 454. p. 231. July, &c. 1739.

Fig. 85 exhibits the Letters conspicuous in the solid Wood, two of which, D B, shew their old Bark smooth and sound. The Wood lying between the Letters and the Bark of the Trunk, as well as that between the Letters and the Heart of the Tree, is likewise solid and sound, bearing not the least Trace of Letters. The Characters \mathfrak{g} \mathfrak{C} , being somewhat hollow, receive the Bark of the Letters D B*.

The same Letters are seen in the Bark of the Tree, only that they are partly ill-shaped, partly almost effaced, whereas those within bear a due Proportion, as if done with a Pencil.

Now should it be asked after what Manner these Letters reached the Middle of the Beech? and how it came to pass, that two of them, and no more, had their old dry Bark sticking to them?

Both these Queries are answered by the Vegetation of Plants. But as this is not a proper Place to expound it, I will suppose it known, and thus briefly complete the Affair.

It is an ancient Custom to cut Names, and various Characters, on the Rinds of Trees, especially on such as are smooth. That this has happened to our Beech, the mere Inspection of the Bark commands our Affirmation †.

An Incision made, the *Tubuli* conveying the nutritious Juice, and the *Utriculi*, in which it is prepared, are divided and lacerated, and more of them, as the Incision was made deeper and wider; and consequently the Sap is not carried on in the Circulation, but extravasated and stopped at the Wounds. Hence the Origin of the Characters in the Bark and Wood.

Now as a new Circle of *Fibres* grows yearly on the Tree between the Wood and Bark, it is not impossible but a Number of these should, in a Process of Years, more and more surround the ingrav'd Characters, and at length cover them. And this Number was the greater in our Beech, on account of better than half a Century elapsed since the In-

* Daniel Barckholiz, formerly Casarean Poet-Laureat.

† The Characters, besides D B, mark the Names of a noble Family, to which the Land, whereon the Tree was felled, formerly belonged: Regina, Dersthea, Michael, Gertrude, Joannes, Helwingii.

cision, which was made in the Year 1672, as appears on the Outside of the Bark, as may be seen in the Figure. But while new Circles of *Fibres* are successively added, the *Tunicle* or Skin of the Bark is broken each Time, and the *Utriculi* extended and dilated.

Wherefore it is easy, from what had been said, to draw the Reason, why the Bits of Bark cut off on all Sides, in the Letters D B, had the same Fate with the Letters; why the Wood between the Bark and Letters was solid and sound; and why the Shapes of the Letters bore a just Proportion in the Middle of the Wood, and not in the Bark.

So much for our *Beech*.

• Now let us see, in few Words, what Authors say of such figured Woods.

Solomon Reiselius, of *Letters found within the very cleft Trunk of a Beech*, *Eph. Nat. Cur. Dec. 1. An. 6. Obs. 4.* has at length, though with some Difficulty, guessed the genuine Cause from frequent Examples of Incisions.

But *Joannes Meyerus*, on a *Thief hanging from a Gibbet, drawn by Nature's Pencil in a Beech*, *Eph. N. C. Dec. 3. An. 5. Obs. 29.* and *Joannes Petrus Albrechtus*, on a *certain rare Figure seen in a Beech*, *Eph. ibid.* ascribe it to a Sport of Nature, and give this Reason; because they could not discover the least Sign of Imposture, the deep Situation of the Figures hindering them from having any Suspicion on that Head.

On the contrary, *Luke Schraeckius*, on *figured Beech - Wood*, *Eph. N. C. Dec. 3. An. 7, 8. Obs. 118.* follows *Reiselius's* Opinion; and being versed in *Malpighi's* Anatomy of Plants, writes: "No Wonder, if Figures cut in a young Tree, by the Length of Time, and the Accretion of many Barks, appear at last about it's Middle, when grown old."

John Christopher Gottwald, on a *crucified Man drawn by Nature in the Middle of a Beech - Trunk**, *Eph. N. C. Dec. 3. An. 9. Obs. 158.* accusing Nature's simple Violence, or a Disease of the Tree, is corrected by the most celebrated *John James Scheuchzer*, in his *Itinera Alpina*, Tom. 3. p. 414. and in *Herbarium Diluvianum*, p. 46. of a *little Man in Beech - Wood*, Tab. X. where he makes mention of other Instances.

John Melch. Verdries is of the same Sentiment, treating of a *Figure found in the Middle of a Beech*, *Eph. N. C. Cent. 3 & 4. Obs. 89.*

There remains, to my Knowledge, the *Figure of a Chalice, with a Sword perpendicularly erect, and on it's Point sustaining a Crown*, found in the Heart of a Piece of Wood at the *Hague*; which the Authors of the Collections of *Breslau* exhibit to us "as a singular *Phenomenon*, worthy of being compared to *Aldrovandus's Guaiacum - Tree*, and figured Stones, if no optick Fallacy, Error of Judgment, artificial Fissure of the Wood, or other such Deceit, intervene."

* This Wood is kept in the Library of the Council of *Dantzick*.



Fig. 83.

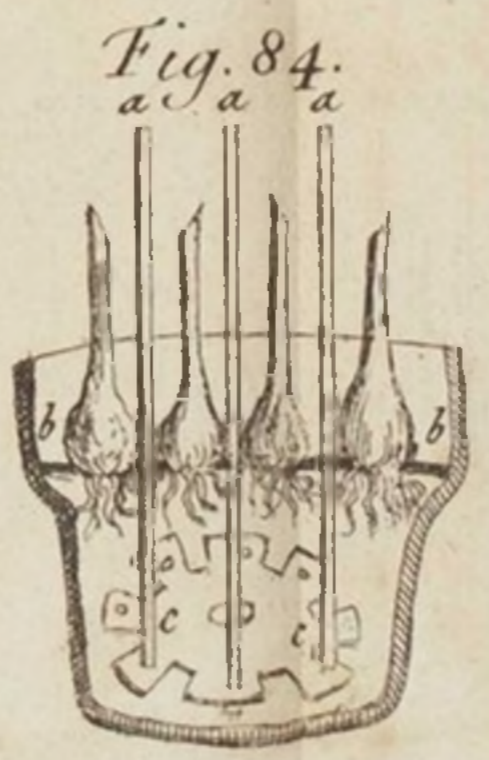


Fig. 84.
a a
b b

Fig. 85.



THE
NORTH
WEST
HALL

XXVII. 1. The Horn of a large Deer was found in the Heart of an Oak in *Whinfield-Park* in *Cumberland*, belonging to the Earl of *Thanet*. It was discovered upon cutting down the Tree. It was found fixed in the Timber with large Iron Cramps; it seems therefore, that it had at first been fastened on the Outside of the Tree, which in growing afterwards had inclosed the Horn. In the same Park I saw a Tree 13 Feet of Diameter.

Of the Horn of a Deer found in the Heart of an Oak, by Sir John Clerk, one of the Barons of the Exchequer in Scotland, and

F. R. S. Dated Nov. 6, 1731. Ibid. p. 235.

2. This Horn of a Deer found in the Heart of an Oak, and that fastened with Iron Cramps, is one of the most remarkable Instances of this Kind, it being the largest extraneous Body we have any where recorded to have been thus buried, as it were, in the Wood of a Tree. If *Joannes Meycrus*, and *Joannes Petrus Albrechtus*, (p. 233.) had seen this, they could not have imagined the Figures seen by them in Beech-Trees to have been the Sport of Nature, but must have confessed them to have been the Sport of an idle Hand. To the same Cause are to be ascribed those Figures of *Crucifix's*, *Virgin Mary's*, &c. found in the Heart of Trees; as, for Example, the Figure of a *Crucifix*, which I myself saw at *Maestricht*, in the Church of the *White Nuns* of the Order of *St Augustin*, said to be found in the Heart of a Walnut-Tree upon it's being split with Lightning. And it being usual in some Countries to nail small Images of *our Saviour* on the Cross, of *Virgin Mary's*, &c. to Trees by the Road-side, in Forests and on Commons, it would be no greater Miracle to find any of these buried in the Wood of the Tree, than it was to find the Deer's Horn so lodged.

Remarks by the Publisher. Ibid. p. 236.

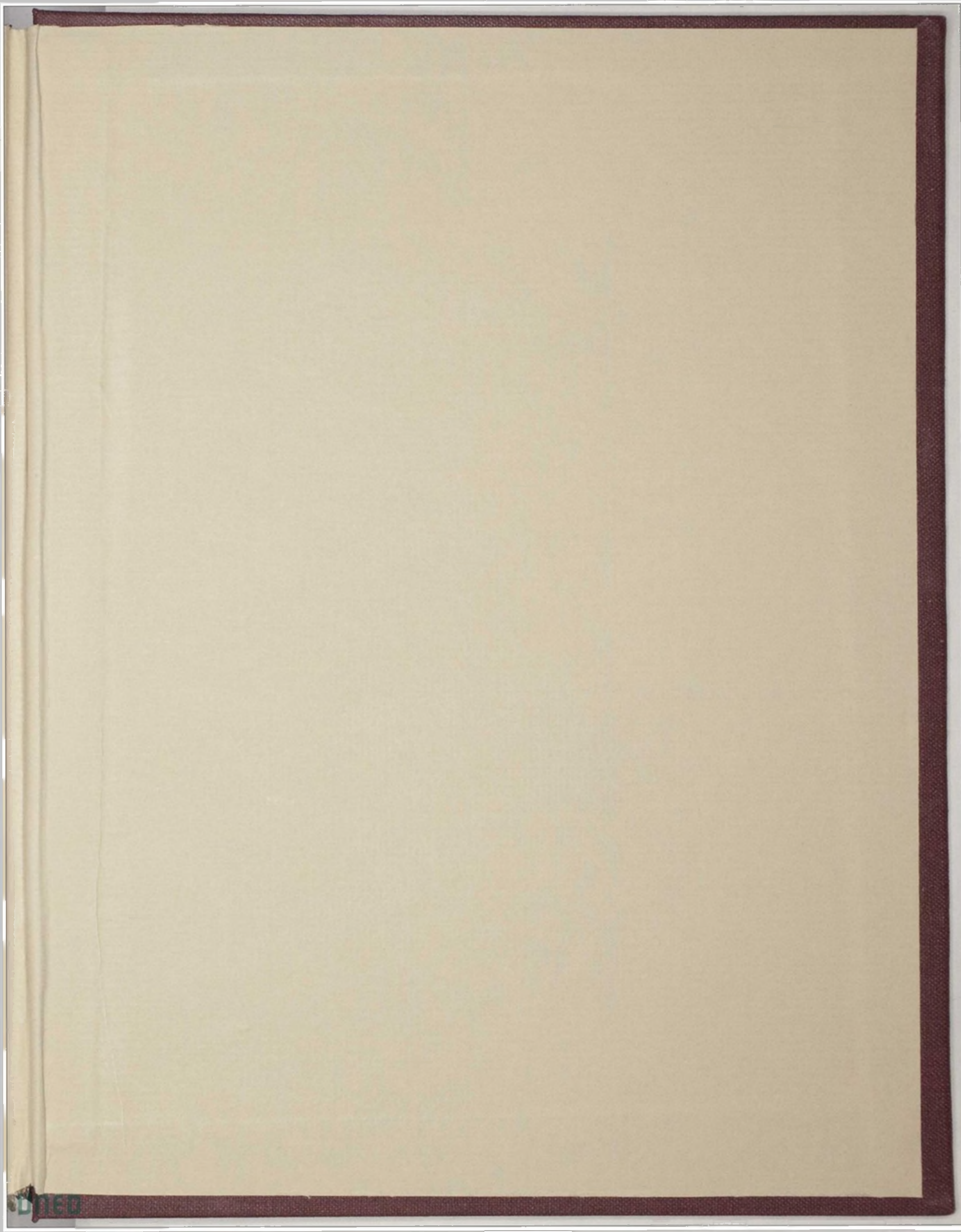
Sir *Hans Sloane*, in his noble *Museum*, hath a Log of Wood brought by Mr *Cunningham* from an Island in the *East-Indies*, which, upon being split, exhibited these Words in *Portuguese*, DA BOA ORA. i. e. Det [*Deus*] bonam Horam.

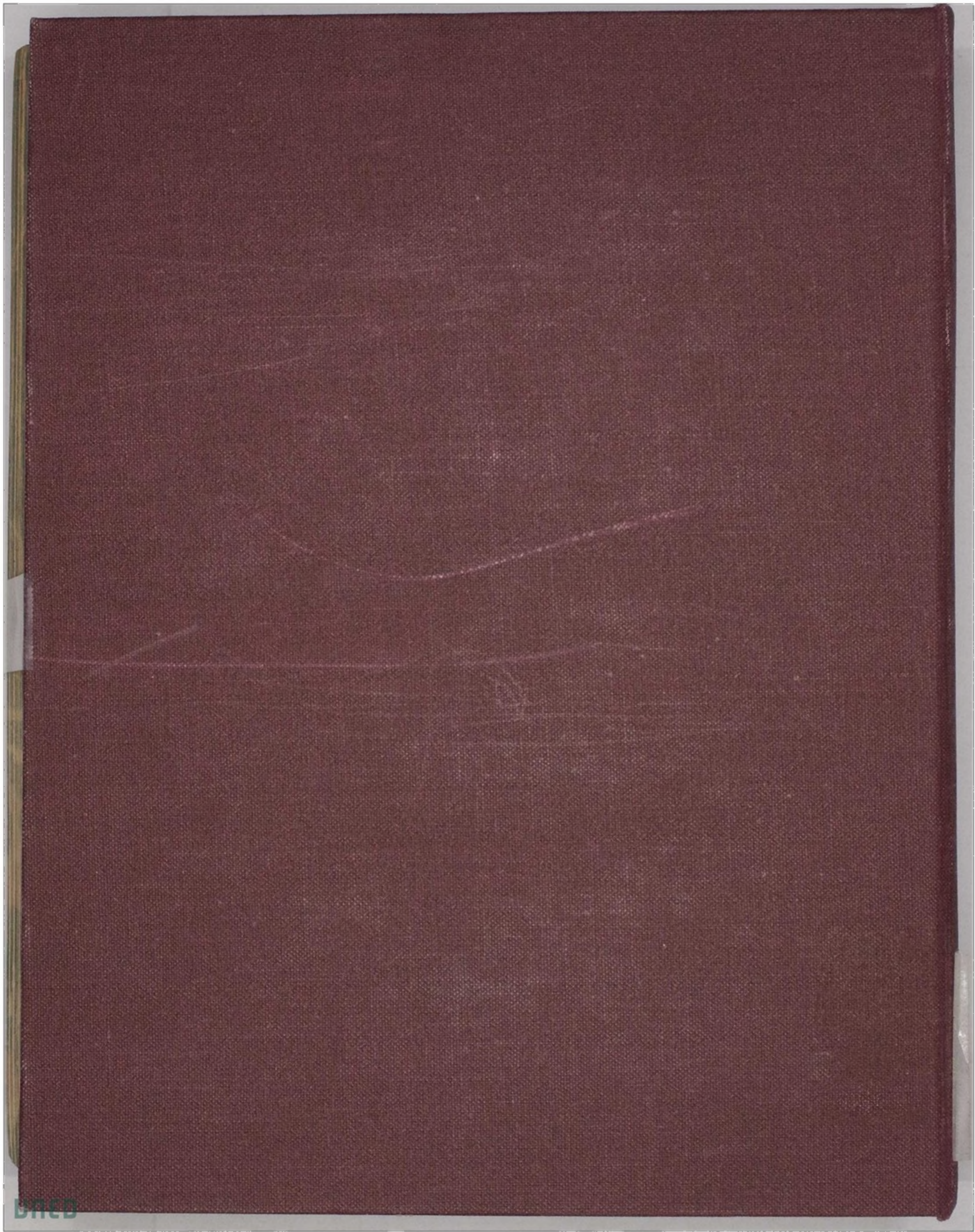
End of the Eighth VOLUME.

XXVII. The Horn of a large Deer was found in the Heart of an Oak in the Forest of ... in ... It was discovered upon cutting down the Tree. It was found in the Heart of the Oak, and it is said that it was growing there for many years. In the late Part I saw a Tree 15 ...

The Horn of a Deer found in the Heart of an Oak, and that ... It is said that the Horn was found in the Heart of an Oak, and that it was growing there for many years. In the late Part I saw a Tree 15 ...







PHILOSOPHICAL
TRANSACTIONS

VOL. VIII

1732-1744

F. A.
059