

learned *Fleetwood* guessed nearest the Truth, supposing it the 4th Part—not of any Measure, but—of some Load or Weight [*Chron. Pretios.* p. 72.]. I wonder he stopped here, and did not observe what that Load of Weight was, *viz.* a Tun or 2000 Pound: But the *Avoirdupois* Ton, in Use at present for all gross Weights, threw such a Mist upon the Subject as could not easily be seen through.

From the original and natural Signification of the word *Hundred*, it plainly appears, that *Twenty hundred*, or a *Ton*, must be exactly Two thousand Weight.

II. *An Account of a Tract intituled, Jo. Frederici Weidleri Commentatio de Parheliis Mense Januario Anni 1736. prope Petroburgum Angliæ & Vitembergæ Saxonum visis. Accedit de rubore cœli igneo Mense Decembri Anni 1737. observato Corollarium. Vitembergæ, 1738. 4°. Drawn up by Tho. Stack, M. D. F. R. S.*

THIS Tract is divided into 17 Sections. In the 1st and 2^d the Author describes his own Observation of Two Mock-Suns at *Wittemberg*, on *Jan. 11. 1735-6, N. S.* In the 3^d he gives a Meteorological Diary from *Jan. 1. to 18.* and in the 4th the Rev^d Mr. *Neve's* Observation on $\frac{\text{Dec. 31.}}{\text{Jan. 11.}}$ of Two *Parhelia* near *Peterborough*. But these Descriptions have been already communicated to the ROYAL SO-

CIETY*. In the 5th he compares the Two Observations. In the 6th and 7th, he mentions several *Parabellii* taken notice of by the Antients and Moderns; and in the 8th enumerates the different Observables of this *Phanomenon*, for the better investigating its Causes.

The 9th gives the Opinions of several of the Antients concerning the Presages taken from Mock-Suns.

From the 10th to the 13th inclusive, he relates divers Manners of accounting for them, by the chief of the Antients and Moderns.

In the 14th, preparatory to his own Opinion, he lays down the Doctrine of the Rise of Vapours in small globular Bubbles of Air, with a watery Coat to each.

In the 15th, he refutes, by several Reasons and Experiments, *Huygens's* Manner of accounting for *Haloes*, which is by a vast Number of very small Vapours, each with a snowy *Nucleus*, coated round with a transparent Covering: And says, that when the Sun depicts its Image in the Atmosphere, and by the Force of its Rays puts the Vapours in Motion, and drives them towards the Surface, till they are collected in such a Quantity, and at such a Distance from the Sun on each Side, that its Rays are twice refracted, and twice reflected, by the time they reach the Eye; they exhibit the Appearance of a *Halo*, adorned with the Colours of the Rainbow: Which may happen in globular pellucid Vapours without snowy *Nuclei*, as appears by the Experiment of hollow glass Spheres filled with Water. Therefore, whenever those spherical Vapours are situated, as before,

* *Philosophical Transactions*, N^o 445.

fore, the Refractions and Reflexions will happen every-where alike, and the Figure of a circular Crown, with the usual Order of Colours, will be the Consequence.

As to the *Halo*, that attends *Parhelia*, being 44 or 45 Degrees in Diameter, he adopts *Gassendi's* Opinion as probable, who applies to it the Geometrical Theorem: *De Angulo ad Centrum, duplo Anguli ad Peripheriam*. For when a *Halo* surrounds the Sun, the Sun is in the Centre, and the Eye out of it, as it were on the Surface of the *Phenomenon*; whereas, when the Rainbow appears the Eye is placed in a Line drawn from the Sun to the Centre of the Rainbow: And thus the Eye serves for a Centre, from which the Diameter of the *Iris* is beheld, the Sun being placed on the Circumference. Yet he says, it still remains to be accounted for, Why, when Two *Habes* appear at once, the Greater is double the Diameter of the Less, *i. e.* about 90 Degrees?

16th, But as *Haloes* often appear about the Sun and Moon, without *Parhelia* or *Paraseltinae*, there must be a peculiar Disposition of Vapours requisite for forming *Parhelia*.

Parhelia, he says, are situate either in the Interfection of a vertical *Halo*, and the horizontal *Annulus*, which passes through the Sun; or in the Section of some horizontal Bands and the *Corona*: And the angular Figure of *Parhelia* leaves us no room to doubt, that it is produced by Planes of the *Annulus* or Bands running into the *Corona*. Now *Newton's* Theory of Colours, and the Experiments it is built upon, shew, that Whiteness, which is a heterogeneous Light, is restored by blending or collecting

collecting the coloured Lights: And this will likewise happen, when the white heterogeneous Light of the bright Ring or Band does penetrate and confound the Rays of the *Halo*, now somewhat weakened. It is plain, that in order to a genuine Explication of Mock-Suns, it is chiefly requisite to have a clear Notion of the Origin of the horizontal Ring, or Bands. And from *Huygens's* Experiment with a cylindric Glass full of Water exposed to the Sun, which produces a white horizontal Ring by Reflexion alone, without an opake *Nucleus*; he asserts that the horizontal Bands, that intersect the solar *Coronæ*, are formed, when cylindric frozen Vapours are suspended about the Sun, chiefly where the *Halo* is depicted, in a Situation perpendicular to the Horizon; which being rectilinear, each of them exhibits by Reflexion a lucid Line equal to the Sun's Diameter; and several of these optic Lines joining, compose the Plane of the Ring or Band.

His last Section is spent in explaining the Appearance of Part of an inverted *Iris*, which accompanied his Mock-Suns: In order to which, he thus accounts for a (common or) primary Rainbow.

A primary *Iris* is formed, when the Sun's Rays falling on Drops of Rain, after suffering Two Refractions, and One Reflexion, tend to the Eye in such a Direction, that the Axis of the *Iris*, coming directly from its Centre, and passing by the Eye to the Sun, makes with these Rays returning from the Drops, an Angle of 40 Degrees below, and of 42 Degrees above; whereby the Width of the *Iris* is $2^{\circ} 15'$, and its Diameter $42^{\circ} 17'$.

But as this inverted *Iris* was but One Degree broad, and the Diameter of the Arch probably but half that

of the primary *Iris*; he is of Opinion, that the Sun's Rays, refracted and reflected as above, entered the Eye at half the aforesaid Angle, by the Eye's being placed beyond the Point, where the Rays met with the Axis. For thus the Order of the Colours is preserved, and this *Iris* is but half the Size of the common one.

As an Appendix to this Tract, Professor *Weidler* adds the following Account of the remarkable red Lights on the $\frac{16}{5}$ *December* 1737. seen not only by him at *Wittemberg*, but here at *London*, and in most Parts of *Europe*.

December 9. 1737. the Barometer was remarkably low; viz. 28 Inches 8 Lines *English* Measure. It rained all that Day very plentifully; and from thence to the End of the Month the Sky was much loaded with thick Vapours. But on the 16th, the little Wind there was being at North-west, and the Barometer at 30 Inches 2 Lines $\frac{3}{4}$ *London* Measure, soon after Sun-set, (the Moon in its last Quarter) the Sky began to appear very red; and, from Seven to Nine, gave a Light as strong as that of the Full Moon behind a thin Cloud. The whole Sky was of that Colour, which is occasioned by a Fire seen at a Distance in the Night. Such an uncommon Sight put the Inhabitants of this Town in great Terror. The greatest Brightness here was about 8 h. 45'; from which Time it gradually decreased; and at a Quarter after Nine it seemed almost dissipated. But it returned now-and-then, and continued, by Intervals, all Night. Now though the whole Face of the Heavens was remarkably red, yet the greatest Brightness was

was in the North, and a little to the West. There were neither Pyramids, nor luminous Streamings, so common in *Aurora Boreales*; nor even the least Appearance of the horizontal black Cloud at North. The following Day was equally dark with the preceding, yet without the least Remains of the Redness. Such was the Face of the Heavens at *Wittemberg*, and in the Neighbourhood. And, soon after, the public News gave an Account of the like *Phenomenon* being seen at *Vienna, Venice, Mantua, Florence, Rome*, and some other Places. At *Vienna* the greatest Brightness was observed at 9 h. 15'. The most enlightened Parts were the North-west and South-south-east; and there were some Returns of the Brightness on the 17th and 18th. But in *Italy*, at *Mantua, Florence, and Rome*, the Redness was accompanied with lucid Columns and Pyramids. And from *Rome*, in particular, they write, that this *Aurora Borealis* exceeded in Brightness all those that had been hitherto observed. From these Observations it is no difficult Matter to deduce the Causes of these red Lights.

That this *Aurora Borealis*, on the 16th, was a very considerable one, appears both by the great Expansion of the luminous Matter from its Rise in the North towards the South, and by the Return of the Brightness seen at *Vienna* on the subsequent Days. At *Mantua* the Northern Light reached the *Zenith*, and it is more than probable it did so in our more Northern Horizon: Wherefore, as the Matter was collected at the *Zenith*, the Light was reflected thence to all Parts of the Sky. But as the lower Region of our Atmosphere was at the same time overspread with

with Vapours of a certain uniform Density, and intirely proper for separating an homogeneous Light; those Rays of the heterogeneous Light, which are the least refrangible, or which produce the red Colour, were accordingly separated by Reflexion and Refraction in great Quantities, and coloured the whole Sky with a fiery Redness. And where the Light was brightest, *viz.* between the North and West, which is generally the Focus of *Aurora Boreales*, there likewise the Redness was strongest.

III. *An Attempt to examine the Barrows in Cornwall, by Stephen Williams, M. D. F. R. S.*

IT may not be improper to observe, that these *Barrows*, or conical Hillocks, are generally situated on Places of Eminence, on or near the Summit of Downs, and so capable of being seen at a great Distance; and likewise very often near the most public or greatest Roads, though sometimes in inclosed or fenced Lands, but not often: They lie sometimes Two, Three, even Seven, in a strait Line, now-and-then only One or Two by themselves: Sometimes also the single ones seem to regard, in respect of their Position, a greater Number, as is observable in TAB. I. N^o IV. where the Urn was found, and N^o V. on the same Down.

The Height and Dimensions of the *Barrows* in *Cornwall*, are various, from Four to Thirty Feet high, and from Fifteen to One hundred and Thirty broad: