A view of the passage of ye moon's shadow over England &c. in ye annular eclipse of the sun, which will happen April the 1st 1764

Pamflet voor de ringvormige zonsverduistering van 1 april 1764

A Map of the Passage of ye MOON'S Shadow over England &c. in ye Annular Eclipse of the SUN, Which will happen April the 1st 1764:

by G. Witchell, Teacher of the Mathematics.

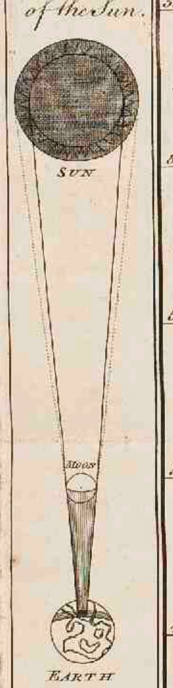
To the Revd. NATHANIEL BLISS, F.R.S. ASTRONOMER ROYAL at GREENWICH, And Savilian Professor of Geometry in the University of Oxford, THIS PLATE is (with his Permission) most Humbly INSCRIBED.

TYPE for ye ROYAL OBSERVATORY at GREENWICH

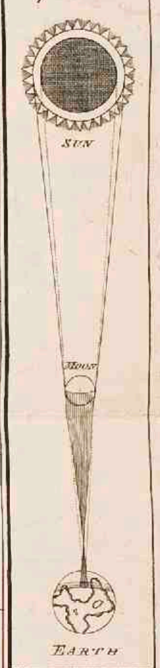
	Apparent Time at GREENWICH			Apparent Time at LONDON		
	H	′	″	H	′	″
Beginning	9	3	6	9	2	43
Middle	10	28	34	10	28	8
End	12	0	29	12	0	4
Duration	2	57	23	2	57	21
Quantity Eclipsed	11	1	37	11	0	37

The Type for London being not sensibly different from this, it is needless to insert it.

A Total Eclipse of the Sun.



An Annular Eclipse of the Sun.



Phases of the Eclipse at some of the Principal Places mentioned in the Map.

Oxford.	Cambridge.	York.	Berwick.	Dublin.	Gravesend.	Canterbury.	Hague.	Paris.	Auxerre.
22 Min. past X.	30 Min. past X.	27 Min. past X.	26 Min. past X.	57 Min. past IX.	31 Min. past X.	36 Min. past X.	52 Min. past X.	37 Min. past X.	41 Min. past X.
Quantity Eclipsed X ¾ Digits.	Quantity Eclipsed X ⅚ Digits.	Quantity Eclipsed X ½ Digits.	Quantity Eclipsed X ¼ Digits.	Quantity Eclipsed IX ⅝ Digits.	Quantity Eclipsed Limbs in Contact.	Quantity Eclipsed Annular.	Quantity Eclipsed Nearly Central.	Quantity Eclipsed Annular.	Quantity Eclipsed Limbs in Contact.

The Cause of Eclipses is now so generally known, that I believe it is scarce necessary to inform the Reader, that a Solar Eclipse is occasioned by the interposition of the Opake Body of the Moon, between the Sun & the Eye of the Spectator, & that it can only happen when the Moon is in Conjunction with the Sun: But the distinction of Solar Eclipses into Total & Annular, being not so commonly understood, it may be proper to say a little upon that Subject, & the better to illustrate it, I have placed a representation of one of each kind in the Margin, in which it is to be observed, that the Moon's Apparent Diameter, is expressed (in each figure) by the Angle made by the two dotted Lines. —— Total Eclipses of the Sun are those which happen when the Moon is so near the Earth, that her Shadow is intercepted by the Earth's Surface, by which means, the inhabitants of those places over which it passes, are for a small space of time, entirely deprived of the solar rays, the apparent diameter of the Moon being at such times, greater than that of the Sun; this is so clearly shewn by the figure that it does not seem to want any further Explanation. ——
The other figure represents the nature of an Annular Eclipse, this happens when the Moon is so remote from the Earth, at the time of her Conjunction with the Sun, that her Shadow terminates in a point before it reaches to the Earth's surface, for which reason no part of the Earth, can be immers'd in the Umbra, or total Shadow; but the Solar rays intersecting each other in that point, begin from thence to diverge, & proceeding on (till they are stopt by the Earth) form a Penumbra, or partial shadow: now if a spectator was situate in ye center of the base of this penumbral Cone, it is manifest that he will have the Moon directly interposed between the Sun & his Sight, & consequently will see a Central Eclipse of the Sun; but in this Case, the Moon's apparent diameter, being less than that of the Sun, she will appear to him, to be wholly included within the Sun's Disk, & encompassed about with a luminous Ring, or Annulus, from which Circumstance this species of Eclipses derive their Name.
The shaded Oval, in the Map, represents the base of the penumbral Cone, in the ensuing Eclipse, & shews the extent of the Annular Appearance at the time of the greatest Obscurity at London; the line passing through its Center, points out those places, where the Annulus will be seen of an equal breadth round the Moon, as the two limits do those, where the limbs (or edges) of the Sun and Moon, will appear in Contact; in every place included within the limits, the Annulus will be seen compleat, but of an unequal breadth on the opposite limbs of the Moon; but the Inhabitants of those places which are without the limits, will see only a partial Eclipse, whose Magnitude will depend on their distance from the limits. —— In the Calculation of this Eclipse, I have considered the Earth, as an oblate Spheroid, whose Axes are to each other as 178 to 179, being that which was determined from the Mensuration of a Degree in Lapland and France; The place of the Sun was calculated from the Solar Tables of M. l'Abbe de la Caille, who has introduced the small Equations which arise from the action of the other Planets on the Earth, and the place of the Moon, from MSS. Tables which I received (among other Instances of Friendship) from that eminent Mathematician, the late Mr. T. Simpson of Woolwich, Member of the Royal Societies of London & Stockholm.
According to these Tables, the Ecliptic Conjunction of ye Sun & Moon happens at 10h. 24′. 52″ mean time at Greenwich in Lo. 12. 9. 53, the Moon's Latitude being then 39. 34″ North, her Horizontal Diameter 29. 36″ & her Equatorial Horizontal Parallax 54. 16. the Diameter of the Sun being 32. 4. 8. ——