ART. XXI.--On the Solar Eclipse of July 8th, 1842.
American Journal of Science and Arts (1820-1879); Oct-Dec 1841; 42, 1; American Periodicals
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ART. XXI.——*On the Solar Eclipse of July 8th*, 1842.

A TOTAL eclipse of the sun at any particular place is so unfrequent, that only a small part of the inhabitants of the earth ever has an opportunity of beholding this, the most sublime of celestial phenomena. In April, 1715, the sun was totally eclipsed in London, and in May, 1724, in Paris; but from those years to 1900, or during nearly two centuries, the shadow of the moon neither has, or will pass over either of those cities. Nor have we been in this respect, more fortunate. A total eclipse took place in Massachusetts and the central part of New York on June 16th, 1806; another occurred in part of South Carolina and Georgia on Nov. 30th, 1834; the third, during this century, will be total in part of North Carolina, and will happen on Aug. 7th, 1869; the fourth, on May 27th, 1900, will be total in part of Virginia; and as the *average* width or diameter of the moon's shadow on the earth, may be considered about one hundred miles, it is evident that during the nineteenth century, not more than one quarter of our territory between Maine and Florida, will see a total eclipse. Strictly speaking, the darkness during a total eclipse, is not as has been supposed, nearly or quite total; since the moment the moon completely obscures the sun, she appears to be surrounded by a mild but beautiful effulgence, which though not too brilliant to be beheld by the naked eye, sheds sufficient light to render objects distinctly visible. At Boston, in 1806, it is said, about as much light remained, during the total obscuration, as is given by the moon when full, and in Beaufort, S. C., Nov. 30, 1834, only two planets and four stars of the first magnitude were seen, though one of them, Antares, was then only six degrees from the sun. But, although nearly twenty eight years will elapse before the next passage of the moon's shadow over the United States, on the eighth of next July, in a considerable portion of continental Europe, the sun will be totally eclipsed. That this phenomenon will be observed with interest by those of our countrymen, favorably situated, cannot be doubted, and it is therefore hoped that the following results, deduced from a long and careful computation, may be useful to those readers of the Journal, who may wish to behold the complete obscuration of the sun, and who are in doubt whither to proceed. On this occasion the centre of the shadow will first

touch the earth at sunrise, at a point in the Atlantic Ocean situated in lat. 37° N., long. 10° W. from Greenwich, or two degrees west of Portugal; it thence passes across the southern part of that kingdom, diagonally across Spain, the south of France, Sardinia, Lombardy, Austria, the north of Hungary, Austrian Galicia, the south of European Russia, the southwest of Russia in Asia, the Chinese Empire and part of the North Pacific, to a point in lat. 15° N., long. 148° E., where it will leave the earth at sunset, three hours and five minutes after it first touched it, on the coast of Portugal, and after describing a circuit of about ten thousand miles. The width of the shadow will, as usual, vary somewhat in its passage across the earth, but in Italy and Germany, it will be a little more than one hundred geographical miles, so that if the path of the centre be carefully marked on a good map, and other lines be drawn parallel thereto, to the north and to the south, at the distance of about fifty miles therefrom, the places at which the eclipse will be total, will be easily ascertained, unless situated like Venice, just within, or like Ofen, just without, the limit of the shadow, about which there is some doubt, in consequence of a possible difference between the tabular and observed latitude of the moon. In this manner it will be seen, that in addition to the places herein after enumerated, the eclipse will probably be total at St. Ubes, Evora, and Elvas in Portugal; at Badajos, Truxillo, Toledo, Urgel and Gerona in Spain; at Perpignan, Carcassone, Montpelier, Avignon, Nismes and Toulon in France; at Alessandria, Asti, Cremona, Lodi, Mantua, Parma, Placenza, Saluzzo, Savona and Tortona in Italy; at Brixen, Bruck, Clagenfurth, Judenburgh, Marburg, Trent and Villach in Austria; at Orel, Penza and Tambow in Russia; and that the shadow will pass near the city of Nankin and the island of Chusan, in China.

As the approaching eclipse will excite great interest throughout Europe, and especially in those places where it will be total, it is earnestly hoped that particular attention will be paid by those favorably situated, and in possession of suitable instruments, to the determination of the correctness of a recent suggestion, that the irregularities so frequently noticed at the second and third contacts of nearly central eclipses, and at all the contacts of the transits of Venus, may be seen or not at the pleasure of the observer, according as the color of the dark glass, he applies to his

telescope, is red or green.   These irregularities, as seen by many, have been minutely described by Francis Baily, Esq. of London, in an article in the tenth volume of the Memoirs of the Astronomical Society, although it particularly relates to the appearances, observed by himself, in the south part of Scotland, during the eclipse of May 15th, 1836, which was annular there.   Many of the appearances described by Mr. Baily, were seen through a *red* glass at the second and third contacts of the eclipse of Feb. 12th, 1831, which was annular in the southeastern part of this State.   Shortly afterwards, however, it having been ascertained that a double screen, composed of one light red and one light green glass, would not only render the light of the sun very pleasant to the eye, but would far better define the limbs, and would sometimes even enable me to see a small spot, that was invisible through the dark red alone, a screen of that kind was adapted to the telescope, and was used for the partial eclipses of 1832 and 1836, and those that were central in 1834 and 1838. Through this screen no one of the irregularities described by Mr. Baily, has ever been perceived, although carefully looked for. Indeed so remarkable was the difference between the observed and expected appearances of the sun's limbs at the second and third contacts at Beaufort, S. C. on Nov. 30th, 1834, that even then, a suspicion was excited that the entire absence of all distortion or irregularity in the cusps, just before and after the total obscuration, was to be attributed to the color of the screen ; especially since other observers in the vicinity of Beaufort saw through red screens, many or most of the usual phenomena.   This suspicion was strengthened by the observations on the large but not central eclipse of May, 1836 ; it was therefore communicated to several of our astronomers, who paid particular attention to it, at the formation and rupture of the ring on Sept. 18th, 1838.   In Philadelphia and its vicinity there were many observers, provided with telescopes of nearly equal optical capacity, but protected by screens of different colors.   The result appears to be, that in every, or nearly every instance in which the red glass was used, many or all of the usual irregularities were seen, whilst those observers who used yellow or green screens, saw these appearances either greatly modified or not at all.   At Princeton, near the northern boundary of the ring, two skilful astronomers, provided with 3½ feet telescopes by Dollond and Fraunhofer, were enabled dis-

tinctly to see some of these appearances through the red eye-piece of the former, though none was visible through the green screen of the latter instrument. At Washington, where the eclipse was nearly central, no distortion of the limb of the moon could be seen through the double screen above mentioned, and the cusps of the sun just before and after the ring, were as pointed as needles. The Committee of the Philosophical Society of Philadelphia, in their report on this eclipse, say, "This suggestion is one of great importance, as it seems to furnish evidence of the existence of a lunar atmosphere, through which, as through our own, the red rays have the greatest penetrative power. It also leads to new views concerning the cause of the remarkable appearances of the beads of light and the dark lines frequently noticed; since it shows that their appearance may be completely modified by a change in the color, and consequently in the absorbing power of the screen glass through which they are observed." It is believed that on another account will this suggestion if well founded be of great importance, viz. in its obvious tendency to diminish if not wholly remove, the discordancies not unfrequently found in the best observations on solar eclipses and transits of Venus, and which with regard to the latter in 1761 and 1769, were so great as materially to diminish the value of this method of determining the distance between the earth and the sun.

The elements of the eclipse were computed from the lunar tables, both of Burckhardt and Damoiseau, and as they appeared to differ in their results by about 13″ of longitude, the mean or average of the results was adopted, which it is hoped will be found more conformable to observation. As these tables are adapted to the meridian of Paris, the time of that meridian has been retained, but the longitudes of the places are counted from Greenwich, which is 2° 20′ 23″ west of the former. The ellipticity was considered $\frac{1}{300}$th. But no correction was applied for irradiation and inflection, which if allowed would cause the eclipse at each place to begin about ten seconds later, and to end about eleven seconds earlier than the time herein after stated. The latitudes and longitudes of the several places, were with a few exceptions, taken from the English and French Nautical Almanacs.

Path of the Centre* of the Moon's Shadow over the Earth, during the Total Eclipse of the Sun of July 7th, (July 8th, Civil Time,) 1842, Mean Astronomical Time.

Eclipse Central at	Latitude.	Longitude.	Eclipse Central at	Latitude.	Longitude.
h. m. s.	° ′	° ′	h. m. s.	° ′	° ′
17 42 40	37 6.7 N.	10 22.1 W.	18 10 0	52 19.2 N.	35 30.5 E.
17 42 45	38 5.3	8 7.9	18 11 0	52 28.8	36 28.6
17 42 50	38 29.7	7 11.5	18 12 0	52 37.8	37 26.0
17 42 55	38 49.9	6 24.9	18 13 0	52 46.3	38 22.8
17 43 0	39 6.9	5 45.7	18 14 0	52 54.2	39 19.1
17 43 5	39 21.2	5 12.5	18 15 0	53 1.6	40 14.8
17 43 15	39 45.8	4 15.0	18 16 0	53 8.5	41 10.0
17 43 30	40 16.8	3 1.9	18 17 0	53 14.9	42 4.7
17 43 45	40 43.1	1 59.7	18 18 0	53 20.9	42 58.8
17 44 0	41 6.6	1 4.0	18 19 0	53 26.4	43 52.4
17 44 15	41 28.0	0 12.8	18 20 0	53 31.5	44 45.5
17 44 30	41 47.5	0 34.4 E.	18 21 0	53 36.1	45 38.2
17 44 45	42 5.4	1 18.5	18 22 0	53 40.3	46 30.4
17 45 0	42 22.1	2 0.0	18 23 0	53 44.2	47 22.1
17 45 30	42 52.8	3 17.5	18 24 0	53 47.6	48 13.4
17 46 0	43 21.2	4 28.5	18 25 0	53 50.7	49 4.2
17 46 30	43 47.0	5 34.5	18 26 0	53 53.5	49 54.5
17 47 0	44 10.9	6 36.6	18 27 0	53 55.9	50 44.3
17 47 30	44 33.3	7 35.7	18 28 0	53 58.0	51 33.7
17 48 0	44 54.3	8 32.2	18 29 0	53 59.8	52 22.7
17 48 30	45 14.2	9 26.3	18 30 0	54 1.3	53 11.3
17 49 0	45 33.0	10 18.2	18 31 0	54 2.1	53 59.7
17 49 30	45 50.9	11 8.3	18 32 0	54 2.5	54 47.7
17 50 0	46 8.0	11 56.7	18 33 0	54 2.6	55 35.3
17 50 30	46 24.4	12 43.7	18 34 0	54 2.4	56 22.6
17 51 0	46 40.1	13 29.6	18 35 0	54 1.7	57 9.5
17 51 30	46 55.2	14 14.3	18 37 30	53 58.8	59 5.1
17 52 0	47 9.7	14 57.9	18 40 0	53 54.1	60 58.4
17 52 30	47 23.7	15 40.6	18 42 30	53 47.7	62 49.3
17 53 0	47 37.2	16 22.4	18 45 0	53 39.6	64 37.8
17 53 30	47 50.2	17 3.5	18 47 30	53 30.0	66 24.1
17 54 0	48 2.7	17 43.8	18 50 0	53 18.8	68 8.1
17 54 30	48 14.8	18 23.5	18 52 30	53 6.1	69 50.0
17 55 0	48 26.6	19 2.5	18 55 0	52 51.9	71 29.7
17 55 30	48 38.0	19 40.9	18 57 30	52 36.2	73 7.4
17 56 0	48 49.1	20 18.7	19 0 0	52 19.0	74 43.0
17 56 30	48 59.9	20 55.9	19 2 30	52 0.5	76 16.6
17 57 0	49 10.3	21 32.6	19 5 0	51 40.9	77 48.3
17 57 30	49 20.4	22 8.8	19 7 30	51 20.0	79 18.0
17 58 0	49 30.2	22 44.5	19 10 0	50 57.8	80 46.0
17 58 30	49 39.7	23 19.8	19 12 30	50 34.5	82 12.2
17 59 0	49 49.0	23 54.7	19 15 0	50 10.0	83 36.8
17 59 30	49 58.0	24 29.2	19 17 30	49 44.4	84 59.7
18 0 0	50 6.7	25 3.3	19 20 0	49 17.8	86 21.1
18 1 0	50 23.5	26 10.6	19 22 30	48 50.2	87 41.1
18 2 0	50 39.4	27 16.8	19 25 0	48 21.5	88 59.6
18 3 0	50 54.4	28 21.8	19 27 30	47 51.8	90 16.8
18 4 0	51 8.6	29 25.7	19 30 0	47 21.0	91 32.8
18 5 0	51 22.1	30 28.6	19 32 30	46 49.3	92 47.7
18 6 0	51 34.8	31 30.6	19 35 0	46 16.5	94 1.5
18 7 0	51 46.9	32 31.8	19 37 30	45 42.7	95 14.4
18 8 0	51 58.3	33 32.1	19 40 0	45 8.0	96 26.4
18 9 0	52 9.1	34 31.7	19 42 30	44 32.3	97 37.7

* The path of the centre is expressed, not in degrees, minutes, and seconds, but in degrees, minutes, and *tenths of a minute.*

Eclipse Central, nt	Latitude	Longitude	Eclipse Central, at	Latitude	Longitude
h. m. s.	° '	° '	h. m. s.	° '	° '
19 45 0	43 55.6 N.	98 48.5 E.	20 27 30	30 20.1 N.	120 0.7 E.
19 47 30	43 17.9	99 58.7	20 30 0	29 14.1	121 37.8
19 50 0	42 39.3	101 8.5	20 32 30	28 4.1	123 22.3
19 52 30	41 59.5	102 18.1	20 35 0	26 49.3	125 16.8
19 55 0	41 18.7	103 27.6	20 37 30	25 28.0	127 24.5
19 57 30	40 36.8	104 37.1	20 38 45	24 44.2	128 34.4
20 0 0	39 53.7	105 46.8	20 40 0	23 57.7	129 49.5
20 2 30	39 9.4	106 57.1	20 41 15	23 8.1	131 12.0
20 5 0	38 23.9	108 7.9	20 42 30	22 14.0	132 44.5
20 7 30	37 37.1	109 19.4	20 43 45	21 13.9	134 30.5
20 10 0	36 49.0	110 31.8	20 45 0	20 5.8	136 34.9
20 12 30	35 59.4	111 45.6	20 46 15	18 42.0	139 15.1
20 15 0	35 8.0	113 1.2	20 47 0	17 36.1	141 27.8
20 17 30	34 14.8	114 18.8	20 47 30	16 34.8	143 35.3
20 20 0	33 19.7	115 38.9	20 47 50	15 16.1	146 33.8
20 22 30	32 22.4	117 2.1	20 47 52	14 45.5	147 44.2
20 25 0	31 22.7	118 29.1			

Duration of the central eclipse on the earth, 3h. 5m. 12s.

Phases of the Eclipse at some of the principal Cities of Europe at which it will be Total, in Mean Time.

	Brescia.	Genoa.	Gratz.	Lemberg.	Madrid.
Latitude,	45°32'19"	44°24'18"	47° 4' 9"	49°51'42"	40°24'57"
Longitude,	10 13 31	8 54 23	15 27 23	24 2 53	3 41 52
	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
Beginning,	5 24 3	5 17 45	5 46 12	6 24 38	before s.r.
Beginning of total darkness,	6 19 18	6 12 53	6 43 14	7 24 33	5 18 45
Nearest approach,	6 20 31	6 13 42	6 44 29	7 25 58	5 19 38
End of total darkness,	6 21 44	6 14 31	6 45 44	7 27 24	5 20 30
Eclipse ends,	7 21 49	7 14 27	7 47 52	8 32 32	6 15 36
Duration of total darkness,	2 26	1 38	2 30	2 51	1 45
Duration of eclipse,	1 57 46	1 56 42	2 1 40	2 7 54	
Distance of north limbs,	39."11	68."50	52."83	42."47	17."80
Distance of centres,	1. 00	28. 81	11. 53	0. 84	18. 70
Distance of south limbs,	41. 11	10. 88	29. 82	44. 15	55. 29
Point first touched,	40.°4	39.°1	39.°9	40.°4	

	Marseilles.	Milan.	Nice.	Padua.	Pavia.
Latitude,	43°17'50"	45°28' 1"	43°41'58"	45°24' 2"	45°11' 6"
Longitude,	5 22 15	9 11 48	7 16 55	11 52 18	9 9 25
	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
Beginning,	5 3 16	5 20 2	5 10 51	5 30 14	5 19 34
Beginning of total darkness,	5 57 3	6 15 4	6 5 36	6 26 28	6 14 28
Nearest approach,	5 58 4	6 16 11	6 6 14	6 27 12	6 15 40
End of total darkness,	5 59 5	6 17 18	6 6 52	6 27 56	6 16 52
Eclipse ends,	6 57 25	7 17 4	7 6 20	7 29 9	7 16 32
Duration of total darkness,	2 2	2 14	1 16	1 28	2 24
Duration of eclipse,	1 54 9	1 57 2	1 55 29	1 58 55	1 56 58
Distance of north limbs,	56."77	25."06	72."28	72."91	37."25
Distance of centres,	17. 96	14. 83	33. 05	32. 47	2. 69
Distance of south limbs,	20. 85	54. 72	6. 18	7. 97	42. 45
Point first touched,	39.°8	41.°3	38.°9	38.°9	40.°5

	Pressburg.	Turin.	Venice.	Verona.	Vienna.
Latitude, . . .	48° 8′ 30″	45° 4′ 6″	45°25′ 55″	45°26′ 8″	48°12′35″
Longitude, . . .	17 6 28	7 42 6	12 20 21	10 59 13	16 22 58
	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
Beginning, . . .	5 54 6	5 13 55	5 32 6	5 26 50	5 51 18
Beginning of total darkness,	6 51 44	6 8 35	6 28 49	6 22 26	6 48 58
Nearest approach,	6 52 59	6 9 35	6 29 11	6 23 33	6 49 57
End of total darkness,	6 54 14	6 10 34	6 29 33	6 24 40	6 50 55
Eclipse ends,	7 56 56	7 9 53	7 31 23	7 25 9	7 53 36
Duration of total darkness,	2 30	1 59	0 44	2 14	1 57
Duration of eclipse, .	2 2 50	1 55 58	1 59 17	1 58 19	2 2 18
Distance of north limbs,	27.″76	17.″72	79.″25	56.″55	13.″66
Distance of centres,	14. 03	21. 82	38. 72	16 29	28. 00
Distance of south limbs,	55. 82	61. 36	1. 81	23. 97	69. 66
Point first touched, .	41.°0	41.°5	38.°7	39.°6	41.°5

The point on the sun's disc first touched by the moon, or at which the eclipse will begin, is counted from the vertex to the right hand, as seen through a telescope that does *not* invert. The longitudes of all the places, except Lisbon and Madrid, are *east* of Greenwich. At Lisbon the sun will rise at 4h. 44m., nearly totally eclipsed. At the following places the eclipse will be nearly, but not quite, total.

Places.				Nearest approach.	Dist. of centres.	Difference S. D.
				h. m. s.		″
Cracow, .	.	.	.	7 8 0	64′62	42.″53
Innspruck,	.	.	.	6 27 33	61.09	40 59
Kremmunster,	.	.	.	6 40 3	55.30	41.16
Lisbon, .	.	.	.	4 57 42	46.49	35.15
Ofen (Buda),	.	.	.	7 0 38	45.76	42.12
Trieste, .	.	.	.	6 35 33	51.93	40.84

Elements of the Eclipse, Mean Time at Paris.   Solar Elements.

	Longitude.	Right Ascen.	Declination.	Sidereal time.	
h. m.	° ′ ″	° ′ ″	° ′ ″	h. m. sec.	
16 40	105 32 15.80	106 51 41.32	22 33 17.89	7 2 52.81	⊙'s Latitude +0″.06
17 00	105 33 3.48	106 52 32.60	22 33 12.35	7 2 56.10	" Hor. Paral. 8″ 44
18 00	105 35 26.51	106 55 6.43	22 32 55.74	7 3 5.95	" S. diam. 15′ 45″.37
19 00	105 37 49.55	106 57 40.26	22 32 39.11	7 3 15.81	Obliquity 23° 27′38″ 28
20 00	105 40 12.59	107 00 14.04	22 32 22.45	7 3 25 66	
21 00	105 42 35.63	107 2 47.86	22 32 5.76	7 3 35 52	
22 00	105 44 58 68	107 5 21.6	22 31 49.05	7 3 45.38	

Lunar Elements.

	Longitude.	Latitude.	Right Ascen.	Declination.	Hor. Par.	Semi-Diam.
h. m.	° ′ ″	° ′ ″	° ′ ″	° ′ ″	′ ″	′ ″
16 40	104 07 18.17	+36 49.34	105 24 25.38	23 19 17.51	59 54.77	16 19.56
17 00	104 19 23.66	35 42.61	105 37 23.05	23 16 53 97	59 55.22	16 19.63
18 00	104 55 41.24	32 22.20	106 16 14.40	23 9 36 59	59 56.50	16 20.04
19 00	105 32 0.39	29 1.51	106 55 3.20	23 2 9.46	59 57.77	16 20.39
20 00	106 8 21.03	25 40.54	107 33 49.30	22 54 32.56	59 59.01	16 20.72
21 00	106 44 43.09	22 19.31	108 12 32 55	22 46 46.02	60 00.21	16 21.04
22 00	107 20 6.51	18 57.73	108 51 12.70	22 33 49.83	60 01.41	16 21.35

Boston, December 6, 1841.   R. T. P.