Observations of Occultations of Stars by the Moon, of Phenomena of Jupiter's Satellites, and of the Eclipse of the Sun, 1880, December 31, made at the Royal Observatory, Greenwich, in the Year 1880.

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Occultations of Stars by the Moon.

Day of Obs.	Phenomenon.	Telescope.	Power.	Moon's Limb.	Mean Solar Time of Obs. h. m. s.	Observer.
1880, Jan. 20	(*a*) Disapp. of ϵ Arietis	E. Eq.	140	Dark	7 4 27·7	A. D.
March 13	Disapp. of 101 Piscium	,,	,,	,,	7 34 36·6	C.
21	Disapp. of d^2 Cancri	,,	,,	,,	7 16 25·6	,,
24	(*b*) Disapp. of p^2 Leonis	,,	,,	,,	13 35 54·4	,,
April 16	Disapp. of 56 Geminorum	Altaz.	100	,,	10 43 0·9	T.
May 18	(*c*) Disapp. of p^2 Leonis	E. Eq.	140	,,	7 56 58·1	C.
Sept. 13	Disapp. of 50 Sagittarii	Altaz.	100	,,	7 14 51·5	,,
Nov. 17	(*d*) Disapp. of υ' Tauri	,,	,,	Bright	6 54 39·9	,,
	Disapp. of υ' Tauri	E. Eq.	140	,,	6 54 39·4	A. P.
19	Disapp. of η Geminorum	,,	,,	,,	8 52 4·3	C.
	(*e*) Reapp. of η Geminorum	,,	,,	Dark	9 58 12·5	,,
	Disapp. of μ Geminorum	,,	,,	Bright	13 39 40·3	,,
	Reapp. of μ Geminorum	,,	,,	Dark	14 43 10·3	,,
20	Disapp. of ζ Geminorum	Altaz.	100	Bright	8 16 40·8	J. P.
	Reapp. of ζ Geminorum	,,	,,	Dark	9 14 31·4	,,

Notes.

(*a*) The star seemed to disappear gradually.
(*b*) Images very bad; observation doubtful, as the observer lost sight of the star several times before it finally disappeared.
(*c*) Observation satisfactory.
(*d*) The observer lost sight of the star once or twice when close to the limb.
(*e*) The reappearance was not sudden; the star was first seen as a very small spot, and in about $0^s{\cdot}2$ or $0^s{\cdot}3$ it flashed out to its full brightness.

Phenomena of Jupiter's Satellites.

Day of Observation.	Satellite.	Phenomenon.	Telescope.	Power.	Mean Solar Time of Observation. h m s	Mean Solar Time of N.A. h m s	Observer.
1880, Aug. 2	I.	Occ. reapp. First seen	E. Eq.	140	12 44 9	12 45	C.
		Last contact	,,	,,	12 45 22		
2	(*a*) III.	Tr. egr. Bisection	,,	,,	12 59 10	13 6	,,
		Last contact	,,	,,	13 2 24		
9	III.	Tr. egr. First contact	,,	,,	14 32 57	14 34	J.
		Bisection	,,	,,	14 39 26		
		Last contact	,,	,,	14 46 15		
9	I.	Occ. reapp. First contact	,,	,,	14 33 57	14 34	,,
		Bisection	,,	,,	14 34 52		
		Last contact	,,	,,	14 35 56		
31	II.	Occ. reapp. Bisection	,,	,,	12 55 51	12 58	T.
		Last contact	,,	,,	12 58 20		
Sept. 1	I.	Ecl. disapp. First obscuration	,,	310	11 18 41	11 20 41	A. D.
		Last seen	,,	,,	11 20 43		
2	I.	Tr. ingr. First contact	,,	,,	9 27 49	9 29	C.
		Bisection	,,	,,	9 30 3		
		Last contact	,,	,,	9 32 3		

Day of Observation.	Satellite.	Phenomenon.	Telescope.	Power.	Mean Solar Time of Observation. h m s	Mean Solar Time of N. A. h m s	Observer.
Sept. 2	I.	Tr. egr. First contact	E. Eq.	310	11 35 43	11 42	C.
		Bisection	,,	,,	11 38 27		
		Last contact	,,	,,	11 40 27		
3	III.	Ecl. disapp. Last seen	,,	,,	11 17 24	11 17 25	T.
	(*b*) III.	Ecl. reapp. First seen	,,	,,	13 44 29		
		Full brightness	,,	,,	13 45 56	13 47 36	,,
7	II.	Ecl. disapp. Last seen	,,	,,	11 11 54	11 11 1	H. P.
16	(*c*) II.	Tr. ingr. First contact	,,	,,	9 10 57	9 12	A. D.
		Last contact	,,	,,	9 16 18		
Oct. 2	(*d*) I.	Tr. ingr. First contact	,,	140	10 48 34	10 51	,,
		Last contact	,,	,,	10 54 18		
2	(*e*) II.	Occ. reapp. First contact	,,	,,	11 1 31	11 5	,,
		Last contact	,,	,,	11 8 20		
2	(*f*) I.	Tr. egr. First contact	,,	,,	13 0 12	13 4	,,
		Last contact	,,	,,	13 5 6		
11	(*g*) I.	Tr. ingr. First contact	,,	,,	6 59 30	7 0	,,
		Last contact	,,	,,	7 3 21		
11	(*h*) II.	Tr. egr. First contact	,,	,,	7 39 59	7 46	,,
		Last contact	,,	,,	7 44 33		
11	(*i*) I.	Tr. egr. First contact	,,	,,	9 8 39	9 13	,,
		Last contact	,,	,,	9 13 8		

Day of Observation.	Satellite.	Phenomenon.	Telescope.	Power.	Mean Solar Time of Observation. h m s	Mean Solar Time of N. A. h m s	Observer.
Oct. 18	(*k*) II.	Tr. ingr. First contact	E. Eq.	140	7 24 9		
		Bisection	,,	,,	7 25 39	7 25	C.
		Last contact	,,	,,	7 27 38		
18	I.	Tr. ingr. First contact	,,	,,	8 43 56		
		Bisection	,,	,,	8 45 26	8 44	,,
		Last contact	,,	,,	8 47 25		
18	(*l*) II.	Tr. egr. First contact	,,	,,	9 54 59		
		Bisection	,,	,,	9 57 44	10 2	,,
		Last contact	,,	,,	10 0 13		
18	I.	Tr. egr. Last contact	,,	,,	10 56 4	10 57	,,
25	(*m*) I.	Tr. egr. First contact	S. E. Eq.	130	12 36 3		
		Bisection	,,	,,	12 40 12	12 41	M.
		Last contact	,,	,,	12 44 11		
Nov. 2	I.	Ecl. reapp. First seen	E. Eq.	140	12 18 3	12 17 50	J.
3	II.	Occ. disapp. First contact	Naylor	215	6 28 45		
		Bisection	,,	,,	6 31 15	6 30	W. C.
		Last contact	,,	,,	6 33 15		
3	II.	Occ. disapp. First contact	E. Eq.	310	6 30 25		
		Bisection	,,	,,	6 31 55	6 30	C.
		Last contact	,,	,,	6 33 24		

Day of Observation.	Satellite.	Phenomenon.	Telescope.	Power.	Mean Sola Time of Observation. h m s	Mean Solar Time of N. A. h m s	Observer.
Nov. 3	(*n*) I.	Tr. ingr. First contact	Naylor	215	6 39 44		
		Bisection	,,	,,	6 41 3	6 39	W. C.
		Last contact	,,	,,	6 43 13		
3	I.	Tr. ingr. First contact	E. Eq.	310	6 38 38		
		Bisection	,,	,,	6 40 53	6 39	C.
		Last contact	,,	,,	6 42 38		
3	III.	Tr. ingr. First contact	Naylor	215	6 54 30		
		Bisection	,,	,,	6 59 39	6 54	W. C.
		Last contact	,,	,,	7 3 29		
3	(*o*) III.	Tr. ingr. First contact	E. Eq.	310	6 52 51		
		Bisection	,,	,,	6 58 50	6 54	C.
		Last contact	,,	,,	7 6 4		
3	I.	Tr. egr. First contact	,,	,,	8 47 32	8 52	,,
		Last contact	,,	,,	8 51 47		
3	III.	Tr. egr. Bisection	Naylor	215	9 14 41	9 21	W. C.
		Last contact	,,	,,	9 21 40		
3	III.	Tr. egr. Bisection	E. Eq.	310	9 15 58	9 21	C.
		Last contact	,,	,,	9 20 42		
3	(*p*) II.	Ecl. reapp. First seen	,,	,,	10 27 49	10 28 43	,,

Day of Observation.	Satellite.	Phenomenon.	Telescope.	Power.	Mean Solar Time of Observation. h m s	Mean Solar Time of N. A. h m s	Observer.
Nov. 4	(*q*) I.	Ecl. reapp. First seen	S. E. Eq.	130	6 46 18	6 46 42	M.
	I.	Ecl. reapp. First seen	E. Eq.	310	6 45 57	6 46 42	T.
		Full brightness	,,	,,	6 47 27		
10	I.	Tr. ingr. First contact	Naylor	215	8 23 19	8 25	M.
		Bisection	,,	,,	8 25 29		
		Last contact	,,	,,	8 27 48		
10	II.	Occ. disapp. First contact	,,	,,	8 46 34	8 47	,,
		Bisection	,,	,,	8 48 44		
		Last contact	,,	,,	8 50 9		
19	(*r*) I.	Tr. egr. Last contact	E. Eq.	310	6 53 26	6 53	C.
19	II.	Tr. egr. First contact	,,	,,	8 27 11	8 34	,,
		Bisection	,,	,,	8 29 11		
		Last contact	,,	,,	8 30 40		
21	(*s*) II	Ecl. reapp. First seen	Naylor	110	4 56 34	4 58 4	W. C.
		Full brightness	,,	,,	4 59 3		
21	III.	Occ. reapp. Last contact	,,	215	5 48 22	5 57	,,
21	III.	Ecl. disapp. First obscuration	,,	,,	7 36 0	7 43 23	,,
	(*t*) III.	Last seen	,,	,,	7 44 4		

Day of Observation.	Satellite.	Phenomenon.	Telescope	Power.	Mean Solar Time of Observation. h m s	Mean Solar Time of N. A. h m s	Observer.
Nov. 21	(*u*) III.	Ecl. reapp. First seen	,,	,,	9 53 23	9 58 24	W. C.
		Full brightness	,,	,,	10 1 2		
21	III.	Ecl. reapp. First seen	E. Eq.	310	9 53 12	9 58 24	C.
		Full brightness	,,	,,	9 59 5		
27	I.	Ecl. reapp. First seen	,,	,,	7 2 39	7 2 56	,,
27	I.	Ecl. reapp. First seen	Naylor	215	7 2 26	7 2 56	M.
28	(*v*) III.	Occ. disapp. First contact	,,	,,	6 49 2	6 58	W. C.
		Bisection	,,	,,	6 53 12		
		Last contact	,,	,,	7 1 20		
28	II.	Ecl. reapp. First seen	,,	,,	7 32 33	7 34 3	,,
		Full brightness	,,	,,	7 36 3		
28	(*w*) III.	Occ. reapp. First seen	,,	,,	9 25 11	9 35	,,
		Last contact	,,	,,	9 30 40		
Dec. 3	(*x*) I.	Tr. egr. First contact	E. Eq.	140	10 27 55	10 31	A. D.
		Last contact	,,	,,	10 33 25		
3	(*y*) II.	Tr. ingr. First contact	,,	,,	10 39 54	10 47	,,
		Last contact	,,	,,	10 48 37		
Dec. 20	(*z*) I.	Ecl. reapp. First seen	Altaz.	100	7 20 31	7 19 32	C.
30	II.	Ecl. reapp. First seen	E. Eq.	140	7 17 46	7 17 51	J.

Notes.

(*a*) Images very blurred and unsteady.

(*b*) The planet and satellites were ill-defined.

(*c*) Limb ill-defined.

(*d*) The images were diffused and tremulous and the observation difficult. The satellite could be traced for a quarter of an hour on the disk of Jupiter, and was distinctly brighter than the surface of the planet near the limb.

(*e*) Images diffused and tremulous.

(*f*) Tremulous; light cloud.

(*g* and *h*) Ill-defined and tremulous.

(*i*) Steady, but diffused.

(*k*) The satellite when on the disk of Jupiter appeared brighter than the surrounding surface.

(*l*) The shadows of the satellites were intensely black.

(*m*) Limb of planet tremulous; light clouds passing.

(*n*) The satellite was much brighter than Jupiter's disk near the limb. About eleven minutes after the last contact it was invisible on the planet.

(*o*) The satellite was seen bright on Jupiter's disk about seven minutes after the last contact, and barely visible eleven minutes later.

(*p*) Definition very bad.

(*q*) There was a considerable amount of fog, which probably prevented the first speck of light being recognised at once. The images were very steady.

(*r*) Not good; very cloudy.

(*s*) and (*t*) Observation good.

(*u*) A few seconds late.

(*v*) Sky hazy; definition fair. The satellite was seen very distinctly through the edge of the planet's disk.

(*w*) Definition bad.

(*x*) The satellite faint; the sky thick.

(*y*) The satellite faint; observation difficult.

(*z*) Planet faint on account of fog; the observation not satisfactory.

Eclipse of the Sun, 1880, *December* 31.

Beginning and Ending of the Eclipse.

		Phenomenon.	Telescope.	Power.	Mean Solar Time of Observation. h m s	Observer.
1880, Dec. 31	(*a*)	First Contact	S.E. Eq.	295	1 40 33·6	W. C.
,,	(*b*)	,,	E. Eq.	70	1 40 32·9	D.
,,		,,	Naylor	215	1 40 35·8	A. D.
,,	(*c*)	,,	Altazimuth	66	1 40 37·4	T.
,,	(*d*)	Last Contact	S.E. Eq.	295	3 28 23·0	W. C.
,,	(*e*)	,,	E. Eq.	140	3 28 19·3	C.

Notes.

(*a*) Probably a few seconds late.

(*b*) At the time of contact the Sun's limb was steady and free from cloud. Clouds were, however, passing over the Sun till about 20 seconds before first contact, occasionally obscuring the limb.

(*c*) Clouds only just left the sun a few seconds before first contact.

(*d*) Observation pretty good.

(*e*) Very tremulous.

During the Eclipse the following observations were made with the S. E. Equatoreal:—

From 1 40 to 1 55 G.M.T.,	10 differences of N.P.D. of N. and S. cusps.
1 55 to 2 15	10 differences of R.A. of *p* and *f* cusps.
2 15 to 2 40	13 differences of N.P.D. of S limbs of Sun and Moon.
2 40 to 3 0	11 differences of N.P.D. of *p* and *f* cusps.
3 0 to 3 25	12 differences of R.A. of *p* and *f* cusps.

The clear aperture of the object-glass of the S.E. Equatoreal is $12\frac{3}{4}$ inches, of the East Equatoreal $6\frac{3}{4}$ inches, of the Altazimuth 4 inches, and of the Naylor Equatoreal 6 inches.

The initials W. C., D., C., A. D., M., T., H. P., J. P., J., and A. P., are those of Mr. Christie, Mr. Dunkin, Mr. Criswick, Mr. Downing, Mr. Maunder, Mr. Thackeray, Mr. H. Pead, Mr. Power, Mr. James, and Mr. A. Pead.

Royal Observatory, Greenwich,
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