

a heavy percentage of the *Venus* plates. Some of the new gelatine processes might give even better results, but I have no personal experience of the behaviour of these plates under the micrometer, and I should not be inclined to expect any very good results from them. Next, a shortened exposure, and if possible a better means of making it than by the drop-slit as at present arranged. Thirdly, some means of securely clamping the instrument. The Dallmeyer photoheliographs are sadly deficient in clamping power. Lastly, a small finder added to each instrument would be a great improvement, and would have prevented the unfortunate failure of the Janssen method at Honolulu.

The most important station for photographic work would be the Falkland Islands; Santiago and Cordoba and other South American posts ranking next, as in all probability photographs will in any case be taken, both in Europe and the United States, supplying the needed corresponding northern stations. A photoheliograph in Cape Colony and another in New Zealand would be desirable, but less essential. There is one already at work in the Mauritius, where ingress is visible at sunset, but the sun will be very low there. Cuba or Central America would also be good positions, but the post most necessary to be occupied is, as has been already stated, the Falkland Islands, there being but a poor chance of fine weather in the Straits of Magellan.

Blackheath:
1882, January 12.

The Relative Motions of the Great Red Spot and Brilliant Equatorial Spot on Jupiter. By W. F. Denning, Esq.

In the early part of the night of December 24 the sky was shrouded in thick haze, through which *Jupiter* shone very dimly; but at about 9^h 35^m the atmosphere became much clearer, and I was enabled to observe the markings then visible on the planet. At 9^h 43^m, with power 150 on my 10-inch Reflector, I noted the middle of the red spot and the bright equatorial spot crossing the central meridian together. I had anticipated from comparative observations of the two objects on the nights of December 20, 22, and 23, that they must occupy the same longitude at this time, and the fact was thus proved by actual observation.

Now, on November 19, 1880, at 9^h 23^m, I observed the same markings in conjunction as they came to transit; and I have watched the motions of these objects, as frequently as opportunity permitted, during the interval of 400 days and 20 minutes which has elapsed between the two observed conjunctions of November 19, 1880, and December 24, 1881.

The red spot has performed 967 rotations, but the white spot has circulated around *Jupiter* 976 times, or 9 times more than the red spot. The mean revolution of the bright spot, relatively to the position of the red spot, has therefore been 44 days 10^h 42^m 13^s.3. The epochs of conjunction computed on this period, and dating from the first observation on November 19, 1880, are :—

		h	m	s
1880, November	19	9	23	0
1881, January	2	20	5	13
February	16	6	47	27
April	1	17	29	40
May	16	4	11	53
June	29	14	54	7
August	13	1	36	20
September	26	12	18	33
November	9	23	0	47
December	24	9	43	0

The two spots have, however, both shown irregularities of motion in the interval, so that, though the mean motion is represented by the period as above, the individual conjunctions derived from observation are not precisely conformable to the above times. Apart from this, the two objects near the epochs of their conjunction could not be always followed, owing to cloudy weather or to the unfavourable position of *Jupiter*. I have, however, derived the approximate times of actual conjunction from observations close to the dates on which they occurred as follows :—

Approximately Observed Conjunction.		Derived from Observations on	Observed Period of Revolution.	Diff. from Mean
	h m		d h m	44 ^d 10 ^h 42 ^m .
1881, Jan. 3	7 9	1880, Dec. 28 1881, Jan. 6	44 21 46	+ 0 11 4
		2 near ☉	{ Four periods averaging	
June 29	11 53	July 10	44 7 11	- 0 3 31
Aug. 13	1 1	Aug. 8	44 13 8	+ 0 2 26
Sept. 26	7 32	Sept. 21 28	44 6 31	- 0 4 11
Nov. 10	11 3	Nov. 14 15	45 3 31	+ 0 16 49
Dec. 24	9 43	Dec. 24	43 22 40	- 0 12 2

Thus the observed times are very close to those computed for the conjunctions of June 29, August 13, and September 26, but

the conjunction of November 10 happened $16^{\text{h}} 49^{\text{m}}$ later than usual, while that of December 24 showed a nearly corresponding period the other way, for the time is earlier by $12^{\text{h}} 2^{\text{m}}$ than that predicted. In fact the revolution of the bright spot in the former case showed an excess of $1^{\text{d}} 4^{\text{h}} 51^{\text{m}}$ as compared with the latter. Between September 28 and October 17 the bright spot exhibited a remarkable deviation from its mean motion, for its longitude became displaced to the extent of $+13^{\circ}$ E. The daily rate of rotation is $878^{\circ}.48$ as derived by Mr. Marth from a large number of observations, and while on September 28 the longitude of the white spot was $18^{\circ}.4$, it increased to $19^{\circ}.4$ on September 30, to $23^{\circ}.5$ on October 3, to $27^{\circ}.4$ on October 11, and to $31^{\circ}.4$ on October 17. This shows a great retardation, while the subsequent observations in November and December prove the motion to have been slightly accelerated. These curious variations have obviously originated the large difference between the periods of the last two revolutions of the spot.

I believe the observed times of conjunction given in the above table, though depending upon eye estimates, may be relied upon to within small limits of error. I have adopted the daily motion of the brilliant spot as $=8^{\circ}.1$ or $13^{\text{m}} 24^{\text{s}}$, as compared with the position of the red spot.

During the period July 8–December 24, 1881, I obtained 43 transits of the latter and 41 of the former. The bright spot is subject to temporary obscurations at periods which seem to be of irregular occurrence.

For the information of observers who desire further to trace the remarkable motions of these spots, I give the following computed times of conjunction for the ensuing year:—

		h	m	s
1882, February	6	20	25	13
March	23	7	7	27
May	6	17	49	40
June	20	4	31	53
August	3	15	14	7
September	17	1	56	20
October	31	12	38	33
December	14	23	20	47

It is probable that the brilliant spot has been perceptible for some years, though observers have not until recently been able to connect the observations made during several oppositions of the planet. Dr. F. Terby, of Louvain, observed a brilliant white spot N. of the *f.* end of the red spot on November 27, 1879, and January 11, 1880. One revolution of this object had evidently been completed in the interval of 45 days, and the position of Dr. Terby's spot, relatively to the red, is identical with that computed back for the brilliant spot now visible. The

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conjunction of November 29, 1879, was also observed by Mr. Gledhill at Halifax. He noted a "bright gap" into N. border of the great South belt and slightly preceding the middle of the red spot (November 29, 1879, 6^h 30^m). A collection of the sketches made during the last five years would undoubtedly allow some salient facts to be gleaned as to the previous history of this singular object.

Ashley Down, Bristol:
1881, December 26.

Observation of the Outer Satellite of Mars made at the Royal Observatory, Greenwich.

(Communicated by the Astronomer Royal.)

The satellites of *Mars* have been looked for on four nights during the present Opposition, viz. on Dec. 29 and 30, and January 6 and 9. On three nights the search was wholly unsuccessful, but on December 30 a single measure was secured of an object which is believed to have been *Deimos*, the outer satellite. It was glimpsed once or twice between 9^h and 11^h G.M.T., but at length it was steadily held for about three minutes, and a fairly satisfactory measure obtained.

1881, December 30.

Greenwich Mean Solar Time.	Greenwich Sidereal Time.	Distance in Arc.	Position- Angle.
h m s	h m s		
11 7 51	5 45 56	46''6	242° 16'

The position-angle may perhaps be rather small.

The satellite was seen again a little later on, but clouds came up before another measure could be secured.

It is believed that *Phobos* was glimpsed three or four times between 8^h 30^m and 9^h 0^m G.M.T., and its distance was roughly estimated as 0.8 diameter of *Mars* clear of the disk, and its position-angle as about 240°.

Deimos was far more difficult to observe than during the Opposition of 1879.

The observation was obtained with the Great Equatoreal of 12³/₄ inches aperture. Observer, Mr. Maunder.

Royal Observatory, Greenwich:
1882, January 13.

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