Correspondence.

The Ninth Satellite of Jupiter.

The discovery of this very tiny body, which is of the 19th magnitude, was briefly announced by telegram last July. Some further particulars, confirming its satellite character, are contained in the October number of the Publications of the Astronomical Society of the Pacific. The object was first photographed on July 21 last by Mr. Seth B. Nicholson, using the Crossley reflector, and giving a 2-hours' exposure; it was found 15′ east, 6′ south of the eighth satellite, and one magnitude fainter. It was photographed daily till the end of July, and on August 21, 22, 23. The orbit was deduced by Leuschner's method, and proved to be an ellipse, with a period of nearly three years, so that it is still further from Jupiter than the eighth, whose period is two years. The solar perturbations must be extraordinarily large, and the stability of the orbit uncertain. Like VIII. its motion is retrograde; this was to be expected, for Mr. Jackson recently showed that such motion was stable at a greater distance from the primary than direct motion. The eccentricity and inclination of the orbit of IX. are not yet given, but are probably large. It goes four times round Jupiter while Jupiter goes once round the Sun.

A. C. D. Crommelin.

Motion of the Great Red Spot on Jupiter.

In the Monthly Notices, R.A.S., Vol. LIX., pp. 579–80, I gave the annual rates of rotation of the Red Spot and Hollow in the S. belt during the period from 1831 to 1899. The mean of the whole was $9^h\ 55^m\ 36^s{\cdot}4$ from 60,074 rotations. Relatively to the rate of $9^h\ 55^m\ 40^s{\cdot}63$ adopted in the ephemerides for system II. in recent years the spot must have lost about 2,580° of longitude during the 68 years.

Between 1878 and 1899 the spot exhibited a slackening motion, the rotation period during this interval of 21 years increasing 8 seconds from $9^h\ 55^m\ 33^s{\cdot}7$ to $9^h\ 55^m\ 41^s{\cdot}7$.

In 1901 the south tropical disturbance appeared in the form of several irregular and apparently connected spots or dusky waves in the bright zone separating the S. side of the S. equatorial belt from the S. temperate belt. Subsequently the motion of the Red Spot fluctuated very considerably, its rate being evidently influenced by the greater velocity of the S. tropical disturbance, as first pointed out by M. Antoniadi. As the latter marking overtook the Red Spot it pushed it forward, and when it had passed it the spot immediately slackened and relapsed into the rate exhibited prior to the conjunction with the S. tropical disturbance.

In and since 1900 the mean rate of rotation has been approximately as in the following table. In every year, however, the exact longitude of the spot could not be ascertained in January or December from the fact that Jupiter was too near to the Sun. In such cases the position of the marking was computed from the places observed near to the dates required :—

Year.	Longitudes.	Mean Rotation Period.
	° °	h m s
1900	37 to 44	9 55 41·4
1901	44 „ 45	9 55 40·7
1902	45 „ 36	9 55 39·6*
1903	36 „ 33	9 55 40·2
1904	33 „ 26	9 55 39·7*
1905	26 „ 31	9 55 41·2
1906	31 „ 22	9 55 39·5*
1907	22 „ 24	9 55 40·9
1908	24 „ 15	9 55 39·6*
1909	15 „ 12	9 55 40·3
1910	12 „ 343	9 55 37·4*
1911	343 „ 314	9 55 37·4
1912	314 „ 284	9 55 37·2
1913	284 „ 240	9 55 35·7*
1914	240 „ 207 June 30.	9 55 33·6

An asterisk is affixed to those years in which conjunctions of the Red Spot and S. tropical disturbance occurred.

The present rate seems to nearly coincide with the lowest value it showed in 1876, viz., $9^h\ 55^m\ 33^s{\cdot}4$, and the acceleration is still operating and apparently increasing.

Since June 1910, when the longitude of the spot was zero and the meridian of system II. ran through its centre, its longitude has decreased 153 degrees, which corresponds to a westerly drift of about 120,000 miles. At this date (June 30, 1914) the spot came to transit $4^h\ 13^m$ before the predicted times of transit of the zero meridian given in the Nautical Almanac. As the longitude of the spot appears to be decreasing about 5 or 6 degrees per month, the interval of $4^h\ 13^m$ is increasing nearly 9 minutes per month.

It is to be hoped that a large number of transit times of the spot will be taken during the present opposition. The outlines of the object are so faint that they can only be glimpsed in a very satisfactory condition of the sky. Transits of the *p.* and *f.* ends of the S. tropical disturbance* will also be valuable not only for determining its rate of rotation, but also its length, which varies enormously.

W. F. Denning.

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* In this paper I have used this term though it is sometimes called the S. temperate disturbance or spot. There is reason for the latter designation, for the marking moves at the same rate as the S. temperate spots, and its S. side come on the S. temperate belt.

The later Stages of the Perseid Meteoric Shower.

It is very difficult to determine the exact position of the radiant of the Perseids at their concluding phase and to definitely ascribe a limit to the visible activity of the shower. In 1914 it was certainly very distinct on August 16 at 56° + 59° and it appeared to be continued on August 20 at 69° + 58°, but these positions, and especially the latter, are rather far eastward of the theoretical or computed places.

But there are several other displays of streaking meteors the radiants of which immediately surround the Perseid position from about August 15 to 25, and it is not often possible to say of a meteor, seen within the period referred to, whether it is a true Perseid or a member of one of the contiguous systems of Perseids, Camelopardids, or Aurigids. The following appear to be the most active and well-defined :—

Name of Shower.	R.A.	Decl.	Radiants averaged
	°	°	
γ Camelopardids	55·2	+72·0	10
Camelopardids	60·6	+59·2	10
μ Perseids	61·2	+49·5	10
Aurigids	70·5	+51·8	11
α Camelopardids	70·7	+65·1	16
δ Aurigids	77·6	+56·5	13

If the positions of the Perseid radiant should run on from August 16 in perfect conformity with its motion prior to that date as observed at Bristol, then the ephemeris should be nearly as under :—

Day of Month.	R.A.	Decl.
	°	°
August 16	52·9	+58·0
„ 17	54·4	+58·2
„ 18	55·9	+58·4
„ 19	57·4	+58·5
„ 20	58·9	+58·7
„ 21	60·4	+58·8
„ 22	61·9	+58·9
„ 23	63·4	+59·0
„ 24	65·0	+59·1
„ 25	66·5	+59·2

But I usually find that observations indicate a position too far east (the R.A. being excessive), and I conclude from this circumstance that meteors from the three last showers included in the first table are involved in producing the result alluded to—strong evidence of the fact has indeed been found from a careful discussion of a large amount of material gathered here in and

since August 1876. There are undoubtedly occasional shots from the right position of the shifting radiant of Perseids up to August 25, but they cannot be clearly traced after that date. Up to about August 16 the Perseids decidedly form the chief shower, but on later nights than that the neighbouring Camelopardids and Aurigids assume the ascendency.

This year Perseids were displayed over the 38 nights from July 14 to August 20, as observed, but they may very probably have exceeded these limits. The shower, though not a specially abundant one, was rather noteworthy for the large proportion of brilliant meteors which it exhibited. A considerable number of double or multiple observations of identical objects have been gathered, and it will be possible to compute the real paths of a larger collection of meteors than in any other year within recollection.

A notable incident of the recent Perseid season was the striking occurrence of a rich shower of bright meteors from a few degrees N. of α Lyræ. They were rapid, bluish-white in colour, with quick flashing outbursts of light near their terminal points. I found the place of the radiant at $279^\circ + 45^\circ$ from 20 of these Lyrids seen here between August 12 and 21. They are very similar objects in appearance to the Cygnids and α Cepheids, $290^\circ + 53^\circ + 311^\circ + 62^\circ$, which I saw actively displayed during the Perseid shower of 1893. These showers were reobserved this year, but not nearly with the same richness as formerly.

Bristol, August 23. W. F. Denning.

The Green Flash.

On the 24th September about 5.56 p.m. I saw the Green Flash at sunset from my house at Sanderstead, Surrey. The air was remarkably clear and the red Sun was bright and free from mist, an unusual condition near London. It set over the roof of the Russell Hill Schools, which are distant $1\frac{1}{4}$ miles and only 50 feet higher than my house, so that the Sun was practically on the horizon. The Flash, although bright, was momentary, owing probably to the short distance through which dispersion could act. It is curious that Mr. Edmund Clark and myself both saw the Sun set over the roofs of buildings and observed the Flash.

Alfred Carpenter, R.N.

The Green Flash.

Coming up from Purley Station this evening it was noted that the Sun was setting in an exceptionally clear sky. Accordingly I watched from near the S.W. corner of Coxley Plane Wood (said to be a Doomsday Book landmark) on Riddlesdown, just over 400 feet above sea level. The Sun was sinking below the Banstead Hills, or rather the roofs of Banstead Asylum, nearly 4 miles distant across the main Brighton Road valley and of just the same elevation. It finally vanished, still

markedly bright, at 5.55 p.m., and with an almost instantaneous but unmistakeable "Green Flash," such as I had previously seen once from the Lion's Head Hill, Capetown, and once on the South Atlantic.

Asgarth, Riddlesdown Road, Purley, Surrey.
24th September 1914.

J. EDMUND CLARK.

Solar Transit of Mercury for Venus.

On 4th November 1914 will occur a solar transit of Mercury for Venus. Using heliocentric co-ordinates, I get the following results for the transit of the centre of Mercury assumed to be seen from the centre of Venus. Ingress, $12^h\ 11^m$ p.m. P.A. 77°. Mid-transit, $2^h\ 41^m$ p.m. Least distance of centres, $7'\ 52''$. Conjunction in longitude, $2^h\ 49^m$ p.m. Distance of centres, $7'\ 57''$ (Mercury north). Egress, $5^h\ 11^m$ p.m. P.A. 299°. The position-angles are reckoned eastward from the ecliptic north point of the Sun, *i.e.*, from the point of the limb nearest the North Pole of our ecliptic. Duration, $5^h\ 0^m$. Length of solar chord, $41'\ 20''$. Relative hourly velocity of Mercury, $8'\ 15''$. Diameter of the Sun for Venus, $44'\ 13''{\cdot}70$. Diameter of Mercury for Venus, $16''{\cdot}78$. The transit takes place north of the Sun's centre. As a rule, fractions of a second of arc and of a minute of time, though taken into account in the work, are omitted from the results.

C. T. WHITMELL.

Solar Transit of Mercury for the Earth.

It may be of interest to put here for comparison the data for the above transit, which will occur just three days later, on 7 November 1914. Most of the items are from the N.A., but I have made some additions. The centre of Mercury is supposed to be seen from the centre of the Earth. Ingress, $9^h\ 58^m$ a.m. P.A. 156°. Conjunction in R.A., $11^h\ 12^m$ a.m. Distance of centres, $11'\ 40''$ (Mercury south). Mid-transit, $12^h\ 3^m$ p.m. Least distance of centres, $10'\ 31''$. Egress, $2^h\ 8^m$ p.m. P.A. 255°. The position-angles are reckoned eastward from the actual north point of the Sun, *i.e.*, from the equinoctial north point of the limb. Duration, $4^h\ 10^m$. Length of the solar chord, $24'\ 30''$. Relative hourly velocity of Mercury, $5'\ 53''$. Diameter of the Sun for the Earth, $32'\ 17''{\cdot}18$. Diameter of Mercury for the Earth, $9''{\cdot}88$. The transit takes place below (south of) the Sun's centre. It will be noticed that the transit of Mercury for the Earth takes nearly an hour less than it does for Venus, the shorter solar chord in the former case more than compensating for the reduced velocity.

I am indebted to Mr. Arthur Burnet, of the Leeds Astronomical Society, for pointing out to me the date of the transit of Mercury for Venus. He has also made independently a

calculation, and it is very gratifying to find that my results are practically in complete agreement with those of so careful a computer.

Hyde Park, Leeds. C. T. Whitmell.
21st October 1914.

Invitation to Four Marks Observatory.

The following letters have been received by the Council from Mr. Worthington :—

Being under the impression that some of our fellow-members may be glad of an opportunity which I am not able to use to the full, I write to offer them the use of the instruments at Four Marks Observatory, subject only to the condition that they come and tell me what they desire to study, so that we may arrange together how best to do it. Already Messrs. Steavenson and Maxwell have worked at the observatory, and will, I have no doubt, be glad to answer any questions which this letter may raise.

The main instruments are 10-in. Cooke refractor, with visual prominence spectroscope ; 20-in. Calver reflector ; 4-in. Alvan Clark refractor (to be mounted very shortly) ; two Steinheil photoheliographs giving $1\frac{1}{4}$ and $2\frac{1}{2}$-in. images of the Sun.

Of course, if there were many observers arrangements could be made for each to get a share of time, if more than one was using the same instrument.

There are in the house two spare beds, but any number of additional observers could camp on good stretchers in the adjoining bungalow.

Anyone who may think of doing this will find me here in the mornings up till 11 a.m., and will be very welcome to talk it over.

Royal Societies Club, James H. Worthington.
St. James's Street, S.W.

P.S.—I have a 10-in. Mertz visual objective, 150-in. focus, which I will lend to anyone who can mount and use it. The most handy and economical method of mounting would probably be the polar equatorial.

I have the pleasure to inform you about the observing possibilities at Four Marks Observatory. In explanation of my previous letter, I may say that any arrangement for observing there will be limited to three months. Anyone wishing to go should consult me personally. I shall be glad to meet them by appointment. There is a good train service—four trains a day in each direction from Waterloo without change. Time of journey, 1 hour 50 minutes to $2\frac{1}{4}$ hours. Station, Medstead ; 51 miles from London ; altitude, 700 feet. The observatory is about 10 minutes walk from the station, in Blackberry Lane, and due S.E. of station. Fare, week end, 3rd, 5*s.* 9*d.* return.

I shall be at the observatory for the transit of Mercury next month and shall be glad to see visitors for that occasion. Mid-transit occurs there within a few seconds of mean local noon.

I have no doubt that Mr. W. H. Steavenson will gladly answer any questions which I have omitted. Any observer can have a bedroom at the observatory. He may find the inn—the Windmill—handy (5 minutes) for casual meals when he is alone there. I should strongly advise observers to go two at a time or three, as the handling of the instruments is arduous single handed. When there are two or more at the observatory the kitchen there will provide for all meals.

The Studio, JAMES H. WORTHINGTON.
404B, Fulham Road,
1914, October 23.

An Appeal.

I am trying to collect money to send out warm kit and other comforts to the following :—

Sappers and Miners, Indian Contingent; 15th Brigade, and the 26th, 57th, and 106th Batteries, Royal Field Artillery; also the 7th Battalion, Lincolnshire Regiment.

I am not asking for large sums, but if any member who is willing to help me in this work will be good enough to send me one shilling to the address given below the donations will be gratefully received and duly acknowledged.

HELEN M. METCALFE (Miss).

Metcalfe Park, Enfield, Ireland,
October 27th, 1914.

New Books and Memoirs.

The Essence of Astronomy : Things everyone should know about the Sun, Moon and Stars, by Edward W. Price : 8vo. G. P. Putnam's Sons : New York and London : The Knickerbocker Press. 1914. Pp. 207. 3*s.* 6*d.* net.

This is a neatly got up little book; illustrated by a fair number of good astronomical photographs. So far it is possible to praise it. Beyond that it is a mere compilation, and the compiler does not appear to have any first-hand knowledge of his subject, or special gift for the work of compilation. No indication is given of the principles and processes of astronomy; the reader is simply furnished with a bald catalogue of facts.

Many of the author's expressions are open to serious criticism. Why is it "a humiliating truth" that the Sun is a small star? (p. 2). How can comets, or any other bodies indeed, be "most unique"? (p. 6). The eclipse cycle, called the Saros, is of about 18 years, not 19 (p. 107). The chronological table near the end of the book contains several items that require revision :—"the astrolabe invented, 1480," "Eros discovered, 1908." The brief bibliography with which the book concludes certainly contains