

27	...	5·6	...	5·5
28	...	?	...	5·0
<i>Supplement.</i>				
1	...	?	...	?
2	...	6 var. ?	...	?

(To be continued.)

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

FUNDAMENTAL POINT FOR LUNAR MEASURES.

Sir,—In the *Astronomical Register* for October, 1872, the question was raised as to which point near the centre of the moon was best adapted to serve as a fundamental point, or origin for lunar measures. This is a subject of considerable interest, for the completion of the triangulation of the moon's surface, commenced by Mädler in 1833, is the most urgent selenographical want. There is likewise another question in connection with which the selection of a fundamental point or origin of measures is a point of the highest importance, and this is one possessing an interest entirely apart from selenography, namely, the real libration of the moon due to the earth's attraction and the moon's ellipsoidal shape.

In a letter appearing in the *Astronomical Register* for January, 1873, a few observations made in October, 1872, in connection with this question, were given, and a promise of further when opportunity offered, and this communication is the redemption of that promise.

In the letter referred to the following points were mentioned, as suitable for the purpose, in so far as brightness and distinctness were concerned, viz., Mösting A, Murchison B, Murchison A, Ukert and Bode A, and observations as to their brightness and the duration of their shadows given.

Since the date of the letter referred to, the above list has been extended, and as far as mere distinctness is concerned, the following formations seem suitable for the purpose in view :

1. Mösting A. A 9° bright crater, 6 miles in diameter, and whose centre, according to Mädler, is in 3° 10' S. lat. and 5° 15' E. long.
2. Bode. A fine crater from six measures of Lohrmanns in 6° 37' 54" N. lat., and 2° 30' 41" E. long. It is circular in form, 9·3 miles in diameter, with a 4° bright interior, and 8° bright walls.
3. Bode B. A 7° bright small craterlet, sharply defined usually, and not to be confounded with any neighbouring formation. Its place according to Mädler is 8° 20' N. lat., and 3° 0' E. long.
4. Bode A. A brilliant deep craterlet, about 4 miles in diameter, and 8° to 8½° bright, being the most distinct point in this region. Its place according to Mädler is 8° 56' N. lat. and —1° 16' E. long.
5. Murchison A. A sharply marked fine crater, on the west border of the formation Murchison. It is Triesnecker A of Mädler who places it in 3° 57' N. lat. and 1° 6' W. long., and estimates its brightness at 7°. Its

present brightness much exceeds this, and is fully 8° bright, the formation occasionally rivalling in brilliancy even Mösting A, and must be then quite $8\frac{1}{2}^\circ$ bright. It is IA α 12 of the British Association map.

6. Ukert. A ring plain 14.1 miles in diameter, whose centre is in $7^\circ 33'$ N. lat., and $1^\circ 26'$ W. long., according to Mädler, who estimated its walls to be $7\frac{1}{2}^\circ$ bright, or more brilliant than the last. Its brightness now is only perhaps 7° .

7. Hipparchus E. A small crater north-west of Horrocks, and according to Mädler, who estimated its brightness as 7° , its place $2^\circ 50'$ S. lat., and $7^\circ 2'$ W. long. In the British Association map, founded on measures of photographs, it is placed far east, and somewhat north of this position. Mädler's estimate of its brilliancy scarcely holds, and $7\frac{1}{2}^\circ$ would be truer.

8. Hipparchus C. A fine crater, with 8° bright walls, and a 3° bright floor, according to Mädler, who places it in $7^\circ 19'$ S. lat., and $8^\circ 18'$ W. long. While its walls at times appears now to reach perhaps $8\frac{1}{2}^\circ$, its floor is nearer 5° in brightness than 3° , and though from its small dimensions it is difficult to estimate the brightness of the interior 4° to $4\frac{1}{2}^\circ$ appears most probably correct. Though the 6° bright peaks of Hind and Halley, and 6° bright crater Hipparchus ℓ are close, there is scarcely any need to fear that the crater C would be confounded with these, it standing out from the superior purity and brilliancy of its light perfectly distinct. The only other crater or point ever likely to be confused with it is the brilliant craterlet Hipparchus E, which stands in relation to Murchison A and Bode much in the same manner as Hipparchus C does to Mösting A and Lalande. To any one in any way familiar, with the region this mistake could not possibly occur.

The crater formation Triesnecker or Murchison B, has not been included, for though lying close to the centre of the moon's surface it is not well qualified for the purpose of an origin of measures.

Of the entire list of formation Mösting A is one of the most suitable, and its place having at the recommendation of Mädler and Bessel been adopted by the Wichmann as the fundamental point in his fine investigation of the real libration of the moon, its claims cannot be overlooked. From 50 measures Wichmann determined the position of this point to be $3^\circ 10' 55''$ S. lat., and $5^\circ 13' 23''$ E. long., and this position has been confirmed by a number of new measures made by myself. As for a new investigation of the real libration of the moon, this point must be brought into the scope of the measures, it must always be considered one of the principal points on the moon.

The 3rd and 4th on the list, Bode B and A, are well suited to be a second point, though perhaps somewhat too far north, yet their sharpness and distinctness is a recommendation of moment. They have been therefore carefully measured and their positions determined to be as follows:—

Bode B, 6 measures, $8^\circ 42' 40''$ N. lat. $3^\circ 9' 41''$ E. long.

Bode A, 6 measures, $8^\circ 53' 57''$ N. lat. $1^\circ 19' 40''$ E. long.

The position of the first agrees fairly well with that found by Mädler, though further north, whilst the position of the second shows Mädler's result to have been very accurate.

Ukert, 6th on the list is too large to be adopted, though it must be borne in mind that a very small formation is not so suitable as one of from three to five miles in diameter. The position of the centre of the interior has been determined from a series of measures to be as under:—

Ukert. 11 measures, $7^\circ 48' 24''$ N. lat., $1^\circ 9' 10''$ W. long. Mädler therefore places this formation too far south-west by fully fifteen minutes, or some four seconds of arc.

The 7th on the list, Hipparchus E, though very well suited in itself to

be a standard point, and well individualised, is not well placed in regard to other points, which, together with Mösting A, should serve as a basis for future work. It has therefore not been made a point of the first order like the previous formation but four measures of the second order give $4^{\circ} 0' S.$ lat. and $6^{\circ} 1' W.$ long.

There remains, therefore, the three points—Bode, Murchison A, and Hipparchus C to consider. The last two of these in conjunction with Mösting A, form nearly an equilateral triangle with the moon's mean centre in the middle, and are exceedingly well placed for an investigation of the real libration of the moon. These three formations, all over 8° bright, perfectly distinct and sharply defined, are the best system of fundamental points upon the moon, and have, therefore, been adopted by myself as such. These positions have been determined with care, and are more accurate, probably, than any point of the first order in the triangulation of Mädler, and only surpassed by Manilius, Mösting A, and perhaps, Bode.

Murchison A.

18 Measures.

Latitude N. = $4^{\circ} 3' 57''$ Prob. error = $1' 56'' = 0''.53$ of arc.
Longitude W. = $1^{\circ} 0' 4''$ Prob. error = $2' 33'' = 0''.69$ of arc.

Hipparchus C.

18 Measures.

Latitude S. = $7^{\circ} 22' 57''$ Prob. error = $3' 36'' = 0''.96$ of arc.
Longitude W. = $8^{\circ} 3' 34''$ Prob. error = $1' 34'' = 0''.42$ of arc.

These two results agree well with Mädler's results as points of the second order which, as mentioned, are for Murchison A. N. lat., $3^{\circ} 57'$. W. long., $1^{\circ} 6'$, and Hipparchus C, S. lat., = $7^{\circ} 19'$ and W long. $8^{\circ} 18'$; the only difference being Mädler placing the longitude of the last some $15'$ too far west; an error as shown by Birt, and since confirmed by myself, common to nearly all his positions of the second order in this region.

The position of Mösting A according to Wichmann 50 measures, is

S. Latitude = $3^{\circ} 10' 55''$ Prob. error $24''$
E. Longitude = $5^{\circ} 13' 23''$ Prob. error $1' 30''$

The probable error of a single observation of Wichmann is a little less than those of my own, but both markedly less than those of Mädler, the difference being directly as the superiority of the instrument employed.

Bode, the last point to be considered, though not one of the triangle, will yet be found very important if employed as an auxiliary point, being exceedingly well placed to connect any new investigation into the lunar co-ordinates, with the previous ones of Bouvard and Nicolle, and Wichmann. It will be indispensable, therefore, to bring it within the grasp of any future work of this nature. Its position has been determined with considerable care and a series of twenty-eight new measures made by myself. Uniting these with the six due to Lohrmann, and the result is as follows:—

Bode.

34 Measures.

N. Latitude = $6^{\circ} 37' 55''$ Prob error $1' 48'' = 0''.46$ in arc.
E. Longitude = $2^{\circ} 37' 51''$ Prob. error $1' 49'' = 0''.46$ in arc.

This result confirms with considerable exactitude the previous result obtained by Lohrmann, the latitudes agreeing exactly, and the difference of some eight minutes in longitude being within the probable error of Lohrmann's result.

Bode is, therefore, after Manilius and Mösting A, the best determined point on the entire moon, and one that with an adequate power, about 250, very easily and accurately measured, separate results on the same day agreeing usually within one second of arc. The dark interior,

about four seconds in diameter, enabling the exact bi-section by the micrometer wire to be determined with exactness.

The result therefore of my observations indicates that the triangle formed by Mösting A, Hipparchus C, and Murchison A is the best adapted for the purpose of ascertaining the exact position of the mean centre of the moon's surface; to serve as standard points, or point to serve as origin of measures; and to serve as the basis of a properly elaborate investigation of the real libration of the moon. Further, that Bode, which is well suited to serve as a standard point, will prove the point best adapted to act as a link between any new investigation of the real libration of the moon and the earlier researches. The advantages gained by employing a system of three points rather than one cannot be detailed now, but are considerable.

Yours faithfully,

E. NEISON.

MOON.

On November 11 and 12 possessors of telescopes may again have the chance of observing those apparent depressions of the moon's rim, which gave occasion for Mr. Key's rather startling diagram in the 24th volume of the *Monthly Notices*, and to the recurring visibility of which, in October, attention was called on page 247 of the *Astronomical Register*. The circumstances on November 12 will be favourable for testing directly the correctness of the diagram, the preceding limb, where the depressions were seen, being still fully illuminated.

A. MARTH.

CAPELLA.

Sir,—Cannot most of the varying colours of Capella, given in your September number, p. 215, be accounted for by its comparatively low altitude when most of the observations were made? I do not know what are the "conditions laid down by Dr. Argelander in his well-known article," to which Mr. Ellner says he paid due attention; but it is evident that most of his observations were made when Capella was low enough to show those flashes of different colours which stars always exhibit when they twinkle strongly. Under such circumstances it would be impossible to tell its true colour. To me the colour of Capella, when the true colour has been visible, has always appeared just the same; but then my observations do not date so far back as 1855.

ι ANDROMEDÆ.

This star, about which G. F. Chambers enquires on p. 221, is recorded by Ptolemy and Argelander of the 4th magnitude, and by Süfi as a bright 4th: by all as equal to κ and λ . It is still exactly equal to κ .

I am, yours truly,

West Hendon House,

Sunderland: Oct. 9, 1875.

T. W. BACKHOUSE.

THE NOVEMBER METEORS.

Sir,—I am not sufficiently acquainted with the history of the November shower of meteors to know whether attention has been called to the