thin iron plate in front of this magnet. These experiments are worth repeating by those who desire clearer conceptions of the manner of action of that remarkable instrument.

SUN-SPOTS AND TERRESTRIAL MAGNETISM

IN a remarkable article on "La Météorologie Cosmique," which has appeared in the *Annuaire* of the Bureau des Longitudes, for 1878, M. Faye says with reference to the influence of sunspots on the earth's magnetism, that the observations of Cassini "give 1787·25 for the date of the maximum observed then at Paris, whilst the latest observations—those of Mr. Broun, himself at Trevandium—assign 1870·85 for the epoch of the last maximum. The interval is 83·60 years. On dividing this by 8, the number of periods in this interval, 10·45 years, are found for the duration of the period. That is to say, almost exactly the value already found by Lamont by means of his own observations at Munich. The period of the spots deduced by M. Wolf, 11·1 years, not being equal to that for the magnetic variations, these two phenomena have no relation to each other."

I desire to offer a remark on this conclusion, which seems to me too hasty. On examining the two periodic series, that for the diurnal variation of declination and that for the frequency of the solar spots, we see that there is a perfect coincidence in their phases though the length of successive periods is not constant. We may find a mean length of ten, eleven, or more years, according to the epoch from which the calculation is begun, but we shall always find the same length from both series if we commence at the same date.

It seems to me then that the true way to determine whether there is an intimate connection between the two phenomena is to compare their phases, and see whether the maxima and minima of the one coincide with those of the other. If there is identity in these respects, we must without doubt find the same mean values for the periods.

M. Faye accepts the date 1787·25 as that of a maximum for the oscillations of the declination. If we look then at the curve, Fig. 2, given by him in the article in question, we see that this corresponds exactly with a maximum of sun-spot frequency. In like manner similar coincidences are seen in the epochs deduced from the observations of Arago and others up to the present time when compared one by one with the sun-spot observations of Schwabe, Carrington, Secchi, as well as of those made at Kew. The conclusion seems to me very different from that of M. Faye. We are entitled to apply the rule he has given (p. 634): "If two series of phenomena, however different they may appear at first, follow exactly the same period, they ought to be referred to the same cause."

There is another passage upon which I desire to offer a remark: "Two kinds of meteors exercise a considerable influence on the direction of the magnetic needle, these are the auroræ boreales and the cyclones."

For the first there is a general agreement, but for the cyclones what observations have we which prove any such influence? If cyclones exercise a considerable influence on the direction of the needle, in what phase of the phenomenon does this occur? Is it on their formation, on their passage over some particular meridian, or when their centre is over a place? In the last case each cyclone will be a source of disturbance, which will be manifested as it progresses, and not simultaneously at all places, which, however, is what really occurs in the case of magnetic disturbances. Electricity is, without doubt, a cause, but only in the case of such considerable discharges as the aurora polaris; but not the local electricity which may accompany cyclones. When there is a storm, and the thunder rolls, and the electrometer shows enormous

variations of atmospheric electricity, changing sign continually, the magnetic needle continues its usual and regular progress. Of this we can offer hundreds of examples.

Lisbon, February 22

JOAS CAPELLO

P.S.—The mean movements of the magnetic needle in the Lisbon Observatory, from eight A.M. to two P.M. are given in *NATURE*, vol. xiii. p. 448, for the years 1858 to 1875; the following are the corresponding mean ranges for the next two years:—

1876 ... 5·81' 1877 ... 5·54'

So that the mean movement was less in 1877 than in 1876.

OUR ASTRONOMICAL COLUMN

NEW COMPANION TO ALDEBARAN.—Mr. S. W. Burnham notifies his discovery with the 18½-inch Alvan Clark refractor of the Dearborn Observatory, of a minute star much nearer to Aldebaran than that which makes the double star H. VI. 66; he compares it with the ruddy bright star, as resembling, in difficulty and appearance, Mars and his outer satellite. The mean of three days' observations gives the angle 109°·0, and the distance 30"·35 for 1877·90, or if the second result which, as printed, differs nearly ten degrees from the other two, the angle will be 111°·9. The secular proper motion of Aldebaran, according to Mädler, is 19"·1 in the direction 157°; some years must elapse before the question of physical or optical duplicity can be decided. Eight days' measures of the close companion of Sirius, by Mr. Burnham, with the same instrument, assign for the angle of position 52°·4, distance 10"·85 at the epoch 1877·97.

THE STAR LALANDE 37813.—Mr. J. E. Gore writes from Ballisodare, Co. Sligo, with reference to this star, which appears in the reduced catalogue as a *second* magnitude, and which, observing in the Punjab in August, 1877, he had found a little less than Lacaille 8308 or 7 m. This is one of the errors in the catalogue which, as in a case recently noticed in this column, can only be cleared up by referring to the *Histoire Céleste*. The observation was made on August 20, 1795, and the star No. 37813 was really estimated 7·8 m. *a* Aquilæ was observed immediately before it, and entered 2 m.; it is this erroneous magnitude for the bright star of Aquila that has become attached to the star of which Mr. Gore writes. There is a very noticeable proper motion in N.P.D., apparently about + 0"·48 annually, as shown by comparison of the observations of Lacaille, Lalande, Jacob, and Argelander, with the position in the Washington Catalogue for 1860.

THE MINOR PLANETS.—Discoveries in this group still progress. No. 186 was detected by M. Prosper Henry at Paris, on April 6, shining as a star of 11·5 m., and No. 187 by M. Coggia at Marseilles, on April 10; it was estimated 10 m. No. 178 (Palisa, 1877, November 6) has been named *Belisana*, and No. 184 (Palisa, 1878, February 28) it is proposed to call *Deiopaia*. With already *seven* additions to the list, it would not appear that 1878 is likely to fall short of the most prolific of preceding years in these discoveries.

THE TRANSIT OF MERCURY ON MAY 6.—If we calculate strictly from Le Verrier's tables of sun and planet, using therefore the value of the sun's diameter which he deduced from the transits of Mercury in his memoir, printed as an addition to the *Connaissance des Temps* for 1848, we shall have the following formula for determining the time of the first *external* contact of limbs in the approaching transit:—

$t = 3h. 13m. 1s. - [1'8723] r \sin L - [1'9079] r \cos L, \cos (L' - 56^\circ 49' 3")$
in which t is the Greenwich mean time of contact, r the