electrons. Prof. Poincaré is careful to emphasise the assumptions on which recent views are based, but if the assumptions are correct the final result consists in stripping from matter the attribute of mass by which it is usually defined. Mass appears purely as the result of electrical action, or, in Prof. Poincaré's own striking words, "dans ce système il n'y a pas de vraie matière, il n'y a plus que des trous dans l'éther."

SOME time ago Prof. Nernst described a simple form of torsion balance capable of measuring weights of a few milligrams with an accuracy of 0·001 milligram. In the current number of the *Berichte* Mr. H. v. Wartenberg gives an interesting application of this instrument to the determination of the molecular weight of silver vapour. The method used was a modification of the well known apparatus due to Victor Meyer, the vessel being made of iridium, coated internally with a mixture of the oxides of yttrium and zirconium. This iridium vessel was heated in an electric furnace to about 2000° C., the weight of silver used in each experiment varying from 0·905 to 0·322 milligram. The values obtained for the molecular weight of the silver were between 107 and 147, indicating that silver is monatomic.

MESSRS. DAWBARN AND WARD, LTD., have published in their "Home Worker's" series a little book by Mr. Joseph E. Dangerfield on "Brass and Iron Founding." The price is 1*s.* 6*d.* net.

THE "Swincam" camera stand enables a camera to be fixed on the tripod in almost any position, so that photographs can be taken in situations which present insurmountable difficulties with ordinary stands. A revised pamphlet showing some of the possibilities and performances of this speciality in tripod stands has been issued by the maker, Mr. W. Butler, Southport.

MESSRS. WHITTAKER AND CO. have published a second edition of Mr. S. R. Bottone's "Radiography and the 'X' Rays." The book was reviewed in our issue of July 28, 1898 (vol. lviii. p. 292); and it is only necessary to say here that recent improvements in Röntgen-ray apparatus, and interesting matter connected with the therapeutic effects of the rays, are dealt with in the new edition.

OUR ASTRONOMICAL COLUMN.

COMET 1906*a*.—The following is taken from a continuation of the daily ephemeris for comet 1906*a* (Brooks), published by Herr M. Ebell in No. 4075 of the *Astronomische Nachrichten*:—

Ephemeris 12h. M.T. Berlin.

1906	α (true) h. m. s.	δ (true) ° ′	log *r*	log Δ	Brightness
Feb. 22	6 45 35	+78 30	0·2047	0·0024	0 82
24	6 21 29	+75 12	0·2094	0·0150	0·76
26	6 7 28	+71 59	0·2140	0·0288	0·69
28	5 58 38	+68 55	0·2187	0·0435	0·64
Mar. 2	5 52 47	+66 1	0·2234	0·0589	0·58
4	5 48 50	+63 19	0 2282	0·0748	0·53

It will be seen from the above that the comet is now travelling rapidly down the constellation Camelus towards Perseus, and is becoming much fainter.

A set of parabolic elements of the orbit of this object has been computed by M. E. Maubant, and appears in No. 6 (1906) of the *Comptes rendus*.

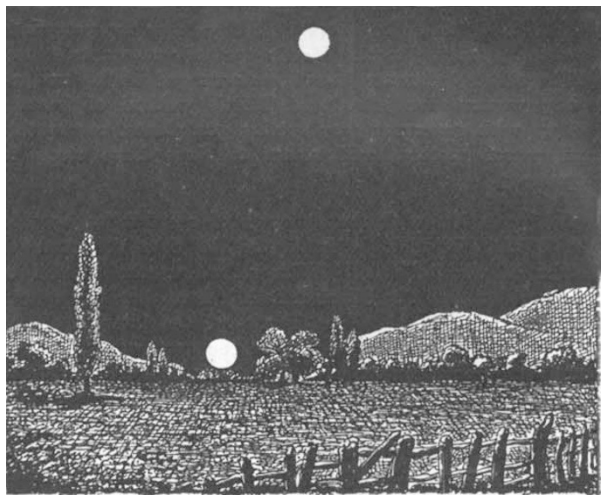
COMET 1905*c*.—Photographs of Giacobini's comet (1905*c*) obtained at Greenwich early in January showed that the magnitude was about 3·0, and that this object had a tail about 2° in length.

A note in the February number of the *Bulletin de la Société astronomique de France* quotes M. Giacobini, who, in a letter to a correspondent, stated that the comet was visible to the naked eye during the whole week preceding January 9, and that it then had a tail about 1° in length, the position angle of which was 45°. The nucleus was estimated as being of the second or third magnitude. The nearest approaches of this object to the earth took place on January 6 and February 2, the respective distances being 1·102 and 1·150 astronomical units. Its distance from the sun at perihelion was 0·2154 unit.

THE APPARENT ENLARGEMENT OF THE MOON AT THE HORIZON.—In the *Archives de Psychologie* (vol. v., No. 18, October, 1905) M. Ed. Claparède publishes an interesting paper on the causes which produce the impression that the sun, moon, and other celestial bodies are larger when near to the horizon than when seen at the zenith.

After discussing a number of theories propounded by previous writers on this subject, from Aristotle onwards, he examines several possible causes, and recounts the results of various experiments he has made whilst considering the matter.

Finally, he arrives at the conclusion that when we see the moon, or sun, at the horizon, we are surprised into believing it to belong to things terrestrial—to come into the class of objects which are by far of the greatest interest to us. As such we notice it with much greater attention,



and for this reason overestimate its size. When at the zenith the moon is of little interest in comparison with the terrestrial objects which belong to our daily life, and we therefore think of it as relatively unimportant; consequently we underestimate its size. This correlation of importance and size is always common, and, as an illustration of it, M. Claparède quotes the fact that boys are always astonished when they learn for the first time that Napoleon was below the average height.

M. Claparède used the illustration we reproduce, in his experiments with individuals. Covering one of the moons shown, he asked his subjects to draw the other one the same size, and then asked them to draw the second whilst the first was covered. Of twenty couples of drawings thus obtained, from thirteen subjects of all ages, the moon at the horizon was shown as the greater on fourteen, as equal on five, and as less on one. The greatest difference was shown on two drawings by the same boy, where the moon was 9 mm. (horizon) and 4·5 mm. (raised) respectively, the actual diameter on the copy being 4·5 mm.

M. Claparède's paper may be obtained, as a separate brochure, from MM. Kündig et Fils, Geneva, price 1 franc.

MAGNETIC OBSERVATIONS DURING THE TOTAL ECLIPSE OF THE SUN.—We have received from Father P. Cirera, of the l'Ebre Observatory, an extract from the *Comptes rendus* giving an account of the magnetic records obtained at

that observatory during the total solar eclipse of August 30, 1905, and the days immediately preceding and following it.

Extraordinary deviations from the normal diurnal curves were registered in all three elements, and these are plainly shown on the photographic copy of the records which accompanies Father Cirera's communication.

OBSERVATIONS OF JUPITER.—Major Molesworth's report of his observations of Jupiter, made at Trincomali, Ceylon, during 1904–5, appears in No. 3, vol. lxvi., of the *Monthly Notices R.A.S.*, and records the times of rotation of, and the changes in, most of the Jovian features.

One especially remarkable observation was that the following and preceding ends of the large mass of dark matter, known as the Great S. Tropical Dark Area, appeared, on comparing the observations, to have crossed the whole Red Spot bay simultaneously. As it seems impossible that there could be any such instantaneous transference of material, Major Molesworth explains the phenomenon by the suggestion that the movement of the dark area into the belt following the bay caused the extrusion of an equal amount of dark material from the belt preceding the bay.

GRANULATIONS ON THE SOLAR SURFACE.[1]

AN interesting research which promises fair to lead us to an increased knowledge concerning the nature of the sun's photosphere has recently been instituted by Prof. Hansky at the Pulkowa Observatory. On examining the splendid collection of photographs of the solar surface obtained by Prof. Janssen at Meudon, Prof. Hansky was not able to satisfy himself that the whole of the *réseau* seen on the negative was actually of solar origin; it seemed probable that some parts of it were produced by waves in our atmosphere, and on no two consecutive negatives, nor even on two taken simultaneously, could the same granules be recognised. For this reason he attacked the problem at Pulkowa, bringing into operation the astrographic telescope in order to obtain photographs on a large scale.

The solar image at the focus of this instrument has a diameter of 3 cm., which by the use of a concave lens was increased to about 54 cm. (*i.e.* 21·3 inches). With this apparatus numerous photographs were obtained during May and June, 1905, and showed many of the finer details of the granulations which cover the solar surface; but even on this scale it was impossible to recognise the same features on successive photographs. A further improvement was then made, so that the intervals between the exposures might be appreciably shortened—in no case had it been less than five minutes—and with the new arrangement adapted to the astrograph it became possible to take eight consecutive photographs with intervals of fifteen to thirty seconds' duration. These showed the changes taking place in the sizes and relative positions of the granules very plainly, and from them the author has chosen six for reproduction in his circular. Fig. 1 is a copy of one of these reproductions, and shows the general nature of the photographs which Prof. Hansky is obtaining, and from which he hopes to derive valuable results. The scale is such that the solar diameter would measure about 0·6 m., or 23·5 inches. The large black portions represent parts of sun-spots which came within the region photographed.

Although on this scale obvious changes in the size and arrangement of the granules took place in twenty-five seconds, it was impossible to measure their magnitude, so Prof. Hansky intensified the photographs by successive copying, and finally obtained positives showing portions of the disc on such a scale that the length of the solar diameter would be about 6 m. (19·7 feet), that is to say, 1 mm. = 0″·32, or 233 km. on the solar surface.

An examination of these positives showed that the primary desideratum had been attained; the same granules were recognisable on successive photographs, and the scale was large enough to enable measurements of the granules themselves and of their movements to be made. The displacements were measured with the stereo-comparator, and were referred to a neighbouring small spot, movement towards the spot being indicated by the negative, and away from the spot by the positive, sign. The diameter of the actual sun was taken as 1,400,000 km., and on June 21 this gave 1″ = 740 km. The mean variation of any two settings on the same object was ±0″·12, and the probable error for the relative displacement ±0″·10.

The displacements of the granules during the twenty-five seconds which elapsed between two successive photographs taken on June 25 were very diverse. In that interval five of the granules had moved −0″·9, −0″·55, −0″·77, −0″·48,

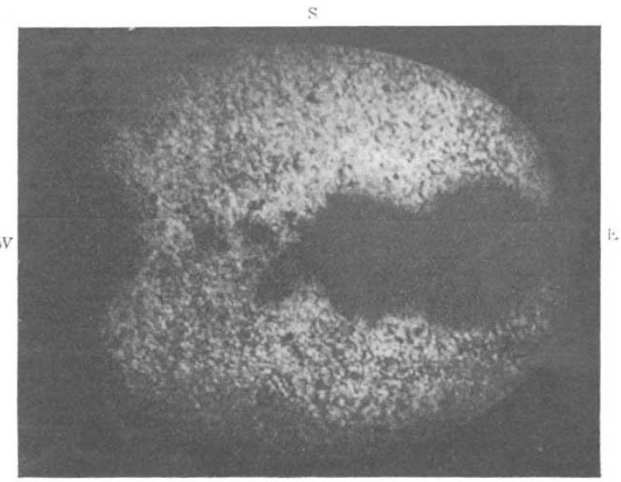


FIG. 1.—June 25, 1905, 5h. 0m. 20s.

and −0″·80 respectively, which in the mean gave −0″·70, or −518 km., *i.e.* about −21 km. per second. Another group gave −38 km. per second, whilst for a third the comparatively low velocity of −14 km. per second was recorded.

Comparisons of other photographs showed that some granules were moving away from the spot with various velocities, and, as shown by the following figures, it appeared that the periodic movement of the granules materially affected the size of the spot. The diameter of the spot is given for different times on June 25:—

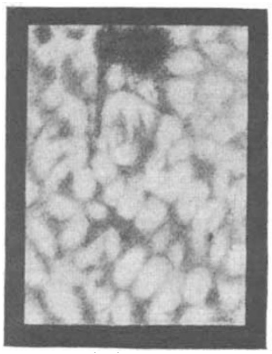


FIG. 2.—June 25, 1905, 4h. 17m. 15s.

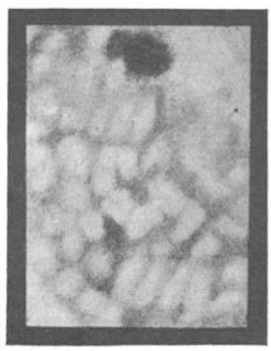


FIG. 3.—June 25, 1905, 4h. 17m. 40s.

4h. 17m. 15s., 2″·64; 4h. 17m. 40s., 2″·25; 5h. 3m. 15s., 3″·03; 5h. 4m. 15s., 1″·35; 5h. 5m. 50s., 2″·70; 5h. 6m. 20s., 2″·88.

On consecutive photographs taken with an interval of one minute the same granulation was recognised with difficulty, whilst with a three-minute interval the whole *réseau* was practically re-arranged beyond recognition, although in one or two cases it was possible to trace a granule after this interval, and in two cases it was remarked that gemination had taken place.

The dimensions of the granules varied greatly between

[1] "Photographies de la Granulation solaire faites à Poulkowa." By A. Hansky.