

ton weight. A table of values of the coefficients is given for values of  $W$  from 15 tons up to 75 tons. This formula shows a maximum error of half of 1 per cent. when compared with the experimental results. Another empirical formula is given which has a maximum error of 9.5 per cent., viz.

$$R = \frac{S + 39.6 - 0.031 W}{4.08 + 0.152 W}$$

The formulæ are limited to conditions similar to those prevailing during the trials, viz. straight and level track of good construction, temperature above 30° F., wind velocity not more than 20 miles per hour.

In our notice of the fourth edition of "Les Roches et leurs Éléments minéralogiques," by the late M. Ed. Jannettaz, in December last (vol. lxxxv., p. 166), we complained of the description of the work as a revised and enlarged edition (Quatrième édition, revue et augmentée). We have now to acknowledge the receipt from the publishers, MM. Hermann et Fils, Paris, of another copy with modified cover and title-page, in which it is now described correctly as "Quatrième édition, conforme à la Troisième et augmentée de huit planches." The publishers assure us they had no intention of misleading purchasers by the wording of the former description. The work has at least the merit of cheapness, the price being only eight francs.

We have received from the Board of Agriculture and Fisheries a memoir of the Geological Survey, Scotland, entitled "Catalogue of Photographs of Geological Subjects," which has been prepared by the Geological Survey and Museum. The catalogue enumerates the first 1913 photographs taken to illustrate subjects of geological interest in Scotland. The number, subject, and locality of each photograph are given, and the number of the 1-inch map in which each locality occurs. The districts illustrated lie chiefly in the north-west Highlands, Skye, in the counties of Argyll, Perth, Aberdeen, Kincardine, Fife, Haddington, and Mid-Lothian. Copies of the catalogue, price 6d., can be obtained from any agents for the sale of Ordnance Survey maps, or through any bookseller.

#### OUR ASTRONOMICAL COLUMN.

**NOVA LACERTÆ.**—*L'Astronomie* for February contains a number of observations of Nova Lacertæ, and includes a reproduction of a spectrogram secured by Dr. Max Wolf, at Heidelberg, on January 2. In addition to the broad bright hydrogen lines, the outstanding features are the band at  $\lambda$  463, several emission lines between H $\beta$  and H $\gamma$ , a conspicuous break in the continuous spectrum on the more refrangible side of H $\gamma$ , and the strong emission line near  $\lambda$  4056.

**NOVA SAGITTARIÏ,** No. 3, H.V. 3306.—While examining a plate taken at Arequipa on September 6, 1899, with the 1-inch Cooke lens, Miss Cannon found a star image which appeared to be that of a nova in the position (1900) R.A. = 18h. 13m. 47.5s., dec. = -25° 13.5'; this is about 1° north of the C.D.M. tenth-magnitude star -25° 13020.

The customary investigation of past plates revealed the fact that the light-curve of the star had the characteristics of the curves of novæ. A large number of photographs were examined covering the period June 7, 1889, to September 3, 1910, and many of them showed no trace of the nova. On plates taken on August 5, 6, 7, and 9, 1899, it is not shown, although the last-named shows a neighbouring star of magnitude 11.4, yet the photograph of August 10, 1899 (G.M.T. 12h. 28m.), shows it at full brightness, viz. magnitude 8.5; this photograph was taken with the 13-inch Boyden telescope, the exposure being 100m. Seven plates, taken for the cluster N.G.C. 6266, show a star of magnitude 15.6 in the position of the nova, within the limits of measurement, but this object exhibits no variability on five earlier plates or on five plates taken

since 1905. Since August 10, 1899, the nova has appeared on twenty-six plates taken with various instruments at Cambridge (Mass.), and Arequipa, and on the last of these, taken on October 3, 1901, its magnitude was 13.3. The light-curve shows that the brightness decreased rapidly at first, but was nearly stationary, at magnitude 12.0, from April to July, 1900. A plate accompanying Circular 183 of the Harvard College Observatory reproduces the photographs of the nova's region taken on August 3 and 10, 1899.

**THE SATELLITES OF MARS.**—Observations of Phobos and Deimos during the opposition of 1909 are recorded by Prof. Lowell in No. 50 of the Lowell Observatory Bulletins. Several interesting observations relating to the apparent magnitudes of the two satellites are described, Phobos generally appearing the brighter. Thus on September 16, 1909, it was half a magnitude brighter than Deimos, although with reduced apertures—6 inches being the limit—it was the fainter.

From a discussion of the data obtained, Prof. Lowell finds that Phobos is probably 2.48 times the diameter of Deimos, has 6.15 times the visible surface, and, if the densities are equal, has 15.25 times the mass. The data are too meagre to give a definite conclusion, but, so far as they go, they suggest that there is a difference of brilliancy in one, or both, of the satellites, dependent on their orbital positions; this suggests that each satellite has different local albedoes, or an irregularity of shape, and that it always keeps the same face towards Mars.

**THE SPECTRA OF SOME WOLF-RAYET STARS.**—Bulletin No. 182 of the Lick Observatory contains a note by Mr. J. C. Duncan describing the spectra of seven Wolf-Rayet stars photographed by him, with the one-prism spectrograph mounted on the 36-inch refractor, during the summer of 1908.

Many of the lines and bands shown on these photographs exhibit no notable differences from those published by Prof. Campbell in 1894, but those given in the following table did not appear in the earlier publication:—

| $\lambda$ of centre of line or band | Star B.D.    | Description of line or band     |
|-------------------------------------|--------------|---------------------------------|
| 4120.84 ...                         | +35.3953 ... | Narrow dark line                |
| 4068.40 ...                         | +30.3639 ... | " bright "                      |
| 4630 ...                            | +36.3956 ... | " faint band                    |
| 4058 ...                            | +36.3987 ... | Fairly bright band 15 A.U. wide |
| 4099 ...                            | +36.3987 ... | " " 34 "                        |
| 4628 ...                            | +36.3987 ... | Faint band 54 A.U. wide         |
| 4056 ...                            | +37.3821 ... | " "                             |

**SOUTHERN NEBULÆ.**—Two notes describing remarkable southern nebulae appear in No. 5 of the Transvaal Observatory Circulars.

The first deals with a great ring nebula in Aquarius (N.G.C. 7293, Harding; 22h. 23m., -21° 26'), which is nearly circular and has a diameter of 11'. Mr. Innes describes it as a remarkable object, looking like a ring nebula superimposed on a planetary nebula, and states that it was first seen in the 2-inch finder. This points to the description "very faint" in the N.G.C. being incorrect, or the nebula is variable; it is difficult to account for its being missed, with its present brightness, by Messier and the Herschels. From a photograph taken on October 4, 1910, with 60m. exposure, Mr. Woods describes the nebula as a broad, continuous ring extending across 52s. in R.A. and 12.6' in declination, and appearing slightly fainter in 135° and 315° than at other parts.

The second object was discovered on a plate taken by Mr. Mitchell on August 1, 1910, with the Franklin-Adams star camera, with an exposure of 2 hours. This is a large, irregular nebula, around and preceding  $\pi$  Scorpiotis, which is not mentioned in any of Dreyer's three catalogues. Its position is 15h. 53m., -25° 50', and it extends over 1° in a north and south direction, its other diameter being about  $\frac{1}{2}$ °.

**A SLOWLY MOVING METEOR.**—A fairly bright meteor, remarkable for the leisurely rate at which it moved, was seen by Mr. F. E. Baxandall, at Putney, at 9 p.m. on February 19. It first appeared in about 169°, +39°, and, travelling very slowly, passed through 211°, +28°, finally disappearing below the north-east horizon after a flight lasting fully 15 seconds.