

MR. JOHN MURRAY has published the nineteenth edition of "The Reign of Law," by the Duke of Argyll.

THE *Amateur Photographer* has issued its fourth "home portraiture number." It reproduces one photograph each from the work contributed by sixty competitors for prizes.

IN the Report of the U.S. Commissioner of Education for the year 1887-88 it is stated that 48 educational institutions in the United States receive the benefit of the national land grant of 1862. Among these institutions are the Arkansas Industrial University, the State Agricultural College at Colorado, the Maine State College of Agriculture and the Mechanic Arts, the Massachusetts Institute of Technology, the Missouri School of Mines and Metallurgy, and the Scientific School of Rutgers College. In 38 of the Colleges an officer of the Army or Navy is detailed to act as professor of military science and tactics. If a State has more than one school endowed by the national land grant of 1862, the school which is reported by the Governor of the State as most nearly meeting the requirements of existing law is held to have the first claim to the officer allotted to the State.

M. A. ANGOT, of the French Meteorological Office, has published in the *Annales* of that office a very careful discussion of the diurnal range of the barometer, based upon the best available data for all parts of the globe. After having given the mean range for each month and for the year, he has calculated the amplitudes and phases of the first four simple harmonic oscillations into which the complex oscillation of the barometric diurnal range may be resolved, and which may be considered as the resultant of the superposition of two waves of different origin and character. One of these, which the author terms the thermic wave, is of a more or less complicated form in appearance, and is easily explained as being produced by the diurnal variation of temperature and by the differences that this variation presents between neighbouring stations. The other, the principal semi-diurnal wave, for which he has given the numerical law, presents a much more simple form, and is not at all affected by local conditions. It is possibly produced by the calorific action of the sun upon the upper strata of the atmosphere; but, as the author states, this is still only an hypothesis, and the theory of this part of the phenomenon remains to be established. His conclusions upon the effect of the thermic wave are very interesting, and the whole discussion will well repay a careful study.

MR. T. W. BAKER writes to us that, in his note regarding the meteor of March 3, he omitted to state the time of its appearance, which was 7.28 p.m.

AN important paper upon the crystalline allotropic forms of sulphur and selenium is contributed by Dr. Muthmann, of Munich, to the latest number of the *Zeitschrift für Krystallographie*. Besides the well-known rhombic pyramids and monoclinic prisms, sulphur may, under certain conditions, be obtained in a third crystalline modification, which has been termed by Gernez "*soufre nacré*." This third modification has been fully investigated by Dr. Muthmann, and, in addition, a new fourth totally distinct variety has been discovered. The third form is best obtained by boiling about five grams of powdered sulphur with 750 c.c. of absolute alcohol in a flask provided with an inverted condenser for one hour, filtering through a warmed funnel into a large flask heated to 70° C. in a water-bath, and allowing the alcohol to slowly evaporate. After about twelve hours a large deposit of brilliant tabular crystals is formed. Similar crystals of the third variety may be obtained by agitating a saturated alcoholic solution of ammonium sulphide with excess of powdered sulphur, filtering, diluting with a little alcohol and allowing to stand in a loosely covered cylinder. In a few hours crystals are found deposited, often measuring a couple of centi-

metres in length and 1-2 mm. thick. Another method which yielded very beautiful crystals of this modification consisted in allowing a solution of acid potassium sulphate to slowly diffuse into a solution of sodium thiosulphate. In about four weeks' time, perfect crystals, almost white in appearance, and exhibiting strongly the mother-of-pearl lustre, were obtained. This third variety of sulphur also crystallizes in the monoclinic system. The ratio of its axes is  $a : b : c = 1.0609 : 1 : 0.7094$ . The axial angle  $\beta = 88^\circ 13'$ . The symmetry plane,  $\delta = (010) \infty R \infty$ , is so largely developed as to give the crystals the appearance of plates. At the edges of the plates the two primary pyramids  $(111) - P$  and  $(\bar{1}\bar{1}\bar{1}) + P$ , a prism  $(210) \infty P 2$ , and a clinodome  $(012)\frac{1}{2} R \infty$  are well developed. These crystals are totally distinct from those of the second modification; the axial ratios of the latter are  $a : b : c = 0.9957 : 1 : 0.9998$  and  $\beta = 84^\circ 14'$ . Upon the sides of the vessel containing the alcoholic ammonium sulphide solution prepared as above, Dr. Muthmann noticed curious tabular crystals of hexagonal section, which immediately became altered upon contact with a disturbing body, such as a platinum wire or glass rod. They were likewise found to consist of pure sulphur, and, on optical and goniometrical examination, were found to consist of a distinct fourth modification, also monoclinic. They greatly resemble a rhombohedron with predominating basal plane. They are best obtained by allowing to slowly evaporate in a tall cylinder a saturated solution of sulphur in alcoholic ammonium sulphide diluted with four times its volume of alcohol. The temperature during this crystallization must not exceed 14° C. Occasionally in this experiment all four forms of sulphur are obtained; the surface is covered with crystals of the third variety, tables of the fourth modification are deposited upon the sides, and the base of the cylinder is spangled with rhombic pyramids interspersed with monoclinic needles of the second form. If crystals of the third variety are suspended in their mother liquors and left for some days, they are converted into a voluminous mass of minute rhombic pyramids. The conversion into the more stable rhombic form is almost instantaneous if a rhombic crystal be dropped into the liquid containing suspended third variety crystals. The immediate alteration of crystals of the fourth kind is even more remarkable, the mere movement of the cover-glass, when examining them under the microscope, being sufficient to instantly change the optical properties to those of the rhombic form. It is interesting that this fourth form of sulphur is isomorphous with the form of selenium obtained by evaporation of a hot saturated solution in carbon bisulphide.

THE additions to the Zoological Society's Gardens during the past week include two Badgers (*Meles taxus*) from Ireland, presented by Mr. P. Bicknell; a Grey Hypocolius (*Hypocolius ampelinus* ♂) from Scinde, presented by Mr. W. D. Cumming; a Rhesus Monkey (*Macacus rhesus* ♂) from India, a Spotted Ichnumon (*Herpestes nepalensis*) from Nepal, deposited; an Axis Deer (*Cervus axis*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on March 13 = 9h. 25m. 55s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ' "
(1) { G.C. 1861 ...	—	White.	9 25 47	+21 58
{ G.C. 1863 ...	—	White.	9 25 58	+22 0
(2) 8 Leo Minoris ...	5.7	Reddish-yellow.	9 24 51	+35 35
(3) 4 Hydrae ...	4	Whitish-yellow.	9 34 12	- 0 39
(4) 6 Leonis ...	4	Yellowish-white.	9 35 18	+10 24
(5) 132 Schj. ...	Var.	Red.	10 32 7	-12 25

*Remarks.*

(1) Described by Herschel as a bright extended nebula with two nuclei, the north following one being very faint. In 1848, Lord Rosse observed that the nebula was distinctly spiral, and his drawing represents it as elliptical in shape. The nebula is about 3' long and is situated about 2' south of the star  $\lambda$  Leonis. I am not aware that any record of the spectrum has been published.

(2) A star of Group II. Dunér states that the bands 2, 3, 7, 8 are visible, but are rather weak and not very wide. The bands 4 and 5 are very delicate. The star belongs to species 5 of the subdivision of the group, which means that the meteor-swarm of which the "star" is probably composed is somewhat sparse. The bright carbon flutings should therefore be well developed. Bright lines may possibly also be present, if the swarm is not too far condensed.

(3) Konkoly and Vogel both describe the spectrum of this star as a well-developed one of the solar type. The usual differential observations are required.

(4) A star of Group IV. (Vogel). The usual observations of the relative thicknesses of the hydrogen and other lines are required.

(5) A star of Group VI., with a spectrum of extraordinary beauty (Dunér). The spectrum consists of four zones, and all the bands 1-10 are strongly developed. Band 6 is not very dark. The specific differences in stars of this group have not yet been fully investigated. The principal variations so far observed are: (1) the length of continuous spectrum, as indicated by the number of zones visible; (2) the number and intensities of the secondary bands; (3) the intensity of band 6 as compared with bands 9 and 10.

Gould believes this star to be variable, his estimates of the magnitude varying between 4.3 and 6.1. Birmingham's values vary from 4.5 to 6.3. The star appears to be U Hydræ, and, if so, a maximum will be reached about March 18 (*Observatory Companion*, 1890). Espin believes the period to be about 195 days.

As yet, we have no information as to changes of spectrum accompanying changes of magnitude in stars of this group.

A. FOWLER.

THE SOLAR AND THE LUNAR SPECTRUM.—Prof. Langley's second memoir on this subject, which was read before the National Academy of Science in November 1886, has been received. In a previous memoir it was demonstrated that evidence of heat had been found in the invisible spectrum of the sunlit side of the moon, and the experiments indicated that this heat was chiefly not reflected but radiated from a surface at a low temperature. The amount of heat, however, was excessively minute, even when compared with the feeblest part of the solar spectrum known in 1882, yet it was easily recognizable because of the fact that, whereas in the typical solar spectrum heat is greatest in the short wave-lengths, in the typical lunar spectrum heat is greatest in the long wave-lengths.

In this second memoir the results of further observation of the infra-red solar spectrum are given, the newly investigated region being close to that which contains a large part of the lunar heat. The researches considerably extend those previously made. In passing from the visible part of the spectrum into the infra-red region, wider regions of absorption occur. To an eye which could see the whole spectrum, visible and invisible, the luminous part would be, as is well known, interrupted by dark lines, the lower part to  $5\mu$  would appear to consist of alternate dark and bright bands, and the part below  $5\mu$  be nearly dark, but with feeble "bright" bands at intervals. This appearance is shown in a plate accompanying the memoir. It is noted as a curious fact that the centres of several of the bands or lines are under some conditions found to be shifted to a recognizable extent, and hence their wave-lengths are, within certain limits, variable. This apparent shift is found to be because the absorption does not increase symmetrically with the centre of the band, but more on one side than another, so as to considerably modify the position of greatest absorption.

THE CORONA OF 1889 DECEMBER 22.—The March number of the *Observatory* contains a Woodburytype reproduction of this corona taken by the late Father Perry with a short focus reflector of Mr. Common's, and a note by Mr. W. H. Wesley, assistant secretary of the Royal Astronomical Society, upon its prominent features. Mr. Wesley finds that, as in the eclipse of January 1, 1889, the extension is greatest towards the equatorial

regions, and on the longest exposed plate it can be traced to nearly a diameter from the limb. A wide rift at the north pole, extending  $60^\circ$  or  $70^\circ$  along the limb, contains several fine straight rays similar to the polar rays in 1878 and 1889 January 1, but not so numerous, regular, or distinct. The usual polar rays are scarcely distinguishable at the south pole. A remarkable fact is that the general mass of the corona on the eastern side is considerably broader from north to south than on the western side. This was also the case in 1878. Numerous prominences are seen on the eastern limb, and plates taken near the end of totality show a range of low prominences on the western limb. An interesting feature in the plates taken with the reflector is the photographic reversal of the prominences and the brighter parts of the corona. In the larger exposed negatives the prominences and the corona near the limb are bright instead of dark, whilst the limb itself is bounded by a very definite dark line indicating a double reversal.

THE NEBULAR HYPOTHESIS.—Mr. Herbert Spencer contributed an essay on Laplace's famous theory to the *Westminster Review* for July 1858. With the assistance of Mr. Thynne Lynn, a new edition of this essay has been prepared and distributed amongst leading astronomers at home and abroad.

The revised calculations bring out more strongly than ever Mr. Spencer's views of the nebular hypothesis, and in particular the portion referring to Mars. When the essay first appeared the density of this planet was taken as 0.95, but recent and more exact determinations show the value to be much too high, and taking this into account the fact comes out that to agree with Mr. Spencer's views Mars should have from one to four satellites as it has since 1877 been known to have.

Olbers's theory that the asteroids are fragments of an exploded planet is favoured, and the genesis of the thirteen short-period comets is found in the same catastrophe. It is needless to say that the theory is defended in a most masterly manner, although the arguments against its acceptance are overwhelming.

NEBULA, GENERAL CATALOGUE NO. 4795.—The Journal of the Liverpool Astronomical Society for December 1889, which has just been issued, contains a note by Mr. W. E. Jackson on this nebula, R.A. 22h. 24m., N.P.D.  $111^\circ 24'$ . It is described in the General Catalogue as "Remarkable, pretty faint, very large, extended or binuclear." Mr. Jackson has carefully observed the nebula several times, and finds that there are several stars involved, although no mention of them is made in the Catalogue, and that there is a strong suspicion of others beyond the reach of his 6 inch Grubb telescope. A sketch of the appearance accompanies the note.

A NEW ASTEROID.—Minor planet  $\textcircled{283}$  was discovered by Prof. Luther (Hamburg) on February 24.

## CAMBRIDGE ANTHROPOMETRY.

ABOUT two years ago the results were published, in the Journal of the Anthropological Society, of the first batch of measurements taken at Cambridge. These comprised rather more than 1100 cases. During the last two years a nearly equal number have been obtained, and it therefore becomes important to compare the results yielded by these distinct batches.

The measurements proposed by Mr. Galton, and adopted by the Cambridge Committee, were the following:—(1) A test for the eyesight. The extreme distance at which a man could read "diamond type" (viz. the print employed in the little pocket Common Prayer-books) was noted with each eye separately; the figures given in our tables indicate the mean of the two. It may be remarked that, as this instrument would only record up to 35 inches, and as about ten per cent. of the men could read at this distance, it is certain that many could have seen further. The arithmetical mean, therefore, though good enough for our present purposes, is here less scientifically appropriate than the "median." (2) A test of the muscular strength of the arms when employed in an action similar to that of pulling a bow. Two handles, connected at a convenient distance apart, are pulled away from each other against the pressure of a spring. (3) A test of the power of "squeeze" of each hand separately. In this case two handles stand a short distance apart, and are then pressed towards each other against the action of a spring. The figures here given denote the mean of the two results. (4) Measurement of the size of the head. This is taken in three different directions, viz. from front to back, between the two