

tree-planting and to preserve the forests. This is followed by an account of present practice and ideals. The work of the departmental committee appointed by the late Mr. Hanbury is dealt with very fully. The second article is on submarine vessels, and is unsigned. It is accompanied by four plates, and gives a full description of the attempts made to perfect this form of boat, and of the best models now in existence.

IN reviewing Prof. G. P. Merrill's "Stones for Building and Decoration," when the book was first published in 1891, we cited it as affording an admirable example of the value of exact scientific knowledge when applied to the treatment of economic questions. The fact that since the date mentioned, as Prof. Merrill points out in the preface to the third edition which has now been issued, there has been a very notable increase in the output of building stone from American quarries, serves to emphasise the real connection between the scientific treatment of an industry and its success. The present edition differs from the previous ones in containing a revised chapter on methods of testing, a new chapter on the use of drift boulders for building purposes, and five maps showing the geographic distribution of the more important building stones. The new edition is published in this country by Messrs. Chapman and Hall, Ltd., and its price is 21s. net.

THE additions to the Zoological Society's Gardens during the past week include a Chimpanzee (*Anthropopithecus troglodytes*) from West Africa, presented by Mr. H. Freeland; a Chacma Baboon (*Papio cynocephalus*) from South Africa, presented by General Sir Henry de Bathe; a Rhesus Monkey (*Macacus rhesus*) from India, presented by Mr. H. Baker; a Levaillant's Cynictis (*Cynictis penicillata*) from South Africa, presented by Mr. C. Marsh; an Egyptian Ichneumon (*Herpestes ichneumon*) from North Africa, presented by Dixon Bey; a Nagor Antelope (*Cervicapra redunca*), a Crowned Duiker (*Cephalophus coronatus*), a Serval (*Felis serval*), an African Civet Cat (*Viverra civetta*) from West Africa, presented by Sir G. E. Denton, K.C.M.G.; a Cuckoo (*Cuculus canorus*), British, presented by Mr. J. O. Pickington; a Back-marked Snake (*Coluber scalaris*), South European, presented by Mr. W. H. St. Quintin; a Common Toad (*Bufo vulgaris*), European, presented by Mr. H. Verrall; a Chameleon Lizard (*Chamaeleolis chamaeleontides*), two Large Cuban Anolis (*Anolis equestris*) from Cuba, deposited; three Peacock Pheasants (*Polyplectron chinquis*) from British Burmah, purchased.

#### OUR ASTRONOMICAL COLUMN.

THE SPECTRUM OF  $\alpha$  CETI.—No. 41 of the Lick Observatory *Bulletin* is devoted to a discussion of the spectrum of Ceti by Mr. Joel Stebbins.

Using the Mills spectrograph modified to a one-prism instrument, he obtained a series of twenty-five good spectra during the period June, 1902, to January, 1903, in which period the star decreased in magnitude from 3.8 to 9.0. The spectrograms were obtained on Cramer's "Crown" or "Isochromatic" plates, are 28mm. in length, and extend from  $\lambda$  3700 to  $\lambda$  5600.

Mr. Stebbins finds that the absorption spectrum of Mira is very different from that of the sun; the calcium lines *g*, *H* and *K* are all present, but *g* is much stronger than in the solar spectrum. From measurements of six suitable lines he found that the velocity in the line of sight is constant, with a value of +66km. A summary of the dark lines discovered indicates the undoubted presence of Fe, Va, Cr

and Ca, and the Al and Sr lines are prominent, whilst the presence of Mn and Ti is as yet considered doubtful.

The general conclusion arrived at is that many of the lines become broader as the star's magnitude declines, and this is undoubtedly true of the *g* calcium line at  $\lambda$  4227.84. In the later photographs some new lines, not definitely coincident with solar lines, were observed, the chief of these being  $\lambda$  3990.64,  $\lambda$  4045.16,  $\lambda$  4093.55, and  $\lambda$  4097.08.

As regards the continuous spectrum, the photographs show that as the star declines in magnitude the continuous spectrum between  $\lambda$  4300 and  $\lambda$  5000 decreases in intensity as compared with that between  $\lambda$  4000 and  $\lambda$  4300.

Amongst the bright lines the hydrogen series is undoubtedly present, although previous observers have doubted the presence of  $H\alpha$ ,  $H\beta$  and  $H\epsilon$ ; the two latter seem to have become stronger, compared with the other hydrogen lines and the continuous spectrum, as the star became fainter. The presence of bright metallic lines is as yet open to question. In 1898 Campbell observed  $H\gamma$  as a triple line, and it was intended in this research to make polariscopic tests for the Zeeman effect, but, as the line was found to be single on the first spectrograms obtained, no such tests were made.

Mr. Stebbins discusses the principal theories concerning the remarkable variation in the magnitude of Mira, and is led to the conclusion that it is due to internal forces. Numerous tables and diagrams, and several reproductions of the spectrograms of Mira, accompany the dissertation.

#### PHOTOGRAPHIC EFFICIENCY OF A SHORT FOCUS REFLECTOR.

—In an abstract from No. 539 of the *Astronomical Journal* Prof. Schaeberle discusses the photographic efficiency of short focus reflectors, and describes some remarkable photographs obtained by himself with a 13-inch parabolic reflector of 20 inches focus. This reflector is mounted alongside a similar one, which is used as a finder and has an aperture of 12 inches, a focal length of 46 inches, and an eye-piece magnifying 360 diameters, on an ordinary English equatorial mounting, the photographic plate ( $1\frac{1}{4} \times \frac{3}{4}$ ) being placed at the focus of the mirror.

The results obtained showed that with less than five minutes' exposure the 13-inch revealed stars which are apparently beyond the reach of the 36-inch Lick telescope, and also revealed all the stars obtained by the 3-foot Crossley reflector with two hours' exposure.

The Ring nebula just shows on plates having had four seconds' exposure, and the central star and Lassell's No. 1 star (mag. 13) plainly show on an eight seconds' exposure. These photographs disclosed the true form of the Ring nebula, showing that it is a two-branched spiral which commences at the central star, and in a clockwise direction emerges on opposite sides near the minor axis. A reproduction of a photograph, which has been enlarged 150 times, accompanies the article, and shows the details of the nebula very clearly; this photograph was obtained on October 30, 1902, with an exposure of 128 seconds.

It has been shown by the photographs obtained that, under favourable conditions and using fast plates ("Seed" No. 27), this instrument can photograph stars fainter than the seventeenth visual magnitude in less than five minutes.

THE GODLEE OBSERVATORY.—In a brochure issued from the printing department of the Manchester Municipal School of Technology, the principal gives a detailed description of the Grubb telescope presented to the observatory connected with the school by Mr. Francis Godlee, of Manchester.

The mounting is of the twin equatorial type, and carries an 8-inch refractor and a 12-inch Newtonian reflector, besides a 6-inch achromatic doublet intended for astrographic work.

The refractor is provided with a filar micrometer, a finely divided position circle, and the usual accessories necessary for delicate visual observations. The polar axis is fitted with two R.A. circles, one of which may be set to sidereal time and rotates with the axis, so that the R.A. may be obtained by finding the difference between the readings of the two circles. The driving of the telescopes is performed by the usual clockwork arrangements, and is electrically regulated by a pendulum having a perfectly free movement; the mounting is so designed as to permit the instrument to make the whole circumpolar revolution without interruption.