

THE additions to the Zoological Society's Gardens during the past week include two Rhesus Monkeys (*Macacus rhesus* ♀ ♀) from India, presented respectively by Col. J. M. McNeile and Mrs. E. White; a Rose-crested Cockatoo (*Cacatua mluccensis*) from Moluccas, presented by Miss Townshend Wilson; twelve Barbary Turtle Doves (*Turtur risorius*) from Africa, presented by Mr. E. L. Armbrecht, F.Z.S.; four Copper-head Snakes (*Cenchrus contortrix*), two Rattlesnakes (*Crotalus durissus*), a Hog-nosed Snake (*Heterodon platyrhinos*) from North America, presented by Mr. W. A. Conklin, C.M.Z.S.; a Long-nosed Snake (*Heterodon nasicus*) from Indiana, U.S.A., presented by Miss Catherine Hopley; a Fire-bellied Toad (*Bombinator igneus*) from Germany, presented by Mr. G. A. Boulenger, F.Z.S.; a Bactrian Camel (*Camelus bactrinus* ♂), bred in England, two Eleonora Falcons (*Falco eleonora*) from North Africa, a Macaque Monkey (*Macacus cynomolgus* ♂) from India, deposited; two Manchurian Crossoptilons (*Crossoptilon manchuricum* ♂ ♀), two Bar-tailed Pheasants *Phasianus reevesi* ♂ ♀) from Northern China, purchased; ten Barbary Turtle Doves (*Turtur risorius*), four Ring Doves (*Turtur communis*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN

STELLAR PHOTOGRAPHY AT HARVARD COLLEGE.—Prof. Pickering has recently presented to the American Academy of Arts and Sciences an important memoir on the work in stellar photography which has been carried on at Harvard College, mainly by aid of an appropriation from the Bache Fund. The memoir commences with a brief sketch of the history of stellar photography, from its origination in 1850, when Mr. J. A. Whipple succeeded in obtaining a satisfactory daguerreotype of Vega with the Harvard 15-inch equatorial, the first stellar photograph ever secured. In 1857, the collodion process having then been introduced, Prof. G. P. Bond resumed the investigation, and showed that photography was capable of doing real work in the observation of double stars. In 1882 some preliminary experiments with a lens of 2½ inches aperture were made, and with such satisfactory results that in 1885 the work was resumed with a Voigtländer lens of 8 inches aperture, and about 45 inches focal length, that focal length having been selected that the photographs might correspond in scale to the maps of the "Durchmusterung." Of the three departments into which stellar photography may be divided, viz. star-charting, photographing star-trails, and spectrum photography, Prof. Pickering has chiefly interested himself in the two latter. Star-trails—the images, that is, produced on a plate when the telescope is stationary, or is not following the star with precision—are made exceedingly useful. It furnishes the best method of determining the magnitudes of stars photographically, and the average deviation of the measures of the brightness of circumpolar stars on different plates proved to be less than a tenth of a magnitude, a greater accordance than is given by any photometric method. It is Prof. Pickering's intention to obtain determinations of the brightness of all stars north of 30° S. decl. by this method, and the work is now nearly completed. One of the plates taken on November 9, 1885, incidentally affords conclusive evidence that Mr. Gore's Nova Orionis was then much less bright than it was on the night of its discovery, some five weeks later. By photographing on the same plate circumpolar stars near their upper and lower culminations, the means for determining the atmospheric absorption on the nights of observation have been secured. Prof. Pickering has also made some experiments on the applicability of photography to the transit instrument, and concludes that the position of a star may be determined from its trail with an average deviation of only 0.03s. Prof. Pickering also shows how star-trails may be made useful in determining the errors of mounting of the photographic instrument. Photographs of stellar spectra have been obtained by simply placing a large prism in front of the object-glass. The spectra of all the stars over an extended area are thus obtained at a single exposure; an exposure of five minutes giving the spectra of all stars down to the sixth magnitude in a region 10° square. The entire sky north of 23° S. decl. is to be examined in this way, and the work is now far on the way to completion. An exposure of an hour shows the spectra of stars down to the ninth magnitude. A photograph of the Pleiades in this manner brings out the in-

teresting fact that, with very few exceptions, all have spectra of the same class—a circumstance which seems strongly to confirm the idea of a community of origin. The exceptions may not improbably lie at a considerable distance on this side or the other of the group, and should, as Prof. Pickering suggests, receive attention in any study of the parallax of the Pleiades. Prof. Pickering also here discusses several theoretical points of interest, one being the relation between the dimensions of the lens employed and the light of the faintest star that can be photographed with it. He concludes, on the whole, that, where the telescope follows the star with exactness, the limiting amount of light may be assumed as proportional to the aperture divided by the square root of the focal length. Three photographic plates accompany the memoir: the first showing the photographic instrument, the second the trails of a number of close circumpolar stars, and the third several specimens of photographs of stellar spectra, those of Vega, Altair, and of the Pleiades being amongst the number.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 NOVEMBER 14-20

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on November 14

Sun rises, 7h. 18m.; souths, 11h. 44m. 35'5s.; sets, 16h. 11m.; decl. on meridian, 18° 18' S.; Sidereal Time at Sunset, 19h. 46m.

Moon (at Last Quarter November 18) rises, 17h. 54m.*; souths, 1h. 43m.; sets, 9h. 37m.; decl. on meridian, 18° 13' N.

| Planet | Rises | | Souths | | Sets | | Decl. on meridian |
|---------|-------|----|--------|----|------|----|-------------------|
| | h. | m. | h. | m. | h. | m. | |
| Mercury | 9 | 37 | 13 | 17 | 16 | 57 | 25 11 S. |
| Venus | 6 | 49 | 11 | 27 | 16 | 5 | 16 16 S. |
| Mars | 10 | 39 | 14 | 23 | 18 | 7 | 24 36 S. |
| Jupiter | 4 | 35 | 9 | 57 | 15 | 19 | 8 15 S. |
| Saturn | 20 | 2* | 4 | 4 | 12 | 6 | 21 19 N. |

* Indicates that the rising is that of the preceding evening.

Occultation of Star by the Moon (visible at Greenwich)

| Nov. | Star | Mag. | Disap. | Reap. | Corresponding angles from vertex to right for inverted image |
|------|-----------|------|--------|-------|--|
| 14 | 115 Tauri | 6 | 4 2 | 5 11 | 139 295 |

Nov. 16 ... 13 ... Saturn in conjunction with and 3° 3' north of the Moon.

Variable Stars

| Star | R.A. | | Decl. | | h. m. |
|-----------------|------|------|-------|-------|----------------|
| | h. | m. | ° | ' | |
| U Cephei | 0 | 52.2 | 81 | 16 N. | Nov. 18, 3 8 m |
| R Arietis | 2 | 9.6 | 24 | 31 N. | 18, m |
| Algol | 3 | 0.8 | 40 | 31 N. | 14, 0 45 m |
| ζ Geminorum | 6 | 57.4 | 20 | 44 N. | 18, 21 30 m |
| U Canis Minoris | 7 | 35.2 | 8 | 39 N. | 18, M |
| R Virginis | 12 | 32.7 | 7 | 37 N. | 18, m |
| S Ursæ Majoris | 12 | 39.0 | 61 | 43 N. | 14, m |
| U Virginis | 12 | 45.3 | 6 | 10 N. | 18, M |
| R Scuti | 18 | 41.4 | 5 | 50 N. | 17, m |
| β Lyrae | 18 | 45.9 | 33 | 14 N. | 16, 0 0 M |
| η Aquilæ | 19 | 46.7 | 0 | 43 N. | 16, 19 0 M |
| δ Cephei | 22 | 24.9 | 57 | 50 N. | 14, 0 0 m |

M signifies maximum; m minimum.

Meteor Showers

November 14 is the date of the Leonid shower, R.A. 149°, Decl. 22° N.

THE EROSION OF THE ENGLISH COASTS

THE opening meeting of the present session of the Geologists' Association took place last Friday evening at University College, when an address was delivered by Mr. W. Topley, President of the Association and Secretary of the British Association Committee on Coast Erosion. The subject of the address was "The Erosion of the Coasts of England and Wales."

Mr. Topley, in his address, referred to the great service