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 moluccensis*) 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 (*Cenchris 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 eleonoræ*) from North Africa, a Macaque Monkey (*Macacus cynomolgus* ♂) from India, deposited; two Mantchurian Crossoptilons (*Crossoptilon mantchuricum* ♂ ♀), 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 interesting 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 h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
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. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
14 ...	115 Tauri...	... 6 ...	4 2 ...	5 11	... 139 295

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

Variable Stars

Star	R.A. h. m.	Decl. ° ′			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*
			,,	16,	21 34	*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 Lyræ...	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

rendered to the country by Mr. J. B. Redman, who had given much attention to the question of coast erosion, and to whom the British Association Committee was greatly indebted. The speaker then proceeded, by the aid of diagrams and drawings on the blackboard, to describe the mode in which the sea acts on coasts of various kinds, and stated the rate at which erosion is taking place in different parts of the country. It was greatest along the coast of Holderness and Norfolk, where the sea gained on the land at the average rate of from 2 to 3 yards per year. But locally and during exceptional gales the rate was much higher. On January 30, 1877, parts of Norfolk lost an average of 3 yards for several miles, and near Bacton the loss was 15 yards. Typical instances of erosion were cited, among the places mentioned being Folkestone, Brighton, Worthing, Bournemouth, Westward Ho! and Pembrokeshire. The speaker then went on to describe the shingle beaches and their changes, and to discuss the effects of natural and artificial groynes. On the south coast of England the shingle travelled from west to east, and if left to itself it would form a natural protection along the greater part of the coast, and the average amount of erosion would be small. But in certain places land-owners, town-councils, and other corporations desired that there should be no loss of land, and they erected groynes to collect the shingle, and so robbed the coast to the east of its natural protection. Worthing was heavily groyned and the shingle largely collected, but just east of the town the coast was rapidly receding. Folkestone pier was a large groyne which had collected an extensive area of shingle on its west side; Copt Point and Eastwear Bay, once protected by a continuous band of shingle, were now nearly bare, and the coast was rapidly going. At Copt Point land was laid out for building, and roads were made; but the notice-board advertising "this desirable freehold building land," was seen half-way down the cliff. Natural groynes were sometimes recklessly destroyed, and this was the case at Hengistbury Head, where ironstone was quarried from the cliff and foreshore; the reef had held back sufficient shingle to protect the land to the west, but when the reef was removed, the shingle travelled on, and the land rapidly receded. Great damage was done by taking shingle for road metal, ballast, or other purposes. The amount so taken appeared small and unimportant because a single storm might throw up as much as might be taken in many months, but the aggregate amount so removed was enormous, and must tell in time. It had been estimated that the shingle removed near Kilnsea in twenty years represented a bank 3 miles long, 31 yards wide, and 6 feet deep. It was interesting to note that the erosion of that part of the coast averaged only from three-quarters of a yard to a yard and a half per year for some time before the shingle trade was so largely developed; but later on, owing to the loss of the shingle, the rate of erosion rose from 3 to 6 yards per year. The change might not be entirely due to the cause mentioned, but it clearly was so to a large extent. Although the Board of Trade had now stopped the practice at that part of the coast, it was still in full action in a large number of places. The speaker then passed to the consideration of the land gained from the sea. A great part of the material worn from the coasts of Holderness and Norfolk was carried into the estuaries of the Humber and the Wash, and there formed banks of sand and silt of great hindrance to navigation, but when reclaimed of great agricultural value. Recent estimates showed that the area of land thus made in the Humber and Wash was far in excess of that lost. Taking the whole coast-line of England, it was probable that the total area of land was as great now as it was 500 years ago. Although the general result of a survey of this question was less serious than was generally supposed, it was evident that greater control was requisite over the action of land-owners and public bodies along the coast. The powers now vested in the Board of Trade might be more rigorously and systematically applied, or fresh powers obtained. This was especially desirable along the south coasts, as there the damage done by reckless groyning was enormous, but the area of land now gained was small.

OBSERVATIONS ON HEREDITY IN CATS WITH AN ABNORMAL NUMBER OF TOES

IN 1883 I contributed an article to NATURE (vol. xxix. p. 20) upon this subject, giving an account of my observations from 1879 up to the date at which the paper was written. The last observation was concerned with a family of four male tabby kittens, all of which possessed the abnormality to a very marked extent. This was the first family produced by a female tabby (and slight tortoiseshell) cat which, when born, was the most abnormal form which had come under my notice, possessing two extra toes on all the paws, *i.e.* seven on each fore-paw and six on each hind-paw. The right paws of this cat were figured in

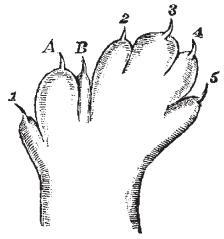

FIG. 1.—Right fore-paw from above, with extra toes.

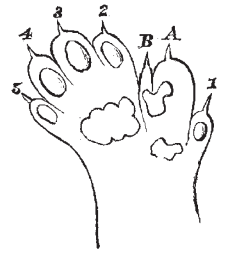

FIG. 2.—Right fore-paw from below, with extra toes.

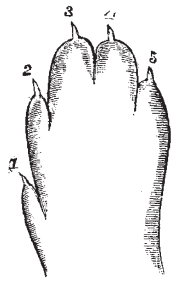

FIG. 3.—Right fore-paw from above, normal.

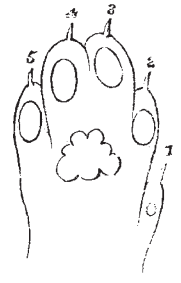

FIG. 4.—Right fore-paw from below, normal.

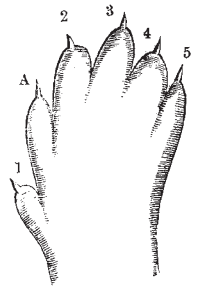

FIG. 5.—Right hind-paw from above, with extra toes.

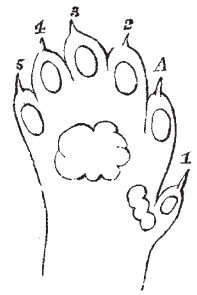

FIG. 6.—Right hind-paw from below, with extra toes.

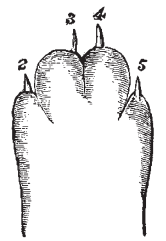

FIG. 7.—Right hind-paw from above, normal.

FIG. 8.—Right hind-paw from below, normal.

the paper referred to, together with the corresponding paws of a normal cat, for comparison. These figures are now reproduced in order to illustrate the present paper. I quote the description of the figures from the previous paper. "It is seen that the extra toes (in the fore-feet) are those labelled A and B (in Figs. 1 and 2), and they confer the extraordinary breadth upon the foot. The most recently added is B, which is still