thus appears that the figure of about three feet in a century, which was deduced from former observations, cannot be very far from the truth. As to local anomalies, they remain still unexplained.

THE additions to the Zoological Society's Gardens during the past week include two Yellow-fronted Tanagers (*Euphonia flavifrons*) from Dominica, presented by Mrs. Herbert; two Manx Shearwaters (*Puffinus anglorum*) from the Scilly Islands, presented by Mr. F. Hensman; an Ocelot (*Felis pardalis*) from South America, deposited; four Black-tailed Godwits (*Limosa ægocephala*), European, purchased; two Indian Muntjacs (*Cervulus muntjac* ♂ ♀) from India, received in exchange; a Persian Gazelle (*Gazella subgutterosa* ♀), two Bennett's Wallabys (*Halmaturus bennetti* ♀ ♀), a Hog Deer (*Cervus porcinus* ♂), a Collared Fruit Bat (*Cynonycteris collaris*), two Grey Wagtails (*Motacilla melanope*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

COMET 1888 *e* (BARNARD, SEPTEMBER 2).—The following ephemeris for Berlin midnight for this object is in continuation of that given in NATURE, vol. xxxix. p. 616:—

1889.	R.A. h. m. s.	Decl. ° ′	Log *r*.	Log Δ.	Brightness.
June 1	22 54 22	2 39·9 N.	0·3730	0·3441	2·1
5	22 47 38	2 40·5	0·3786	0·3317	2·1
9	22 40 4	2 38·1	0·3842	0·3193	2·2
13	22 31 38	2 32·5	0·3898	0·3070	2·3
17	22 22 16	2 23·6	0·3954	0·2952	2·4
21	22 11 57	2 10·7 N.	0·4010	0·2839	2·4

The brightness at discovery is taken as unity.

THE MOTION OF STARS IN THE LINE OF SIGHT.—Prof. H. C. Vogel, noting the difficulty which has been experienced at the Greenwich and Rugby Observatories in making eye-observations of the displacement of the lines in stellar spectra due to the approach or recession of the stars, has endeavoured to solve the problem by means of photography, and has met with very considerable success. The atmospheric tremors, which are so baffling and often misleading to direct eye-observation, counteract each other and produce little or no effect on the photograph; and the feebleness of the light of a star when spread out into a long spectrum is overcome by a lengthened exposure. Prof. Vogel gives the following results (in German miles per second) for five stars, of which four have been observed at Greenwich:—

Star.	Vogel.	Greenwich.
Capella	+3·5	+4·8
Aldebaran	+6·5	+6·8
Polaris	−3·5	not observed
α Persei	−1·5	−4·8
Procyon	−1·5	+0·8

The Greenwich observations for 1888, nearly contemporaneous therefore with the Potsdam observations, give the motion of Procyon as −0·8. The agreement of the individual photographs is very gratifying, and is much closer than that of the eye-measures made on different nights.

THE LATITUDE OF DETROIT.—A determination of the latitude of the Detroit Observatory has recently been made by Dr. Ludovic Estes.[1] The zenith telescope was employed, and the results were discussed by the method of least squares. The value arrived at after all corrections is 42° 16′ 48″·66 ± 0″·051. An interesting point in connection with the observations is that smaller values were obtained from low stars, which seems "to indicate that northern stars are refracted less than southern, for the same zenith distance; and that, therefore, the layers of the atmosphere, instead of being parallel to the surface of the earth, are depressed more rapidly toward the north" (p. 54).

THE MINOR PLANET VICTORIA.—A programme has been prepared by Dr. Gill, of the Royal Observatory, Cape of Good Hope, for observations of the minor planet Victoria at its opposition in 1889; the opposition in right ascension occurring on July 16, and the primary object of these observations being to determine the parallax of the sun from heliometric measures. A list of comparison stars is given, and is so arranged that when the planet is situated at the greatest zenith distance where good observations may be made, one comparison star may be below and another above it, the measurement by the heliometer of the difference of two nearly equal and opposite distances giving the most accurate result obtainable.

Victoria has a zenith distance of 62° at an hour-angle of 4h. for the Cape, 2h. for European Observatories, and 3h. for Newhaven. A list is given of the limits of hour-angle during which observations of the planet may be made from June 10 to August 29.

The corrected ephemeris of the planet has been computed, and it is hoped that co-operating meridian Observatories will determine the places of the thirty-seven comparison stars with the meridian circle, and at the same time procure as many meridian observations of the planet as possible. Provided that means exist for determining the distortion of the photographic film, and the optical distortion of the field, photographs taken in both hemispheres showing the planet lengthened out so as to form a straight line, whilst neighbouring stars are well defined, are available for the determination of parallax. Dates are also given when photographic observations of Victoria may be advantageously combined with heliometer observations.

MERIDIAN OBSERVATIONS OF IRIS.—A similar programme to the above was issued by Dr. Gill, in September 1888, for observations of the minor planet Iris; and Mr. Arthur A. Rambaut, assistant astronomer at Dunsink Observatory, has made observations, with the meridian circle, of the places of the planet and the twenty-eight comparison stars given. The measures will be found in *Monthly Notices R.A.S.*, March 1889, and extend from September 7, 1888, to January 10, 1889. Between these dates twenty-six observations of Iris were made, and its apparent right ascension and declination found. During the progress of the work two comparison stars were added to Dr. Gill's list.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1889 *JUNE* 2–8.

(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 June 2

Sun rises, 3h. 50m.; souths, 11h. 57m. 45·8s.; daily increase of southing, 9·6s.; sets, 20h. 6m.: right asc. on meridian, 4h. 42·3m.; decl. 22° 15′ N. Sidereal Time at Sunset, 12h. 52m.

Moon (at First Quarter on June 6, 20h.) rises, 6h. 42m.; souths, 15h. 2m.; sets, 23h. 17m.: right asc. on meridian, 7h. 46·8m.; decl. 22° 19′ N.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	5 4	13 25	21 46	6 9·7	23 56 N.
Venus ...	2 25	9 28	16 31	2 12·5	11 33 N.
Mars ...	4 1	12 16	20 31	5 0·6	23 19 N.
Jupiter ...	21 49*	1 44	5 39	18 26·6	23 6 S.
Saturn ...	8 52	16 28	0 4*	9 13·2	17 17 N.
Uranus ...	14 52	20 22	1 52*	13 7·7	6 31 S.
Neptune..	3 31	11 18	19 5	4 2·6	19 5 N.

* Indicates that the rising is that of the preceding evening and the setting that of the following morning.

June.	h.	
4 ...	8 ...	Saturn in conjunction with and 1° 47′ south of the Moon.
6 ...	— ...	Venus at period of greatest morning brilliancy.
6 ...	20 ...	Mercury stationary.

Saturn, June 2.—Outer major axis of outer ring = 39″·1: outer minor axis of outer ring = 10″·6: southern surface visible.

Meteor-Showers.

	R.A.	Decl.	
Near β Coronæ ...	228°	30° N.	June 2.
,, β Ophiuchi ...	262	5 N.	Rather slow.
,, α Cephei ...	317	61 N.	Swift; streaks.

[1] Ann Arbor, Mich.: The Register Printing and Publishing Company, 1888.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·5	81 17 N.	June	4, 23 49	*m*
S Cancri	8 37·6	19 26 N.	,,	5, 3 18	*m*
R Virginis	12 32·9	7 36 N.	,,	7,	*M*
δ Libræ	14 55·1	8 5 S.	,,	3, 22 7	*m*
R Ursæ Minoris ...	16 31·5	72 30 N.	,,	3,	*M*
U Ophiuchi... ...	17 10·9	1 20 N.	,,	6, 3 14	*m*
			,,	6, 23 22	*m*
X Sagittarii	17 40·6	27 47 S.	,,	7, 0 0	*m*
U Sagittarii... ...	18 25·6	19 12 S.	,,	2, 2 0	*m*
			,,	5, 1 0	*M*
R Lyræ	18 52·0	43 48 N.	,,	5,	*M*
R Sagittæ	20 9·0	16 23 N.	,,	7,	*m*
U Capricorni ...	20 42·0	15 12 S.	,,	7,	*M*
W Cygni	21 31·9	44 53 N.	,,	8,	*M*

M signifies maximum ; *m* minimum.

GEOGRAPHICAL NOTES.

AT the anniversary meeting of the Royal Geographical Society on Monday, the medals and other honours already announced in NATURE were awarded. Dr. Radde, of Tiflis, appeared in person to receive his medal, which he acknowledged briefly and appreciatively. The address of the President, General Strachey, was of more than usual interest. After referring to the geographical events of the year, he took up the subject of Central Africa, its future exploration, and its subjection to the commercial and civilizing influence of Europe. General Strachey reviewed the results of European contact with the various other parts of the world, savage and semi-civilized. "There is no room to doubt," he said, "that the occupation of the earth by man in the many various modes presented to us has been determined mainly by the physical conditions of the surface, the distribution of land and sea, and the nature of the climate, operating in conjunction with the particular inherited capacities of the several branches of the human race, which have themselves been largely determined by these same physical conditions. The diffusion of races, and their more or less permanent occupation of various parts of the earth, have necessarily been regulated by their relative powers of adapting themselves to, and taking advantage of, the facilities for existence offered by the regions they occupied, and of resisting adverse pressure of all sorts brought to bear upon them from without. Among the best safeguards against that form of pressure which consists of the intrusion of other races, have ever been isolation by the ocean, or by high mountains, great land distances, forests and deserts; and hence it has been that the interiors of the great continents have for the most part been last explored, and their inhabitants least disturbed. As the first of these defences was weakened by the development of the art of navigation, the progressive races of Europe began to seek for fresh scope for their activities in many distant regions, thus for the first time rendered accessible to them. From very small beginnings within the Mediterranean, which for several centuries gained strength only by slow degrees, at length burst forth some 400 years ago the stream of conquest and commercial adventure which has in our time been carried across every part of the ocean; and has beaten on all its shores, throwing open an infinitude of lines of attack for the inroads of European progress upon regions previously resting in various conditions of relatively primitive stagnation." General Strachey then, in a highly suggestive manner, reviewed the methods and results of European conquest or European civilization in North, Central, and South America, Australasia, India, China, North Africa and South Africa, and, coming finally to Central Africa, he pointed out that the conditions there were peculiar and required peculiar treatment. "The vast area of tropical Africa," he said, "its climate, often so hostile to Europeans, and the numbers and character of the population, combined with the peculiar difficulties attending all transport in the interior, have retarded the progress of geographical discovery, and obstructed that intercommunication between neighbouring districts which supplies the natural machinery by which the progress of the less advanced races is carried forward. It is impossible to suppose that the impression to be made on these countries by the mere handful of men of northern race who are now scattered along its coasts or at a few points in its interior, can be anything but extremely slow, and it is hardly less certain that under the wholly different conditions that Central Africa presents from those of any other country hitherto brought within the operation of the process of civilization, the form which that process will take, and its results, will be very different from anything that past experience can suggest. The possibility of any colonization by direct immigration on such a scale as to produce effects in any way analogous to those obtained in North America or Australia is obviously excluded; the condition of the people over the greater part of the continent renders it equally impossible to look forward to a time when systems of administration at all approaching that of India could be established; and amalgamation between European settlers and the indigenous races appears no less out of the question. The operation of bringing a population such as that of Central Africa under the restraints of civilization will necessarily be a long and no doubt in some respects a painful one, for assuredly the conflict with slavery, cannibalism, and massacre cannot be carried to a successful issue by gentle means alone. The dangers that attend precipitation, with consequent reaction, have been already exemplified too plainly, and by the sacrifice of too many noble lives; and in circumstances such as those that here have to be dealt with, toleration of unavoidable evil at the outset may well afford the best and most certain means of introducing permanent improvement. Nor can I see any reason to question the conclusion that the best method of entering on this gigantic task is that which the general sense of Europe has practically resolved to adopt—namely, to form commercial associations intrusted with the exercise of reasonable administrative authority within the several areas assigned to them, hoping that thus the African population may by degrees be taught that the path to social and material comfort and well-being lies through well ordered industry and peaceful occupations; in imparting which lessons the earnest co-operation of the many purely philanthropic missions already established among these people may be most confidently counted on."

BEACON LIGHTS AND FOG SIGNALS.[1]

II.

IN 1876, Mr. Julius Pintsch, of Berlin, patented in this country his system of illuminating buoys or other floating bodies by compressed oil gas, and in 1878 one of these buoys was experimentally tried at sea with success by the Trinity House. The system is similar to that previously adopted by Mr. Pintsch with great success in the lighting of railway carriages, but with the addition for buoys of a specially constructed lantern, containing a small cylindrical lens for fixed light. Through the kindness of the Pintsch's Lighting Company, we have here one of these apparatus, producing an intensity in the beam of about twenty candle units. With the charge of gas contained in the buoy, the light is shown continuously, night and day, from two to four months, according to the dimensions of the buoy, without refilling or requiring any other attention except occasional cleaning of the lens and the glazing of the lantern. In 1883, Mr. William B. Rickman patented a very ingenious addition to this apparatus for producing occulting or flashing light. The apparatus is automatically worked by the issuing compressed gas on its way from the buoy to the burner. After passing the regulator where the pressure of the gas is reduced for burning, it enters a cylindrical chamber covered with a diaphragm of very flexible specially prepared leather, this diaphragm, on being slightly raised by the in-flowing gas, communicates motion to a lever, which, assisted by a spiral spring, closes the inlet pipe, and opens at the same time the passage to the burner. As the gas passes on and is consumed at the burner, the diaphragm by its own weight, assisted by the spring, sinks, and touching the lever, closes the outlet aperture to the burner, and at the same moment opens the inlet of the gas from the buoy for another charge. Thus the light is extinguished while the gas is entering the chamber, and until the latter is refilled, when the passage from the buoy is again closed by the rising of the diaphragm. A small pilot jet is constantly burning to insure the re-ignition of the gas when re-admitted to the burner. It is evident that several characteristic distinctions of light may be obtained by modifications of this ingenious apparatus. About 150 buoys lighted on the Pintsch system are already rendering valuable

[1] Friday evening discourse delivered at the Royal Institution by Sir James N. Douglass, F.R.S., on March 15. Continued from p. 91.