

and Indian Exhibition, has been prepared by Dr. James Hector, the Director of the Geological Survey of New Zealand, and forms part of the large exhibit of that gentleman. There are several large labels inside the glass case, in which the necessary explanations are given.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*) from Madagascar, presented by Mr. Angus Ogilvy; two Black-tailed Parrakeets (*Polytelis melanura*) from South Australia, presented by Mr. James Thomson; an Indian Cobra (*Naia tripudians*) from India, presented by Messrs. H. Thwaites and V. A. Julius; a Common Viper (*Vipera berus*), British, presented by Mr. W. H. B. Pain; a Loggerhead Turtle (*Thalassochelys caouana*) from the Atlantic Ocean, presented by Mr. R. G. Fraser, R.N.; a Rook (*Corvus frugilegus*), British, presented by Mr. H. J. Peckover; a Black-faced Spider Monkey (*Ateles ater*) from Eastern Peru, a Crab-eating Raccoon (*Procyon cancrivorus*) from West Indies; an Indian Cobra (*Naia tripudians*) from India, deposited; two Spotted Hyenas (*Hyena crocuta*) from South Africa, two Side-striped Jackals (*Canis lateralis*) from West Africa, a Griffon Vulture (*Gyps fulvus*), a Smooth Snake (*Coronella levis*), a Viperine Snake (*Tropidonotus viperinus*), European, purchased; two Triangular Spotted Pigeons (*Columba guineæ*), bred in the Gardens.

#### OUR ASTRONOMICAL COLUMN

A CATALOGUE OF "COMPARISON" STARS.—Dr. N. M. Kam of Schiedam has published in *Verhandelingen der Koninklijke Akademie van Wetenschappen*, Deel. xxiv. (Amsterdam), a star catalogue compiled from the places of stars determined by meridian observations, which have been extracted from vols. i. to lxxvi. of the *Astronomische Nachrichten*, and reduced to the epoch 1855.0. The positions of the stars contained in this catalogue were determined in connection with observations of planets and comets, and it was in compliance with Argelander's express desire that the work of collecting them and reducing the positions to a common epoch was commenced by Hoek, then Director of the Utrecht Observatory. Dr. Kam, who was Hoek's assistant, continued the work after the death of the latter, and has at length been able to publish his results. The principal catalogue contains the completely determined places of 4350 stars, and is followed by two subsidiary catalogues, the first giving the places of 236 stars, and the second those of 335 stars; all of the latter, however, are incomplete, *i.e.* the place is given in one element only. The catalogues are followed by a comparison of the places of the stars contained in them with their places as given in the Bonn *Durchmusterung*, or, for stars south of  $-2^{\circ}$  Decl., with other authorities. Notes on proper motions, corrigenda, &c., are appended, which are of considerable interest and value. We hope that the work of collecting and cataloguing the class of stars here dealt with will be continued either by Dr. Kam or by some other astronomer as well fitted for the task as he has proved himself to be.

THE PARIS OBSERVATORY.—Admiral Mouchez, Director of the Paris Observatory, has recently published his annual report to the Council of the Observatory. It is a very instructive and interesting document, and affords gratifying evidence of the enterprise and energy with which the work of this great institution is carried on.

The most striking portion of the report is that which deals with the work of the Bros. Henry in astronomical photography, but as this, as well as M. Lœwy's ingenious device for determining the amount of astronomical refraction, have already been noticed in NATURE, it will not be necessary to again refer to them. Leaving these two great undertakings therefore on one side, the rest of the report exhibits a large amount of solid work. The meridian service has comprised 16,173 observations, 795 of the sun and planets. The instruments of the Salle Méridienne have been devoted to the observation of Lalande's stars. As the great Catalogue approaches completion, the stars still to be observed become more widely scattered, and fewer observations are necessarily secured. The division-errors of the Gambey circle are being carefully investigated by M. Périgaud, and the Garden circle has been used for the determination of the abso-

lute positions of a number of circumpolar stars. A new flexure apparatus has been constructed by M. Gautier, and 603 stars have been already observed with it. The same ingenious artist has also devised a new mode of supporting a mercury trough, for freeing it from the effect of tremors, which has been found to work very satisfactorily. The equatorials have been employed as usual in observations of comets, minor planets, and nebulae; the equatorial of the east tower having been employed by MM. Henry in the revision of some of their photographic charts containing very faint stars, especially the Pleiades and the regions round Vega and  $\epsilon$  Lyrae. In the department of the calculations, the calculations for the great Catalogue had been completed as far as 8h. of R.A., and were being carried on from 8h. to 12h. The Catalogue itself was printed up to No. 3800, and the manuscript prepared up to No. 4700. Of the volume of observations for 1882, seventy-three sheets had been printed, and the rest was in the printer's hands. The volume for 1883 had been commenced, and of the *Mémoires*, tome xviii., had been distributed, and tome xix. was in course of publication.

Several important investigations have also been carried on by individual members of the staff. M. Lœwy has devised a new method for determining the absolute co-ordinates of circumpolar stars, and M. Renan has published two notes on his experiments in application of these methods. M. Callandreaux has published several notes on the theory of the figure of the planets and of the earth, and numerical tables for assisting in the calculation of ephemerides for minor planets; whilst M. Prosper Henry has been engaged in devising suitable methods for the measurement and reduction of the photographic star-charts, which differ so widely from ordinary astronomical observations. A new determination of the length of the seconds pendulum has also been made by Capt. Defforges, of the Geographical Service, the length corrected to sea-level being found to be 0.99394m. Amongst the works to be carried out in the present year is the study of the movements of the soil by the aid of a multiplying seismograph devised by M. Bouquet de la Grye. The report concludes with a reproduction of a photograph of the Pleiades and a comparison of the results thus obtained by photography in a single hour with those obtained by M. Wolf in his study of the same group through the toil of years.

NOTES ON VARIABLE STARS.—Mr. Espin, the special observer to the Liverpool Astronomical Society, has recently commenced the issue of circulars calling attention to various variable stars or stars suspected of variation. Circular No. 1 gives an ephemeris for 10 Sagittæ, the next maximum, mag. 5.6, falling due June 5.4d., and the next minimum, mag. 6.4, June 11.1, period 8.317d. Circular No. 2 calls attention to the star D.M. + 8°, No. 3780, R.A. (1885.0) 18h. 32m. 51s., Decl.  $8^{\circ} 43' 5''$  N., as a probable variable. Circular No. 3 gives new elements for U Hydree, R.A. 10h. 31.9m., Decl.  $12^{\circ} 40' 7''$  S., from whence it would appear that the next maximum is due 1886 June 25.5d. Circular No. 4 gives provisional elements for W. Cygni, R.A. (1886.0) 21h. 31m. 44s., Decl.  $44^{\circ} 51' 0''$  N., as follows:— $P = 120$  to  $130$  days,  $V = 5.8 \pm$  to  $7.5 \pm$ ,  $M = 1886$  May 19  $\pm$ ,  $m = 1886$  Feb. 14  $\pm$ .

THE "CANALS" OF MARS.—M. Terby, in a note presented some little time ago to the Royal Academy of Belgium, drew attention to the occurrence in the drawings of Mars made by Herschel and Schrœter of several markings resembling the well-known Kaiser Sea in size and distinctness, and pointed out that M. Schiaparelli, in his observations of 1881–82, represented the "canal" Indus as developed to dimensions almost as great as those of the Kaiser Sea, and that this development coincided with the "geminatio" or doubling of almost all the other canals. M. Faye now announces at the last meeting of the Académie des Sciences that M. Perrotin and the other observers at the Nice Observatory have recently been able to re-detect M. Schiaparelli's canals. The reality of the existence of the delicate markings discovered by the keen-sighted astronomer of Brera seems thus fully demonstrated, and it appears highly probable that they vary in shape and distinctness with the changes of the Martial seasons.

#### ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 JUNE 6-12

(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 6

Sun rises, 3h. 47m.; souths, 11h. 58m. 23'3s.; sets, 2oh. 9m.; decl. on meridian, 22° 41' N.: Sidereal Time at Sunset, 13h. 10m.

Moon (at First Quarter on June 9) rises, 8h. 10m.; souths, 15h. 49m.; sets, 23h. 17m.; decl. on meridian, 15° 7' N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian
Mercury ...	3 25 ...	11 29 ...	19 33 ...	21 45 N.
Venus ...	2 10 ...	9 7 ...	16 4 ...	10 20 N.
Mars ...	11 47 ...	18 18 ...	0 49* ...	5 28 N.
Jupiter...	12 31 ...	18 48 ...	1 5* ...	2 43 N.
Saturn... ..	5 26 ...	13 37 ...	21 48 ...	22 43 N.

\* Indicates that the setting is that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich)

June	Star	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image
			h. m.	h. m.	
10 ...	B.A.C. 4043 ...	6½ ...	0 5 ...	0 51 ...	74 325
11 ...	38 Virginis ...	6 ...	1 0 ...	near approach	200 —
June	h.				
9 ...	9 ...				Mars in conjunction with and 0° 6' north of the Moon.
9 ...	22 ...				Jupiter in conjunction with and 0° 1' north of the Moon.
11 ...	5 ...				Mercury at least distance from the Sun.
12 ...	2 ...				Mercury in superior conjunction with the Sun.

Variable Stars

Star	R.A.	Decl.	h. m.
	h. m.	°	h. m.
U Cephei ...	0 52'2 ...	81 16 N. ...	June 9, 2 16 m
S Canis Minoris ...	7 26'5 ...	8 34 N. ...	,, 11, m
W Virginis ...	13 20'2 ...	2 47 S. ...	,, 8, 21 40 M
δ Libræ ...	14 54'9 ...	8 4 S. ...	,, 6, 0 50 m
U Coronæ ...	15 13'6 ...	32 4 N. ...	,, 7, 1 16 m
U Ophiuchi ...	17 10'8 ...	1 20 N. ...	,, 11, 0 42 m
X Sagittarii... ..	17 40'4 ...	27 47 S. ...	,, 12, 2 20 M
W Sagittarii ...	17 57'8 ...	29 35 S. ...	,, 6, 2 25 M
T Herculis ...	18 4'8 ...	31 0 N. ...	,, 11, m
η Aquilæ ...	19 46'7 ...	0 43 N. ...	,, 11, 21 30 M
R Sagittæ ...	20 8'9 ...	16 23 N. ...	,, 10, m
δ Cephei ...	22 24'9 ...	57 50 N. ...	,, 6, 0 0 m
			,, 12, 21 35 M

M signifies maximum; m minimum.

Meteor Showers

Radiants near β Ophiuchi, R.A. 261°, Decl. 5° N., from Sagitta, R.A. 292°, Decl. 15° N., and from Vulpecula, R.A. 312°, Decl. 24° N., are represented at this time of the year, as well as the *Cygnids II.*, R.A. 319°, Decl. 32° N.

GEOGRAPHICAL NOTES

THE French forces in Tonquin having now succeeded in occupying Lao-Kai, near the Chinese frontier, the capital of the Black Flag State, the whole course of the Red River in Tonquin is for the first time open to exploration. Accordingly two flat-bottomed gunboats with an exceedingly small draught have been built and equipped, and left Hanoi on April 3 to ascend the river, having on board officers whose duty it is to survey the river and the adjacent country, to fix the positions of the most important points, and to produce a map of the whole.

AT the meeting of the Geographical Society of Paris on the 21st ult., M. de Lesseps referred to the works on the Panama Canal, and argued that locks or dams were unnecessary. M. Aubry gave a summary of a journey which he made in 1883 and 1884 to Choa and the Gallas country in pursuit of a mission with which he was charged by the Minister of Public Instruction. He collected a large number of mineralogical specimens, and studied the region from a geological and palæontological point of view. He also surveyed the courses of two rivers.

THE Government of British North Borneo has secured the services of Capt. Beeston for the purpose of making a mineralogical and geographical survey of the country. He has started for the Segama River, which has already been visited by Frank

Hatton, to investigate the localities in which gold is said to have been found.

AT the instance of the Société de Géographie Commerciale of Nantes, a Commercial-Geographic Exhibition will be held in that city between June 15 and August 15 next. According to the programme the Exhibition will be divided into five classes: (1) scientific geography; (2) ethnography; (3) travelling and means of communication; (4) French and French-Colonial produce; (5) educational material.

ON RECENT PROGRESS IN THE COAL-TAR INDUSTRY<sup>1</sup>

THOSE who have read Goethe's episodes from his life, known as "Wahrheit und Dichtung," will remember his description of his visit in 1741 to the burning hill near Dutweiler, a village in the Palatinate. Here he met old Stauf, a coal philosopher, *philosophus fer ignem*, whose peculiar appearance and more peculiar mode of life, Goethe remarks upon. He was engaged in an unsavoury process of collecting the oils, resin, and tar obtained in the destructive distillation of coal carried on in a rude form of coke oven. Nor were his labours crowned with pecuniary success, for he complained that he wished to turn the oil and resin to account, and save the soot, on which Goethe adds that, in attempting to do too much, the enterprise altogether failed. We can scarcely imagine, however, what Goethe's feelings would have been could he have foreseen the beautiful and useful products which the development of the science of a century and a half has been able to extract from Stauf's evil-smelling oils. With what wonder would he have regarded the synthetic power of modern chemistry, if he could have learnt that not only the brightest, the most varied colours of every tone and shade can be obtained from this coal-tar, but that some of the finest perfumes can, by the skill of the chemist, be extracted from it. Nay, that from these apparently useless oils, medicines which vie in potency with the rare vegeto-alkaloids can be obtained, and lastly, perhaps most remarkable of all, that the same raw material may be made to yield an innocuous principle, termed *saccharine*, possessed of far greater sweetness than sugar itself. The attainment of such results might well be regarded as savouring of the chimerical dreams of the alchemist, rather than expressions of sober truth, and the modern chemist may ask a riddle more paradoxical than that of Samson, "Out of the burning came forth coolness, and out of the strong came forth sweetness"; and by no one could the answer be given who had not ploughed with the heifer of science, "What smells stronger than tar, and what tastes sweeter than saccharine?" That these are matters of fact we may assure ourselves by the most convincing of all proofs—their money value, and we learn that the annual value of the products now extracted from an unsightly and apparently worthless material amounts to several millions sterling, whilst the industries based upon these results give employment to thousands of men.

*Sources of the Coal-tar Products.*—In order to obtain these products, whether colours, perfumes, antipyretic medicines, or sweet principle, a certain class of raw material is needed, for it is as impossible to get nutriment from a stone as to procure these products from wrong sources. All organic compounds can be traced back to certain hydrocarbons, which may be said to form the skeletons of the compounds, and these hydrocarbons are divisible into two great classes: (1) the paraffinoid, and (2) the benzenoid hydrocarbons. The chemical differences both in properties and constitution between these two series are well marked. One is the foundation of the fats, whilst the other class gives rise to the essences or aromatic bodies. Now all the colours, finer perfumes, and antipyretic medicines referred to, are members of the latter of these two classes. Hence if we wish to construct these complicated structures, we must employ building materials which are capable of being cemented into a coherent edifice, and therefore we must start with hydrocarbons belonging to the benzenoid series, as any attempt to build up the colours directly from paraffin compounds would prove impracticable. Of all the sources of hydrocarbons, by far the largest is the natural petroleum oils. But these consist almost entirely of paraffins, and hence this source is commercially inapplicable for the production of colours. We have, however, in coal itself, a raw material which

<sup>1</sup> A Discourse by Prof. Sir Henry E. Roscoe, M.P., LL.D., F.R.S. delivered at the Royal Institution, Friday, April 16, 1886.