

year. This consisted of the funds provided by Mrs. Henry Draper for carrying on the photographic study of stellar spectra as a memorial to her late husband; the fund left by the late Uriah A. Boyden for the establishment of a mountain Observatory; and the large bequest of the late Robert Treat Paine. Prof. Pickering points out, however, that the Observatory still stands in need of further endowment, as its new resources are necessarily largely absorbed in those new lines of research for which they were specially designed, and considerable improvements are required in the principal building; and he adds that it is probable that there has never been a time in the history of the institution when so large a return could be obtained from a given expenditure as at present. The most striking results obtained during the year have been those secured by the use of the Henry Draper Memorial Fund in the photographic study of stellar spectra, and which have been already referred to in these columns. Under the Boyden Fund several instruments have been devised and constructed for the automatic registration of the meteorological conditions and general fitness for observing of sites for Observatories, and these have been carefully tested at various elevated stations. The usual observations have also been kept up, including the observation with the meridian photometer of the magnitudes of stars in zones at intervals of 5° in the region covered by the Southern D.M. This work was about half finished, and would, it was expected, be entirely completed within the present year. The east equatorial had been used in the observation of eclipses of Jupiter's satellites and of comparison-stars for variables. A wedge photometer, arranged in a somewhat modified manner, is employed with this telescope, and is to be used in the investigation of the phases of asteroids and in the observation of zones of D.M. stars. The meridian circle is to be engaged in the observation of one of the zones required in the proposed revision of the Southern D.M.

COMET 1888 *a* (SAWERTHAL).—Dr. L. Becker has computed the following elements and ephemeris from observations made on February 18 at the Cape, March 13 at Palermo, and March 27 at Strasburg. From the outstanding deviation of the middle place it may be inferred that unless there be some considerable error in the observations the true orbit will prove to be elliptical.

$T = 1888 \text{ March } 16^{\circ}96412 \text{ G.M.T.}$

$$\left. \begin{aligned} \pi - \Omega &= 359^{\circ}49'45''.1 \\ \Omega &= 245^{\circ}30'40''.2 \\ i &= 42^{\circ}17'47''.4 \end{aligned} \right\} \text{Mean Eq. } 1880^{\circ}0.$$

$\log q = 9^{\circ}844562$

Error of middle place ($O - C$).

$\Delta \alpha \cos \delta = -2'.61s. \quad \dots \quad \Delta \delta = +7''.1.$

Ephemeris for Greenwich, Midnight.

1888	R.A.	Decl.	Log Δ .	Log r .	Brightness.
	h. m. s.	° ' "			
April 20	22 57 31	00 22' 7" N.	0'1517	9'9912	0'3
22	23 2 48	21 44' 3"			
24	23 7 58	23 2' 3"	0'1681	0'0143	0'3
26	23 13 3	24 16' 9"			
28	23 18 2	25 28' 3"	0'1835	0'0369	0'2
30	23 22 55	26 36' 7"			
May 2	23 27 41	27 42' 2" N.	0'1980	0'0588	0'2:

The brightness at discovery is taken as unity.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 APRIL 22-28.

(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 April 22

Sun rises, 4h. 50m.; souths, 11h. 58m. 21' 1s.; sets, 19h. 6m. right asc. on meridian, 2h. 2' 2m.; decl. 12° 26' N. Sidereal Time at Sunset, 9h. 11m.
Moon (Full on April 26, 6h.) rises, 14h. 3m.; souths, 21h. 7m.; sets, 3h. 56m.*; right asc. on meridian, 11h. 12' 3m.; decl. 8° 39' N.

Planet.	Rises.		Souths.		Sets.		Right asc. and declination on meridian.	
	h.	m.	h.	m.	h.	m.	h.	m.
Mercury..	4	31	10	52	17	13	0 55' 3"	3 21' N.
Venus ...	4	21	10	40	16	59	0 44' 1"	3 2' N.
Mars ...	17	24	23	1	4 38*	13	7 0"	5 12' S.
Jupiter ...	21	56*	2	10	6	24	16 12' 7"	20 8' S.
Saturn ...	10	7	18	5	2	3*	8 9' 5"	20 44' N.
Uranus ...	17	11	22	49	4	27*	12 54' 3"	5 4' S.
Neptune..	6	1	13	43	21	25	3 47' 6"	18 18' N.

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

Occultations of Stars by the Moon (visible at Greenwich).

April.	Star.	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image.
			h. m.	h. m.	
22	B.A.C. 3837	6	18 9	19 32	90° 173'
25	65 Virginis	6	4 19	near approach	17 —
28	χ Ophiuchi	6	5 46	6 44	96 316

April. h.
24 ... 22 ... Mars in conjunction with and 3° 16' south of the Moon.
28 ... 1 ... Jupiter in conjunction with and 3° 26' south of the Moon.

Variable Stars.

Star.	R.A.		Decl.		h. m.
	h.	m.	h.	m.	
U Cephei ...	0	52' 4"	81	16' N.	Apr. 22, 3 21 m
U Virginis ...	12	45' 4"	6	10' N.	23, m
V Boötis ...	14	25' 3"	39	22' N.	27, M
δ Libræ ...	14	55' 0"	8	4' S.	24, 22 4 m
U Coronæ ...	15	13' 6"	32	3' N.	24, 1 14 m
S Coronæ ...	15	16' 8"	31	46' N.	25, M
U Ophiuchi...	17	10' 9"	1	20' N.	22, 0 38 m
					27, 1 24 m
β Lyræ...	18	46' 0"	33	14' N.	22, 3 0 M
U Capricorni	20	41' 9"	15	12' S.	26, m
T Vulpeculæ	20	46' 7"	27	50' N.	23, 2 0 m
δ Cephei ...	22	25' 0"	57	51' N.	22, 21 0 m
S Aquarii ...	22	51' 1"	20	56' S.	23, M

M signifies maximum; m minimum.

GEOGRAPHICAL NOTES.

THE death is announced of Nicholas von Miklucho-Maclay, at the age of forty-two years. M. Maclay's name must be familiar to our readers in connection with New Guinea explorations. He was the son of a Russian nobleman, and studied medicine and natural science at St. Petersburg and at several Dutch Universities. In 1866 he accompanied Prof. Haeckel to Madeira; in 1867 he visited the Canary Islands, and, in 1869, Morocco. He then made preparations for an extended exploration among the Pacific Islands, and especially in New Guinea. He went by South America, Tahiti, and Samoa to New Guinea, and remained for over a year, 1871-72, on its north-west coast, afterwards exploring the south-west coast to the south of Geelvink Bay. In 1874-75 he visited Further India, and especially Malacca, where he explored several districts in the interior, and obtained important results. After visiting the Pelew, Admiralty, and other island groups, Maclay again went to New Guinea (1876-78), devoting himself to the north coast, where he was now well known, and was on friendly terms with several Papuan tribes. Maclay then went to Singapore and Sydney to restore his shattered health, but was in New Guinea again in 1879, afterwards visiting several Pacific islands and going on to Sydney once more. He returned to Russia in 1882, bringing with him rich collections in ethnography and in natural history. M. Maclay afterwards resided for some time in Sydney, where he founded a biological station. He recently returned to Russia, and at the time of his death, we understand, was preparing for publication a complete account of his many years' work. At present the records of his travels, with their rich anthropological results, are to be found mainly in the Proceedings of the Batavia Society and the Russian Geographical Society.

We also learn of the death of Herr Anton Stecker, who has done some good exploring work in Africa. In 1878 he accompanied Rohlf's to Kufra, and in 1880 he went out at the expense

of the German African Society to Tripoli, and thence by Egypt and Abyssinia to Galla Land. Herr Stecker's observations referred largely to natural history, of which he was a student.

LIEUT. WISSMANN, the African traveller, who was obliged to spend the winter at Madeira on account of ill-health, there had an opportunity of writing the report of his second journey to Africa. The book has just been published by Brockhaus. At present Lieut. Wissmann is engaged on an account of his first expedition to the south of the Congo Basin, in company with Dr. Pogge.

DRS. FRIEDERICH KURTZ AND WILHELM BODENBENDER, both Professors at the Cordoba University (Argentine Republic), have started on a scientific expedition to the East Andes.

FORESTRY IN THE CAPE COLONY.

THE Report of Consul Siler, the United States representative at Cape Colony, which has been just issued, contains a full account of the present state of forestry in that country. He says that of the 214,000 square miles which are comprised in Cape Colony, there are something over 350 square miles covered with large forest trees. These forests lie almost all together near the sea, running nearly parallel to the coast, in the temperate regions of the southern mountain chains. Till recent years the system of felling pursued was a most wasteful and unsystematic one. Far from confining the operations of the woodcutters to certain limited sections or areas, the authorities permitted them to roam about at pleasure, and to pick and choose from among the forests what trees they should cut down. This license had its natural effect: only the choicest trees were cut, and even of these only selected portions were taken away, the rejected parts being left to cumber the ground. It has been estimated by those skilled in woodcraft that by this pernicious system 30 cubic feet of wood were wasted to each one utilized; and thus it is that many forests have totally disappeared, and even those that were not so easily accessible have been sadly impoverished. Till 1880 no steps were taken to preserve this natural wealth that was being so shamefully abused. In that year, however, the question was strongly urged on the attention of the Colonial Parliament. One of the chief defects of the system was pointed out—namely, the total absence of skilled caretakers, those then in charge having received no technical education whatever; and to meet this in some measure Parliament at once voted a sum of money to pay a trained superintendent. The choice fell on Count de Vasselot, who had had wide experience in French forestry at Nancy, and he at once proceeded to lay the foundations of the present forest department at the Cape. One of his first steps was to divide the forests into districts, which he again subdivided into sections, and to direct that felling should proceed in sections, the re-growth of the first section being given time to develop into mature trees before the axe was again used in that section. By this system the entire shutting up of any forest for a time is done away with. At present the period for the "revolution" of fellings is fixed at forty years. The tariffs now vary for standing timber from 2 cents to 6 cents per cubic foot of sound wood; with the exception of stinkwood (*Oreodaphne bullata*), which, being very hard and very valuable, was almost threatened with extermination, for which the price is 24 cents per cubic foot. Poles from 6 inches to 10 inches in diameter are sold at the rate of 2 cents per running foot; spars from 4 inches to 6 inches in diameter at 12 cents per 100 running feet.

The Consul illustrates the general system of managing and preserving the forests now followed in the colony by a minute description of that used in Knysna, the most extensive and most valuable of all the Cape forests. The total area of the Knysna may be roughly stated to be 100,000 acres, and of this magnificent forest almost three-fourths have been impoverished and in fact exhausted by the indiscriminate and reckless system of felling pursued in the past. At present the staff to conserve and replant this forest consists of one conservator, three superior grade officers, and six rangers or guards. Each higher grade officer has the superintendence of a tract of woodland varying in extent from 10,000 to 30,000 acres, in which he surveys the large timber, fixes the limits of the blocks or series, and plans out the boundaries of the various sections. No works are sanctioned without the consent of the Superintendent of Woods and Forests, and, if he has given his approval, the sections are surveyed and the trees fit for felling are marked with an official stamp. The

duties of the rangers are to ride about their districts and endeavour to discover any breaches of the forest regulations, and in cases of successful prosecution they are rewarded according to the zeal and ability displayed by them. Besides the officers above-named, there are thirteen foresters distributed over the different woods, whose duty it is to plant, and, if necessary, transplant trees, and to take care of young trees. These men are paid at the rate of \$20 a month, are provided with free quarters and ten acres of garden land, and are paid a bonus of \$2.50 per 1000 for planting nursery plants, \$2.50 per 1000 for 1-foot trees in the forest, or for nursery work and transplanting \$5 per 1000 trees. This bonus cannot in the case of any individual forester exceed \$200 in the year, without special permission. Each forester is expected to raise at least 40,000 young trees annually. So far as can at present be judged, seeing that the system has had but a few years' trial, it has undoubtedly proved a success. To show the amount of work that some of these foresters get through, it may be mentioned that in King William's Town forests in the year 1885 six foresters planted in the course of the year 138,080 plants in the nursery, and transplanted from the nursery into the forests 63,885 young trees. With the object of encouraging these valuable efforts to preserve the forests and to increase the area under timber, the Colonial Government has laid out several large tracts of land into plantations and nurseries, and although these are but of very recent formation they have already proved their utility in the reforestation of the country. At the Government nurseries there are at the present moment over one million plants flourishing. In the working of these nurseries and plantations, convict labour has been utilized as largely as possible, and by this means the cost of the convict prisons has largely diminished. One other work in this connection of the Colonial Government is worthy of remark. At the plantation of Tokai, on the Table Mountain range, 150 species of extra-tropical trees have been introduced, and from them plants have been raised, with which it is proposed to reforest the whole Table Mountain slopes, and already, in the short space of two seasons, 1000 acres have been replanted. From all the Government nurseries plants can be purchased at a nominal rate, and this, together with a recent Act whereby public bodies receive Government aid to the extent of one-half their expenditure on replanting, has given a strong stimulus to, and has aroused general interest in, the science of arboriculture among the colonists. Following the example of many American States, their first "arbor day," in 1886, was proclaimed a public holiday; and so great was its success that it is very likely to become a permanent institution. The Consul concludes his Report by saying that it is confidently hoped that with such machinery at work and with a growing interest in the advantages of tree-cultivation, in the future, Cape Colony will be independent of foreign markets for her timber supply; and that it is probable that the presence of forests, by increasing the rainfall, will bring tracts which are at present barren into cultivation.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 22.—"On the Skull, Brain, and Auditory Organ of a new Species of Pterosaurian (*Scaphognathus Purdoni*) from the Upper Lias, near Whitby, Yorkshire." By E. T. Newton, F.G.S., F.Z.S., Geological Survey. Communicated by Dr. Archibald Geikie, F.R.S.

The fossil Pterodactyl skull, which is the subject of this communication, was obtained from the Upper Lias of Lofthouse, near Whitby, by the Rev. D. W. Purdon, of Wolverhampton. It is the first Pterodactyl found in the Yorkshire Lias, and is a new form, allied to the Continental Jurassic species *Scaphognathus (Pterodactylus) crassirostris* of Goldfuss. The structure of the skull, including the back, base, and palatal regions, is better shown than in any previously discovered specimen; and in addition to this the brain and parts of the auditory organs have been exposed.

In its present condition the skull is about five and a half inches long; but apparently about two inches of the front are wanting. The elongated snout gives the skull a very bird-like appearance; but its most striking features are the five apertures, surrounded by bone, seen on each side. The orbit is the largest of these apertures; in front of this, and next in size, is the ant-orbital fossa; still further forward is the somewhat smaller external