and Nebulæ." It will be published shortly by Messrs. Roper and Drowley.

THE Fifteenth Annual Report of the progress of the Geological and Natural History Survey of Minnesota, by Mr. N. H. Winchell, State Geologist, has been issued. This Report relates chiefly to the geology of the iron-bearing rocks. It seems that during the last two years great interest has been manifested with regard to the iron industry in Northern Minnesota.

WE have received Part 3 of the twenty-first volume of the Journal and Proceedings of the Royal Society of New South Wales. Among the contents are papers on Port Jackson silt beds, by F. B. Gipps; some New South Wales tan-substances, parts 3 and 4, by J. H. Maiden, Curator of the Technological Museum, Sydney; soils and subsoils of Sydney and suburbs, by J. B. Henson; quarantine and small-pox, by J. Ashburton Thompson; on the presence of fusel-oil in beer, by W. M. Hamlet; autographic instruments used in the development of flying-machines, by Lawrence Hargrave.

PART 1 of the seventh volume of the "Encyclopædic Dictionary" (Cassell and Co.) has just been issued. This carefully-compiled work, as we have repeatedly had occasion to note, contains all the words in the English language, with a full account of their origin, meaning, pronunciation, and use. Great pains are taken to secure that scientific terms shall be properly explained.

MESSRS. OLIVER AND BOYD are about to publish "India in 1887, as seen by Robert Wallace, Professor of Agriculture and Rural Economy in the University of Edinburgh." The author was four months in India and Ceylon, and made inquiry as to the breeds of cattle and horses, and as to the condition of native agriculture, soils, irrigation, &c. The work contains 290 illustrations. Prof. Wallace especially wished to "learn in an unmistakable manner what fruits the Cirencester College training had borne."

WE have received Parts 1 and 2 of "The Speaking Parrots," by Dr. Karl Russ (Upcott Gill). Much useful information is given as to the purchase and reception of parrots, the cages in which they ought to be kept, their food, the best way of taming and training them, the preservation of their health, and as to their diseases.

AN Australian edition of Longmans' "School Geography," by Mr. George G. Chisholm, has just been issued. For this edition the sections on Australasia and the British Isles have been entirely re-written, and modifications have been made in other parts of the text with the view of calling attention to matters of special interest in Australia and New Zealand.

A NEW catalogue of mathematical works has been issued by Messrs. Dulau and Co.

THE current number of the *Technology Quarterly* opens with an interesting paper, by Mr. James P. Munroe, on the beginning of the Massachusetts Institute of Technology. The Institute was legally established on April 10, 1861, after more than two years of almost constant effort in the face of opposition and discouragement.

IT has been decided that the Miss Williams Scholarship for Women, of the annual value of £20, tenable for three years, shall be offered at the entrance scholarship examination at University College, Cardiff, on September 18, and that it may be held with a College exhibition. As it is specially intended to encourage the higher education of women in Wales, preference will be given to the children of Welsh parents.

A COLLECTION of American pottery for the American National Museum is about to be made by Dr. David T. Day of the United States Geological Survey. *Science* says that the collection of Sèvres pottery presented by the French Government is an exceedingly fine one, as is also that of Japanese ceramics; and the department of Indian pottery is not approached elsewhere in the world. But the Museum possesses very little modern American pottery.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. A. B. Parker; a Larger Hill-Mynah (*Gracula intermedia*) from North India, presented by Mrs. M. von Kornatzki; two Naked-footed Owlets (*Athene noctua*) from France, presented by Miss Pierce; a Swainson's Lorikeet (*Trichoglossus novæ-hollandiæ*) from Australia, presented by Mr. H. A. Hankey; two Loggerhead Ducks (*Tachyeres cinereus*) from the Falkland Islands, presented by Mr. Archibald McCall; a Duyker-bok (*Cephalophus mergens* ♀) from South Africa, a Red-legged Partridge (*Caccabis rufa*), a Barbary Partridge (*Caccabis petrosa*), five —— Pigeons (*Columba ballii*) from Teneriffe, deposited; a Bennett's Wallaby (*Halmaturus bennetti* ♀), two Long-fronted Gerbilles (*Gerbillus longifrons*) born in the Gardens; a Yellow-legged Herring Gull (*Larus cachinnans*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

ROTATION PERIOD OF THE SUN FROM FACULÆ.—The fifth part of vol. iv. of the Publications of the Astrophysical Observatory at Potsdam has recently appeared, and contains a determination by Dr. J. Wilsing of the rotation period of the sun from observations of faculæ. The previous determinations of the solar rotation have been based upon observations of the spots, or upon the relative displacement of lines in the spectra of the east and west limbs, for, as faculæ can usually only be seen well when near the limb, and therefore can seldom be watched for more than three consecutive days, and as they often undergo rapid changes, they did not seem well suited for such a discussion. Their irregular and often straggling shapes, too, render measures of their positions much less precise than those of spots. Notwithstanding these difficulties Dr. Wilsing's inquiry seems to have met with a measure of success. Of the faculæ shown on the solar photographs taken at Potsdam from 1884 March 14 to August 31, 144 groups were seen at three or more different epochs, at intervals of one or more semi-rotations. Arranging these according to their distribution in solar latitude, in zones of 3° wide, Dr. Wilsing finds practically the same rotation period for each zone from + 24° to − 33°, the difference from the mean of the daily angular motion only exceeding 2′ in a single instance, and in many cases amounting only to 20″ or 30″. As these differences are so small and follow no law, it would appear that, whilst, as Carrington and Spoerer have shown, the different spot zones have different rates of rotation, the layer of the faculæ rotates as a whole. Since the faculæ are certainly at a higher level than the spots, this conclusion is one which will fail to be accepted until we have much further and more convincing evidence than we have at present. In the present discussion it sometimes happens that a group of faculæ is considered as identical with an earlier group seen two or three semi-rotations earlier, when the same part of the sun has been seen in the interval, but without showing the group, although the district has been favourably presented for displaying faculæ. In such a case, and particularly if several semi-rotations have elapsed, the two groups will be identified or not according to the rotation period assumed; so that if a single rotation period for the whole sun be assumed in the preliminary reductions of position for the sake of identification of the groups, there will be an inevitable tendency towards a single rotation period in the final result.

The mean daily angular velocity given by the faculæ is 14° 16′ 11″·3, corresponding to a sidereal period of 25d. 5h. 28m. 12s., the values for the northern and southern hemisphere, taken separately, differing only by 11″·5. It is worthy of note that this corresponds to the rotation period of spots about latitude 10°, as given alike by Carrington and Spoerer's formulæ, and that the two zones 5° to 15° yield the greater number both of spots and faculæ which are available for these investigations. The present discussion, with whatever reserve its conclusions are to be accepted,

is, however, both interesting and important and should lead to further inquiries in the same direction, when a more extended series of observations should be laid under contribution.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 JULY 1–7.

(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 July 1

Sun rises, 3h. 50m.; souths, 12h. 3m. 38·5s.; sets, 20h. 17m.: right asc. on meridian, 6h. 43·5m.; decl. 23° 4′ N. Sidereal Time at Sunset, 14h. 58m.

Moon (at Last Quarter July 1, 4h.) rises, 0h. 8m.; souths, 6h. 9m.; sets, 12h. 22m.: right asc. on meridian, 0h. 47·5m.; decl. 0° 16′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	5 9 ...	12 51 ...	20 33 ...	7 31·5 ...	18 16 N.
Venus ...	3 33 ...	11 51 ...	20 9 ...	6 31·2 ...	23 41 N.
Mars ...	13 16 ...	18 35 ...	23 54 ...	13 15·9 ...	8 46 S.
Jupiter ...	16 35 ...	20 59 ...	1 23*...	15 40·5 ...	18 42 S.
Saturn ...	6 6 ...	13 55 ...	21 44 ...	8 34·7 ...	19 22 N.
Uranus...	12 29 ...	18 9 ...	23 49 ...	12 49·5 ...	4 36 S.
Neptune..	1 32 ...	9 18 ...	17 4 ...	3 57·8 ...	18 49 N.

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

Comet Sawerthal.

July.	h.	Right Ascension. h. m.	Declination. ° ′
1 ...	0 ...	1 1·0 ...	47 51 N.
5 ...	0 ...	1 3·6 ...	48 44

July. h.
3 ... 17 ... Sun at greatest distance from the Earth.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·4 ...	81 16 N. ...	July	5, 22 12	*m*
R Sculptoris ...	1 21·8 ...	33 7 S. ...	,,	4,	*M*
V Tauri	4 45·6 ...	17 21 N. ...	,,	2,	*M*
T Cancri	8 50·3 ...	20 17 N. ...	,,	6,	*m*
R Leonis Minoris.	9 38·9 ...	35 2 N. ...	,,	3,	*M*
W Virginis	13 20·3 ...	2 48 S. ...	,,	7, 21 0	*M*
δ Libræ	14 55·0 ...	8 4 S. ...	,,	6, 1 36	*m*
U Coronæ	15 13·6 ...	32 3 N. ...	,,	2, 2 18	*m*
R Ursæ Minoris ...	16 31·5 ...	72 30 N. ...	,,	7,	*m*
U Ophiuchi... ...	17 10·9 ...	1 20 N. ...	,,	3, 23 46	*m*
U Sagittarii... ...	18 25·3 ...	19 12 S. ...	,,	3, 1 0	*M*
β Lyræ...	18 46·0 ...	33 14 N. ...	,,	2, 3 0	*M*
R Lyræ	18 51·9 ...	43 48 N. ...	,,	3,	*M*
η Aquilæ	19 46·8 ...	0 43 N. ...	,,	2, 1 0	*m*
S Sagittæ	19 50·9 ...	16 20 N. ...	,,	6, 1 0	*m*
S Cygni	20 3·2 ...	57 40 N. ...	,,	1,	*M*
X Cygni	20 39·0 ...	35 11 N. ...	,,	6, 23 0	*m*
T Vulpeculæ ...	20 46·7 ...	27 50 N. ...	,,	2, 1 0	*M*
			,,	3, 2 0	*m*
δ Cephei	22 25·0 ...	57 51 N. ...	,,	7, 0 0	*m*
R Cassiopeiæ ...	23 52·7 ...	50 46 N. ...	,,	7,	*M*

M signifies maximum; *m* minimum.

GEOGRAPHICAL NOTES.

AT Monday's meeting of the Royal Geographical Society, Lieutenant Wissmann was present, and was formally presented by the President with the gold medal which has been awarded to him by the Society for his exploring work in Africa. Lieutenant Wissmann afterwards gave some account of his explorations in the region to the south of the great Congo bend. He began his African work eight years ago in company with the late Dr. Pogge, with whom he traversed the region lying between Loanda and Nyangwe on the Upper Congo. The Kassai and several others of the great rivers that flow north to the Congo were crossed, and a large area of new country, thickly covered with an interesting population, opened up. Dr. Pogge returned to the west coast, whilst Lieutenant Wissmann proceeded from Nyangwe to Zanzibar. He returned to Africa a second time in the service of the King of the Belgians, and in company with Dr. Wolf, Lieutenant von François, and others, made his way again from Loanda into the interior. During the period between 1884 and 1887, Lieutenant Wissmann explored the Great Kassai, and did much to unravel the complicated system of rivers, of which it is the centre. Moreover, his observations on the people, as well as the fauna and flora, render his work of great scientific value. He again crossed to Nyangwe, and, by Lakes Tanganyika and Nyassa, reached the east coast at the mouth of the Zambesi. He returned to Europe in the autumn of last year, with his health shattered, and was compelled to go to Madeira to recruit. Now Lieutenant Wissmann returns to Germany, and will no doubt there work out the results of his eight years' work in Africa. Already one volume has been published, dealing with the exploration of the Kassai-Sankuni.

CAPTAIN W. J. L. WHARTON, the Hydrographer, also read a paper at Monday's meeting of the Royal Geographical Society. He described the results of a very complete examination which has recently been made of Christmas Island, in the Indian Ocean, some 200 miles south of the western end of Java. The island is a peculiar one, and extremely difficult to explore. It consists apparently of high cliffs of coral, covered with the densest vegetation. After describing the results of examination by Captain Aldrich and others, Captain Wharton concluded by giving a summary of the conclusions to be drawn. We have, he said, a high island, on the surface of which, wherever examined, we find limestone, bearing in most places the appearance of coral origin, though in some specimens the shells of the Foraminifera abound, and in none of them have direct evidences of coral structure been detected. It must be remembered, however, that coral limestone becomes so altered by the deposition of lime by infiltration, that a large surface of it may be searched before a piece retaining its coralline structure is found, and that the specimens sent home are very small. From the description of Captain Aldrich, who is well acquainted with coral formations, it may be taken for granted that the majority of this rock is of coral origin. The rock forming the summit is of this structureless character. In two spots, and at the bottom of a hole in the summit of the ridge, we have volcanic rock. The island is very steep on all sides, great depths being found close to the cliffs, while on all sides, at a short distance, soundings over three miles in depth were obtained. It appears, then, most probable that Christmas Island is founded on a volcanic mound which rose from the bottom to a certain distance from the surface of the sea; that Foraminifera shells dying on the surface were rained upon it in sufficient number to form a stratum, since solidified into limestone rock; that as the mound neared the surface, corals built upon it, and it is possible from the sketch of the island, and from Captain Aldrich's description of the slope of the ridge inwards, that it first assumed an atoll form. This, however, is a mere inference from probabilities. The island was next gradually upheaved, the coral growing outwards on the gentle slope until a period of immobility ensued long enough to permit the waves to erode the upper cliff. Another short period of upheaval, and one of stationary character ensued, when the second cliff was worn away. A third interval of upheaval, probably longer than the others, and then a second stand, when the lowest and highest inland cliff was formed. Finally, another lift was given, and the stationary period now in existence completed the process. The volcanic stones found in various places on the higher parts of the island point to a thinning of the limestone covering in those places. Denudation has worn away the limestone, and the volcanic core is consequently exposed. Man has never lived on Christmas Island, nor would it be a pleasant residence, as, apart from the fact that there is no water—the rain sinking into the limestone rock—the extreme discomfort of locomotion, and the absence of any harbour whence the produce that might possibly be raised could be conveniently shipped, will deter any settlers from seeking a home there until other more favourable spots are occupied. There is no other instance with which Captain Wharton is acquainted of an island of this height retaining its coral covering so intact. Coral reefs have been found at heights of 1000 feet in Cuba, in the Fiji Islands, and other places; but in all cases they are mere fragments, and the intervening spaces show no signs of coral. Further and closer investigation may record more direct evidence of its structure, and of the successive steps which have resulted in its present condition; but the Hydrographer thought our present knowledge of Christmas Island was sufficient to make this short notice interesting to the Society.