others, as bearing a wonderful resemblance to the Chinese, and if, instead of wearing their hair cut round their heads so as to form a kind of mop, they wore pigtails, the casual observer would scarcely be able to tell where the difference lay. The hideous custom for which the Botocudos have always been so famous, viz. that of wearing huge lip- and ear-ornaments of wood, is fast dying out, and at the present time is only to be met with among some of the older members of the tribes, who retain all the habits and manners of their primitive forefathers intact.

THE January number of *Petermann's Mitteilungen* contains a paper by Count Pfeil, describing his journey last summer in East Africa, from Pangani along the Pangani River, south through Useguha to the Kingani River, and north to Bagamoyo. Dr. Henry Lange briefly describes the region watered by the Rio Tubarao and Rio Ararangua in Brazil. Dr. H. Fritsche contributes a series of astronomico-geographical and magnetic observations at thirty-one places in North-West Russia and North Germany in 1885-6-7, and Mr. S. Brooke gives a short acount of an excursion he made into the West Australian desert, starting from Israelite Bay on the south coast.

IN the January number of the *Scottish Geographical Magazine*, Mr. John Murray publishes the final results of his long research on the height of the land and the depth of the ocean. The paper consists mainly of a series of elaborate measurements giving the detailed data on which he founds his general conclusions. The conclusions to which Mr. Murray comes are of great interest, but they are too important to be stated in a note. The mean height of the land of the globe he estimates at 2252 feet. He finds that 84 per cent. of the land of the globe lies between the sea-level and a height of 6000 feet. The mean depth of the ocean again is 14,640 feet. In contrast with the land, only 42 per cent. of the waters of the ocean lie between the surface and a depth of 6000 feet; while 56 per cent. of the ocean waters are situated between depths of 6000 and 18,000 feet. The total area of the dry land Mr. Murray makes to be 55,000,000 square miles, while that of the ocean is 137,200,000 square miles. The bulk of the dry land above the sea is 23,450,000 cubic miles, and the volume of the waters of the ocean 323,800,000 cubic miles. The amount of matter carried from the land each year in suspension and solution, he estimates at 3·7 cubic miles; it would thus take 6,340,000 years to transport the whole of the solid land down to the sea. Should the whole of the solid land be reduced to one level under the ocean, then the surface of the earth would be covered by an ocean with a uniform depth of about two miles. The volume of the whole sphere, Mr. Murray estimates at 259,850,117,778 cubic miles. With the data now published should be compared Mr. Murray's Aberdeen lecture (NATURE, vol. xxxii. p. 581).

IN the last number of the *Comptes rendus* of the Paris Geographical Society, M. Chaffaujon gives a detailed narrative of his recent journey up the Orinoco. The section of greatest interest is that which relates to the upper course of the river, which M. Chaffaujon found to be all wrong on existing maps. This he has traced with much care. He examined also with care the outlet of the Casiquiare, by which the river is connected with the Rio Negro and the Amazons. He finds the bank of the river here to be mostly gravel, and in the rainy season the river coming down from the mountains with considerable force impinges against the bank, and forces a passage out. He states that the place of outlet seems to be shifting downwards every year.

THE TOTAL ECLIPSE OF THE MOON, JANUARY 28.

A TOTAL eclipse of the Moon offers some special advantages for the exact determination of the diameter and distance of our satellite. Observations of the bright limbs are exposed to considerable errors from the effect of irradiation, and liable to be affected by personal habit in the observer. The method of occultations has, under ordinary circumstances, proved scarcely more successful, owing chiefly to the fact that immersion and emersion so seldom take place under similar conditions. But in a total eclipse of the Moon, the disappearances and reappearances occur at limbs under similar illumination, and since the diminution of the Moon's light allows much fainter stars to be seen close to the Moon than can usually be observed, a much greater number of observations can be made than under ordinary conditions, and the effects of local irregularities of the Moon's circumference can be eliminated by observations made at a great number of points. If, then, as many Observatories as possible would combine to observe the occultations of the small stars passed over by the Moon during its eclipse, the labours of a few hours would give materials for a better determination of its diameter and parallax than could otherwise be obtained from the observations of many years. In view of these advantages, and noting too how hitherto they had been neglected by astronomers, Dr. Döllen, of Pulkowa, published a paper in the *Astronomische Nachrichten*, No. 2615, previous to the eclipse of October 4, 1884, in which he gave a catalogue of 116 stars which would be occulted during that eclipse, and begged for the co-operation of as many observers as possible. Unfortunately, the weather in many places was very unfavourable, and even where the sky was clear an unforeseen hindrance to observation was experienced in the unusual faintness of the eclipsed Moon. The part of the sky, too, through which it was passing was bare of stars above the 9th and 10th magnitudes. Still the results were sufficiently successful to encourage Prof. Struve and Dr. Döllen to repeat the attempt, especially as under several aspects the approaching eclipse of January 28 presents more favourable conditions than that of October 4, 1884: the magnitude of the eclipse will be somewhat larger, and the duration of the total phase a few minutes longer. Accordingly, Dr. Döllen has drawn up a catalogue of 300 stars which will be occulted, whilst Prof. Struve has computed by a graphical method the times of disappearance and reappearance, and the position-angles of the occulted stars, for 120 Observatories, which he has invited to co-operate with him in the work of observation. The experience gained during the 1884 eclipse has led Dr. Döllen to include only those stars occulted during the total phase or immediately before and after, but he has thought it well to give stars down to the 11th magnitude.

Of the 300 stars given in Dr. Döllen's catalogue, the majority of course will not be seen to be occulted from any part of this country. The following, however, may be observed here:—

No.	R.A.	Decl.	No.	R.A.	Decl.
87	130 25′·18	17 26′·95 N.	164	131 3′·87	17 26′·81 N.
91	27·98	35·12	165	3·96	25·64
93	28·70	35·57	166	4·48	32·90
97	29·14	45·66	172	6·26	17·96
98	29·53	37·64	180	10·35	32·80
100	30·08	38·14	181	12·61	38·34
102	30·18	23·95	190	16·58	12·54
108	34·21	44·27	192	18·52	44·17
110	35·90	30·12	194	19·26	38·34
112	36·51	47·21	197	21·11	19·06
114	130 37·43	17 19·16 N.	198	131 21·33	17 26·69 N.
115	37·44	47·07	201	23·15	37·63
116	37·89	48·54	207	24·96	26·65
124	40·69	49·34	209	25·71	22·85
125	40·76	18·56	210	26·11	30·07
126	41·76	30·46	212	28·48	17·66
128	43·50	34·10	216	30·76	17·96
130	45·17	45·27	219	31·77	8·64
134	48·24	42·16	221	32·45	35·77
136	49·50	45·96	223	32·58	26·14
138	130 50·10	17 26·35 N.	224	131 33·05	17 32·50 N.
142	54·18	18·36	225	33·65	22·31
144	54·71	35·17	226	33·71	13·84
148	56·91	38·34	233	37·74	9·24
150	57·53	22·75	236	39·74	21·26
152	57·97	28·93	237	40·51	30·82
153	59·04	22·95	242	43·43	17·36
155	59·88	15·96	247	48·32	24·55
156	131 0·48	36·32	248	48·44	11·24
157	0·75	39·91	251	49·29	9·44

The positions given are the apparent positions for January 28, 1888, and are expressed for R.A., as well as declination, in degrees, minutes of a degree, and hundredths of a minute.

The following are the times of disappearance and reappearance as furnished by Prof. Struve for the stars which will be occulted

by the Moon at Greenwich. The angles are counted from the true North through the true East as in observations of double stars, &c. :—

Disappearances.

Star's No.	Angle. °	G.M.T. h. m.
148	74	10 23·1
152	107	25·8
156	80	30·5
Beginning of total phase		
150	131	10 32·3
157	65	33·8
153	128	34·8
142	154	37·1
166	89	38·7
164	111	39·7
165	116	41·1
180	86	52·0
155	163	55·3
172	145	58·8
181	63	11 1·3
198	100	17·6
194	57	18·6
197	127	24·4
207	97	25·5
201	56	27·8
210	84	28·1
209	110	29·4
190	164	34·2
212	127	41·2
223	94	42·9
216	124	45·3
224	70	46·4
225	107	46·9
221	56	49·4
226	138	58·2
236	105	12 0·8
237	70	3·5
End of total phase		
242	116	12 11·9
219	168	12·1
233	155	17·4
247	87	19·1

Reappearances.

Star's No.	Angle. °	G.M.T. h. m.
87	243	10 22·3
97	316	23·6
124	351	29·3
116	339	30·2
102	234	30·2
Beginning of total phase		
91	277	10 32·3
112	330	32·7
93	278	33·7
115	331	34·6
98	286	34·6
114	211	35·1
100	288	35·4
108	314	35·7
125	211	42·5
110	264	50·1
130	328	53·1
136	337	57·9
126	269	11 3·7
134	317	6·4
128	283	6·6
138	260	22·1
142	228	22·3
144	294	29·8
148	308	30·2
155	221	31·5
157	318	34·5
150	252	38·1
156	303	40·3
152	275	40·6
153	254	41·8
166	294	52·6
164	273	54·4
172	240	54·5
165	268	54·7
181	322	59·7
180	298	12 4·8
End of total phase		
190	222	12 10·9
194	328	11·2
201	330	19·4

The following table gives the magnitude of the occulted stars :—

Star's No.	Mag.	Star's No.	Mag.	Star's No.	Mag.	Star's No.	Mag.
100	9·5	150	10	181	10	219	10
108	9·3	153	10	197	10	221	10
126	9·5	157	9·4	198	9·5	225	10
128	9·5	164	8·0	201	8·7	226	10
136	9·5	165	9·4	209	10	236	9·5
142	10	166	9·5	210	9·5	247	9·2
148	10	180	9·5	216	10		

The remaining stars are all of the eleventh magnitude.

It would be advisable for intending observers to make a rough map of the stars they are to observe, and to acquaint themselves as completely as they are able with their configuration. The observations should be rehearsed as far as possible on previous evenings, that the necessary quickness in changing from one point of the Moon's limb to another may be acquired, and a fair acquaintance made with the sequence of the settings. It will be well probably, to somewhat reduce the list of stars for observation; since some of the phenomena follow each other so closely that some must be lost, and if the work of selection is left for the actual time of observation probably more stars will be lost than necessity demands, and a risk of confusion and mistake will be incurred. The suggestion has also been made that the eye-piece to be employed should not be placed as usual in the centre of the field, but be made to revolve round it at the distance of the Moon's radius. The Moon would then be brought to the centre of the field, and kept there throughout the entire series of observations, and only the eye-piece would be moved. A fairly high power will probably be found the best for the work.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Among the lectures for the present term we note the following:—

Chemistry: Prof. Dewar, on Organic Chemistry; Mr. Pattison Muir (Caius), on Chemical Affinity; Mr. Heycock (King's), on Chemical Philosophy for Natural Sciences Tripos, Part I.; Mr. Robinson, on Agricultural Chemistry.

Physics: Prof. Stokes, Physical Optics; Prof. J. J. Thomson, Properties of Matter; Mr. Shaw (Emmanuel), Thermodynamics and Radiation.

Geology: Prof. Hughes, Geology of a District to be visited at Easter; Mr. Marr, Principles of Geology.

Botany: Mr. Gardiner, Advanced Anatomy of Plants; Mr. Potter, Advanced Systematic Botany.

Zoology: Prof. Newton, Geographical Distribution of Vertebrates; Mr. Sedgwick, Morphology of Mollusca and Echinodermata; Mr. Gordon, Morphology of Amniota, recent and extinct.

Physiology: Dr. Lea, Chemical Physiology; Mr. Langley, Advanced Histology and Physiology; Dr. Gaskell, Advanced Physiology of Vascular System.

Prof. Ray lectures on Pathology, and has practical classes; Prof. Latham on the Physiological Actions and Therapeutical Uses of Remedies; Dr. Anningson gives demonstrations in Practical Hygiene.

In Mathematics the following are among the lectures:—Prof. Cayley, Analytical Geometry; Mr. Forsyth, Modern Algebra, symbolical methods and ternary forms; Dr. Ferrers, Elliptic Functions; Dr. Besant, Integral Calculus, Definite Integrals, Mean Value and Probability, Calculus of Variations, and Differential Equations; Mr. Ball, History of Mathematics up to 1637; Mr. Mollison, Discontinuous Functions and Conduction of Heat; Mr. Whitehead, Grassmann's Ausdehnungslehre, with special reference to its applications.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 22, 1887.—"The Early Stages in the Development of *Antedon rosacea*." By H. Bury, B.A., F.L.S., Scholar of Trinity College, Cambridge. Communicated by P. Herbert Carpenter, D.Sc., F.R.S., F.L.S.

In the orientation of the larva, J. Barrois' suggestion (*Comptes rendus*, November 9, 1886) has been adopted, viz. that the stalk of the Pentacrinoid represents the præoral lobe of other Echinoderms. Besides the right and left body-cavities, an anterior unpaired body-cavity is developed (distinct from the hydrocele), and opens to the exterior by the water-pore in the free-swimming larva.

A larval nervous system is developed, but is lost after fixation.

The vestibule of the fixed larva (Cystid) is formed by invagination, as described by Barrois (*Comptes rendus*, May 24, 1886).

The water-tube (stone canal), by opening into the anterior body-cavity (now very small), places the water-vascular ring in indirect communication with the exterior.

The anus opens in the same interradius as the water-pore.

In the skeleton, besides the parts already known, three underbasals are present, which are of great phylogenetic interest.

Geological Society, December 21, 1887.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—On the correlation of some of the Eocene strata in the Tertiary basins of England, Belgium, and the north of France, by Prof. Joseph Prestwich, F.R.S. Although the relations of the several series have been for the most part established, there are still differences of opinion as to the exact relation of the Sable de Bracheux and of the Soissonnais to the English series; of the Oldhaven Beds to the Woolwich series; and of the London Clay and Lower and Upper Bagshots to equivalent strata in the Paris basin. The author referred to the usual classification of the Eocene series, and proceeded to deal with each group in ascending order. The Calcaire de Mons is not represented in England, but may be in France by the Strontianiferous marls of Meudon. It contains a rich molluscan fauna, including 300 species of Gasteropods, many of which are peculiar, but all the genera are Tertiary forms. The Heersian are beds of local occurrence, and the author sees no good reason for separating them from the Lower Landenian or Thanet Sands. He gave reasons for excluding the Sands of Bracheux from this group. Out