

branches of science. The memoirs are "not for the specialist, but interesting and popular expositions of what the specialist knows to be sound and opportune." A number of the memoirs are reprints of addresses and articles which have appeared in NATURE, some are original articles, and others are translations or reprints from contributions to various scientific publications. Almost every phase of scientific activity seems to be included among the papers, and many subjects are illustrated by fine half-tone pictures. The Smithsonian Institution does good service to science by the publication of these sound and instructive surveys of the state of natural knowledge.

THE additions to the Zoological Society's Gardens during the past week include a Smooth-headed Capuchin (*Cebus monachus*) from South-east Brazil, presented by Mr. Herbert Gibson; a Palm Squirrel (*Sciurus palmarum*) from India, presented by Miss Aggie O'Connor; a Kinkajou (*Cercoptes caudivolvulus*, ♀) from South America, presented by Mr. J. J. Quelch; a Mexican Guan (*Ortalis vetula*) from Cartagena, Colombia, presented by Captain W. H. Milner; a Martinique Gallinule (*Zonornis martinicus*), captured at sea, presented by Mr. H. O. Milner; a Leith's Tortoise (*Testudo leithi*) from Egypt, presented by Mr. S. S. Flower; a Black-tailed Wallaby (*Macropus ualabatus*, ♀) from New South Wales, three Rabbit-eared Bandicoots (*Perogale lagotis*, 3 ♂), two Spotted Bower Birds (*Chlamydotera maculata*) from Australia, two Westermann's Cassowaries (*Casuarus westermanni*) from New Guinea, a White-throated Monitor (*Varanus albigularis*) from South Africa, two Starred Tortoises (*Testudo elegans*) from India, four Elephantine Tortoises (*Testudo elephantina*) from the Aldabra Islands, deposited.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JUNE:—

- June 1. 14h. 53m. to 15h. 40m. Occultation of the star 19 Piscium (mag. 5.2) by the moon.
- 7. 16h. 43m. to 17h. 53m. Partial eclipse of the sun visible at Greenwich. The greatest phase occurs at 17h. 17m., at which time 0.188 (nearly one-fifth) of the sun's disc will be obscured. At places N.W. of Greenwich the eclipse will be of somewhat greater magnitude.
- 11. 2h. Saturn in opposition to the sun.
- 15. Illuminated portion of the disc of Venus 0.904, of Mars 0.913.
- 20. 11h. 30m. Minimum of the variable star Algol (β Persei).
- 22. 7h. Saturn in conjunction with the moon.
- 23. 8h. 19m. Minimum of the variable star Algol (β Persei).
- 23. 10h. 34m. to 11h. 41m. Occultation of B.A.C. 6343 (mag. 5.8) by the moon.
- 24. 13h. 17m. to 14h. 12m. Occultation of f Sagittarii (mag. 5.1) by the moon.
- 25. 10h. 45m. to 11h. 48m. Occultation of B.A.C. 7145 (mag. 6.0) by the moon.
- 27. 12h. 59m. to 14h. 2m. Occultation of κ Aquarii (mag. 5.5) by the moon.
- 28. 11h. 22m. to 12h. 10m. Occultation of κ Piscium (mag. 5) by the moon.

COMET 1899 a (SWIFT).—

Ephemeris for 12h. Berlin Mean Time.

1899.	R.A.	Decl.	Br.
	h. m. s.		
June 1	17 58 35	+ 50 13.1	
2	17 36 8	55 13.8	1.34
3	17 15 28	54 1.7	
4	16 56 46	52 39.2	1.18
5	16 39 54	51 9.5	
6	16 24 46	49 34.6	1.03
7	16 11 13	47 57.1	
8	15 59 12	+ 46 18.1	0.88

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The comet is now passing with a greatly accelerated motion in a south-westerly direction. During the week it will traverse the constellations Draco and Hercules; on the 1st it passes close to ξ Draconis, while on the 8th it will be a little more than 1° north-west of φ Hercules. In *Astr. Nach.*, No. 3567, Prof. A. A. Nijland, of Utrecht, says that, viewed with a finder of 74 mm. aperture on May 5, the comet appeared about 5.5 mag., having a tail about 1°.5 in length.

TEMPEL'S COMET (1873 II.).—

Ephemeris for 12h. Paris Mean Time.

1899.	R.A.	Decl.	Br.
	h. m. s.		
June 1	19 34 17.4	- 3 52 50	1.121
3	37 19.0	3 58 10	
5	40 18.6	4 5 17	1.271
7	43 16.1	4 14 21	
9	46 11.7	4 25 27	1.439
11	49 5.4	4 38 45	
13	51 57.2	4 54 22	1.625
15	19 54 47.2	- 5 12 25	

As the comet approaches perihelion (June 18) it is rapidly becoming brighter, and should now be visible with small instruments. It reached its highest northerly declination on May 26, and is now travelling to the south-east through Aquila into the head of Capricornus.

NEW VARIABLE OF ALGOL TYPE.—M. Ceraski, of the Moscow Observatory, writes in *Astr. Nach.* (Bd. 149, No. 3567), announcing the discovery of a new variable of the Algol type in the constellation Cygnus. The star was detected by the varying intensity of its image on photographs taken during May and July 1898. Its position is

B.D. + 45° 3062. 1855. R.A. = 20h. 2m. 24.5s.
Decl. = + 45° 52.9.

Its magnitude is usually about 8.6, but on May 8 this year it was observed to be at minimum about 13.4h., Moscow mean time, its light then being nearly two magnitudes fainter than the normal.

VARIABLE RADIAL VELOCITY OF ζ GEMINORUM.—Prof. W. W. Campbell has called attention to this star in a paper communicated to the *Astrophysical Journal* (vol. ix, p. 86, 1899), where he gives the results of measures on three photographs. In *Astr. Nach.* (Bd. 149, No. 3565), M. A. Belopolsky gives the results of an extensive series of measures he has been able to obtain with the 30-inch refractor and two-prism spectrograph of the Pulkowa Observatory. The individual observations are given, and also a summation in the form of a table showing the radial velocities at stated intervals from minimum. This latter is as follows:—

Interval from minimum	Velocity	Interval from minimum	Velocity
d. h.		d. h.	
0 2	+ 4.76 g.M.	5 1	- 2.70 g.M.
0 12	+ 2.86	6 19	+ 1.96
1 12	+ 0.71	8 1	+ 3.00
2 1	+ 0.68	8 5	+ 3.02
3 1	+ 0.04	9 6	+ 5.06
3 12	+ 0.50	9 15	+ 4.41
4 1	- 0.40	10 2	+ 4.11
4 13	+ 0.34		

Prof. Campbell's maximum and minimum values were 20 kil. and 6 kil. respectively.

THE RESULTS OF THE "VALDIVIA" EXPEDITION.

DR. SUPAN gives the following summary (based on the official report in the *Reichs-Anzeiger* of March 25) of the chief results of the German expedition in the *Valdivia* to Antarctic waters, in the April number of *Petermann's Mitteilungen*.

(1) Rediscovery and determination of position of Bouvet Island, first discovered by Bouvet in 1739, and sighted since then only by Lindsay (1808) and Norris (1825). The island, which lies in lat. 54° 26' S., long. 3° 24' E., and is 9½ kilo-

metres from E. to W. and 8 kilometres from N. to S., is a volcanic mountain, the edge of the crater rising to a height of 935 metres on the northern side. It is entirely covered with ice, which comes down to sea-level, and presents a steep wall to the sea: it would seem from this that in this region a tongue of polar cold projects northwards, a conclusion supported by the serial temperature observations. No trace of vegetation could be recognised with the telescope, and animal life appeared to be exceedingly scanty. No definite information was obtained as to the existence of Thompson Island.

(2) Enderby Land was not visited, as the course was again turned northward at lat. 64° S., but the samples of the sea-bottom yielded evidence that the land is not volcanic. Along the edge of the pack-ice the bottom was covered with diatom ooze, mixed with a larger proportion of clay the nearer Enderby Land was approached. In lat. $63^{\circ} 17'$ S., long. $57^{\circ} 51'$ E., material from ground-moraines, carried to sea by icebergs, was obtained; this consisted of gneiss, granite, schists, and one large piece of red sandstone.

(3) *Climate*.—The zone of fresh westerly winds and low barometer extends south of Africa only to lat. 55° S., and of Kerguelen only to $56\frac{1}{2}^{\circ}$ S.; south of this a belt of calms and light variable winds extends to 60° S., and beyond 60° S. the prevailing winds are easterly. In other parts of the Southern Ocean, the westerly winds extend further south, to 60° and 64° S. latitude. Hence it may be supposed that the position of the Antarctic anticyclone is towards the western part of the Indian Ocean, and not directly over the pole.

In November 1898 the limit of drift ice was found in long. 7° E., to be in lat. $56\frac{1}{2}^{\circ}$ S. On the voyage from the most southerly point in the neighbourhood of Enderby Land, no icebergs were met with north of $61^{\circ} 22'$ S.

(4) *Oceanography*.—Amongst the most important achievements of the *Valdivia* expedition is the making of a large number of new soundings, with the discovery of an extensive deep-water area. It has hitherto been assumed that the sea-bottom rose rapidly towards the south from the Eastern Atlantic and the western part of the Indian Ocean, but it now seems likely that deep water extends from both these basins into Antarctic latitudes. Kerguelen, and the Crozet and Prince Edward Islands were regarded as projections on the margin of a supposed Antarctic plateau, and this idea had obtained so strong a hold that both V. v. Haardt (1895) and Fricker (1898) simply ignored the soundings of the *Challenger* in their maps, although these had shown depths of over 3000 metres in the Indian Ocean between long. 80° and 95° E. and lat. 60° and 66° S. In the regions sounded by the *Valdivia*, between 7° and 53° E. long., the depth has been found to exceed 5000 metres.

South of the fifty-sixth parallel, the bottom temperature was everywhere below 0° C., but nowhere below $-0^{\circ}5$ C. The serial temperatures in 63° S. lat., 54° E. long., in the month of December, gave the following distribution: (a) a surface layer, 120 metres thick, with temperatures between 0° C. and $-1^{\circ}7$ C.; (b) an intermediate layer, about 2200 metres thick, with temperatures above 0° C., and rising to $1^{\circ}7$ C.; (c) a bottom layer of equal or greater thickness with temperatures below 0° C., but never colder than $-0^{\circ}5$. Temperature fell from the surface down to 80 metres, then rose to 1200 metres, and then again fell slowly to the bottom. The same arrangement was found further to the west, but the temperatures were somewhat lower, and again to the east, in the track of the *Challenger*; but in the latter case the cold surface layer is thicker, and the warm layer usually reaches to the bottom (3000 to 3300 metres), the cold under-layer being only met with in a sounding of over 3600 metres. The lowest temperature observed by the *Challenger* was $-1^{\circ}7$, the highest only $1^{\circ}4$. The sea in the region of Enderby Land would thus seem to be favoured by relatively high temperatures, and it remains to bring this into direct relation to the warm Kerguelen stream: this must be done by more observations to the south of Kerguelen.

(5) *Marine Biogeography*.—The quantity of plankton increases down to about 2000 metres, diminishing rapidly at greater depths, although no level is destitute of animal life. The quantity of vegetable plankton, on the other hand, reaches its lowest within 300 or 400 metres of the surface. The characteristic of the Antarctic plankton is the abundance of diatoms, and the occurrence of special forms: the appearance of the Antarctic type begins as far north as 40° S., but in 50° S. the presence of forms belonging to warmer seas is still noticeable.

THE WEARING AWAY OF SAND BEACHES.

THE rate of erosion of cliffs and land bordering on the sea, caused by the action of the waves, has been the subject of frequent investigation, and numerous records exist as to the rate at which the land is being encroached on by the sea. On low flat coasts the means of ascertaining the result of the contest between the sea and the land is more difficult to ascertain. The ordinary means of measurement is by a comparison of old charts, which are seldom trustworthy for this purpose. These charts being for navigable purposes, the depth of the water and the position of objects on shore forming sea marks were the subjects for which accuracy alone was required. The same remarks apply to old plans of estates and manors which were intended to delineate the property of the owners, the sea shore below high water not being a matter requiring trustworthy accuracy.

The results obtained by the Department of the Waterstaat in Holland, from periodical measurements of the coast adjacent to the North Sea, are therefore of great interest as showing the effect of the sea on flat beaches in low countries.

Between the years 1843-46, the Department caused to be placed all along the Dutch coast, extending from the Helder to the Hook of Holland, a distance of 75 miles, at the foot of the sand hills, oak posts at intervals of one kilometre ($\frac{1}{2}$ mile) to form a permanent base line; and from these, at regular intervals, measurements have been periodically taken to the foot of the dunes on the land side, and to the low water line on the sea side.

The results are recorded in the *Proceedings* of the Dutch Institution of Civil Engineers.¹

They are also set out in considerable detail, and tables given for the different periods, in the report of a Commission appointed to investigate the shell fishery of the coast, issued in 1896.²

The coast between the two parts named forms the arc of a very large circle, the depth of the embayment in the centre being $5\frac{1}{2}$ miles. The main direction for the southern part faces about N.W., and of the northern part W.N.W. The winds which have most effect on the coast are those from the S.W., changing round to N.W.

The set of the flood tide is from south to north, the range decreasing from 5 feet at the Hook of Holland to $4\frac{1}{2}$ feet at the Texel. The coast line is bordered seaward by a sand beach extending from 300 to 350 feet to low water, lying at a slope of about 1 in 70; and on the land side by sand dunes, which vary from 1 to 3 miles in width and from 40 to 50 feet in height. These decrease in size towards the Texel.

With the exception of the detrital matter brought down in suspension by the river Maas, there is no source for a supply of material to feed the beach. The cliffs which border the French coast, from which the shingle and sand on the beach there is derived, terminate at Sangatte. The drift of the shingle and sand derived from the erosion of these cliffs extends only for a limited distance, and dies out a little beyond Calais and Dunkirk.

As regards the Belgian coast, the beach along which consists entirely of sand, from comparisons made by the Government engineers a few years ago of the various charts and plans dating from the beginning of the present century, and from a comparison of surveys of the coast made in 1833 and 1870, the conclusion was arrived at that no material alteration in the beach of the Belgian coast has taken place, so far as any means of comparison existed; and this was confirmed by measurements, taken in 1833 and 1870, of the height of the beach at the groynes at Ostend, Heyst and Wendyke, which showed that there had been no material alteration in the form of the beach.

The Dutch coast, between the periods to which the present investigations extend, has been subjected to two disturbing elements, in addition to one abnormally heavy gale in December 1894. The opening out of the new water way to Rotterdam through the Hook of Holland, and the construction of the harbour at Ymuiden for the entrance to the Amsterdam Canal, with the long piers extending across the beach, led to a considerable transposition of material at those parts of the shore; but the effect was local, and extended only over a short distance.

As a general result, the measurements show that during the last half-century, on the Dutch coast, the sea has been

¹ "Tidschrift Van het Koninglijk, Instituut Van Ingenieurs" (1883).

² "Uitkomst Van het Onderzoek of de Schelpvisserij Langs de Noord-zee kust Nadeelig Kan Zijn Voor Het Weerstandsvermogen Van Het Strand en het Behoud Der Duinen als Zeewering" (1896).