difficulty by a busy man who does not live in London, it has been taken over by Mr. Topley. The "Record" is to be brought up to date by giving the titles only of papers, &c., for the years 1880 to 1887. The portion for 1880 to 1884 is finished, and in great part printed; and so large is the amount of geological literature that in this contracted form (without abstracts) two volumes will be needed for the five years.

RECENT Shanghai papers contain the report of the "Chinese Scientific Book Depot," an institution which was established three years ago for the purpose of facilitating the spread of all useful literature in the native language throughout China, and especially of books, maps, and other publications of a scientific or technical character. It does not publish works, but has merely organized a system by which the translations and compilations on scientific subjects issued by the various Departments of the Chinese central and local Governments, by missionary and other philanthropic Societies, are more widely distributed amongst the Chinese people. The demand for such books is fast increasing, and the establishment of the central depot, with branches at the more important cities, suggested itself three years since. Self-support has been the motto of the institution, and, in order to overcome Chinese prejudices, everything smacking of foreign influence has been eliminated as far as possible. During the second year a branch was opened at Tientsin, and subsequently Hangchow, Swatow, Pekin, Hankow, Foochow, and Amoy were similarly provided. During the three years about £2500 worth of books, maps, &c., have been sold, some of them finding their way to the most distant parts of China, Corea, and Japan. Taking the average price per volume at 4*d.* to 5*d.*, this would give a circulation of about 150,000 volumes of useful literature, chiefly of a scientific and educational character. The shops have also served to some extent as reading-rooms, where inquirers after Western knowledge have been able to sit down and examine any works in which they felt interested. The number of scientific and other treatises already translated or compiled and published in Chinese under foreign management amounts at present to over 200. To these have been added about 250 of the most useful native works, including scientific treatises by the early Jesuit fathers.

SIR EDWARD BIRKBECK, President of the National Sea Fisheries Protection Association, is now promoting in Parliament a Bill, the object of which is to secure reasonably cheap and rapid transport for common kinds of sea fish, in quantities of 1 cwt. and upwards, from the coast to the various inland centres of population, and thus, by securing a plentiful distribution, to render an inestimable benefit alike to the poor of our inland towns and villages and the fishermen of our coast. The Bill does not attempt to interfere with the rates now charged by railway companies for prime fish, nor with quantities of less than 1 cwt. of common fish. Sir Edward Birkbeck should have no great difficulty in securing sufficient support for so moderate and good a measure.

DR. F. NANSEN, of the Bergen Museum, Norway, who thinks of journeying across Greenland next summer from east to west, intends to land on the east coast at Cape Dan (66° N.), and proceed in a north-westerly direction to Disco Bay. He will be accompanied by three men—a Norwegian soldier well known for his prowess on *Ski*, or snow-runners, and two Lapps, probably the same who accompanied Nordenskiöld. In order to qualify himself for the contemplated task, Dr. Nansen is preparing to travel on *Ski* from Bergen to Christiania, right across the mountains of Central Norway, a feat never before accomplished by anyone.

THE additions to the Zoological Society's Gardens during the past week include an African Civet Cat (*Viverra civetta*) from South Africa, presented by Capt. Webster, R.M.S. *Hawarden Castle;* three Barred Doves (*Geopelia striata*) from Batavia, Java, presented by Mrs. G. A. Thomson; a Cape Crowned Crane (*Balearica chrysopelargus*) from South Africa; a Gold Pheasant (*Thaumalea picta*) from China, deposited; a Common Wolf (*Canis lupus* ♀) European, received in exchange; two Red Kangaroos (*Macropus rufus*), two Suricates (*Suricata tetradactyla*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SOLAR ACTIVITY IN 1887.—The decline in the three orders of solar phenomena, spots, faculæ, and prominences which had been so marked during 1886, and particularly during the latter part of that year, continued in 1887, and although there was no spotless period so long continued as that of November 1886 (see NATURE, vol. xxxv. p. 445), the mean spotted area for the year just passed has been much below that for the year preceding it, and faculæ and prominences have shown a similar falling off. During the first four months of 1887, sunspots were both few and small, and there were several intervals of a week or longer in which no spots were seen at all; January 9–18, February 7–16, March 3–9, April 4–11, being such intervals. There was also very little on the sun from March 10–15, and from March 27 to April 18. But after this a revival set in and a fine group of spots was seen on the sun, May 14–23, appearing again in the three following rotations, June 5–18, July 3–14, and July 30–August 9. The days of greatest spotted area during the year were July 6, 7, and 8, but after this the spots began to decrease again, and were few and small in September, October, and November. August 23 to September 12 was a very quiet period, spots only being seen on about four days; and October 6–17, October 28 to November 4, and November 21 to December 1, were spotless intervals. The last month of the year, however, showed a second rally, a fine group of spots being observed during its first fortnight, and another appearing as the first passed off at the west limb. On the whole the mean daily spotted area for 1887 was about two-fifths of that which it was for 1886. Comparing the results for 1885, 1886, and 1887, with the years preceding the last minimum, 1885 shows a somewhat greater mean daily spotted area than 1874, 1886 than 1875, and 1887 than 1876. If, therefore, the decline continues to proceed as during the last cycle, the next minimum will fall early in 1890.

The following figures, taken from Prof. Tacchini's tables, as given in the *Comptes rendus*, may be compared with those given for 1885 and 1886 (NATURE, vol. xxxiii. p. 398, and xxxv. p. 445):—

	Sunspots.			Faculæ.
	Relative Frequence.	Relative Size.	Mean Daily Number of Groups.	Relative Size.
January	2·87	9·35	1·17	11·52
February	3·35	7·83	1·32	10·09
March	1·00	3·35	0·42	16·00
April	1·12	7·76	0·68	6·80
May	4·18	22·04	1·11	9·29
June	4·15	29·74	1·37	20·37
July	5·07	25·25	1·68	14·11
August	4·60	23·53	1·32	14·29
September	2·47	15·75	0·56	9·23
October	1·27	20·21	0·70	10·53
November	1·70	6·41	0·71	17·30
December	6·68	40·10	1·21	16·84

In general accord with the above figures are Wolf's "relative numbers." These are given below for 1886 and 1887, together with the monthly means of the variations in magnetic declination as observed at Milan. The agreement in the general form of the curves for spot numbers and magnetic variation has not been so close in 1887 as in some previous years, nor is the calculated mean value for the magnetic variation so near the observed as in 1885 and 1886; the values calculated by M. Wolf's formula being 6′·79 for 1886, and 6′·21 for 1887, but the observed being 6′·72 and 6′·61.

	Wolf's Relative Numbers (Zürich). 1886	1887	Variation in Magnetic Declination (Milan). 1886	1887
January	28·4 ...	13·1 ..	4·07 ...	3·71
February	23·6 ...	15·7 ...	4·91 ...	3·69
March	61·8 ...	2·7 ...	8·61 ...	6·99
April	45·9 ...	7·5 ...	9·89 ...	9·33
May	29·0 ...	17·2 ...	9·06 ..	9·30
June	25·7 ...	16·3 ...	8·37 ...	9·55
July	32·9 ...	26·2 ...	9·58 ...	10·25
August	19·0 ...	21·1 ...	8·17 ..	9·07
September... ...	17·1 ...	6·9 ...	7·61 ...	6·08
October	9·5 ...	5·4 ...	6·33 ...	6·03
November... ...	0·0 ...	4·5 ...	2·48 ...	3·07
December	15·1 ...	20·5 ...	1·61 ...	2·23
Mean	25·7 ...	13·1 ..	6·72 ...	6·61

The fluctuations in the numbers and dimensions of the prominences have not been so great as for the spots, but the prominences likewise showed a maximum in July and a decline afterwards. The highest prominence observed by Prof. Tacchini during the year was on July 2, 2½′ in height. Both faculæ and prominences failed to show a depression similar to that so conspicuous in November in the numbers of the spots, or the revival these displayed in December, the faculæ thus according in their behaviour rather with the prominences than with the spots. The following figures, given by the Rev. S. J. Perry in the *Observatory* for February 1888, show the general decline in prominence activity during 1887, as compared with 1886 :—

	Mean Height of Chromosphere.	Mean Height of Prominences.	Mean Extent of Prominence Arc.
	″	″	°
1886	8·05 ...	24·78 ...	13·26
1887	8·13 ...	23·86 ...	9·29

A New Comet.—A comet was discovered by Sawerthal on February 18. It was observed at Cape Town, February 18, 14h. 32·5m., in R.A. 19h. 11m. 32·5s., and N.P.D. 146° 3′ 44″. Daily motion, R.A. + 7m. ; N.P.D. − 1° 15′. Its physical appearance was as follows :—It was about the seventh magnitude, had a well-defined nucleus, and a tail a degree in length. It was visible to the naked eye.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1888 *MARCH* 4–10.

(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 March 4

Sun rises, 6h. 40m. ; souths, 12h. 11m. 46·0s. ; sets, 17h. 44m. : right asc. on meridian, 23h. 2·5m. ; decl. 6° 9′ S. Sidereal Time at Sunset, 4h. 36m.

Moon (Last Quarter on March 5, 3h.) rises, 0h. 26m. ; souths, 5h. 14m. ; sets, 9h. 54m. : right asc. on meridian, 16h. 3·8m. ; decl. 15° 53′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Right asc. and declination on meridian. h. m.	° ′
Mercury..	6 14 ...	12 1 ...	17 48 ...	22 51·6 ...	3 21 S.
Venus.....	5 35 ...	10 5 ...	14 35 ...	20 55·6 ...	17 37 S.
Mars.....	21 49*...	3 7 ...	8 25 ...	13 56·3 ...	9 2 S.
Jupiter....	1 14 ...	5 27 ...	9 40 ...	16 16·5 ...	20 22 S.
Saturn....	13 20 ...	21 18 ...	5 16*...	8 10·1 ...	20 40 N.
Uranus ...	20 39*...	2 13 ...	7 47 ...	13 1·8 ...	5 51 S.
Neptune..	9 11 ...	16 51 ..	0 31*...	3 42·4 ...	17 59 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).

March.	Star.	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image. ° °
4 ...	49 Libræ	5½ ...	0 0 ...	0 30 ...	334 274
6 ...	B.A.C. 6098 ...	6 ...	2 28 ...	3 25 ...	72 200

March.	h.	
4 ...	11 ...	Jupiter in conjunction with and 3° 47′ south of the Moon.
4 ...	14 ...	Mars stationary.
9 ...	22 ...	Venus in conjunction with and 0° 17′ north of the Moon.

Saturn, March 4.—Outer major axis of outer ring = 44″·8 ; outer minor axis of outer ring = 16″·0 ; southern surface visible.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
T Arietis	2 42·1 ...	17 3 N. ...	Mar. 8,		*M*
Algol	3 0·9 ...	40 31 N. ...	,, 4,	0 1	*m*
			,, 6,	20 50	*m*
R Persei	3 22·9 ...	35 17 N. ...	,, 5,		*M*
λ Tauri...	3 54·5 ...	12 10 N. ...	,, 7,	0 20	*m*
			,, 10,	23 12	*m*
ζ Geminorum ...	6 57·5 ...	20 44 N. ...	,, 4,	22 0	*M*
			,, 10,	2 0	*m*
R Canis Majoris...	7 14·5 ...	16 12 S. ...	,, 9,	21 25	*m*
S Cancri	8 37·5 ...	19 26 N. ...	,, 6,	20 59	*m*
δ Libræ	14 55·0 ...	8 4 S. ...	,, 7,	1 6	*m*
U Coronæ	15 13·6 ...	32 3 N. ...	,, 10,	4 7	*m*
U Ophiuchi... ...	17 10·9 ...	1 20 N. ...	,, 5,	1 28	*m*
X Sagittarii	17 40·5 ..	27 47 S. ...	,, 4,	3 0	*M*
β Lyræ...	18 46·0 ...	33 14 N. ...	,, 7,	22 0	*M*
U Aquilæ	19 23·3 ...	7 16 S. ...	,, 10,	5 0	*m*
η Aquilæ	19 46·8 ...	0 43 N. ...	,, 9,	5 0	*m*
Y Cygni	20 47·6 ...	34 14 N. ...	,, 4,	19 11	*m*
			,, 7,	19 5	*m*
W Cygni	21 31·8 ...	44 53 N. ...	,, 5,		*m*
δ Cephei	22 25·0 ...	57 51 N. ...	,, 10,	22 0	*m*

M signifies maximum ; *m* minimum.

Meteor-Showers.

	R.A. °	Decl. °	
From Coma Berenices...	190 ...	26 N. ...	March 8.
Near η Libræ	234 ...	17 S. ...	Swift. March 7.
,, γ Herculis	244 ...	16 N. ...	Very swift. Mar. 7.

THE RELATIONS BETWEEN GEOLOGY AND THE BIOLOGICAL SCIENCES.[1]

II.

IN the remarks which I have hitherto made, I have confined myself to the purely biological aspects of palæontology. As astronomy exhibits to us the orderly working of physical and chemical laws in other and far distant orbs, so palæontology presents us with the biological phenomena of many and widely-separated periods.

But besides the biological, there are two other aspects in which fossils may be viewed ; and in these aspects their relations are almost entirely with zoological science. It is the recognition of this fact which prevents the geologist from acquiescing with the claims of biologists to treat palæontology as nothing more than a branch of their own science.

The assemblage of fossils found in a particular deposit furnishes us with the most valuable evidence concerning the conditions—such as salinity of water, depth, temperature, pressure, &c.,—under which the deposit must have been formed. And, again, in the changes which the materials of fossils can be shown to have undergone we have very accurate data for determining the succession of processes to which the materials of the deposit must have been subjected since their original accumulation.

It is true that this evidence of fossils concerning the conditions under which deposits have been formed, is of a kind which has been sadly misread in the past. Until the study of deposits which are being formed at the present day was taken up in a systematic manner, it was almost hopeless to avoid numerous sources of error ; but at the present day the advantages accruing to geology from the results of deep-sea researches, are at least as great as those which by the same means have been conferred upon biology.

It is almost needless to call attention to the fact that there are vast masses of rock, including most of the calcareous and carbonaceous, and many of the siliceous and ferruginous types, of which the materials have been accumulated entirely by the agency of living organisms ; it is impossible to study the petrology of such deposits without an acquaintance with the nature and functions

[1] Address to the Geological Society by the President, Prof. John W. Judd, F.R.S., at the Anniversary Meeting, on February 17. Continued from p. 404.