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INDIAN CLIMATOLOGY.

Climatological Atlas of India. Published by the Authority of the Government of India, under the Direction of Sir John Eliot, K.C.I.E., F.R.S. Pp. xxxii + 120 plates. (Issued by the Indian Meteorological Department, 1906.) Price 36*s*.

THE Indian network of meteorological observations is the greatest individual organisation within the tropics, and it has, therefore, attained the greatest importance in the pursuit of meteorology and climatology. Founded in the year 1875, it can now look back upon more than thirty years of uninterruptedly successful activity, having during this period had the peculiarly good fortune to be presided over by two distinguished meteorologists—Henry F. Blanford and Sir John Eliot. From the commencement the author of this review has followed with sympathetic interest the development and the active work of the organisation, has been in constant association with its director, and has also, as far as possible, made use of the immense volume of information. In no meteorological organisation in the world are there such comprehensive records, as well of a statistical as of a scientific nature, as in the Indian one; only the much older Russian one can compare with it. Beginning with the smaller, but very valuable, scientific essays of Blanford in the Proceedings of the Asiatic Society of Bengal, it grew into the huge folio volumes of the Indian Meteorological Memoirs, of which the seventeenth volume is completed and published. Then came monographs relating to individual cyclones, Blanford's "Indian Meteorologist's *Vade Mecum*" (Calcutta, 1877), and especially the five volumes of cyclone memoirs by Sir John Eliot, and his "Handbook of Cyclonic Storms in the Bay of Bengal" (second edition, Calcutta, 1900).

The introductory text to the "Climatological Atlas" gives a summary of the publications of the Meteorological Department, relates the history of the development of the department, and describes its objects and aims. Reference may here be permitted to an older publication, "Memoirs of the Indian Surveys," by Sir Clements R. Markham, K.C.B., F.R.S. (second edition, London, 1878, xvi., pp. 275–310), in which is minutely described the beginnings of meteorological efforts in India, down to the establishment under Blanford of a single organisation; it also gives a very good analysis of the meteorological work until the year 1875. The text of the "Atlas" contains the most important facts as to the principles on which the construction of the charts is based; the means are critically derived from the observations of the twenty-five years 1876–1900.[1]

The Indian network of meteorological observations extends from about latitude 6° N., in the tropical Indian Ocean, to the prodigious plateaus of the Himalayas, under 35° N. It includes, in the south as well as in the north, hill stations at and above 6000 feet above sea-level, which supply information on the upper strata of the atmosphere. The region contains the hottest and the most rainy parts of the world, and it is the scene of one of the most peculiar meteorological phenomena—the south-west monsoon—in which the wind *régimes* of the two hemispheres meet between 30° S. and about 30° N.

From the accumulated meteorological records in this highly interesting region we have now this splendid chartographic production, the "Climatological Atlas of India." This work excels in its completeness even the similar work the "Atlas Climatologique de l'Empire de Russie" (St. Petersburg, 1900). In a certain sense these two great works are complementary to each other, giving us such a very extensive picture of the climatic variations over the largest continental area of the world—Asia and Europe—as one would hardly have hoped for a short time ago. The "Indian Climatological Atlas" contains a very valuable peculiarity—it takes into consideration the *daily* variation of the meteorological elements, explaining their extension over the country during the extreme day hours 8 a.m. (10 a.m. for pressure) and 4 p.m., and also the daily variations of pressure and temperature. In India these daily variations play a most important part. The smaller charts complete in a clear manner the information on the large charts, and they are of very great practical value.

The "Atlas" contains 120 charts in perfect technical finish, as is expected from Bartholomew's Geographical Institute. The first chart (double) exhibits in a very excellent manner the orographical features of the Indian Empire, the knowledge of which is very important for the understanding of the progress of meteorological phenomena over them. Another two-page chart shows the political divisions of India, influencing the selection of the meteorological stations. Then come four smaller maps, showing the rainfall divisions according to Blanford and Eliot respectively, the medical provinces, and the meteorological divisions for the Daily Weather Report. Upon these introductory representations follow a couple of double-page maps showing the distribution of the pressure and the winds in the opposite months January and July. These charts embrace the whole of India and the East African and Australian monsoon regions, extending from 35° S. to nearly 50° N., from Asia Minor and East Africa in the west to Japan and the greater part of Australia in the east. With these we are in a position to see at a glance the distribution of pressure with the north-east and with the south-west monsoons. Both charts are very instructive, and particularly the July one, for it shows the origin and advance of the south-west monsoon of western India, which Sir John Eliot first completely explained. A uniform decrease of pressure prevails then from the south Indian Ocean, under 30° S., up to the foot of the Himalayas, in 30° N., with a difference of pressure of close upon an inch (30·3 inches in the south and 29·4 inches in the Punjab). The wind systems of

[1] The complete numerical values are found in various volumes of the Indian Meteorological Memoirs.

the southern and northern hemispheres unite, and there is no longer a division at the equator. This is the great summer monsoon of southern Asia, which in the whole world has nothing to compare with it.

In this, as in succeeding pressure charts, it is seen that in many places the winds recorded are in opposition to the distribution of pressure (local disturbances?). In the January chart we miss the north-west monsoon over the Malay Archipelago (it is found over North Australia), although at Batavia, for example, west, north-west, and north winds prevail in January with a frequency of more than 80 per cent., and similarly also prevail in strength.

Plates xi.–xxiii. exhibit the distribution of mean pressure and the winds for each month and the year at 8 a.m., the hour of observation for the telegrams for the Daily Weather Report. Besides these there are two smaller charts showing the pressure and wind at 10 a.m. and also at 4 p.m., that is, at the hours of the daily extremes. In the quiet, cool-weather season the winds experienced undergo changes of direction in accordance with the distribution of pressure. In the Ganges valley, in May, at 4 p.m., they appear to blow against the gradient, that is, from the lower to the higher pressure, the problem of the nor'-westers, which had already occupied the attention of Blanford.

Plates xxiv.–xxxvi. show the mean pressure and the winds for the day, the smaller charts the actual diurnal range of pressure, and the range reduced to sea-level, monthly and annual. From January to May, in southern India, the daily range of pressure is as much as 0.15 inch to 0.17 inch; during and after the rainy season it diminishes to 0.13 inch or 0.12 inch. These great daily amplitudes justify the representation of the mean daily distribution of pressure. In Plates xi.–xxxvi. the monthly and annual isobars are drawn at intervals of 0.05 inch, an interval which would be ample for Europe, but for a tropical region it appears to be too large. The pressure gradient which sets the great south-west monsoon in motion does not amount to so much as 0.02 inch per degree. We see, therefore, upon some charts—February, March, October, and November—only two to four isobars over the whole of the extensive region, and sometimes it is not very clear as to the local decrease of pressure, especially over the Bay towards the east. This could have been easily remedied by specially noting the mean pressure at the Nicobars, Andamans, and on the coast of Burma.

As to the origin of the most interesting phenomenon in the meteorology of India—the bursting of the monsoon—the charts which lie before us cannot afford sufficient explanation, for the origin lies outside the limits of the charts, far southward in the Indian Ocean, not over the Indian land region, as Sir John Eliot pointed out (Quarterly Journal of the Royal Meteorological Society, January, 1896). The gradual advance of the southern and western sea breezes in the mighty south-west monsoon we see in the charts for February and March to June. The south-west monsoon reaches Ceylon about the middle of May, and arrives at Bombay about the middle of June. So gradual does the advance seem from April to May and from May to June that it is scarcely noticeable in the charts; but we do, however, find an indication. On the May and June charts we see a higher pressure advancing from south and south-west, while in northern India pressure is decreasing. A pressure wave spreads over India from May to June. This is clearly shown in the following pressure changes from month to month:—

			Changes from		
			April–May	May–June	June–July
			In.		
Zanzibar	6 12 S.	..	+0·066	... +0·069	... +0·019
Colombo	6 54 N.	...	−0·014	. +0·009	... +0·016
Trivandrum ...	8 30 N.	...	−0·007	... +0·003	... +0·009
Mooltan	30 12 N.	...	−0·149	... −0·147	... −0·019
Dera Ismail Khan	32 0 N.	...	−0·145	... −0·161	... −0·013

From May to June southern India is flooded with masses of air from the ocean by the south-west monsoon, while over north-west India pressure continues to give way.

Plates xxxvii.–xlix. contain the monthly and anuual mean temperatures over India, the isotherms being drawn for differences of 0°·5 F., and are, therefore, of an especial distinctness. The smaller charts give the lines of equal mean monthly and annual maximum and minimum temperatures. The succeeding plates, l.–lxii., are also devoted to temperature, the large ones showing the lines of equal diurnal range, the small ones the lines of equal absolute maximum and minimum values, monthly and annual. The whole of these plates, therefore, afford a very complete picture of the temperature of India. From the isothermal charts we can easily follow the warming of the Indian land area from south to north-west. In February the warm centre, 82°·5, lies under 16° N. (mean); in March, 87°·5, under about 17° N. (the middle of the peninsula); in April, 92°·5, under 21° N.; in May the centre, 95°, embraces the whole of western India, reaching from 18° to 27° N. In June it takes up a position towards the north-west, in the Punjab—the Mooltan region—with 97°·5, one of the highest monthly temperatures in the world. In July the cooling sets in, 95°, and in August it is 90°, whilst on the Malabar coast, under the influence of the rains, the temperature is already down to 77° (in 12° to 16° N.). In the northern Punjab, where the heat centre lay in June, the temperature sinks to 55° (down to 52°·5) in January. There also are to be found the absolute extremes of the whole of India: 125° in June and 30° to 25° in January. The daily range of temperature varies between 10° on the southern coasts and 32°·5 in the north-west. The rainy season brings to the whole country a great decrease of the daily range of temperature, from 30° and 32°·5 to 15° in Central India.

Plates lxiii.–lxxv. show the distribution, monthly and annual, of the mean daily relative humidity, the two smaller charts on each sheet the distribution at 8 a.m. and 4 p.m. In the Central Provinces in April the atmospheric humidity decreases to 30 per cent. in the daily means, and to 20 per cent. at 4 p.m., whilst on the coast it is 70 per cent., and in Upper

Assam 80 per cent. On the west coast during the rainy season it is 90 per cent.; in the Punjab 50 per cent. to 60 per cent. In similar manner Plates lxxvi.–lxxxviii. show the mean distribution of aqueous vapour, monthly and annual, and at 8 a.m. and 4 p.m., the changes are mostly the reverse of those of relative humidity. The mean vapour pressure reaches 0·90 inch to 0·95 inch on the coasts and over the Bay of Bengal in May, while in January it is only 0·40 inch over the land. The rainy season brings to the whole peninsula a high vapour pressure, but on account of the decrease of temperature it is generally not higher than 0·85 inch; only in the lower and middle Ganges valley is it 0·95 inch. The daily variations of the relative as well as of the absolute humidity are very great in the dry season.

The charts exhibiting the distribution of humidity are followed by Plates lxxxix.–ci., showing the mean daily cloud distribution. Here also we find smaller charts representing the cloudiness at 8 a.m. and 4 p.m. Such an exhaustive picture of cloudiness as we have presented to us in these Indian charts did not hitherto exist for any part of the world. The difference in the cloudiness in various parts of India in the several seasons is very great. In the middle Indus valley we find a mean cloudiness of 1·5, in Upper Assam of 6·0—these are the extremes in the annual means. In June the Punjab has still only 1·0, the Malabar coast and Assam 8·0, in western Bengal even 9·0. In October the minimum, 0·5, lies in the Punjab, the maximum, 8·0, in southern Deccan. The technical finish of these maps is especially beautiful and impressive.

We now come to the concluding series, Plates cii.–cxx., representing the rainfall conditions. The principal charts, monthly and annual, show the rainfall distribution by means of isohyets; the smaller ones give the lines of equal mean number of rainy days and the storm tracks for 1876–1901. Until now no monthly rainfall charts for India had been in existence. H. Blanford had added to his great work on the rainfall of India ("Memoirs," vol. iii.) merely an annual chart. The principal areas of rainfall in India—the Malabar coast and the Khasi Hills of Assam, with from 200 inches to 450 inches of rain annually—are generally well known; but what we regard as the most extensive rain region is the Malabar coast rather than the Khasi Hills, as is especially evident from the June and July charts. On the Malabar coast in July we find a long area with 50 inches of rain, whereas the Khasi Hills have only the isohyet of 20 inches (Cherrapunjee omitted). In June both regions have isohyets of 30 inches. The driest region is in the lower Indus valley (round the hottest place in India —Jacobabad), with an annual total of only 5 inches. The mean values of the number of rainy days lie between the limits of 10 on the lower Indus, 125 on the Malabar coast (Cochin) and in Assam, and 200 in the south-west part of Ceylon. The isohyets are also drawn for the seasons—for January and February, March to May, June to October, and November and December (the main annual Indian seasons), and also for the combined results for December to April and for May to November. The smaller charts show the number of rainy days, and for January, May, July, and October the midday isobars at an elevation of 10,000 feet. On the chart for January and February appear the welcome rains of northern, and especially north-western, India, shown by isohyets of from 2 inches to 5 inches; on the March to May chart the spring rains in Assam, from 20 inches to 30 inches, and on the west coast of Ceylon, 20 inches, are particularly noticeable.

Of special interest are fifteen smaller charts giving the storm and cyclone tracks (period 1876–1901). In the winter half of the year, the cool season, we find the storm tracks (paths of the depressions) in north India, mostly north of 24° N. First, in November there are two, in December thirteen storms in the direction from the lower Indus towards the Ganges delta. In January there are more than thirty northward of 24° N., while there are only four southward to 20° N. In February they still remain in northern latitudes; we see two main paths with twenty-five tracks—in March not more than twelve. This seems to be the end of the period of winter storms in north India. On the April chart we already find the tracks of four great cyclones over the Bay of Bengal, the Arabian Sea, and from the latter two advancing towards north-western India. To the cyclone tracks are attached the dates, so that the direction and velocity can be ascertained, but with the storm tracks we miss an indication of the direction of movement of the depressions (say by means of an arrow). We certainly know that in the winter half-year in northern India these tracks are generally directed from west to east, but as we proceed through the year there are doubtful cases, as the summer depressions from the Bay up to the Ganges valley and westward towards Central India. In May, and again in October and November, we find numerous tracks over the Bay; in November also over the Arabian Sea. In this month two cyclones crossed the peninsula, and, therefore, the Ghats, from the Bay to the Arabian Sea (between 12° and 14° N.)—rare cases. In December only one great cyclone moved up the Bay from south to north, and some smaller ones from east to west. During the rainy season (June to September) the upper north-west corner of the Bay becomes the birthplace of numerous depressions, which pass into the country. In September this "area of cyclonic storm generation" extends further south to 15° N., and also goes further into the Bay. These are the storms which carry the rains of the Ganges valley upwards and over Central India. During the months of June to August it appears that even on the land depressions are developed which go westward (direction of movement wanting) as far as the Indus. Three small charts show these land-formed storm tracks (period 1886–1900).

We now conclude our cursory examination of the very richly-stored volume of charts lying before us, for which science as well as practice, so long as they have to depend upon climatic factors, are indebted to the Indian Government. Sir John Eliot, the author of this work, has produced a worthy monu-

ment of himself as the director of the Meteorological Service of India. We now look forward with the greatest interest to the promised "Manual of Indian Climatology," which, as an addition to the "Atlas," and especially in the interest of the general public, is indispensable. Our knowledge of the meteorology of India has now extended so far beyond the region of the instructive and concise work of Henry F. Blanford, "Climate and Weather of India" (London, 1889), that a new description on a broader foundation appears to us an absolute necessity.

J. HANN.

A NEW TREATISE ON EVOLUTION.

Einführung in die Deszendenztheorie. Sechs Vorträge. By Prof. Karl Camillo Schneider. Pp. viii+147. (Jena: Gustav Fischer, 1906.) Price 4 marks.

THIS is a book with many good points. It gives a fairly complete account of current opinion on the subject of evolution, including the most recent views concerning the nature of variation and the laws of inheritance. Most of the facts cited are sufficiently familiar, but they are explained with unusual lucidity and conciseness. Where authorities differ, their conclusions are as a rule impartially stated; and when, as often happens, the author's own judgment is at fault, he will generally be found to have supplied his readers with material for forming a sounder opinion. The illustrations are copious and well-selected, and the book as a whole will serve as an adequate introduction to modern evolutionary theory.

So far as argument goes, the most effective part of the work is its criticism of Lamarckism, from which, however, we miss any mention of Prof. Ray Lankester's convincing demonstration of the self-contradictory nature of Lamarck's "laws." The author appears to attach far too much importance to the "mutations" of de Vries, and regards as well-established certain conclusions on this head which recent researches have seriously shaken. His objections to the part assigned to selection by Darwin and his followers are singularly feeble, and we are not surprised to find that his knowledge of many of the most important facts bearing on this branch of the subject is imperfect. His account of mimicry, for instance, is quite out of date; and the vast mass of highly significant material that has been accumulated under the influence of Fritz Müller's theory of common warning colours is almost entirely ignored. An error, or rather a series of errors, which unfortunately found their way into Weismann's latest work (as pointed out in NATURE, vol. lxxii., 1905, p. 201), reappears in the coloured plate appended to the present treatise. As these errors remain uncorrected in the English translation of Weismann, and have since been copied into several other publications in Germany and America, it may be well to direct attention to them here in detail.

In the plate referred to (Taf. II.), Fig. 1 represents, not, as stated, the male of *Papilio merope*, but the female of the north-east African form, *P. antinorii*. Figs. 3 and 4 are not "forms of *P. merope* from South Africa," Fig. 3 being the *hippocoon* form of the female of *P. tibullus*, a race of *P. dardanus* which occurs in East Africa from Mombasa to Delagoa Bay, and Fig. 4 representing the female of *P. echerioides*, a species quite distinct from the *dardanus* or *merope* group. The butterfly represented in Fig. 6 is not, as stated, *Amauris niavius* from South Africa (the form usually called *dominicanus*), but belongs to the West African race of the species. Finally, in Fig. 7 is shown, not the Danaine *Amauris echeria*, "the immune model of Fig. 4," but another Papilio, viz. the *cenea* form of *P. dardanus* ♀, the mimic having been here mistaken for its model. These mistakes are the less excusable in that several of the forms in question have been carefully discussed and figured by Prof. Poulton.

The great difficulty to be faced by those who, like the author of the present treatise, seek to minimise the influence of selection, is the universal prevalence of adaptation. We accordingly turned with some interest to the passages in which he gives his own solution of the problem. We must confess to a feeling of disappointment. The author makes no serious effort to grapple with the question; he appears to be satisfied with vague phrases about "extra-personal correlation" which explain nothing, while his dictum —emphasised by spaced type—"Artbildung ist einerseits Vervollkommnung, andererseits Anpassung," when taken with its context, seems to savour of the heresy of orthogenesis. However, he claims for his book that it is only an introduction, not an attempt at explanation, and in both parts of the claim we think he is justified.

F. A. D.

OUR COAL RESOURCES.

The Coal Question. By the late W. Stanley Jevons. Edited by A. W. Flux. Third edition. Pp. 1+467. (London: Macmillan and Co., Ltd., 1906.) Price 10*s.* net.

THE first edition of Jevons's lucid and exhaustive work was published in 1865 and the second in 1866, and since that date it has constantly been referred to, but almost always misunderstood. The Royal Commissions of 1866 and 1901 both shared the general misunderstanding. This is certainly surprising in view of the care the author took to make his position clear. He argued that within a century the want of coal would seriously check our material progress if the rate of progress in consumption shown at the time at which he wrote were maintained.

Since Jevons's tragic death in 1882 (NATURE, vol. xxvi., p. 420), no one has pointed out the superiority of his logical method over that of his many critics. It is, therefore, a matter for congratulation that Prof. Flux, of McGill University, who was formerly Stanley Jevons professor in the Owens College, Manchester, has edited a third edition, in which he has wisely preserved the text unaltered so far as might conveniently be done, while making such additions as were necessary to embody the knowledge accumulated in the forty years since its original issue. The most important change in the general situation since then is the development of the coal resources of Germany.

In regard to this and other developments, the editor has obtained much help from the reports of the Royal Commission on Coal Supplies, and particularly from Mr. Bennett H. Brough's report on foreign and colonial coal resources to that Commission. This material is ably and attractively dealt with by the editor, who shows that it is probable that the exhaustion of the British deposits will not progress much, if at all, more rapidly in relation to their total contents than will be the case with the German coal, and that the reported coal resources of Canada and Australia suggest the reflection that even though an increasing cost of power in Great Britain involve the decay here of the industries on which our country's preponderance is based, the industrial greatness of the British Empire may not pass away.

The first chapter forms practically the author's preface to the first edition, and the subsequent chapters in the new edition deal with the following subjects:—opinions of previous writers, the geological aspect of the coal question, the cost of coal mining, the price of coal, British invention, the economy of fuel, supposed substitutes for coal, the natural law of social growth, the growth and migrations of our population, the change and progress of our industry, our consumption of coal, the export and import of coal, the comparative coal resources of different countries, the iron trade, problem of the trading bodies, taxes and the national debt, and concluding reflections. The width of economic and erudite information and the patriotic tone of the original work have been well maintained, and the whole has been admirably brought up to date. The only trifling matter that has escaped the editor's notice is that in a few cases the titles of some of the authorities cited which changed in the course of time have not been altered. Thus, Lord Armstrong appears as Sir William Armstrong, Sir Henry Bessemer as Mr. Bessemer, Sir Andrew Ramsay as Prof. Ramsay, and Lord Swansea (Sir Henry Hussey Vivian) as Mr. Vivian. The able editing and the arrangement of the matter, as well as the attractive form in which the book is produced, cannot fail to commend themselves to all who share John Stuart Mill's admiration of the work and of its author.

THE RELIGION OF THE MALAYS.

The Peninsular Malays. I. Malay Beliefs. By R. J. Wilkinson. Pp. 81. (London: Luzac and Co., 1906.) Price 2*s.* net.

VARIOUS classes of students, in addition to the Civil Service cadets for whom it is primarily intended, should read the most excellent pamphlet on "Malay Beliefs" recently written by Mr. R. J. Wilkinson. The author is one of the most erudite of students of the Malay language, classical and dialectical, and he has acquired an intimate and sympathetic knowledge of Malay customs and beliefs. This little book contains a clear statement of the strange mixture of Mohammedan creeds and practices that obtains in the peninsula. As Malay Islamism was mainly introduced from southern India, the Malays are Sunnites like the Moslems of the Deccan, but owing to the predominance of Persian influence in India Shiite "heresies" have crept in; further, in the matter of religious law the Malays are Shafeites. Below and penetrating through this imported religion are aboriginal vestiges of paganism, always strongly tinted with magic.

Mr. Wilkinson has some interesting remarks upon the problem of the relation of magic to religion that is at present exercising the minds of students of comparative religion. He says:—

"The magician may 'indicate' some person to receive the special attention of spirits of disease, much as a man sets his dogs upon an enemy. Sometimes by the use of a waxen or other image, or by the exhibition of a 'sample' such as the parings of a man's nails or the clippings of his hair, the wizard conveys to the world of ghosts a knowledge of the person he wishes them to attack—and the ghosts are ever ready to profit by the hint so kindly given. Here the practices of Malay witchcraft come very close to sympathetic Magic—to the view that there is 'a certain physical sympathy between a person and his image':

'It is not wax that I am melting,
But the liver, heart and spleen of So-and-So.'

"Nevertheless there is a marked difference between the animistic magic of the Malays and the 'sympathetic magic' defined in Frazer's 'Golden Bough' and accepted by Mr. Skeat as the explanation of the use of waxen images in the Peninsula. The following invocation (quoted by Mr. Skeat himself) shows the real nature of the practice:

'Salutation to thee, Oh Prophet! Ruler of the World!
Lo! I am burying the corpse of So-and-So.
Do you assist in killing him or making him sick.'

"The actions of the sorcerer merely illustrate or indicate to the spirits the exact nature of the service that he expects of them. If these performances were really based on a belief in 'a certain physical sympathy between the person and his image' it would be unnecessary to invoke the spirits at all."

Mr. Wilkinson gives some good examples of accurate observation but inaccurate inference from the facts. Thus people have noticed that man-eating tigers have the great canine teeth almost entirely worn away, and they infer that the loss of the teeth is a punishment for man-eating, and not that the beast is driven by the loss of his weapons to the desperately dangerous expedient of preying upon man. Again, they know that venomous snakes have stumpy tails, and assume that the use of the venom causes the tail to drop off. The author also gives a suggestive account of the training and methods of the native doctor, who has some real knowledge of drugs, diet, fomentations and massage, and a thorough knowledge of the weakness of human nature. His dodges perplex or mislead rival practitioners, while they delight his patients with the special attention that he appears to be devoting to their individual needs.

It is to be hoped that the author will redeem his promise of issuing other pamphlets on Malay literature, life and customs, government and law, history, and industries.

OUR BOOK SHELF.

John Dalton. By J. P. Millington. Pp. xii+225. (London: J. M. Dent and Co., 1906.) Price 2*s.* 6*d.* net.

THIS volume constitutes the latest addition to the series of "English Men of Science" now in course of publication by Messrs. J. M. Dent and Co., and is a concise and well-written account of the illustrious author of the atomic theory. Everything there is to tell about the old Quaker philosopher has already been told in such well-known works as the "Memoirs" of Henry and of Angus Smith, and in the lesser-known biography of Dr. Lonsdale, and all that a modern historian can do is to put together, with such literary skill as he can command, the facts of his simple, uneventful life. The publication of the "New View of Dalton's Atomic Theory" by Sir Henry Roscoe and Dr. Harden, and the criticism which the "New View" has received from Debus, might have afforded an opportunity to Mr. Millington for the exercise of his critical acumen, but Mr. Millington fails to avail himself of it, the quotation from the "Fundamental Sätze der Chemie," published two years before the appearance of the "New View," having little relevance to the matter in dispute between them.

Mr. Millington's narrative is simple and unaffected in style, befitting the character it seeks to describe. It is calculated to give the reader a just and faithful impression of a calm and beautiful life, utterly unworldly, and free from any taint of self-seeking, envy, or greed.

It might at first sight be thought there was no room for another book on Dalton, but we cannot have too much of such an example, and certainly no biographical series of "English Men of Science" would be complete which omitted his great and honoured name.

Verhandlungen der deutschen zoologischen Gesellschaft, 1906. (Leipzig: W. Engelmann, 1906.) Price 10 marks.

THIS volume contains the papers read at the sixteenth annual congress of the society held at Marburg, June 5–7, 1906. The number of subjects covered by the papers and "demonstrations" is so great that it is only possible to refer to a few. On account of being fully illustrated, special mention must be made of a communication by Prof. L. Plate on the evolution of species in the Bahama land-shells of the pupa group classed under the title of *Cerion glans*. The gradation from a large-sized, heavily-ribbed, and uniformly coloured type to a diminutive one in which the place of ribs is taken by bands of colour is admirably illustrated in the plate.

In the second paper, illustrated by a plate, Dr. F. Doflein deals with the fauna and oceanography of the Japanese coast, especially from the point of view of the dispersal of organisms; in his opinion continental barriers offer much less serious obstacles to the dispersal of marine organisms than is commonly supposed. The zoological distribution of animals also forms the subject of a paper by Dr. E. Stromer, who discusses the bearing of the recent discoveries of fossil vertebrates in the Tertiaries of Egypt on current theories as to the origin of the modern African fauna.

Considerable general interest likewise attaches to a long paper, by Prof. Simroth, on the fauna of Sardinia, which deals in considerable detail with the origin and relationships of the native breeds of domesticated animals, and brings out some noteworthy points in connection therewith. Most of the other papers deal with subjects of interest only to specialists. It may be added that methods of modern research form the subject of the opening address to the session by Prof. Hertwig, and that at the inaugural meeting Prof. Korschelt gave an historical sketch of the rise and progress of the zoological institute of the University of Marburg.

Photograms of the Year 1906. Pp. 164. (London: Dawbarn and Ward, Ltd., n.d.) Price 2*s.*

IN these pages we are introduced to a series of excellent reproductions of typical photographic pictures of the year. This has been compiled by the editors and staff of the *Photogram*, and a descriptive article accompanies the series. Mr. A. C. R. Carter contributes a criticism of the two great photographic exhibitions, namely, the "Salon" and "Royal."

In addition to the above, pictorial photography is dealt with in several other essays by various writers. Thus Mr. Roland Rood writes about America, Mr. Mortimer Lamb about Canada. The year's photography in Spain is dealt with by M. Mendez Leon, while "Western Workers in the United States" is the subject of an article by M. Fayette J. Clute.

As this annual is noted chiefly for the reproduction of photographs, and in this issue the standard is excellent, it may be mentioned that the principal illustrations are reproduced by Messrs. Carl Hentschel, Ltd., and the printing by Messrs. F. W. S. Clark and Co., Ltd., on the "first quality art" paper of Messrs. John Dickinson and Co., Ltd.

One of the frontispieces is an excellent three-colour picture reproduced and printed by Hentschel-colourtype from negatives by Mr. William Gill. To those photographers who are mainly concerned with the "pictorial" branch of photography this annual will therefore prove of great interest.

Les Nombres positifs. Exposé des Théories modernes de l'Arithmétique élementaire. By M. Stuyvaert. Pp. xii+132. (Gand: Van Goethem, 1906.) Price 3 francs.

THIS treatise certainly deserves a trial by school teachers. The author realises that there is a great gulf between arithmetic, as usually taught in schools, and the strict logic of the subject, and, at the same time, that it is impossible to teach it with complete rigour to a school class. He assumes the commutative law of addition, and then proves the elementary rules in a way which is quite sufficient for school purposes, and does not involve any fallacies which afterwards have to be renounced. The treatment of irrationals follows Dedekind; that of fractions is based upon the definition that $a/b=c/d$ if $ad=bc$. Proportion is treated in the way that is usual in France; the section on this subject would require to be expanded and illustrated by the teacher; the same is true of other articles, notably § 13, which is unduly condensed, and where the distinction between algebraic and arithmetical divisibility is rather blurred. Many teachers will regret seeing contracted multiplication expounded by Oughtred's rule of reversing the digits of the multiplier. The rule for contracted division, though instructive, is needlessly complicated from a practical point of view; and, alas! the rule for arithmetical subtraction is given in its old-fashioned form. However, these are minor points, and it is worth while to refer to them only because the book is so attractive in other respects. Attention should be drawn to the author's way of considering fractions, which he sketches out in his preface.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Treatment of Cancer.

IN NATURE of December 20, 1906, I note an article (pp. 177–8) on "The Treatment of Cancer." As a scientific investigator, I must dispute the truth of the fact that I have any co-discoverer in this matter of the use of pancreatic ferments in the treatment of malignant growths. As, of course, you are well aware, all priority in scientific discovery depends upon publication. In the case of the medical man mentioned in the article there has never been any publication of scientific facts, and the reference to the comparative immunity of the small intestine from cancer has a very different scientific explanation from that given in the *British Medical Journal*, 1906, p. 715. The real reason is the very small extent of the original piece of gut, out of which, by growth within itself, the mammalian small intestine is developed. If the explanation given by this medical man were correct, the cœcum ought to be as immune from cancer as the lower end of the small intestine. This gentleman has never claimed to have discovered *a* cure, let alone *the* cure, for cancer. What he professes to have found is that the proteolytic ferment, trypsin, and not the diastatic one, amylopsin, splits up glycogen. This is a very remarkable find to have made! Assuming a miracle to have happened when these unpublished experiments were made, and that trypsin *did* split up glycogen, it may be asked why he and his pharmacist adopted for use as an injection into human patients, from about the end of February last until recently, a decoction containing a small amount of practically pure trypsin, which had no action whatever upon glycogen?

The medical man who made this remarkable find, which will not stand the test of confirmation, himself writes in the pages of the *Medical Press* of December 19, 1906, as follows:—"Every medical man must deplore the frequent attempts which are made in the Lay Press to induce the public to believe that a cure for cancer has been discovered." This is clear enough. Against it I, a scientific man, now affirm not only that *a* cure has been found, but that my own work and discoveries have revealed *the cure*. For the evidences of the truth of this statement I will not refer to various microscopic preparations of tumours after treatment, removed by operation, at a *post-mortem*, or sloughed away, for these are the property of physicians in England and America, who will themselves publish their cases.

Instead, as the space at disposal is limited, I will refer to Prof. W. J. Morton's preliminary report in the New York *Medical Record*, December 8, 1906, to the other cases in course of publication there, and to the brief account of the Naples case of inoperable cancer of the tongue, which I hope to see published shortly in the pages of that medical journal. Six months after all treatment ceased the patient is alive, well, and free from cancer.

This is the sequel of the use of preparations of pancreatic enzymes, scientifically prepared, and employed by such able and distinguished physicians as Cavaliere Guarracino and Prof. Manzo. The cancer yielded to the chemical test. The reagent for this is not, as so many in this country have believed, including certain cancer researchers, a solution of glycerine and water, possibly containing a little trypsin, but it is a potent extract of pancreas-gland, prepared from the fresh gland direct, and containing *all* the enzymes.

The writer of an article in the *British Medical Journal* for December 15, 1906, p. 1736, who displays a close knowledge of the unpublished work of a research body, states that trypsin is among the substances condemned in the passage cited from the fourth annual report of the Imperial Cancer Research Fund. I have not used the term "trypsin treatment," for I agree with Prof. Poirier, of the French Cancer Research, that trypsin will destroy cancer, but not cure it. The preparations used must be such as those manufactured by Messrs. Fairchild Bros. and Foster, and they must be employed in the way directed by a scientific investigator. If the statement be aimed at the course of treatment advised by me, a scientific man, and, as a chemical trade newspaper says, "not even a medical man," if this be the case, I now direct the attention of the scientific members of the executive of the Imperial Cancer Research Fund to its existence. I traverse it completely, and deny that it contains a vestige of truth. As I have produced evidences of its falsity, if it refer to the pancreatic treatment, I now call upon these scientific men to substantiate the truth of the point by the production of evidences, including a clear account of the means adopted to obtain a proper injection compound, or to retract and withdraw the assertion; for what happened in Naples has also occurred in New York, as well as in other places in this country, even in the neighbourhood of this city of Edinburgh.

J. BEARD.

8 Barnton Terrace, Edinburgh, December 23, 1906.

WITH reference to the above letter, questions of priority are not involved in the article referred to. It may be that Dr. Shaw-Mackenzie's advocacy of the trypsin treatment of cancer was based on a misconception, but that he did independently evolve it seems clear to us, and this is all that was suggested in the article. His line of treatment is indicated in a letter to the *British Medical Journal*, May 27, 1905, p. 1183, and again in the same journal, January 27, 1906, p. 240; in the latter not only trypsin, but pancreatin and secretin are suggested. As regards the term "trypsin treatment," Dr. Beard, in an article in the *British Medical Journal* (January 20, 1906, p. 140), uses the phrases, "the length of time and number of injections of trypsin necessary to destroy the tumour," "trypsin is the substance which will destroy the cancer cell (Beard and Shaw-Mackenzie)," &c., and he moreover states, "the preparation of trypsin employed (Fairchild Bros. and Foster's) was that originally dispensed to Dr. Shaw-Mackenzie's prescription by Mr. F. W. Gamble," thus acknowledging Dr. Shaw-Mackenzie's work, and actually making use of the latter's preparation of trypsin! Accepting the details of the case of cancer of the tongue cured by pancreatic extract as correct, it is a remarkable one, but not unique. The writer knows a case of mammary cancer, diagnosed as such 4½ years ago by four doctors, and on which a London surgeon refused to operate, which after treatment with X-rays has atrophied, and the patient is well and in good health to-day, surely as remarkable a case! Lastly, with regard to the alleged cures of cancer obtained by Prof. Morton in America (to which reference was made in the article), these are summarised in the *British Medical Journal*, December 22, 1906, p. 1835. About thirty cases were treated, and the results claimed are cure in two cases, remarkable atrophy of the tumour in one, and arrest of disease in many. In one case the "cure" has lasted four months, in the other one month! It is absurd yet to speak of such cases as "cured"; careful surgeons allow a *three years*' limit! To claim that "the cure" for cancer has been found has at present nothing to substantiate it, and in our opinion Dr. Shaw-Mackenzie's position is far more scientific than Dr. Beard's. We believe that the pancreatic enzymes must be injected into the neighbourhood of the growth or used locally; how, then, could the secondary growths in internal organs, &c., be attacked? Until this can be done, no "cure" for cancer will have been obtained.

THE WRITER OF THE ARTICLE.

The American Gooseberry-mildew.

I GIVE below the facts concerning the outbreak in England of this disease.

This mildew, *Sphaerotheca mors-uvae* (Schwein.), Berk.—known in America since 1834—has proved so destructive there as practically to prevent the cultivation of the European gooseberry on a commercial scale.[1] It was unrecorded in Europe until 1900, when it appeared in a few gardens in the north-east of Ireland. It has spread over

[1] See, for example, Year Book, U.S. Dept. Agric., 1899; also Bull. 114, 161, N.Y. Agric. Exper. Stat.

the eastern half of Ireland, causing great damage.[1] The disease has broken out on the Continent, and assumed epidemic proportions, causing such devastation that drastic legislative measures are being employed. The evidence shows that the outbreaks have originated from gooseberry-plants imported from America.[2]

In October last I discovered the disease in an English nursery on standard gooseberries recently imported from the Continent, and later in commercial plantations in one of the chief gooseberry-growing districts of England. I have since been warning fruit growers, by means of lectures and otherwise, of the new danger. I have taken every step to impress on the Board of Agriculture the necessity for preventing further importation of diseased plants and for enforcing the destruction of all those already infected.

The Board, on being informed of the outbreaks, sent Mr. Massee to the infected districts. As the result of his visit, a series of statements throwing doubt on the foreign origin of the disease and its serious nature have been widely circulated in the Press. These, as coming from the mycologist to the Board of Agriculture, have caused many growers to relax, at this critical stage of the first outbreak, their efforts to stamp out the disease.

I am convinced that there is no scientific foundation for the statements referred to. I have suggested[3] that the points at issue should be submitted to arbitration, for it is most important to fruit growers that no doubt should be allowed to remain on a matter which so affects their interests.

The Board has issued a circular warning growers of the serious nature of the disease; but it does not recognise that the disease is new to the country, and that legislation is necessary. Unless the Board takes stronger measures at once, and unless the effect of the statements made by Mr. Massee can in some way be counteracted, nothing can prevent the disease from spreading and causing losses of many thousands of pounds. E. S. SALMON.

South-Eastern Agricultural College, Wye, Kent, January 5.

Filter Presses.

WE shall shortly be compelled to purchase a filter press, and should be glad if you would give us information as to the best firms to approach in this matter.

THE "COOPER RESEARCH LABORATORY."

Water Lane, Watford, January 7.

[MANUFACTURERS of filter presses are invited to put themselves into communication with our correspondent.—ED. NATURE.]

ARCHÆOLOGICAL DISCOVERIES IN TURKESTAN.

WE have referred already (NATURE, December 13, 1906, p. 155, and December 20, 1906, p. 180) to the archæological expeditions of Dr. M. A. Stein and Dr. von Lecoq in Central Asia. News of Dr. Stein's second expedition, which has resulted in further finds of importance, has lately been received, and details of the discoveries of Dr. von Lecoq (foolishly described in a telegram from India as comparable with those of Layard and Rawlinson!) have been communicated by the discoverer to the Srinagar correspondent of the *Times of India*, quoted in the *Times* of January 3. From these it is evident that Dr. von Lecoq's discoveries are, as might have been expected, analogous to those of his forerunner, Dr. Stein, in imitation and emulation of whose work the Prussian expedition of Dr. von Lecoq was sent out. The MSS. documents found by Dr. von Lecoq are, with the exceptions noted below, of the same type and in the same languages as those found by Dr. Stein, and, further, Buddhist paintings of the kind described by Dr. Lecoq as "the missing stepping-stone by which Indian art advanced across Asia to Japan" were first found by Dr. Stein.

This being said, however, we must note that Dr. von Lecoq's work was carried out in a different part of Turkestan from Dr. Stein's, in the vicinity of Turfan and Urumchi, as well as at Kucha and Kurla. It is therefore to be expected that the results of the Prussian expedition, while generally analogous to those of the Indian ones, will show peculiarities due to difference of geographical position, &c., and it may well be that Dr. von Lecoq has discovered objects of later date than any found by Dr. Stein. The documents which he has found are mostly of the same kind and in the same tongues as those found by Dr. Stein, but some are written in new, or rather little-known, languages, such as Tangut, Koh-Turki, Middle Persian written in the Manichæan alphabet, and a sort of Central Asian dialect of Syriac. Manuscripts in ordinary Syriac were found; these are, of course, monuments of the Christianising activity of the Nestorians in Central Asia from 600 A.D. to 1000 A.D. A curious discovery is thus described:—"The furious zeal of the Chinese conquerors of Turkestan against Buddhism was exemplified by the discovery of the packed bodies, still clad and odorous, of a multitude of Buddhist monks driven into a temple, and stifled there, more than a thousand years ago."

Dr. von Lecoq's colleague, Prof. Grünwedel, is still working in Turkestan. Already fifteen chests of MSS., and altogether about 200 cases of "finds," have been sent to Berlin. "The expedition up to date has cost the German Government 10,000*l.*, a sum which may be contrasted with the 800*l.* spent on Dr. Stein's epoch-marking expedition of 1900–1 by the Indian Government." Comment upon this fact is superfluous, and would in any case be useless.

The current number of the *Geographical Journal* contains a letter from Dr. Stein, dated from Keriya on October 10, 1906, giving an account of his work up to date. Apart from his trigonometrical surveys of the Kuen-lun mountains and his archæological re-examination of the Buddhist monument known as the Rawak Stupa (already mentioned in NATURE), Dr. Stein excavated a small ruined temple in "the extensive débris-strewn areas known collectively as the Tati of Hanguya." Here he found terra-cotta rilievos of the fifth to sixth century A.D., often covered with rich gilding. Dr. von Lecoq reports similar discoveries of gilt paintings. East of the Khotan oasis Dr. Stein excavated ruined shrines near the village-tract of Domoko; that of Khadalik yielded MSS. of the same date as those discovered by Dr. Stein previously at Dandan-Uiliq. In one were found stringed rolls of Chinese copper money, deposited by one of the last devotees before the storm of Tibetan conquest wrested the land from the Chinese. At the time of writing, Dr. Stein was proceeding from Keriya to the eastern sites beyond Niya.

AT THE BACK OF THE BLACK MAN'S MIND.[1]

THERE can be no question as to the originality and value of this book as a contribution to West African ethnology. Mr. Dennett has lived many years amongst the Bavili and other tribes of the Kakongo district (Luango coast) immediately north of the Congo mouth. He has also of late lived as an official several years in the Benin district of the Niger Delta. About three-quarters of the book under

[1] Journ. Roy. Hort. Soc., vols. xxv.–vii., xxix. (1900–6).
[2] See Eriksson, *Zeitschr. f. Pflanzenkrankh.*, Bd. xvi.; also work of de Jaczewski.
[3] The *Times*, December 28, 1906.

[1] "At the Back of the Black Man's Mind; or, Notes on the Kingly Office in West Africa." By R. E. Dennett. Pp. xv+288. (London: Macmillan and Co., Ltd., 1906.) Price 10*s.* net.

review deals with the hierarchy of kings and chiefs, the laws, social organisation, marriage, birth, and death customs, psychology and philosophy of the Bavili; the remainder of the book treats with much the same subjects as they have been observed by the author in Benin. Finally, there is a valuable appendix by Bishop James Johnson on the religious beliefs and social laws of the Yoruba people.

To anyone interested in the Bantu languages or in the social organisation of the Bantu peoples Mr. Dennett's book will be of great importance. He reveals to us the existence of a relatively ancient (though perhaps not so ancient as he imagines) semi-civilisation of these Luango people. It is remarkable how much their ideas regarding their royal families, their kings and chiefs, resemble the customs of Uganda or of the Mwato Yanvo empire in south-central Congoland. There are also similar ideas of totemism or the division of society into cliques and coteries, each with its emblem or ancestral crest, such as the large Cephalophus antelope, the chimpanzee, pig, otter, francolin (which Mr. Dennett miscalls "partridge"), and domestic goat. Though Mr. Dennett does not cite the mushroom as a totem, it appears to be regarded as possessing mystic qualities (as in Uganda). He gives a native equivalent for "totem" as "china" (which he mis-spells *xina*), plural "bina." This word he also renders as "prohibition." It is apparently related to the widespread Bantu root *kina* or *bina*, to dance, such dancing being of a ceremonious or religious nature, and often used to illustrate the action or the object which should be avoided by the persons concerned.

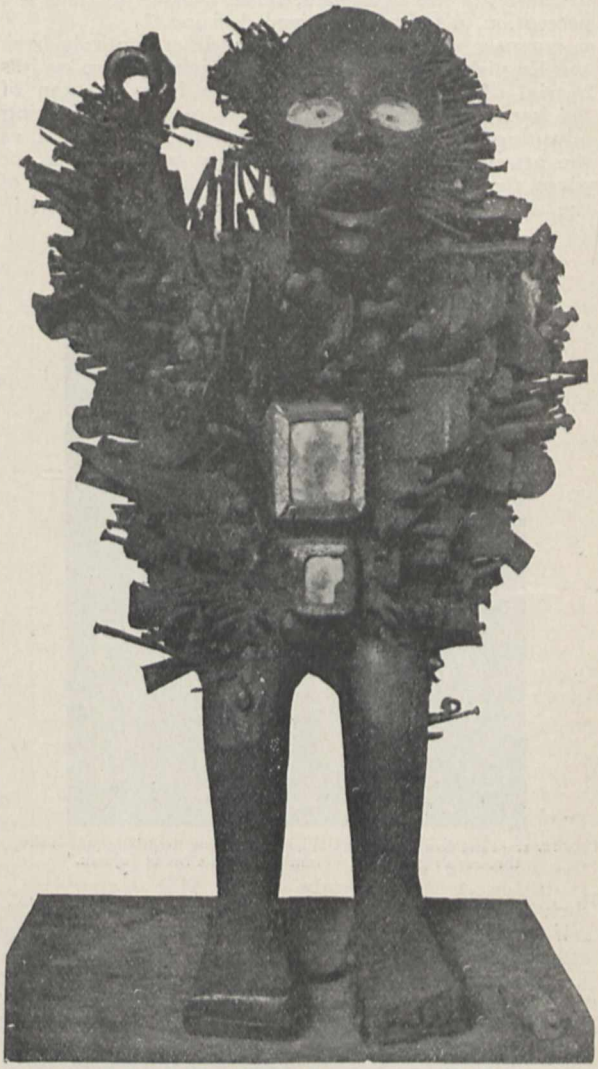
It is also interesting to notice that the word for sacred grove or specially preserved forest in Luango is the same as in the languages of the Victoria Nyanza, *chi-bila, bi-bila* (in East Africa this word is pronounced *-bira*).

Mr. Dennett deals exhaustively with the omens of birds, frogs, dogs, and snakes; also the remarkable connection of the rainbow and its primary colours with certain specified serpents supposed to represent each colour. He describes all the sacred animals (and the folk-lore concerning them), also the names of the four days of the week (for, as in most parts of negro Africa, the week contains only four days); the names of the seasons, native ideas of astronomy and natural history (the details about the life of the chimpanzee are particularly interesting).

Somewhat similar information is given about Benin. Both in regard to the Bantu people of Kakongo and the West African negroes of Benin Mr. Dennett supports his opinion by citations of the native languages, which (overlooking an exasperating orthography) are almost invariably correct. In some cases he does not seem quite to have grasped the meaning of words. For example, *Nzambi mpungu* really means the God of the Firmament, though this is not quite clearly stated by Mr. Dennett, who has not realised that *mpungu* is only a variation of the East African Bantu *mwingu*, from a root (probably originally *-pingu*) meaning the sky, the heavens, the region in which rain falls from the clouds.

The reviewer cannot accept Mr. Dennett's etymology of the Bantu phrases he attempts to explain. He would read into them a philosophy which is altogether misleading. An acquaintance with other and cognate forms of speech would have shown him this.

For the mass of the book, however, the reviewer has nothing but praise, but he must enter here an emphatic protest against the unreasonable orthography adopted in the case of the Luango or Kakongo language (but not as regards the Bini tongue). For the consonant *c* or *ch* (the sound of *ch* in *church*) Mr. Dennett uses the letter *x*. Most transcribers of African tongues have agreed to adopt the single letter *c* to express the combination *tsh* or the palatal *k*. Some missionary writers have made use of the letter *x* in its Portuguese interpretation for the sibilant *sh*. It is a great pity that even this should be done, for if *x* is to be used at all it might preferably be employed to express the combination *kh*, the guttural *ch*; but to transfer this needlessly for *c* or *ch* is a serious stumbling-block to the reader. There are



Mavunga, a Kabenda nail-fetish. From "At the Back of the Black Man's Mind."

other points (which it would be wearisome to discuss in detail as regards the transliteration of these Bantu dialects in Mr. Dennett's book) that hinder and confuse. It is such a valuable contribution to ethnology that one could almost wish a second edition might be brought out with a revised and reasonable orthography—from which, for example, such blots as "Fjort" might be removed. This is the way in which Mr. Dennett for many years past has chosen to spell the Congo word *fi-ote*, which means "a black man."

JUJUTSU.[1]

THIS work gives most clearly and concisely an idea of the fascinating art of jujutsu. It is written with the idea that anyone having had a few lessons may continue the exercises, or throws, without the constant help of a teacher, though to learn from the description only would be quite impossible.

Sir Lauder Brunton has given an admirable preface, from which it may be inferred that the medical profession thinks highly of jujutsu as a matter of exercise for both sexes. He says:—"By it not only is every muscle strengthened, but the highest centres of the brain are developed, those whose functions are perception, discrimination and decision."

Japanese wrestling, or jujutsu, differs entirely from the English form of wrestling, which is more or less a trial of strength. In jujutsu it is a question of quickness and brains; the throws are given by taking advantage of the opponent's movements, so that as the attacker advances the opponent trips him up, or gives the throw, by profiting by the momentum of the attacker's body, placing his foot, leg, or arm in

FIG. 1.—First position of the Uchimata, showing the lifting pull of the thrower's right hand. From "The Fine Art of Jujutsu."

such a position that the attacker cannot save himself from falling. In fact, the momentum of the attacker is used to his own detriment.

In commencing, the pupil learns to give the "Laudori Kata," which form the basis of nearly fifty methods of defence against various attacks, and not until the pupil has had many lessons is he or she allowed to learn how to take a fall. There is as much to learn in taking the falls as in giving them, and, provided he follows the teacher's instructions exactly, he need not be afraid of getting hurt.

After several of the throws have been separately mastered the pupil is taught to put them in practice in the "loose play," and here it is that the real delight of jujutsu commences, for all his faculties must be alert; he may trip up his teacher with an ankle throw; or, taking advantage of some side movement, may give the "Hizagurama" or trip from the side of the knee; or he may turn sharply round and give the shoulder throw, bringing his opponent over his shoulder on to the ground. Then, when well advanced, the pupil takes his chances against his teacher, and the struggle to put in a throw on either side becomes very exciting.

One great delight of these exercises, as mentioned in the preface, is the extreme accuracy which is absolutely necessary; if a certain movement is not done correctly it cannot be done at all. If the opponent fails to take advantage of the movement of the attacker at the right instant it is impossible by main force to effect a throw.

Perhaps the most difficult throws are those given in Figs. 44 and 45, which are here reproduced, called the "Uchimata," for it requires immense practice to get the balance necessary to gain the second position.

Besides the throws, there are many locks which are most effective in overcoming an opponent. Fig. 111 and the following series represents one of these in detail, by which, when used in self-defence, it is not difficult to break the elbow of the attacker.

In addition to the jujutsu described in these pages

FIG. 2.—Second position of the Uchimata, showing the full fling up of the thrower's right leg while standing poised on the left. (From "The Fine Art of Jujutsu.")

there is another form, which consists in wrestling on the ground, where the throws are given and are finished by a lock on the ground; but this is such a very rough form of exercise that it is not described in Mrs. Watts's book.

We have not yet alluded to the excellent illustrations by that well-known amateur photographer Mr. G. W. Beldam. Without them the text would be impossible to follow, and to have caught the different positions so exactly shows immense patience and ability on his part. T. MARY LOCKYER.

[1] "The Fine Art of Jujutsu." By Mrs. Roger Watts, with 141 Action Photographs by G. W. Beldam. Pp. viii+146. (London: W. Heinemann, 1906.) Price 6s. net.

SCIENTIFIC WORK IN EGYPT.[1]

THE work of the Survey Department in Egypt embraces many inquiries outside those usually identified with geodetic measurement. The department is responsible for the conduct of a laboratory in which analyses of rocks, ores, and minerals are made for the Geological Survey, where the illuminating

[1] "A Report on the Work of the Survey Department in 1905." By Capt. H. G. Lyons, F.R.S., Director-General. Pp. 76+plates. (Cairo: Al-Mokattam Printing Office, 1906.)

power of the Cairo gas is determined, and where paint, oils, cement, asphalt, &c., are tested for commercial purposes. Further, the purity of the water supply of Cairo demands constant attention, while the river water and the silt which the Nile carries in suspension during a large portion of the year have to be repeatedly examined. These are matters which must be passed over with a bare mention, though doubtless the management finds the addition of such investigations sufficiently exacting.

More immediately connected with the work of the department appear to be the hydrographic survey of the Nile and river gauging. For the efficient examination of questions connected with this subject a permanent gauging station has been erected at Sarras, thirty-three miles below Wady Halfa, and here are measured in various ways some of the factors that determine the quantity of water in the river. The work is hardly out of the experimental stage at present. A main object is to determine the most appropriate kind of apparatus that will give accurate results with the least expenditure of labour. This section is very interesting, and tables are added showing the volume of water discharged in cubic metres per second, and the mean velocity per second, with other details. The velocity and volume both increase up to the end of August, when, unfortunately, observations were discontinued, though the time of maximum was not reached. A preliminary discussion of the results has shown that the volume of the discharge at Khartoum, when the Atbara was not contributing, was greater than that at Aswan by amounts which could not be explained by loss from evaporation or from use in irrigation. The cause of the loss is not yet decisively explained, though Captain Lyons makes a plausible suggestion.

Another feature of the report is the description of the Helwan Observatory, which seems to be very fairly equipped with magnetic, meteorological, and seismological instruments. Of the astronomical portion, we learn that the 30-inch reflector presented to the Egyptian Government by Mr. R. H. Reynolds, of Birmingham, is in course of erection, and that all the heavy castings are in position. Some of the mechanism has been returned to England for alteration, and the completion of the erection awaits the return of these essential fittings.

Of the geodetic work properly so-called, details are given of the second order triangulation with all necessary fulness. The standard of accuracy attained is not quite that of the highest order, but sufficient for the object for which the measurement was undertaken, namely, the control of the map sheets used in the revenue survey of the country. It is now possible to base a map of Egypt on a connected triangulation from Damietta to Wady Halfa, an extent of nine degrees. Of even greater importance, however, is the triangulation, which it is to be hoped will be ultimately carried out, whereby Egypt will contribute to the measurement of the arc of meridian, which in its entirety will extend from the Cape of Good Hope to the North Cape, along the thirtieth parallel of east longitude. For several years Sir David Gill has been engaged in carrying this chain of triangulation northward, and the prospect of completing a measured arc of some 100° of latitude cannot but be of profound interest to the astronomer, the geologist, and the physicist. Captain Lyons, however, is fully aware that the value of such a work consists very greatly in the maintenance of the same standard of accuracy throughout. The most difficult problem of geodesy, he tells us, is to pass from a particular platinum and iridium bar, on which the length of the metre is defined, to the length of a base line over a more or less rough land surface with as great an accuracy as possible. Viewed in this light, the most interesting portion of the report consists in the description of the method of the comparison of the bars and Jaederin wires used in Egypt. The accuracy seems quite satisfactory. W. E. P.

INTERNATIONAL FISHERY INVESTIGATIONS.[1]

THE results of the first two or three years of active investigation in connection with the general scheme of fishery research, which is being carried out in the seas around north Europe under the auspices of the International Council for the Exploration of the Sea, are now being rapidly published in a series of reports issued in part by the Bureau of the International Council and in part by the authorities of the different countries participating in the international scheme. As the outcome of the work is being thus gradually brought to light, the comprehensive character of the programme becomes increasingly obvious. The remarkable scientific interest of the results obtained from what is probably the greatest and most serious attempt yet made to carry out a scientific investigation by means of international cooperation is placed beyond dispute, nor can it be doubted that the eventual practical benefit of these researches will be of even more importance and of much direct value to the fishing industry.

The first report under review contains detailed accounts of some of the work carried out in 1902 and 1903, whilst in the Marine Biological Journal Mr. James Johnstone, of the Liverpool University Fisheries Laboratory, gives a useful *résumé* of the results published up to the summer of 1906. The remaining reports deal for the most part with more recent publications.

As must be by this time well known, three main lines of research are being developed in the international scheme, the hydrographical, the biological, and the statistical. The hydrographical investigations record and endeavour to explain the constantly changing physical conditions under which fishes pass their lives; the biological investigations aim at a complete account of the life-history of the more important food-fishes, as well as a detailed knowledge of the various smaller marine creatures which serve as the food of fishes; the statistical investigations deal primarily with the variations in the actual quantities of fish removed from the different fishing-grounds and brought to market, and at the same time yield considerable material which is capable of supplementing and amplifying the knowledge of the history of the fishes obtained from the biological observations. Although the three branches of the investigation are for practical reasons carried out more or less independently, the ultimate success of the work depends upon the judicious combination of the knowledge gained from each, and its application to particular problems of the fishing industry.

A striking example of the success of such a combin-

[1] Reports of the British Delegates attending the Meetings of the International Council for the Exploration of the Sea in 1903, 1904 and 1905, and Reports and Correspondence relating Thereto. Vol. ii., General Report of the International Council for 1902–1904 [Cd. 3033]. A Reprint of Conseil permanent international pour l'Exploration de la Mer. Rapports et Procès-Verbaux, vol. iii. (London: Printed for H.M. Stationery Office.)

Conseil permanent international pour l'Exploration de la Mer. Rapports et Procès-Verbaux, vols. v. and vi.; Bulletin trimestriel des Résultats acquis pendant les Croisières périodiques et dans les Périodes intermédiaires, Année 1905–1906, No. 3, Janvier–Mars, 1906; Bulletin statistique des Pêches maritimes des Pays du Nord de l'Europe, vol. i., pour les Années 1903 et 1904.

Journal of the Marine Biological Association of the United Kingdom, vol. vii., No. 5.

ation is contained in Dr. Johansen's paper on the plaice fishery of the Kattegat, and the means whereby it may be improved (*Rapports et Procès-Verbaux*, vol. v., p. 45). From a study of statistical data it is shown that although the intensity of fishing for plaice in the Kattegat, in consequence both of an increase in the number of boats and of improvements in the fishing gear, has increased very greatly since 1885, the actual weight of plaice landed has remained practically stationary from that year until 1904, the year for which the last statistics are available. It is only a rise of about 200 per cent. in the price of plaice that has enabled so many boats to continue profitable fishing; but although the total weight of fish has neither increased nor decreased during the period mentioned, there has been a marked decrease in the average weight per fish, so that the plaice harvest is now composed of a much larger number of smaller fishes than was formerly the case. Johansen, following out an idea previously developed by Petersen, shows that at the present time by far the greater number of plaice are captured before they have attained the size at which their value per unit of weight is greatest.

Biological investigations carried out in the Kattegat have shown that there are important differences between the plaice populations in the northern and in the southern parts of the area. In the northern Kattegat the fish are large and well grown, and attain sexual maturity at a later age and larger size than those in the southern Kattegat. This change in the character of the fish population is correlated with the changes in the hydrographical conditions which take place as the Baltic is approached. The plaice supply of the southern Kattegat consists chiefly of small fish already sexually mature, that of the northern Kattegat of larger and more valuable fish which have not yet attained maturity.

The principal nurseries for young plaice near the Danish coast have been investigated, and the fact that the rate of growth of the fishes on some of these nurseries, as determined both by marking experiments and by examination of otoliths, is abnormally low suggests that these particular grounds are overcrowded with young fish. This condition is not, however, found in either the Kattegat or Skagerak, and in the southern Kattegat the rate of growth during the first two or three years of the life of the plaice is as rapid as in the northern part, although in later years it becomes much less rapid. The experiments with marked fishes which have been carried out on plaice in the Kattegat have shown that far more than 50 per cent. of the plaice are re-captured each year, thus indicating a very high intensity of fishing.

After a careful review of the evidence gathered from all the different lines of research, Johansen comes to the conclusion that the enforcement of a minimum size-limit for Kattegat plaice of 30 cm. (12 inches) would result in an increase in the value of the fishery amounting to from 50 per cent. to 100 per cent., although the exact figure can only be determined by experiment. Further, since in certain parts of the Kattegat only insignificant numbers of small plaice are found, but these grow rapidly, he thinks that the transplantation of large numbers of small fish from more crowded nursery grounds to such places would be worth a trial.

A study of Johansen's paper can hardly fail to leave the impression that a great advance has been made towards the solution of the more important problems connected with the plaice fishery of the Kattegat, and that promising practical schemes, based upon a rational understanding of the questions involved, are already in prospect for the improvement of that fishery. The Kattegat is a somewhat circumscribed sea-area of moderate dimensions, and it will be scarcely surprising if the end to which all scientific fishery investigations are directed is first achieved there; but the reports before us show that work upon quite similar lines is being rapidly done on the plaice fisheries of the larger region, which may be described as the middle and southern North Sea. The summary of the investigations of the German, Dutch, and English naturalists, which is contained in the report of Dr. Garstang, the convener of Committee B ("Reports of British Delegates," vol. ii., p. 191), in that of Dr. Redeke (*ibid.*, p. 265), and in the various statistical papers by Henking (*ibid.*, p. 127), Hoek (*ibid.*, p. 300), and Kyle (*ibid.*, p. 363, and especially *Bulletin statistique*, vol. i.), foreshadow as complete and satisfactory a solution of the problems in this area as has been, one might almost say, already achieved in the Kattegat.

In the larger area the marked-fish experiments have already yielded much valuable information, and it ought not to be long before a fairly complete account is available of the normal migrations of the plaice. The transplantation of small plaice from the crowded nursery grounds along the coast to the shallow waters of the Dogger Bank, in the middle of the North Sea, has been attended with a high measure of success, the growth of the transplanted fish having been several times greater on the Dogger than on the inshore grounds. An experiment in transplantation upon a very much larger scale is the next step which appears to be called for.

The plaice, however, is only one amongst the many fishes which have received attention. Much interesting work has been done on the haddock and on the cod, although most of the reports so far published are of a preliminary character only (Hjort and Petersen, "Reports of British Delegates," vol. ii., p. 153).

The herring, too, is receiving attention, and the statistical data brought together by Kyle (*Bulletin statistique*, vol. i., p. 228), with the accompanying charts, give a graphic picture of the movements of the herring fleets, and therefore, presumably, of the fish themselves. The attempt already begun to correlate these movements with changes in the hydrographical conditions will almost certainly yield valuable guidance to the herring fishermen, and ought to enable them to avoid much fruitless shooting of their nets.

A striking piece of work is Dr. Johs. Schmidt's contribution to our knowledge of the life-history of the common eel (*Rap. et Proc.-Verb.*, vol. v., p. 137). Grassi and Calandruccio had already followed, from specimens taken in the Straits of Messina, the different stages in the metamorphosis of the eel larva from *Leptocephalus brevirostris* to the young elver, and they had suspected that the natural home of the Leptocephali was in deep water, their occurrence in the Straits of Messina being due to the peculiar nature of the currents and the upwelling of water from the deeps. Schmidt's researches, carried out on the Danish investigation steamer *Thor*, to some extent confirm this view, rendering it at the same time more precise, and the spawning grounds of the European eel and the home of the eel larvæ are now for the first time made clear. It is along the edge of the continental slope, to the west of the British Isles, that the young eel larvæ (*Leptocephalus brevirostris*) are found in large numbers, in regions where the depth of the water is about 500 fathoms and the bottom temperature is at least as high as 7° C. The larvæ themselves are not, however, near the bottom,

but occur chiefly in the upper and middle water layers, being found during the daytime in greatest numbers about 50 fathoms below the surface. The inference is obvious that the female eels spawn on the bottom in the same or a neighbouring area to that in which the larvæ are taken. The highest point of larval development seems to occur in June; the Leptocephalus has then ceased to feed, and the next stage of its existence is a long, retrogressive metamorphosis, during which it decreases in size in all dimensions, and gradually takes on the slender eel-like form. During the latter part of the metamorphosis the larvæ, or elvers as they may now be called, become very active, and commence their great migration towards the coast and the fresh waters in which they feed and grow. The whole process of metamorphosis occupies about a year, and during this time the young eels take no food at all.

Schmidt has obtained information from localities all along the west coast of Europe, from Spain to Norway, as to the time of year when the young elvers first appear in the rivers, and the interesting fact comes out that the time of occurrence of the elvers on the different coasts depends, in the first place, on the distance from the deep water in the Atlantic where the eels spawn. On the coasts directly washed by the ocean the ascent into fresh water begins between September and December, or even in January or February, according to the distance from the deep water, whilst on the coast of Denmark and in the inner Danish waters the elvers do not arrive until April and May.

The whole story of the life of the common eel, as now made clear by these investigations, is one of the most fascinating which it has fallen to the lot of any naturalist to unravel. We can picture the great shoal of parent eels, the long journey from the inland waters ended, arriving at their proper spawning places in the deep Atlantic along the whole length of the European coast; the floating eggs gradually developing into transparent, deep-ribbon-shaped Leptocephali; the slow transformation to slender, active elvers; the vast multitude of elvers, foodless, their whole energy concentrated and spent in locomotion only, moving steadily in towards the coast, entering the rivers of Ireland and of France, entrapped in the great funnel of the Severn's mouth, pressing on through the English Channel and into the North Sea, a remnant only, when tribute has been paid to all the rivers by the way, reaching the fresh waters of Denmark and the Baltic coasts; and, finally, the feeding and growth of the eels all over the European continent in preparation for the return migration to the sea.

There can be little doubt that this new knowledge of the life-history of the eel will lead to results of great practical value to the eel fisheries of Denmark. The fact that one large market for Danish eels is in London makes the question one of practical interest to this country also. In the first place, Schmidt points out that since Denmark and the Baltic depend for their supply of young eels upon the general European stock coming from the Atlantic, any protection of the adult fish in Danish waters is quite uncalled for, since even if all the Danish and Baltic eels were caught, only an insignificant reduction in the number of eel larvæ in the deep waters of the Atlantic would result. In the second place, since the evidence seems to show that the main supply of young eels to the Baltic comes from elvers which have travelled through the English Channel, and not around the north of Scotland, only a remnant of the great shoal of migrating elvers reaches that coast, a view which is confirmed by the fact that in Danish rivers no such immense runs of elvers are known as are found in the Severn or in the rivers along the Atlantic sea-board. It would seem that whilst the latter rivers, owing to their geographical position and configuration, receive far more elvers than they are able to support, those of Denmark and the Baltic may have a deficient supply. Schmidt recommends, therefore, that elvers should be taken from the western rivers (elvers caught in large quantities in the Severn are sold at from 1*d.* to 2*d.* per pound, and one pound contains about 1500 individuals) and transferred to the Danish rivers and to the Baltic, where they are wanted, and where there is room for them to grow into large eels.

Lack of space precludes us from describing in the same detail as we have done for the plaice and the eel the work which is in progress in connection with the other food-fishes. Heincke's report on the occurrence and distribution of the eggs, larvæ, and various age-groups of the food-fishes in the North Sea (*Rapports et Procès-Verbaux*, vol. iii.), and the papers by Hjort and others on the life-history of the haddock and cod already referred to, clearly indicate results which may eventually be of even greater interest and importance than those described above.

It seems impossible, after an impartial consideration of the volumes before us, to come to any other conclusion than that the International Fishery Investigations are being conducted with marked energy and enthusiasm by all the countries engaging in them, and that the great conception of an international cooperation of men of science having for its object the acquirement of the knowledge necessary for the rational exploitation of the sea on a scientific basis is in a fair way to justify itself in the eyes of the world.

NOTES.

ON Monday last the Duke of the Abruzzi delivered to a large audience in the Argentine Theatre at Rome a lecture on his expedition to Ruwenzori, and was awarded the gold medal of the Geographical Society of Italy. The King and Queen of Italy were present with their full Court, and the Diplomatic Corps and chief officers of State also attended. The lecture will be repeated at a special meeting of the Royal Geographical Society to be held at the Queen's Hall, Langham Place, on Saturday, when the King and the Prince of Wales have signified their intention to be present.

WE regret to announce that Mr. Cornelius O'Sullivan, F.R.S., known chiefly by his investigations on scientific aspects of brewing, died on January 8, in his sixty-sixth year. We regret also to learn of the death of Mr. T. R. Dallmeyer, head of the famous optical firm, and formerly president of the Royal Photographic Society.

MAJOR E. H. HILLS, C.M.G., R.E., who has been appointed to inspect and report upon the survey departments now working in the protectorates of British East Africa and Uganda, has just left England for Mombasa. On the completion of the above-mentioned work he will proceed to Colombo to make a similar inspection in Ceylon.

A NEW Government farm, to be devoted wholly to tobacco research, is to be opened, says the *Pioneer Mail*, in the Rangpur district of Bengal, which is believed to contain perhaps the most important tobacco-growing area in the whole of India, the climate and soil in certain parts of the district being admirably suited to the cultivation of the crop.

SOLAR halos are not so rare as to be very remarkable meteorological phenomena, but a halo seen complete or in parts in the afternoon of January 4, in various parts of the country, seems to have excited some interest among people unfamiliar with its nature. At Hitchin the halo was first noticed about 2.15, and it lasted until about 3 o'clock, three-quarters of a complete circle being visible. A complete halo was noticed at Southampton and Worcester about 3 o'clock, and portions were observed near Ealing at 3.20, and at Chichester about 4 o'clock.

ON Tuesday next, January 15, Prof. Percy Gardner will deliver the first of two lectures at the Royal Institution on "The Sculpture of Aegina in Relation to Recent Discovery," and on Thursday, January 17, Dr. W. N. Shaw will begin a course of two lectures on "Recent Advances in the Exploration of the Atmosphere." The discourse on January 18 will be delivered by Sir Andrew Noble, Bart., K.C.B., on "Fifty Years of Explosives." Prof. W. W. Watts being unable to deliver his two lectures on the "Building of Britain" and "Recent Light on Ancient Physiographies" on Thursdays, February 14 and 21, Mr. Alfred Harker will deliver two lectures on those dates on "The Minute Structures of Igneous Rocks and their Significance."

A MAGNETIC survey of Mexico is now in progress under the joint auspices of the Mexican Government and the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. It is reported in *Science* that the Mexican Government has two parties in the field under the direction of the Observatorio Astronomico Nacional Mexicano, one having charge of the eastern part of the country and one of the western part, embracing the Pacific coast from Manzanillo to Guaymas, inclusive of Lower California. The Carnegie Institution party will confine operations to the part of Mexico north of the twenty-fifth parallel, upon the completion of which it will proceed to Campeche, Yucatan, and the Central American countries. It will be possible within the next year to construct accurate magnetic maps for the region between the parallels of latitude 20° and 49° north and meridians of longitude 65° and 125° west of Greenwich.

THE Harvard ethnological expedition to South America is now on its way to Arequipa, Peru, where it will make its headquarters for three years. It consists of Dr. W. C. Farabee, a Harvard instructor in anthropology, with two assistants, Mr. L. J. de Milhau and Mr. J. W. Hastings, with Dr. Edward F. Horr as physician to the party. Its main object is to collect all possible information about the little-known Indian tribes living on the headwaters of the Amazon and Parana on the east of the Andes. The only previous exploration in this region was that of Dr. Flick, a German man of science, who, however, covered only a small part of the territory that will now be visited. The expenses of the expedition will be met by a recent Harvard graduate. The Secretary of State has provided letters of introduction to various officials in South America, and assistance is also expected from the Harvard Observatory at Arequipa. Another scientific expedition in which Harvard is interested is that which Prof. Alexander Agassiz is projecting for February, when he will take a small party in a steam yacht for a cruise in the West Indies.

THE University of Michigan has come into possession of a tract of land which is to be developed into a garden meeting all the requirements of the present-day European botanic gardens. We learn from *Science* that the ground comprises about thirty acres, and is separated from the Huron River by an approximately equal area owned by the city of Ann Arbor. By an agreement entered into by the University and the council of the city, the two pieces of land are to be developed as one, thus ensuring a garden and park of at least sixty acres. The following four aims for its use will be observed in the development of the garden:—(1) teaching, in which students are instructed in the various orders and functions of plants; (2) scientific, in which genetic relationship is studied and experimental work is carried on; (3) economic, in which collections of medicinal and economic plants are made, and the effect of horticulture and agriculture is shown; and (4) æsthetic and popularly educational, in which special provision is made to make the plantings, the drives, and walks of interest and value to the public.

AN obituary notice of Prof. Ernesto Cesàro is contributed by Prof. Ernesto Pascal to part xvii. of the current number of the *Rendiconti* of the Lombardy Institution. Cesàro was born at Naples on March 12, 1859, and went to study in the School of Mines at Liége, where his brother had previously been appointed professor of mineralogy. He soon developed a taste for mathematics, and began to publish papers in *Mathesis* and elsewhere. In 1886 he presented more than a hundred papers in competition for university prizes at Messina on infinitesimal calculus, and at Naples on complementary algebra; and six years later, in awarding him the gold medal of the Italian "XL" Society, Beltrami alluded to about 200 papers, many of considerable length, from his pen. Cesàro returned from Belgium to study mathematics at Rome, but never consented to present himself for examination for the university degree. In 1886 he was appointed professor at Palermo, and was awarded an honorary degree by the University of Rome at the early age of twenty-seven. In 1891 he was transferred to Naples. His works deal with arithmetic, theory of functions, algebraic analysis, theory of elasticity, intrinsic geometry and infinitesimal calculus. On September 12, 1906, he was bathing with his son at Torre Annunziata, when a wave struck the boy. In attempting to rescue him the father was struck on the head, and both father and son perished together.

WE have received a copy of an address delivered by Prof. Carl Rabl, director of the Anatomical Institute at Leipzig, before the university of that city on June 21, 1906, and entitled "Über 'Organbildene Substanzen' und ihre Bedeutung für die Vererbung" (published at Leipzig). One of the chief subjects discussed is the theory of the continuity of the chromosomes, that is to say, of the chromatic elements of the nucleus of the germ-cell. In conclusion, it is argued that the development of an organism must be regarded as a continuous chain of chemical progression, based upon and regulated by a definite anatomical substratum.

THE report of the Bristol Museum and Art Gallery for 1906 chronicles the results of the first complete year's working of the combined institutions, and it is satisfactory to learn that in every respect the authorities have reason to congratulate themselves on their efforts. The public has responded in an almost surprising manner to the attractions offered, the attendance during the year having exceeded half a million. In the natural history section groups of birds, both British and foreign, as well as one of tigers, have been set up for the museum by Rowland Ward, Ltd., and have proved highly attractive. In the list of big-game trophies the name of one animal is given as the "Burmese buffalo or gaur," which leaves

the reader in a happy state of ignorance as to the species really referred to.

THE whole of the second part of vol. vii. of the Bulletin of the Tokyo College of Agriculture is devoted to silk-worm culture and problems connected therewith, all three articles being from the pen of Mr. K. Toyama. Breeders, it appears, have a belief that if a male moth is mated with more than one female, the product of the later unions will be feeble. The author finds, however, that polygamy is a normal condition of the species, and that the reputed ill-effects of this habit are non-existent. The study of a fly parasitic on silk-worms forms the subject of the second article. In the third, the conformity or otherwise of hybrid silk-worms to the Mendelian law is discussed. Careful investigation has shown that, as regards the colour of the cocoons and eggs and the nature of the larval markings, Mendel's law is followed, although in respect to the shape of the cocoons and the brood-characters no adherence to this can be detected.

IN the twentieth annual report of the Liverpool Marine Biological Committee, or, in other words, the Marine Biological Station at Port Erin (Isle of Man), reference is made by Prof. Herdman to the urgent need of a steam-yacht for local collecting. For two months such a vessel was privately chartered, and employed in experimenting on the kinds of nets best suited for collecting micro-organisms, but, unfortunately, the funds at the disposal of the committee do not permit the permanent engagement of a steamer. The aquarium continues to form a great attraction to visitors, of whom more than 15,000 were recorded during the summer. Several invertebrates new to the fauna of the Irish Sea have been collected. The suitability to their purpose of the tanks is demonstrated by the fact that several organisms have made their appearance spontaneously, having gained entrance by way of the supply-pipes, some of which were blocked by the invasion. Care has to be taken in regard to placing animals together, as one rare anemone was devoured by a commoner kind, while it was found that the worm Nereis is in the habit of dragging Sabellæ from their tubes. The fact that the lugworm can swim is a new discovery. Prof. Herdman's address on "Some Problems of the Sea," referred to in our issue of last week, forms an appendix to the report.

IN the January issue of the *Century Magazine* Prof. H. F. Osborn describes a find of prehistoric crania from a mound in Douglass County, Nebraska. Of the six skulls discovered, two from an interment near the surface of the mound were of the modern Indian type; but beneath these, and covered by a layer of ashes resting on a stratum of silt compacted by the fire above, four skulls of a remarkable character were unearthed. The only implement found with them was a small, broken, triangular flint knife. Unfortunately, the back part of each of these crania is wanting, but the portions which remain exhibit low cranial capacity, and are believed to approximate to the Australian type. The supra-orbital ridges are not more pronounced than those of the Australian, but the forehead is even more flattened and receding. These skulls, which have been deposited in the museum of the University of Nebraska, indicate a race of low cerebral capacity, inferior to the modern Indians or the typical American mound-builders. Their average stature was about 5 feet 10 inches. Compared with typical primitive forms—those of the Javan *Pithecanthropus erectus*, that of Gibraltar, and the Neanderthal skull—the American specimens seem to represent a class more recent than the last. It would be rash to speculate on the importance of this discovery until the missing portions can be recovered or more perfect specimens unearthed. "Even if not of great antiquity," says Prof. Osborn, "it is certainly of a very primitive type, and tends to increase rather than diminish the probability of the early advent of Man in America." The same issue of this magazine contains President Roosevelt's enthusiastic account of ancient Irish Sagas, in the course of which he takes occasion to advocate the foundation of chairs of Celtic in the universities of America.

THE latest issue—a double number—of *Le Bambou*, dated mid-December, completes the first volume. The articles include a note on the indigenous localities of species of Phyllostachys, an account of the vegetative development of bamboos, and a report on the growth of the species cultivated at Ermitage during the year.

AMONG the papers read before the Botanical Society of Edinburgh, and published in the second part of vol. xxiii. of the Transactions and Proceedings, Mr. J. A. Alexander communicates an article on the flora of Portuguese East Africa, with illustrations, detailing the more conspicuous plants. The dominant order is Compositæ, containing several species of Vernonia, Helichrysum, and Senecio, but the Leguminosæ and Euphorbiaceæ are more interesting and useful. Of Landolphia rubber vines only the species *florida* and *petersiana* are mentioned. An account of the extra-tropical trees planted and grown in Arran by the Rev. D. Landsborough testifies to the mildness of the seasons in parts of Scotland, as the list includes species of the Chamærops palm, the palm-lily Cordyline, Eucalypts, and numerous bamboos; measurements of the height and girth of the trees are recorded. The discovery of an evergreen Cystopteris by Mr. W. Young in Aberdeenshire, that receives the name of *C. fragilis*, var. *sempervirens*, is noteworthy.

IT is annoying, but often necessary, when the names of a group of economic plants are revised to find familiar designations displaced by others more justifiable. The limits of the genus Andropogon have always been uncertain, and consequently, in working out the nomenclature of the oil-grasses of India and Ceylon, to which subject the whole of the eighth number of the *Kew Bulletin* is appropriated, Dr. O. Stapf has found it necessary to transfer ten species to the genus Cymbopogon, to re-christen the species *muricatus*, better known as "khas-khas," by the name of *Vetiveria zizanioides*, and to retain under Andropogon only the insignificant species *odoratus*. This, however, is only a portion of the tangle Dr. Stapf has endeavoured to unravel. The following names are given to the commercial oils:—citronella oil is *Cymbopogon nardus*; lemon-grass oil is *C. citratus*; the lemon-grass oil of Malabar or Cochin becomes *C. flexuosus*; Rusa grass or palmarosa oil, *C. martini*; and *C. schoenanthus* is limited to the "izkhir" of Arabia, that receives the appellation of camel-grass oil.

IN the Journal of the Franklin Institute (vol. clxii., No. 6) it is announced that Mr. E. G. Acheson, of Niagara Falls, has succeeded in making soft graphite artificially. Hitherto the artificial product has been hard graphite, which has been used in the manufacture of electrodes and as a pigment. The soft graphite will be used as a lubricant, as a stove polish, for electrotyping, and for coating gunpowder.

THE *Pioneer Mail* of December 14, 1906, directs attention to the extraordinary development of the manganese ore industry of India since the discovery in 1896 by Mr.

H. G. Turner of the commercial value of the manganese ore in the Vizianagram district of the Madras Presidency. It is evident that India will soon stand first as the largest producer of manganese ore in the world.

IN *Concrete and Constructional Engineering* (vol. i., No. 6) there is an admirably illustrated article dealing with reinforced concrete bridges, by Mr. W. N. Twelvetrees. The article on steel and concrete at the Ritz Hotel, London, describes a striking example of steel-frame construction encased in concrete. A new use for concrete is indicated in the description of a gas-holder tank of reinforced concrete, 84 feet in diameter and 21 feet deep, at Dubuque.

THE annual retrospects published by the engineering journals are of great value for reference to workers in other fields. The report on the year's progress published in the *Engineer* of January 4 is the most exhaustive that has appeared. It covers the domains of mechanical engineering, civil engineering, water supply, gas supply, war material, chemistry, metallurgy, electrical engineering, and sanitary engineering. In the special field of mining and metallurgy the report in the *Mining Journal* of December 29, 1906, is the most complete. The report on shipbuilding, in *Engineering* of January 4, shows that the past year has been very remarkable so far as marine construction is concerned. The tonnage produced in the United Kingdom, 2,030,990 tons, is the highest yet reached.

WE have received from Mr. U. S. Grant a copy of a report he has prepared for the United States Geological Survey (Bulletin No. 284) on the mineral resources of Prince William Sound, on the north side of the Gulf of Alaska. Two mines on the shores of the Sound have demonstrated that copper ore of good grade occurs in the district. Erosion in very recent time has been general, so that no considerable secondary concentration of ores exists. The ores of possible commercial importance have all the characteristics of primary deposits, and irregularity of form is to be expected. Developments should consequently be confined to following the ore.

THREE memoirs (*Boletins* Nos. 40, 42, and 43) issued by the Corps of Mining Engineers of Peru afford striking evidence of the careful attention that is now being devoted by the Peruvian Government to the subject of irrigation. In *Boletin* No. 40 Mr. G. I. Adams discusses the distribution of water in the departments of La Libertad and Ancachs, the memoir being accompanied by a coloured hydrological map. In *Boletin* No. 42 Mr. A. I. Stiles gives the results of a careful technical investigation of the lagoons of Huarochiri, in the department of Lima. He appends a contoured map showing the position of the lagoons, and a map illustrating his scheme for increasing their capacity. In *Boletin* No. 43 Mr. C. W. Sutton and Mr. A. I. Stiles deal with the water supply of the department of Piura.

THE United States Geological Survey continues to devote special attention to the investigation of the mineral resources of Alaska. The resources of Kenai Peninsula, in the most northern portion of the great upward bend of that part of the Pacific coast-line enclosing the Gulf of Alaska, form the subject of an interesting report by Mr. F. H. Moffit and Mr. R. W. Stone (Bulletin No. 277). The former deals with the goldfields of the Turnagain Arm district, where gold in the stream gravels is very unevenly distributed; and the latter describes the coalfields of the Kachemak Bay region, where lignites occur in beds ranging up to 7 feet in thickness, but of low heating power. The geology and coal resources of the Cape Lisburne region are dealt with by Mr. A. J. Collier (Bulletin No. 278). The coals are of two classes, low-grade bituminous coal of Mesozoic age and high-grade bituminous coal of Palæozoic age. The Mesozoic coalfields cover an area of more than 300 square miles, and contain at least 150 feet of coal distributed in forty or fifty seams, ten of which are more than 4 feet thick. The Palæozoic coals occur in limited areas, and the beds are much crumpled and broken, but on account of their good quality will in the future contribute an appreciable addition to the value of the mineral output of Alaska. The Rampart gold-placer region in the central part of Alaska is described by Mr. L. M. Prindle and Mr. F. L. Hess (Bulletin No. 280). The placers are of two general types as regards their origin, placers of ordinary concentration from the disintegration of the bed rock and placers formed through reconcentration of the gold in older gold-bearing gravels by the cutting of streams. The gold of the re-concentrated placers is generally smoother and brighter than that from the others, contains less quartz and iron, and is, therefore, higher in value per ounce. The gold has probably come from comparatively small veins distributed through the surrounding rock.

A SERIES of experiments has been carried out, the *Pioneer Mail* states, at the Plague Research Laboratory at Bombay with the view of determining the germicidal properties of pure nickel and nickel alloy, and to test the possibility that disease might be conveyed by coins. Pure nickel, nickel and copper, copper, and silver coins were experimented with, and the results are said to show that all the coins had bactericidal action on the plague bacillus.

THE law of error forms the subject of several recent papers, including two by Prof. C. V. L. Charlier, in the *Arkiv für matematic Astronomi och Fysik* (Stockholm), ii., 8, 15, and one by Prof. F. Y. Edgeworth in the Journal of the Royal Statistical Society, lxix., 3. These papers deal with the cases in which the frequency curve consists of a series of terms of which the first term represents the ordinary well-known "law of error," and the diagrams showing the effect of the succeeding terms, which Prof. Edgeworth reproduces from Prof. Charlier's "Researches into the Theory of Probability," will give non-mathematical readers a good general idea of the effect of the corrections on the form of the curve.

UNDER the title *Rivista di Scienza*, a new Italian journal is announced dealing with questions of a general nature relative to various branches of science and the connection between them. Contemporaneously with the Italian edition, an international edition will be published containing original contributions printed in either of the four principal international languages in which they are written. The managing committee consists of Profs. Giuseppe Bruni (Parma), Antonio Dionisi (Modena), Federico Enriques (Bologna), Andrea Giardina (Pavia), and Ingegnere Eugenio Rignano (Milan). The editorial secretary is Dr. Giuseppe Jona, Milan, Via Aurelio Saffi, 16.

THE Decimal Association has recently issued two more pamphlets. One, which is sold at 3*d*., gives Lord Kelvin's views on the advantages of the metric system, the opinions of numerous other eminent men, and explanatory tables; the other, by Mr. S. Jackson, is entitled "The Inch Absurdity," and is intended to demonstrate "the utter folly and impossibility" of recent proposals to adopt the

inch, square inch, and cubic inch as standards of length, area, and volume, and the weight of a cubic inch of water at a certain temperature as the standard of weight.

THE issue for 1907 of the "Science Year-book, with Astronomical, Physical and Chemical Tables, Summary of Progress in Science, Bibliographies and Diary," edited by Major B. F. S. Baden-Powell, and published by Messrs. King, Sell and Olding, Ltd., differs little from that of last year. A general article of fewer than ten pages on the progress of science in 1906 has superseded the comparatively full summaries in various scientific subjects given in former years. We observe that the "Year-book" can be obtained in an abridged form without the diary.

THE twenty-third annual issue of the "Year-book of the Scientific and Learned Societies of Great Britain and Ireland," which has been published by Messrs. Charles Griffin and Co., Ltd., provides a convenient short record of the work done by numerous societies and Government institutions in science, literature, and art during the session 1905–6. The information has been compiled from official sources, and the majority of societies and associations included in the volume have demonstrated, by published papers, their activity in extending and disseminating knowledge. The editor may be congratulated upon the production of a work of reference which is of distinct service.

A PRICE-LIST of invar and its applications, issued by Mr. J. H. Agar Baugh, 92 Hatton Garden, E.C., contains some interesting notes on the specific properties of this valuable alloy of nickel-steel. Invar is sold in three grades, and the guaranteed maximum of the coefficient of expansion of the middle quality is only 0·0000015 per 1° C., while that of the highest grade is much less. For pendulum rods, compensation balances for marine chronometers and pocket watches, standard measures of length, tapes for measuring base-lines, and many other purposes, invar has proved particularly valuable, and its use in scientific instruments is likely to be greatly extended.

THE first number of a new weekly journal known as *Electrical Engineering* was published on January 3. The periodical will deal with the subject of electrical engineering, particularly from the practical and utilitarian aspect, and is intended for the engineer rather than the electrician. The number of well-reproduced drawings to scale and of special photographs showing details of constructional work is large, and the paper is, as a whole, particularly attractive. Among other articles may be noticed one on the new Great Northern, Piccadilly, and Brompton Railway, and an incidental reference in another part of the paper gives the information that all the rolling-stock for the latest tube is of Continental manufacture. If the standard of the first number is maintained, the new periodical should have a successful career.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS FOR COMET 1906*g* (THIELE).—A further ephemeris for comet 1906*g*, extending to February 16, is given in No. 4143 of the *Astronomische Nachrichten* by Herr Georg Dybeck. This ephemeris shows that the comet is now (January 10) about 1° north of θ Draconis, and is only about one-third as bright as when discovered.

THE OBSERVATION OF TOTAL SOLAR ECLIPSES.—Observers of total eclipses of the sun will find much to interest them in the address delivered by M. le Comte A. de la Baume Pluvinel to the Astronomical Society of France, and published in the Bulletin for December, 1906.

The lecturer dealt chiefly with the details of the preliminary preparations, which commence at the moment that the astronomer decides to observe the eclipse—usually some months before the actual day—and are not concluded until the observations are actually in progress. In eclipse reports these preparations are generally only summarily dealt with, and the inexperienced reader will be surprised, on reading the lecture, to learn of the innumerable *minutiae* which *have* to be considered and dealt with if success is to attend the observations. The lecturer also named the most famous eclipse observers in the several countries which have participated in these important observations, directing special attention to any exceptional methods employed, as, for example, the utilisation of men-of-war and their trained *personnel* by Sir Norman Lockyer at several eclipses.

OBSERVATIONS OF MARS.—In the December (1906) number of the *Bulletin de la Société astronomique de France*, M. José Comas Sola, director of the Fabra Observatory (Barcelona), gives an illustrated account of his observations of Mars during the opposition of 1905. The following points, among others, are worthy of notice:—On April 26 M. Sola saw a "*lac*" at the intersection of Phison and Orontes, and the Euphrates, although perfectly visible, was always diffuse, despite the fact that, at times, the seeing was very good. On April 28 changes were observed which were evidently due to atmospheric changes on the planet. The "seeing" on May 9 was superb, and, as shown by the drawing for this date, "*canaux*" and "*lacs*" were seen very distinctly, the latter forming the corners of the pentagon around the Elysium. The Propontis was seen to be rather dark and double, with good "seeing," on May 17, at 11h. 40m. (G.M.T.), but at 12h. 40m. it seemed quadruple, formed by four "*lacs*" disposed at the corners of a square.

TRANSIT-CIRCLE OBSERVATIONS.—Parts i. to iii., vol. iv. (second series), of the Publications of the U.S. Naval Observatory contain a large number of transit-circle observations, with their discussions and reductions.

In part i. the observations made with the 6-inch transit circle during the period 1900–3 are dealt with and the results tabulated. It is interesting to note that whilst the variations of this instrument are much smaller since the substitution of brick for stone piers, they are still important, and Prof. Littell, from a discussion of the constants for 1903, shows that they are dependent upon the temperature variations. The azimuth constant shows a regular annual variation of −0·011s. per 1° F., and a diurnal variation of about half that amount. In part ii. the observations made during 1866–91 are collected and discussed in a uniform manner, whilst part iii. is devoted to the discussion of the 6-inch transit-circle observations of standard and zodiacal stars made during 1901 and 1902.

THE "COMPANION TO THE OBSERVATORY."—Only a few changes are to be noted in the current issue of the indispensable annual the "Companion to the Observatory."

Owing to the continued increase in the number of known variable stars, the list of ephemerides supplied by M. Lœwy is given in a somewhat different form, and the Greenwich mean astronomical time, from noon to noon, has been substituted for the civil, midnight to midnight, time employed in recent years. The addition of stars fainter than magnitude 6·5 has increased the number of lunar occultations given. The usual diagram of Saturn's satellites is omitted, because their plane passes through the earth during the current year. The "Companion" is published by Messrs. Taylor and Francis, price 1*s.* 6*d.*

"THE HEAVENS AT A GLANCE, 1907."—For all who take an interest in astronomical phenomena, and have but little time to spare and but modest instrumental equipment, Mr. Mee's card, "The Heavens at a Glance," is the handiest and cheapest calendar published. As in previous issues, it gives the chief events for each month, the dispositions of the sun, moon, and planets throughout the year, notes on eclipses, meteor showers, and variable stars, and a pair of star maps by which the observer may recognise the chief constellations and stars at any season of the year. The price is sevenpence, post free, from Mr. A. Mee, Llanishen, near Cardiff.

THE GEOLOGY OF MINING AREAS.

MR. R. G. McCONNELL has contributed to the "Annual Report of the Geological Survey of Canada," vol. xiv., part B (1905, price 25 cents), a well-illustrated paper of wide interest on the Klondike gold-fields. The general topography and the communications with other regions are described, and the full-page land-scapes convey an excellent idea of the conditions under which mining is carried on. Roads have been developed, the White Pass railroad is completed, and it now takes less than a week to reach Dawson City from Vancouver. In the latitude of only 60° N., the surface-stratum is continuously frozen, and unfrozen ground is reached at depths of from 60 feet to 200 feet. In summer, gravel-beds which are unprotected by moss thaw down to a depth of from 6 feet to 10 feet (p. 9). The gold-bearing quartz-veins are included for the most part in the Klondike series of schists. Microscopic evidence supports the view that these schists are of igneous origin, since a passage is traceable from uncrushed granitoid types to mylonitic sericite-schist (p. 19). Cainozoic rocks are found folded in with the schists in Last Chance Creek, thus proving the recency of earth-movement in this area. In the basin above Rock Creek these beds contain lignites of Upper Eocene age. The low-level gravels of the creeks, which are so important to the gold-miner, include bones of the mammoth, as well as of many existing northern animals (p. 29). The greater part, at least, of the Klondike gold is detrital, and is derived from the small but very numerous quartz-veins associated with the older schists (p. 61). Many of the grains of alluvial gold enclose quartz, and a few are themselves enclosed in quartz. The decay of the rocks must have been enormous to allow of the vast accumulation of auriferous gravels. The quartz-veins are much younger than the schists in which they lie, but are older than the andesites and quartz-porphyries of the district. Lode-mining has so far made little progress, but work among the gravels seems still increasing.

Mr. McConnell has also issued through the Geological Survey of Canada a paper on mineral discoveries on Windy Arm, Tagish Lake, Yukon (1905), where a new mineral district has been opened. The quartz-veins here bear a considerable variety of silver ores, ranging from highly argentiferous galena to stephanite and pyrargyrite.

In the twenty-sixth *Boletín del Cuerpo de Ingenieurs de Minas del Perú* Señor Luis Pflücker describes the gold-bearing deposits of the province of Sandia. All the detrital material at the foot of the mountains contains gold, without regard to the nature of the underlying rock. The proximity of a moraine formed by an existing glacier makes it probable that the detritus has been brought into the field by glacial action. Hydraulic mining is carried on, as may be seen in the illustrations to the bulletin.

Mr. Harold S. Harger brought together a very instructive exhibit of diamond-bearing rocks, and of the minerals associated with the diamond in South Africa, during the meeting of the British Association in Johannesburg in 1905. His paper on the diamond-pipes and fissures of South Africa is now published (Trans. Geol. Soc. of South Africa, vol. viii., 1906, p. 110), and forms a comprehensive and welcome contribution, certain details of which are sure to meet with healthy criticism. Many hundreds of pipes of the Kimberley type are now known to exist, "from the central and northern portions of Cape Colony, throughout Griqualand West, in parts of Damaraland and Rhodesia, also north of the Zambezi, and as far east as British East Africa. . . . In the Orange River Colony, there is hardly a district between the Wesselton Mine near Kimberley, the Drakensberg Range, and the Orange River, in which the much-sought-for volcanic breccia has not been discovered." The diamond-pipes were opened, in all probability, after the outpouring of the amygdaloidal lava of the Drakensberg, since fragments resembling this rock occur in the "blue ground" of the Jagersfontein Mine. From this and other evidence (p. 115) Mr. Harger concludes that they are of late Triassic or Jurassic age. The pipes occur typically in groups, perhaps twenty or thirty near one another, and the large ones seem to contain the truly rich material. While some are necks, circular or oval in section, others are mere swellings along lines of fissure, their thinned-out ends being sometimes traceable for miles. Mr. Harger discusses the composition of the breccia that fills them, and believes that olivine was not an important constituent of the original mass. The analyses quoted from Vogelfontein and the Schuller Mine (p. 120) certainly do not indicate a peridotite-magma, though the rock in the Kimberley Mine, on the other hand, yields 32·38 per cent. of magnesia. The "diamond-fissures," to which special attention is invited by the author, contain a hard basic rock of a less brecciated and more porphyritic character. Mr. Harger believes that the material in the pipes was injected by explosive action, accompanied by a certain amount of heat, though this was not enough to metamorphose the surrounding rocks distinctly. The breccia, in his opinion (p. 122), boiled and churned up its constituents in the vent. Thus, in opposition to Prof. Bonney's view (p. 126), he holds that the rounding of such masses as the included eclogite boulders is due to attrition in the pipe. Certainly no one who has seen the breccia of a diamond-pipe, such as that of the Schuller Mine, near Pretoria, abutting on its apparently unaltered wall, can associate

FIG. 1.—Weathered Kantoor Sandstone, Transvaal.

the rock with the phenomena of ordinary igneous flow. Equally distinctive is the evidence of the derivation of the green pyroxenes and the garnets, to mention no other minerals, from some previously consolidated and deep-seated mass. Few geologists, we fancy, will now dispute the conclusion, first indicated by Prof. Bonney when he described the eclogite from Jagersfontein, that the diamond itself is a derived mineral in the pipes and fissures, and arose (p. 134) from "an ultra-basic 'carbon-saturated' zone at great depth," through which the "kimberlite" broke. The diamond becomes thus linked in our minds with the primitive masses of inorganic graphite, and, still more interestingly, with the nascent carbon dioxide, which still streams upward from the unexplored regions of the crust.

In the same number of the Transactions of the Geological Society of South Africa (p. 147) direct reference is made to these "juvenile" emanations by Prof. Beck, of Freiberg, in a paper on the relation between ore veins and pegmatites. The author's purpose is to connect the pegmatites with the aqueous solutions which remain after the consolidation of an igneous mass. The old theory of "segregation-veins" is set aside, as has been done by

other writers, and Prof. Beck remarks that, since the aqueous solutions in the fissures cooled very slowly, and "their great liquidity was extremely favourable to diffusion of the dissolved substances, crystals of large size are frequently found in pegmatites." While thermal waters found their way to upper parts of the crust, the solutions that resulted in pegmatite-veins represent material retained at considerable depths. Hence ore-deposits associated with pegmatites become exposed only after long ages of denudation. Prof. Beck cites several examples where tin, copper, and gold are among the substances deposited in connection with pegmatites.

Dr. G. B. Trener (*Verhandlungen der k.k. geol. Reichsanstalt*, 1905, pp. 366 and 372) is conducting experiments to show that metals undergo diffusion in solid crystalline rocks at temperatures far below the melting points of the metals employed. The complete results are to be published in the *Jahrbuch* of the Reichsanstalt as a chapter of the description of the Cima d'Asta, but the preliminary announcements have already aroused discussion. Among the curious points raised by Dr. Trener, is the resistance of mica to diffusion of metals in a direction perpendicular to its cleavage planes; well-developed mica-schists may thus be practically impenetrable when their foliation-planes are perpendicular to the direction of diffusion.

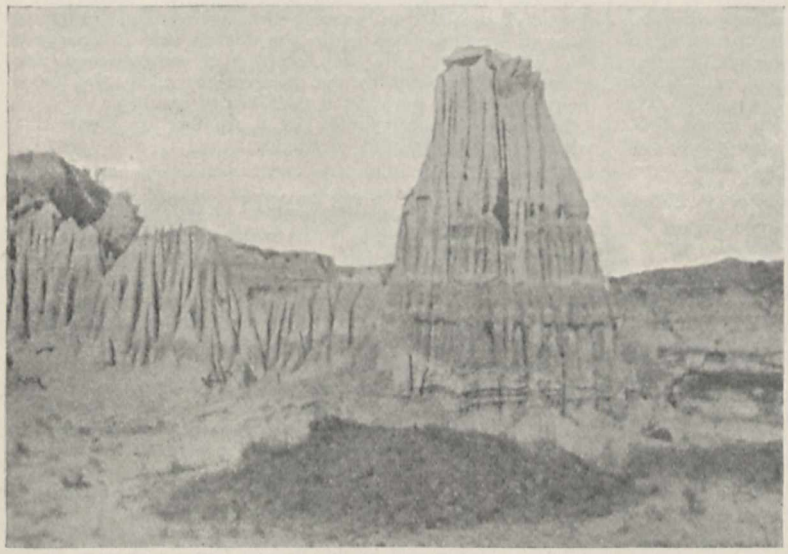


FIG. 2.—Earth-pillars, south of Alkmaar, Transvaal.

The Report of the Geological Survey of the Transvaal for 1904 has been noticed already in NATURE (vol. lxxiv., p. 646). The volume for 1905 has now been issued, dated August, 1906, liberally illustrated with plates and coloured geological maps and sections, and at the same moderate price of 7*s.* 6*d.* The director, Mr. H. Kynaston, describes a recent survey of the Komati Poort coalfield, which is conveniently situated on the Delagoa Bay side of the country. He reminds us of the record of 25 feet of coal in 33 feet of strata passed through by a bore-hole near Tenbosch Station in 1903, and remarks that this massive seam may underlie the smaller ones that have been proved at various points. Arguments are given to show that the horizon of these coal-bearing beds, and those of the Transvaal generally, may be in the Beaufort series, and not in the underlying Ecca series, as has been generally supposed (p. 25). Mr. Kynaston also describes a Coal-measure series (p. 35) in the Bushveld area west of the Pietersburg railway. The igneous rocks of this region present many points of interest, especially in the occurrence of bands of magnetite, resembling dykes, associated with, but not passing into, a considerable mass of norite. Similar bands are well dealt with by Mr. Hall in a later paper in this report (p. 73). Our field-inspection of these iron ores, under the guidance of Mr. Kynaston, would certainly suggest that they were igneous intrusions of an extremely basic type.

Mr. A. L. Hall (p. 41) describes the fine country between Lydenburg and the Devil's Kantoor, or Devil's Shop, so-called from the fantastic weathering of the sandstone masses near the edge of the great escarpment. Gold-mining is carried on in this hilly region, and a lime industry has sprung up near Godwan River Station through the working of secondary deposits of calcite in the dolomitic series. Mr. Hall, we think wisely, introduces the descriptions of the microscopic characters of his rocks, as explanations of their structure, side by side with the account of their features in the field. A rock believed to be a tuff is interestingly recorded (p. 53) among the otherwise intrusive igneous masses found in the Transvaal system. The fine illustrations to the report show the escarpment of the Kantoor quartzite, with the rapid descent towards the old granite on the east; the gorge in the far younger quartzite of the Pretoria series, between Waterval Boven and Waterval Onder, where the traveller from the monotonous plateau of the Transvaal welcomes the picturesque notching of its edge; and other scenes from this noble region, including the weathered quartzite (Fig. 1) of the Kantoor itself.

Another photographic illustration (Fig. 2) shows the detrital sand resulting from the weathering of the older granite, which is now eaten out into pillars as much as 25 feet high, with sometimes a cake of more resisting rock upon the top.

Passing over other papers in this report, as unfortunately must be the case in a general notice, we may mention Mr. Mellor's account of the Witbank Coalfield near Middleburg on the main plateau (p. 81). The Permian glacial conglomerate has here supplied, during an epoch of denudation, much of the material of the overlying Beaufort (?) Coal-measures. The coal-seams, one of them being 24 feet thick, are described and illustrated by sections (p. 97, &c.). The presence of fine muddy layers raises the ash, even in some of the workable coal, to 17 per cent., and the ash rarely falls below 7 per cent.

Mr. Tweddill (p. 106), in a handsomely illustrated paper, describes some ruby-bearing rocks from the Leydsdorp district, notably a beautiful example consisting of a pale pyroxene, kyanite, and finely granular ruby. He holds out hopes, if we read him rightly, that ruby may be in time discovered on a scale of commercial importance in the Transvaal. G. A. J. C.

MEN OF SCIENCE IN AMERICA.

THE issue of *Science* for November 23 contains an article by Prof. McKeen Cattell on the selection, and arrangement in order of merit, of a thousand American men of science. A table was compiled from lists of fellows of societies, biographical dictionaries, "Who's Who," &c., of the numbers of persons engaged in each branch of science. It appears that chemists are the most numerous, in America at all events, forming 164 per 1000 of all scientific men, zoologists coming a close second with 155 per 1000. Anthropologists stand at the foot of the list with only twenty-three, but neither statisticians nor economists, it would seem, were taken into account. Ten leading representatives of each science were then asked to arrange in order of merit a certain number of students of that science, the numbers fixed being roughly proportionate to the totals in the table first compiled. The positions assigned by the different judges to every individual were averaged, and the probable error of the average posi-

tion of each calculated. A general list, including representatives of all the sciences, was also compiled by interpolation, but neither this nor the separate lists are published. An interesting table is given showing the divergences between the ten judges in the case of psychology, as an illustration. The order of merit given by one of the judges is very much more accordant with the average order than those of the others, and they differ considerably *inter se*, though more, if we understand the table rightly, in the case of those at the bottom of the list than of those towards the top. Of the first hundred scientific men on the list who are eligible, sixty-one are included among the ninety-seven members of the National Academy of Sciences. The discussion of the grades and probable errors is continued in *Science* for November 30, and in a third and concluding article in the issue for December 7 Prof. Cattell investigates the geographical distribution of American men of science, according to place of birth and place of residence. The figures as regards the former are extremely striking. The production or "birth-rate" of men of science per million of the population ranges from about 109 in Massachusetts—which stands far above the other States—and eighty-seven in Connecticut down to rates of only one or two in several of the southern States. It is argued that differences in stock can scarcely be great enough to account for this, and that accordingly the production of scientific men must be largely a matter of circumstance. As regards the place of residence, interesting tables are given showing the institutions with which the men of science taken into account are connected. The work forms part of an extended investigation which Prof. Cattell has now been conducting for some ten years, and on which he has published several previous memoirs.

WAVE ACTION IN RELATION TO ENGINEERING STRUCTURES.

A PAPER on wave action in relation to engineering structures, by Major D. D. Gaillard, issued as a professional paper (No. 31) of the Corps of Engineers of the United States Army, contains a great deal of information useful to engineers engaged in designing and constructing sea defences and other works subject to wave action.

The first part of the book is devoted to a general consideration of the theory of the formation of waves, and to a notice of the information that already exists as to this. This, as the author remarks, is embraced in so many volumes that the work of comparing theoretical and observed wave characteristics is rendered very tedious. The investigations that have previously been made into wave action, and of which the results have been published, relate principally to deep-water waves, whereas there is very little recorded information as to the action of waves in comparatively still water to which engineering structures are exposed.

Major Gaillard, the author of this book, was for several years engaged upon works of harbour improvement on the South Atlantic coast and the Great Lakes of America.

Although the waves to be dealt with in Lake Superior are not of the magnitude of those in the open sea, yet the author's observations cover waves of various dimensions extending up to 300 feet in length and 23 feet in height, and the results are recorded of several hundred observations of their length, height, period, and depth in which they broke and to which their effect extended. Numerous examples are also given of the effect of waves in moving large masses of stone and other material. The force of the waves breaking on piers, and other marine structures, was measured both by the marine dynamometer of the class used by Mr. Thomas Stevenson more than half a century ago and also by dynamometers of special construction made under the author's directions. The general type of the Stevenson dynamometer used had discs of from 3 inches to 9 inches, with springs varying in strength from 10 lb. to 50 lb. for every inch of elongation. The greatest dynamical force recorded with these when used at Dunbar, in Scotland, was 7840 lb. per square foot with waves about 20 feet high. These dynamometers only measure the dynamic, and not the static, pressure, and give only a maximum reading for a storm observation, and are affected in their working when there is much sand in the water.

The instruments invented and used by the author, besides the Stevenson type, consisted, in one case, of a steel plate, having an area of one square foot, attached to two elliptical springs similar to those used for carriages, the distance between their centres being 6 inches, the reading of the amount of compression due to the action of the wave being recorded by a rod attached to an index which acted on a paraffin surface. The instrument, before being fixed, was rated by having weights placed on the plates and noting the corresponding compressions. The other dynamometer used by Major Gaillard consisted of a plate covering a square foot attached to a horizontal cylinder filled with water; over the flange of this cylinder was placed a diaphragm of india-rubber ¼-inch in thickness, having a face of one square foot. A ¾-inch pipe led from the cylinder to a tank located in the observing station on the pier. From this pipe there was a communication to a modified form of Bourdon gauge fixed 19 feet above the centre of the diaphragm, and which registered pressures up to 30 lb. per square inch. Communication with the tank having been shut off, any pressure applied to the diaphragm was transmitted by the confined hydrostatic column to the gauge. More than a thousand readings of wave action were taken with this class of dynamometer while the author was in charge of the works, but only two storms of consequence were encountered. So far as the observations went, the instrument appears to have given satisfactory results.

The text is accompanied by a number of illustrations taken from photographs of waves.

SCIENCE IN EXAMINATIONS FOR THE HIGHER CIVIL SERVICE.

THE kind of education received and the subjects studied by future civil servants must have a great and far-reaching effect upon the influence exerted by the public departments which administer the multitudinous and diverse affairs of our scattered Empire. The methods adopted for the selection of such officers must, therefore, be wisely chosen, and, in any examinations designed to facilitate the process of discrimination between men offering themselves for these positions, the subjects in which candidates are tested must be those appropriately related to the work of the department in which successful candidates will be employed, and, at the same time, those most likely to test essential fitness for public work. These and similar principles have been widely canvassed recently both in public addresses and in the Press. Certain changes in the examinations for the selection of Foreign Office clerks and attachés in the Diplomatic Service are to be introduced, and the new regulations have not met with universal approval. It will assist clearness of thought first to compare briefly the existing regulations for the appointments concerned with those shortly to come into force.

Candidates for clerkships on the establishment of the Foreign Office and for attachéships in the Diplomatic Service will, after July 1, instead of being examined according to special regulations which have governed these appointments hitherto, be required to take the combined examination for open competitions for the Home Civil Service (class i.), India Civil Service, and Eastern Cadetships. This decision profoundly modifies the conditions of selection for service in the Foreign Office and the Diplomatic Service. In the past there have been nine obligatory subjects—arithmetic, handwriting and orthography, English composition, précis writing, French, German, general intelligence, geography, and the history of Europe from 1789 to 1880 inclusive. In addition, candidates have been able to offer any two of the following languages, viz., Latin, Italian, Spanish, Portuguese, Russian, modern Greek, and Arabic. In the examination which such candidates will have to take after July 1 next, papers will be set in thirty-two different subjects, from which a selection must be made by the candidate. French and German will be the only obligatory subjects, and candidates will have to reach a high qualifying standard in translation, composition, and oral examination in both

these languages. Portuguese, Russian, and modern Greek are no longer optional languages. The maximum marks to be obtained in each subject are, as a rule, 500 or 600, but 1200 may be scored in each of the two extensive divisions of mathematics included.

Though candidates for the appointments in the Foreign Office and the Diplomatic Service may make a selection from the long list of subjects referred to, the number of papers taken must be such that the maximum of marks that can be obtained from the subjects chosen is limited to 4000. Under the new conditions, the man who attempts to train himself by attendance at a cramming establishment, for the sole purpose of succeeding in the competition, will have a much smaller chance of success than a candidate who has graduated in honours after a university course. The student who has made himself master of any of the great divisions of knowledge will be able to acquit himself with credit. For example, 2400 marks may be gained in science, 2400 in mathematics, 1200 in French and German, 1800 in Latin and Greek, 1000 in Greek and Roman history, and 1300 in English and general modern history, but in any case the total number of marks attainable in the subjects selected by a candidate must not exceed 4000. The underlying principle seems to be to obtain somehow students who have benefited by a thorough study of at least one department of knowledge, of whatever kind; apparently the intention is to secure men of high attainments, no matter in what subjects they have specialised, and to insist upon a good knowledge of French and German from all candidates.

The schedule of subjects is sufficiently comprehensive to afford all ordinary students a fair opportunity to distinguish themselves. The candidate who has made science the staple subject of his university course will compete on almost equal terms with one who has studied classics and classical history, while the candidate who has specialised in modern languages and history need be at no disadvantage.

The comprehensive subject of geography, however, which is at present obligatory, is not included among the subjects from which candidates may, after July 1, make their selection, and it is this omission which has given rise to much discussion and many protests. In reply to a question on the subject in the House of Commons, the Foreign Secretary said:—"Although a knowledge of geography is no doubt very useful, it is a subject with which men of general education are generally acquainted, and which is easily acquired after entry into the service." Distinguished geographers have since shown how far this is from being the case. Sir George Goldie, in an address to the Royal Scottish Geographical Society in Edinburgh, published in the *Geographical Journal* for the present month, relates a notable instance of the difficulties to which a want of geographical knowledge may give rise. "A good many years ago a territorial arrangement with France was in discussion, and I was invited to consider it. The French proposals appeared to the Foreign Office satisfactory; but I found that they were expressed, as might have been expected, in longitudes reckoned from the meridian of Paris, while the map with which our Foreign Office had considered these proposals was made in Germany and reckoned its longitudes from the meridian of Greenwich. The arrangement in question was never completed."

Mr. Douglas Freshfield, in his address last Friday to the Geographical Association, of which he is president, dwelt upon the same point, and said he could give similar instances to that related by Sir George Goldie. Mr. Mackinder has shown in a recent letter to the *Times* that Sir Edward Grey's description of geography is that of the subject as it was studied twenty years ago, and not as it is now understood and taught. Substantial reasons have, in fact, been given for the inclusion of geography among the other branches of science from which candidates may make their selection.

It is hardly necessary to remind readers of NATURE that geography has in recent years taken its place among those branches of knowledge which are studied on scientific lines. No geographical teaching is now recognised by the Board of Education as satisfactory in secondary schools unless it has a basis of practical exercises and follows scientific methods. The subject has obtained university recognition, and is now taught by practical work in the laboratory and the field. As Mr. Mackinder has pointed out, "geography has its own modes of thought and its own points of view which are not to be obtained in a hurry." Mr. Freshfield was able to point out in his address, to which reference has been made, that there is evidence that the Civil Service Commissioners are beginning to reconsider the matter, and that it will not be long before the claims of geography will be fully recognised by the inclusion of the subject, dealt with in accordance with modern scientific methods, as one of those in which candidates may present themselves for examination.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The natural science board has issued a certificate stating that the work submitted by Mr. G. F. Herbert Smith, New College, is of sufficient merit to entitle him to supplicate for the degree of Doctor of Science.

WE learn from *Science* that Columbia University and Barnard College will receive 2000*l.* each under the will of Mrs. Annie P. Burgess.

SIR W. T. LEWIS has promised 1000*l.* toward founding a chair of mining at Cardiff College, University of Wales, provided 30,000*l.* is raised in contributions from coal owners, royalty owners, and workmen.

PROF. OTTO BENNDORF, professor of classical archæology at the University of Vienna, died on January 2 at the age of sixty-eight years. He was well known owing to his works on archæological subjects, and to the excavations he conducted in Asia Minor.

ADDRESSING a gathering of science and art students at Gravesend on January 2, the Earl of Darnley is reported by the *Daily Chronicle* to have made the following confession:—"I place myself before you as an example of deficiency in education. I went through the ordinary public-school course, and received a university education. I found myself at twenty-two a B.A. of Cambridge, with a certain knowledge of Latin and Greek, which I have never found of any particular use, but without any knowledge of French, German, or science. From my example I hope you will glean some benefit by securing that knowledge which it is now too late for me to acquire."

PROF. A. SCHUSTER, F.R.S., has resigned the position as Langworthy professor of physics and director of the physical laboratories in the Victoria University of Manchester. Prof. Schuster's connection with the University dates from 1871, when he entered Owens College as a student. In 1873 he held the post of honorary demonstrator in physics under Prof. Balfour Stewart, and in 1881 he was appointed to the newly-created chair of applied mathematics, which he resigned to become professor of physics in 1888. Both the Council and the Senate have placed on record by formal resolutions their regret at Prof. Schuster's resignation, which is to take effect at the close of the present session, and their sense of the very great services which he has rendered to the University by his work as a teacher, his direction and administration of the physical laboratories, his contributions to the advancement of science, and the prominent part which he has taken in relation to the re-organisation of the University. A general hope has been expressed that Prof. Schuster may still remain in close connection with the University, and take an active part in its affairs generally, as well as specially in connection with scientific research.

PROF. E. RUTHERFORD, F.R.S., Macdonald professor of physics in the McGill University, Montreal, has been appointed to succeed Prof. Schuster as Langworthy professor and as director of the physical laboratories in the Victoria University of Manchester. Prof. Rutherford is a native of New Zealand. After a distinguished academic career in the New Zealand University he proceeded to Cambridge as an 1851 Exhibition scholar, and entered

Trinity College, prosecuting research in the Cavendish Laboratory. He was one of the pioneers of wireless telegraphy, and occupies a high position in the scientific world owing to his experimental work on the ionisation of gases, the discovery of the radium emanation, and the foundation of the now generally accepted theory of radio-activity. It is expected that Prof. Rutherford will arrive in Manchester early in the summer with the view of taking up the regular duties of the professorship at the beginning of the session in October next.

JANUARY has again brought with it conferences of teachers of all grades in various parts of the country. In London, large numbers of schoolmasters, schoolmistresses, and educational administrators have met under the auspices of the London County Council, and discussed for three days subjects as various as silversmith's work and the teaching of phonetics. In Bradford, the educationists of the north of England have, in well-attended meetings, ranged over the field of education. Associations of teachers of special subjects have also held meetings characterised by their enthusiasm. Such gatherings are to be welcomed as maintaining an active interest in education, and as likely to send teachers back to their work with renewed energy and broader knowledge. It is worthy of note that in none of the meetings has science or mathematics taken a prominent part. We have no reason to regard this as indicative of a falling off in the interest in these important parts of the school curriculum; it rather directs attention to the fact that in recent years questions concerning mathematical and scientific teaching have dominated the programmes of teachers' meetings, and much thorough discussion has led to improved teaching and obviated, for the present, the need for further argument. At the Bradford conference an important session had for its subject the development of technical education in a large manufacturing centre. Prof. Charnock, of Bradford, and Principal Reynolds, of the Manchester Technical School, read papers. Mr. Reynolds said we need more intelligence and more knowledge on the part of our working people. He suggested, first, the need for the extension of the age-limit in higher elementary schools to sixteen years. There is an advantage in selecting in each of suitable localities of a town one of the elementary schools, and giving it an extended curriculum, staffing and equipping it accordingly, such school being fed from the elementary department of the school and from neighbouring elementary schools, and supported by a scheme of scholarships. Secondly, the enactment of a law forbidding the employment of young people in working overtime until they reached their eighteenth year, so as to give full opportunity for attending evening classes. Thirdly, the establishment of one-day courses of specialised instruction in the technical school or college for selected apprentices in engineering and other similar important industries. He urged that the present need is a better appreciation of the requirements of general and secondary education so far as to secure a longer school life, and thus a more complete preparation for specialised training.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 15, 1906.—"The Effect of Temperature on the Activity of Radium and its Transformation Products." By Dr. Howard L. **Bronson.** Communicated by Prof. E. Rutherford, F.R.S.

A large number of investigators have attempted to alter the activity of various radio-active substances by subjecting them to very high and also to very low temperatures. Among all these attempts only two, so far as the present author is aware, have apparently given positive results.

The experiments now described show no evidence whatever of any change in the activity of the transformation products of radium when they are subjected to temperatures between −180° C. and 1600° C. If any change does take place it is very small, and cannot be more than 1 per cent. in the case of radium C for temperatures between −180° C. and 1600° C., nor more than 1 per cent. in the case of the emanation or radium B for temperatures between −180° C. and 1500° C.

There is thus removed the only known exception to the general rule, that the activity of radio-active substances is not affected by temperature.

"The Photoelectric Fatigue of Zinc." By H. Stanley **Allen.** Communicated by Prof. H. A. Wilson, F.R.S.

Hertz's observation that ultra-violet light can facilitate the passage of an electric spark led to the discovery of other photoelectric actions. In the earliest experiments on the photoelectric effect of metals it was noticed that the action was diminished by exposure to light. Thus Hallwachs, who found that a metal becomes positively electrified under the influence of ultra-violet light, states that "old surfaces no longer show the phenomenon. The radiation itself lowers the potential to which the plates can be electrified, so that with any succeeding experiment made with the same surface, the potential obtained is lower, while the rise to it takes place more rapidly, and the decrease is greater than when for the same interval of time between the experiments the plate was not illuminated." This diminution of the photoelectric action is spoken of as the "fatigue" of metals under the influence of light, and has received attention from many physicists.

The present paper deals with the manner in which the photoelectric activity of zinc diminishes when the metal is exposed to light.

The experiments described show that it is necessary to employ the sum of two exponential terms in order to obtain an adequate representation for the photoelectric fatigue curve of zinc. Just as Rutherford has explained the curves of decay for the excited activity of radium and thorium as a consequence of successive changes, so it is possible to explain the present results as due to two consecutive changes. The nature of the modifications thus suggested is left an open question.

It is also shown that the longer waves of light can bring about a change in the opposite sense, that is to say, they can produce a certain amount of recovery of photoelectric activity.

Entomological Society, December 5, 1906.—Mr. F. Merrifield, president, in the chair.—*Exhibits.*—A. W. **Bacot**: A specimen of *Catocala nupta*, taken at rest at Hackney, November 9, 1906, remarkable for having two well-developed tarsi on the left fore-leg. Also three ♀ specimens of *Lasiocampa quercus*, L., bred from larvæ from Cornwall in 1906. One of these larvæ had been submitted to a pressure of from 11 to 30 atmospheres (405 lb. to 450 lb. per square inch) on two occasions, a pressure which had proved fatal at once to a frog, used as a control experiment.—Dr. T. A. **Chapman**: A long series of *Hastula hyerana*, Mill., bred in 1906 from larvæ collected at Hyères, illustrating the spread of melanism in this species, and a diagrammatic map of the neighbourhood to explain its distribution in that area.—Dr. F. A. **Dixey**: Specimens of *Teracolus omphale*, Godt., bred by Mr. G. A. K. Marshall, to show that under arranged conditions of moisture and warmth the wet-season phase might be artificially induced.—*Papers.*—*Xanthorhoë ferrugata*, Clerck, and the Mendelian hypothesis: L. B. **Prout.**—The diaposematic resemblance between *Huphina corva*, Wallace, and *Ixias baliensis*, Fruhst.: Dr. F. A. **Dixey.**

Chemical Society, December 20, 1906.—Prof R. Meldola, F.R.S., president, in the chair.—A new laboratory method for the preparation of hydrogen sulphide: F. R. L. **Wilson.** If a current of hydrogen sulphide is passed over calcium hydroxide a hydrosulphide is formed which can be decomposed by carbon dioxide, a carbonate being produced and hydrogen sulphide evolved.—The affinity constants of aminocarboxylic and aminosulphonic acids as determined by the aid of methyl-orange: V. H. **Veley.** It is shown that the usual mathematical expressions hold good, namely, those of straight lines, $y=kx$ or $y=kx-b$, or logarithmic curves, $\log y=\log k+x \log a$. Acids which show irregularities in the Ostwald electric conductivity expression $\phi(k)=a^2/(1-\alpha)V.(\alpha=\mu/\mu_\infty)$ likewise show similar irregularities in the methyl-orange method.—Contributions to the study of the calcium phosphates, i., the hydrates of the calcium hydrogen orthophosphates: H. **Bassett,** jun. The author's experiments show that, in all probability, dicalcium phosphate can only form one hydrate.

namely, the dihydrate.—Contributions to the study of the calcium phosphates, ii., the action of ammonia gas on the calcium hydrogen orthophosphates: H. **Bassett,** jun. —Relation between chemical constitution and physiological action in the tropeines: H. A. D. **Jowett** and F. L. **Pyman.** The authors conclude that Ladenburg's generalisation, which asserts that mydriatic tropeines must possess a benzene nucleus and a fatty hydroxyl in the side chain, cannot be maintained, since it does not hold good in the cases of terebyltropeine or the lactone of *o*-carboxyphenylglyceryltropeine.—Some derivatives of salicylic acid: H. A. D. **Jowett** and F. L. **Pyman.** Descriptions of cinnamoylsalicylic acid, its methyl and ethyl esters, and quinine salt, and also 3 : 5-dichloroacetylsalicylic acid, are given.—The addition of bromine to cinnamic acid and its esters. Preliminary notice: J. J. **Sudborough** and J. **Thomas.** An account of experiments made to determine the velocity of formation of the bromides of this acid and certain of its derivatives is given.—The optical and magneto-optical influence of ethenoid linkings attached to contiguous carbon atoms: J. W. **Brühl.** It has been shown by Sir W. H. Perkin that limonene, dipentene, and $\Delta^{3:8(9)}$-*p*-menthadiene exhibit a remarkable difference in magnetic rotation, the values of the last being much higher than those of the two former. The author showed that this is due to the presence of two double linkings in the position —C : C.C : C— in the molecule of $\Delta^{3:8(9)}$-*p*-menthadiene.—A difficulty in the theory of valency of W. Barlow and W. J. Pope: D. L. **Chapman.** It is shown that the two propositions regarding the assemblages of spheres made by Messrs. Barlow and Pope imply that a sphere of any size can replace any other without any resort to re-marshalling being necessary, and therefore cannot be used in their present unqualified form to demonstrate that valency is a simple volume relation.—The more exact determination of the densities of crystals: Earl of **Berkeley.** A conical pyknometer with thermometer stopper and graduated side-tube is used, and the evaporation of the liquid is relied on to bring the level in the capillary side-tube within the graduations. The liquid used is carbon tetrachloride.—A relation between the volumes of the atoms of certain compounds at the melting points and their valencies. Interpretation by means of the Barlow-Pope theory: G. **Le Bas.** The molecular volumes of complex paraffins and alcohols can be calculated very exactly by means of the formulæ

$$\text{M. V. of } C_nH_{2n+2} = (6n+2)S = 6nS + 2S,$$

and

$$\text{M. V. of } C_nH_{2n+1}OH = (6n+4)S = 6nS + 4S,$$

where S is a constant which has an average value of 2·970, and is called the unitstere.—The action of acid chlorides on thioureas: A. E. **Dixon** and J. **Hawthorne.** —3-Hydroxyphthalic and 3-methoxyphthalic acids and their derivatives: W. H. **Bentley,** Miss R. **Robinson,** and C. **Weizmann.**—4-Hydroxyphthalic and 4-methoxyphthalic acids: W. H. **Bentley** and C. **Weizmann.**—Derivatives of naphthacenequinone: W. H. **Bentley,** A. **Friedl,** F. **Thomas,** and C. **Weizmann.**—Dithioxanthoxalanil (preliminary note): S. **Ruhemann.**

PARIS.

Academy of Sciences, December 31, 1906.—M. H. Poincaré in the chair.—M. H. Becquerel was elected vice-president for the year 1907.—Self-recording apparatus for the solar atmosphere: H. **Deslandres.** After giving an account of the essential conditions of the problem, the author discusses in detail the various methods possible, mentioning those already applied in different observatories. It is pointed out that the more modern patterns differ both in movements and dimensions from the older forms. Five diagrams accompany the paper.—The observations of nebulæ made at the Paris Observatory: G. **Bigourdan.** —A method of measuring the resistance opposed by metals to rapid deformations: P. **Vieille** and R. **Liouville.** A law connecting the deformations of crushers used in ballistic experiments in the two cases—slow deformations, as in calibration, and deformation at varying velocities.—A butyric lactone and unsymmetrical dimethyl-butylene glycol: Louis **Henry.** Butyrolactone, treated with magnesium methyl bromide or iodide, gives the glycol

$$(CH_3)_2(OH)—CH_2—CH_2—CH_2.OH,$$

in about 50 per cent. yield. The glycol reacts with acetyl chloride, giving the chloroacetin

$$(CH_3)_2—CCl—CH_2—CH_2—CH_2Ac.$$

—The conductibility accompanying the expansion of gases: L. **Bloch.** The electrical effects due to the expansion of compressed air and oxygen are comparable, both being due to ions of fairly large mobility present in practically equal amounts. The effects are very irregular, and the mean of a large number of experiments is required to obtain trustworthy results.—Remarks on the thermodynamics of non-homogeneous mixtures: Émil **Bose.** The Duhem-Margules equation may be deduced in a simple manner from a formula given by Nernst for the thermal effects of the mixture of two liquids. The author applies this to the case of two non-miscible liquids.—A new manganese silicide: G. **Gin.** The new silicide has been obtained by the reduction of rhodonite in the electric furnace. The composition corresponds to the constitution Si_2Mn_3. Its physical and chemical properties are described.—The solubility of carbon in manganese sulphide: M. **Houdard.** Carbon dissolves in fused manganese sulphide in quantity proportional to the time of heating, the maximum solubility being 3·2 per cent. The carbon is recovered from the ingot in the form of graphite, it being indifferent whether amorphous carbon or diamond is originally added. The manganese sulphide is not reduced.—The density of gaseous hydrochloric acid; the atomic weight of chlorine: Ph. A. **Guye** and G. **Ter-Gazarian.** An outline is given of the methods adopted for obtaining the gas in the pure state and measuring its density. The mean weight of a litre of HCl at 0° C., under one atmosphere pressure, latitude 45°, at the level of the sea is 1·6398 grams. The molecular weight of the gas has been calculated by the method of reduction to 8° C. of the critical elements. The atomic weight of chlorine thus derived is 35·461, agreeing well with the figure of Dixon and Edgar (35·463) or the value (35·460) deduced from the ratio Ag : Cl for Ag (107·89). As the experiments are preliminary, the authors do not wish to lay too much stress on the exactitude of the coincidence.—The melting points of the homologous hydrocarbons of the methane series: D. E. **Tsakalotos.** An empirical formula is given by means of which the melting points of the hydrocarbons between $C_{16}H_{34}$ and $C_{60}H_{122}$ have been calculated. The agreement between the figures thus calculated and those actually observed is, with one exception, very close, the deviations being less than the experimental error.—The study of the influence of radicals on the character of the complementary valencies of oxygen: M. **Tchelinzef.** An experimental study of the thermal changes which take place on the addition of one or two molecules of ether to various organomagnesium compounds in benzene solution.—The condensation of hydrazines with acetylenic nitriles. A general method for the synthesis of the pyrazolonimines: Ch. **Moureu** and I. **Lazennec.** Hydrazines combine directly with acetylenic nitriles, and it is shown that the resulting compound is cyclic, most probably a pyrazolonimine. The reaction is general, and several examples are given of its application. —The transposition of hydrobenzoin; study of the alkyl-hydrobenzoins and some trisubstituted aromatic glycols: MM. **Tiffeneau** and **Dorlencourt.**—The disease causing bitterness in wines: A. **Trillat.** Evidence is given in support of the view that the bitterness in wine is due to the presence of an aldehyde resin.—The cultural changes brought about in tubers of Solanum: Édouard **Heckel.** An account of the effects produced on several wild species of Solanum by excessive manuring.—Some attempts at grafting in the Solanaceæ: Ed. **Griffon.** In the experiments described grafting has had no specific morphological influence on either the graft or the plant.—The production of a new variety of maize by traumatism: L. **Blaringhem.** Mutilation constitutes a very powerful means for determining sudden variations, both hereditary and progressive, in plants.—Researches on the cultivation of asparagus in the Auxerrois: Eug. **Rousseaux** and Ch. **Brioux.**—The existence of lymphoid formations producing blood cor-

puscles in the Gammaridæ: L. **Bruntz.**—A new antelope from Central Africa, *Cephalophus leopoldi*: Maurice **de Rothschild** and Henri **Neuville.**—The influence of a small quantity of the radium emanation on the development and metamorphosis of batrachians: P. **Wintrebert.**—A comparison of sleep during the day and night: N. **Vaschide.** Sleep during the daytime is in all cases less profound, less restful, and less refreshing than sleep during the night.—The treatment of malignant pustule by iodine: A. F. **Llobet.**—The *charriage* of the northern slopes of the Pyrenees between the valley of Ariège and Roussillion: Léon **Bertrand.**—Some early experiments of M. Daubrée and of M. de Chancourtois relative to the artificial imitation of mountain chains: Stanislas **Meunier.**

DIARY OF SOCIETIES.

THURSDAY, JANUARY 10.

MATHEMATICAL SOCIETY, at 5.30.—Exhibition of Four-dimensional Models: Mrs. A. Stott.—On the Uniform Convergence of Fourier's Series: Dr. E. W. Hobson.—Asymptotic Approximation to Integral Functions of Zero Order: J. E. Littlewood.—Partial Differential Equations of the Second Order having Integral Systems free from Partial Quadratures: Prof. A. R. Forsyth.—On the Singular Points of Some Classes of Power Series in Several Variables: G. H. Hardy.—The Construction of the Line drawn through a Given Point to meet Two Given Lines: Prof. W. Burnside.—On the Reducibility of Covariants of Binary Quantics of Infinite Order, Part iii.: P. W. Wood.—On Hypereven Numbers, and on Fermat's Numbers: Lieut.-Col. A. Cunningham.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—New Incandescent Lamps: J. Swinburne.

FRIDAY, JANUARY 11.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Balancing of Internal-combustion Motors applied to Marine Propulsion: A. T. Weston.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Observation of the Occultation of Saturn by the Moon, 1906, October 27: John Tebbutt.—The Places of Zodiacal Stars for the Epoch 1900: A. M. W. Downing.—The Perturbations of Halley's Comet: P. H. Cowell and A. C. D. Crommelin.—Micrometrical Measures of Double Stars: Rev. T. E. Espin.—New Double Stars: Rev. T. E. Espin.—Observations of Occultations of Stars by the Moon made in the Year 1906: Royal Observatory, Greenwich.—*Probable Paper:* Mean Areas and Heliographic Latitudes of Sun-spots in the Year 1905, Deduced from Photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn, at Kodaikánal Observatory, India, and in Mauritius (communicated by the Astronomer Royal).—*Probable Discussion:* Prof. Fowler's Papers on the Enhanced Lines of Iron in the Region F to C, and on Silicon in the Chromosphere.

MALACOLOGICAL SOCIETY, at 8.—Descriptions of New Species of Achatina from the Congo Free State: S. I. Da Costa.—Further Contributions to the Genus Chloritis, with Descriptions of Eleven New Species: G. K. Gude.—Description of a New Species of Papuina, and Illustrations of some hitherto unfigured Helicoid Land-shells: G. K. Gude.—Descriptions of new Non-marine Shells from New Zealand: Henry Suter.

SATURDAY, JANUARY 12.

ROYAL GEOGRAPHICAL SOCIETY (at The Queen's Hall, Langham Place), at 8.45.—The Duke of the Abruzzi's Expedition to Mount Ruwenzori.

PUBLIC SCHOOL SCIENCE MASTERS' ASSOCIATION (University of London), at 2.30.—The Place of Science and of Literature in a General Education: Rev. and Hon. E. Lyttelton.—The Internal Economy of School Science: Mr. Thwaites.—The best Method of Introducing the Atomic Theory in Science: F. R. L. Wilson.

MONDAY, JANUARY 14.

LONDON INSTITUTION, at 5.—The Wonder Workers of the Soil: Prof. W. B. Bottomley.

TUESDAY, JANUARY 15.

ROYAL INSTITUTION, at 3.—The Sculpture of Aegina in Relation to Recent Discovery: Prof. Percy Gardner.

ZOOLOGICAL SOCIETY, at 8.30.—On a Collection of Mammals made by Dr. Vassal in Annam: J. Lewis Bonhote.—On the "Bleating" or "Drumming" of the Snipe (*Gallinago coelestis*): P. H. Bahr.—Some New and Insufficiently-known Species of Marmoset Monkeys from the Amazonian Region: Dr. E. A. Goeldi.—Contributions to the Knowledge of the Systematic Arrangement and Anatomy of Certain Genera and Species of Squamata: F. E. Beddard, F.R.S.

ROYAL STATISTICAL SOCIETY, at 5.

SOCIETY OF ARTS, at 4.30.—The Progress of the Uganda Protectorate: George Wilson, C.B.

FARADAY SOCIETY, at 8.—The Application of the Electron Theory to Electrolysis: E. E. Fournier d'Albe.

WEDNESDAY, JANUARY 16.

SOCIETY OF ARTS, at 8.—Adjourned Discussion on Mr. J. W. Gordon's Paper, Patent Law Reform.

ROYAL MICROSCOPICAL SOCIETY, at 8.—President's Annual Address, The Flowering Plants of the Mesozoic Age in the Light of Recent Discoveries.—Exhibition of Mounted Specimens of Freshwater Polyzoa: Mr. Rousselet.

METEOROLOGICAL SOCIETY, at 7.45.—Annual General Meeting.—Presidential Address, Weather in War Time: Richard Bentley.

THURSDAY, JANUARY 17.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* Regeneration of Bone, Part ii.: Sir William Macewen, K.C.B., F.R.S.—Further Observations on the Effects Produced in Rats by the Trypanosomata of Gambia Fever and of Sleeping Sickness: H. G. Plimmer.—The Natural and Induced Resistance of Mice to the Growth of Cancer: Dr. E. F. Bashford, J. A. Murray, and Dr. W. Cramer.—On the Pathology of the Dropsy produced by Obstruction of the Superior and Inferior Venæ Cavæ and the Portal Vein; Preliminary Communication: Dr. C. Bolton.—Experiments on the Dark Space in Vacuum Tubes: Sir William Crookes, F.R.S.—On the Discharge of Negative Electricity from Hot Calcium: Dr. F. Horton.

CHEMICAL SOCIETY, at 8.30.—The Relation between Absorption Spectra and Optical Rotatory Power, Part i., The Effect of Unsaturation and Stereo-isomerism: A. W. Stewart.—Organic Derivatives of Silicon, Part ii., The Synthesis of Dl-ethyl, Propyl Benzyl Silicol, its Sulphonation, and the Resolution of the Sulphonic Derivatives into Optically Active Compounds: F. S. Kipping.—The Association of Phenols in the Liquid Condition: J. T. Hewitt and T. F. Winmill.—A New Mercuric Oxychloride: J. T. Hewitt.—Aromatic Selenonium Bases: S. Smiles and T. P. Hilditch.—The Relation of Colour and Fluorescence to Constitution: A. G. Green.—The Constitution of Silver Nitrite, a Correction: E. Divers.—Preparation of Chromyl Chloride: F. D. Law and F. M. Perkin.—Tetraketopiperazine: A. T. de Moulpied and A. Rule.

ROYAL INSTITUTION, at 3.—Recent Advances in the Exploration of the Atmosphere: Dr. W. N. Shaw, F.R.S.

LINNEAN SOCIETY, at 8.—*Platanthera chlorantha*, Custor, var. *tricalcarata*: W. Botting Hemsley, F.R.S.—Acanthacea of Insular Malaya: the late Mr. C. B. Clarke, F.R.S.—A Freshwater Isopod from Calcutta: Rev. T. R. R. Stebbing, F.R.S.

FRIDAY, JANUARY 18.

ROYAL INSTITUTION, at 9.—Fifty Years of Explosives: Sir Andrew Noble, Bart., K.C.B., F.R.S.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Adjourned Discussion on Lighting of Railway Premises, Indoor and Outdoor: H. Fowler.—Eighth Report to the Alloys Research Committee: On the Properties of the Alloys of Aluminium and Copper: Prof. H. C. H. Carpenter and C. A. Edwards.

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