

THURSDAY, JUNE 21, 1906.

BRITISH INLAND NAVIGATION.

Our Waterways. A History of Inland Navigation considered as a Branch of Water Conservancy. By Urquhart A. Forbes and W. H. R. Ashford. Pp. xv+336. (London: John Murray, 1906.) Price 12s. net.

IT was originally intended to deal in this volume with the whole subject of water conservancy, which has been defined as "the scientific treatment and regulation of all the water received in these islands, from its first arrival in the form of dew or rain till its final disappearance in the ocean," tracing the evolution and subsequent history of the various branches of water conservancy, which, in addition to inland navigation, comprise fisheries, water-supply, the mitigation of floods, and the prevention of river pollution. Owing, however, to the greatly increased interest displayed in the improvement and utilisation of our inland waterways, this subject has been given precedence of the other branches, and forms the main purport of this book, though the other branches are occasionally referred to.

The appearance of the volume is in any case very opportune, for it has approximately coincided with the appointment of a Royal Commission to inquire into the condition of the inland waterways of the United Kingdom, and to investigate whether it might be possible to devise some scheme by which inland navigation in the British Isles, so long neglected, may be revived and improved, so as to serve profitably for the conveyance of bulky goods, and thereby reduce the cost of carriage, and thus place British manufacturers in a more favourable condition for competing with their foreign rivals, and especially with those for whom a paternal Government has provided the facilities of free and commodious inland waterways.

After a short introductory chapter on "The Objects of Water Conservancy," the rainfall, drainage areas, and principal rivers of the British Isles are referred to in a chapter on "The Water System of the United Kingdom," and certain important changes noted; whilst in the next chapter the legal aspects of water conservancy are dealt with. The authors trace three distinct periods in the history of the navigation of our waterways, namely, the first period, dating from early times up to near the close of the sixteenth century, when the rivers were used for navigation in their natural condition, as described in a chapter on the "Natural Waterways" of England; a second period, from the close of the sixteenth century to the commencement of the Bridgewater Canal in 1759, inaugurating the canal system in England, during which time inland navigation on the rivers was improved and extended by deepening their channels, of which some account is given in chapter v.; and, lastly, the canal era, dating from the construction of the Bridgewater Canal, which, after a chapter on ancient and early British canals, is dealt with in two chapters in regard to England and Wales. A

chapter on "The Conservancy of Rivers in England and Wales since the Eighteenth Century" brings the history of English rivers down to the present time; whilst another chapter, on "Rivers and Canals in Ireland and Scotland," where the development of inland waterways was only commenced in the eighteenth century, completes the sketch of river and canal navigations in the United Kingdom. In chapter xi. the decline of inland navigation in the face of railway competition, and by the purchase of important links by the railway companies, is referred to, and statistics as to the total length of canals in the United Kingdom, their traffic and revenues are given; whilst the various causes which have contributed to the very depressed condition of the great majority of the canal companies are explained.

Though the book contains, as indicated by the preceding summary, a considerable amount of information as to the rise, progress, and present condition of the inland waterways of the United Kingdom, as well as the legislative enactments controlling them, which Mr. Forbes, as a barrister, is specially qualified to deal with, the most interesting subject at the present time is undoubtedly the one considered in the last chapter, namely, "The Resuscitation of Our Waterways," to which the previous portion of the book has gradually led up. In dealing, however, with this subject, it is important to draw a very definite distinction between the inland waterways with which the authors are concerned and the maritime waterways of the United Kingdom, such as the tidal estuaries and rivers and the Manchester Ship Canal, which, though referred to amongst inland waterways, are quite outside the scope of the book, and are in no need of resuscitation. The flourishing sea-going trade of Great Britain is, indeed, due to her maritime waterways, many of which have been greatly improved to keep pace with the growth of traffic and the increasing draught of large vessels; whilst the Manchester Ship Canal, though proceeding inland, and having unfavourably affected schemes for the development of inland waterways by its unsatisfactory financial results, is essentially a maritime waterway, and has proved of great value to the sea-going trade of the district by converting the inland city of Manchester into a seaport, independent of Liverpool and the railways.

Whereas, however, the United Kingdom, with its very extensive coast-line and numerous important tidal rivers, is exceptionally well fitted by nature for maritime trade, its restricted area and small river-basins, resulting in small rivers above their tidal limit, separated by high water-partings in proportion to the moderate distance between them requiring to be surmounted by a canal, place this country at a serious disadvantage in regard to inland navigation as compared with the continent of Europe, with its very extensive river-basins draining into large rivers flowing for long distances over comparatively level plains, and capable in some cases of being joined across their water-parting by a canal of requisite size, without having to rise to a considerable elevation, and at a reasonable cost. In spite, nevertheless,

of these manifest disadvantages, there is no doubt that the inland waterways of England have been unduly allowed to fall into decay, owing to a surrender in several cases to the railways, the absence of concerted effort to procure uniformity of dimensions in through routes and to effect amalgamations, and the neglect of improvements. Those inland waterways which are under a single control, which possess the requisite traffic in bulky goods, and have been enlarged and improved to provide for the growth of traffic, such as the Aire and Calder Navigation with its coal trade, and the Weaver Navigation with its salt trade, have been able to maintain a very successful competition with the railways; and where waterways connect large centres of commerce and there is a large trade in bulky goods, the old, inadequate waterways have been able to retain a considerable traffic, as exemplified by the Leeds and Liverpool Canal, and the canals clustering round Birmingham and from the Potteries. A careful study of the statistics of Continental waterways proves that, notwithstanding the natural advantages they possess, and the uniformity in size and improvements which have been provided, only those waterways obtain a large traffic which deal with bulky goods and traverse long distances with merely moderate alterations in level.

The value of inland waterways in offering an alternative route to railways for bulky goods, and thus tending to reduce railway rates, as well as relieving railways from being overburdened by the least remunerative portion of their traffic, is obvious; but the points requiring solution are, from what source the funds can be provided for putting the principal waterways in a position to compete with the railways for the conveyance of bulky goods, and what waterways afford a good prospect of a reasonable return on the capital expended in their requisite improvement. The authors, in their final chapter on "The Resuscitation of Our Waterways," after directing attention to the interest aroused in recent years in inland navigation, the steps which have been taken for amalgamating some of the canal companies, the lesser cost of transport and maintenance in the case of canals than with railways, and the possibility of discharging goods at any places on the banks of a canal, indicate three methods by which the necessary improvements, unification of dimensions, amalgamation, and control of inland waterways, might be effected.

The first method is the conferring of additional powers on the Board of Trade to supervise the improvement and development of those waterways which have opportunities of trade in bulky goods, the necessary funds being lent them by Parliament or by local authorities. The second method is "the establishment of a canal trust to acquire, develop, extend, and administer, in the public interest, canals and navigations in England and Wales," which would be empowered to raise the requisite funds by the issue of guaranteed canal stock. The third method is "the nationalisation of waterways" by the purchase of the canals by the Government with funds

raised by a loan with this object, which the authors consider is the best method, and one which would speedily repay the cost "by doubling our means of communication" and "by the immense incentive given to commercial enterprise." Unfortunately, this is a very optimistic view of the results of the purchase and improvement of our inland waterways by the Government, and not at all likely to be realised, for their total length in England and Wales is only about a fifth of the length of the railways; and only a few of these waterways could be improved with any prospect of a remunerative expenditure. Considering that many of the French canals have a traffic which could hardly pay the working expenses, as is the case with the Caledonian Canal, which belongs to the Government, it is evident that the purchase and improvement of the English canals as a whole would be a financial mistake; but the connection of Birmingham with a seaport by an adequate waterway, the improvement of some of the antiquated canals in its neighbourhood, and the development of some through routes might be effected with good prospects of satisfactory commercial and financial results.

RECENT BOTANICAL BOOKS.

- (1) *Alien Flora of Britain*. By S. T. Dunn. Pp. xvi+208. (London: West, Newman and Co., 1905.) Price 5s. net.
- (2) *The Aconites of India*. Annals of the Royal Botanic Garden, Calcutta, vol. x., part ii. By Dr. Otto Stapf. Pp. ii+115-197; with 25 plates. (Calcutta: Bengal Secretarial Press, 1905.) Price 1l. 1s.
- (3) *An Enumeration of the Vascular Plants from Surinam*. By Dr. A. Pulle. Pp. 555. (Leyden: E. J. Brill, Ltd., 1906.) Price 15s.
- (4) *Die europäischen Laubmoose*. By Georg Roth. Pp. xxviii+1331. 2 vols. (Leipzig: W. Engelmann, 1903-1905.)

(5) **I**T has been pertinently remarked that the British cannot altogether escape the designation of aliens in view of the continual influx of foreigners, whether peacefully or formerly as invaders, but in such cases the descendants are eventually regarded as natives. Plants cannot, at any rate within historic times according to the author of this book, pass from the class of aliens to the class of natives. This is an exclusive view, but from a scientific aspect logical and correct. It is a difficult matter to establish a test for the validity of native species, especially in an insular country that has been extensively cultivated and the inhabitants of which have been the foremost voyagers in the world. The criteria adopted by the author depend mainly upon a consideration of the distribution of each species in Great Britain and adjacent countries. This applies especially to plants that are generally recorded as weeds from artificial habitats, but which may nevertheless be truly indigenous; the author distinguishes a considerable number of these that are readily noted, since their descriptions are placed within brackets. A

noticeable genus is *Ribes*, for which the author favours the inclusion amongst natives of the species *alpinum*, *grossularia*, *nigrum*, and *rubrum*. The compilation of this group has demanded much thought, and whether one agrees or disagrees with the discrimination, it is an extremely valuable expression of opinion, and affords the opportunity to those interested to place on record any apparently natural localities for these species. Less interesting, but forming an integral part of the subject, are the more obvious aliens, including introductions, casuals, and what may be termed drifts. The book fully bears out the expectations that were formed of its original and critical character, and to the author's wife due credit must be given for enabling the book to take shape when the pressure of official duties seemed likely to delay its publication.

(2) The early attempts to classify the Indian aconites were prompted by the desire to trace the source of the poisonous root known as Nepal aconite or Bikh. In 1802, when the East India Company decided to send a mission to Nepal, Dr. F. Hamilton was deputed to join the expedition in a scientific capacity, and he endeavoured without success to identify Bikh. After him Wallich took up the collection of Nepal aconites, but, unfortunately, his plants assigned to *Aconitum ferox* were not the source of Bikh, although such was assumed. The confusion so originated was increased when, later on, the same scientific name was applied to different plants from Kumaon and Garoal, and these and other misnomers have continued to the present day. To Sir George Watt much credit is due for attempting to clear up the nomenclature. In touring through the localities mentioned he spared no pains to collect plants and to ascertain their vernacular names with any general information, and this has materially helped Dr. Stapf in preparing the present monograph. Most of the species fall into two sections—*Lycocotylum*, containing perennials, and *Nanellus*, containing biennials. The latter is the important group including *Aconitum sbicatum*, the true Bikh, and the allied Nepal species *Aconitum lociniatum*, termed Bikhoma, also *Aconitum heterophyllum*, which contains a bitter but non-poisonous substance, *atisino*, and a similar species, *Aconitum palmatum*. Dr. Stapf decides against the occurrence of *Aconitum nabellus* in India, the nearest congener being the poisonous species *Aconitum soongaricum*, of which the properties are unknown. In addition to the task of discriminating between the names ascribed to herbarium specimens and establishing the identity of vernacular designations, Dr. Stapf works out a classification based upon the anatomical structure of the roots. For the biennial species he distinguishes three types of root, the first, normal, showing one continuous ring of cambium; in the second the cambium is separated into several portions, and the bundles appear as star-shaped masses embedded in uniform tissue; the third is characterised by cambium bands having a circular or horseshoe-shaped cross-section.

(3) The colony of Surinam, or Dutch Guiana, has

been visited by a large number of plant-collectors, of whom the most important, all about the middle of the last century, were Hostmann, Kappler, Focke, Splitberger, and Kegel, and quite recently Went and the author. A considerable number of the plants sent to Europe by the earlier collectors had been previously worked out, and a list of some fifty papers dealing with the classification of selected portions from different collections is given under the literature; but this is the first attempt to prepare a complete list of the vascular plants. The author has discovered twelve new species, including two in Podostemaceæ, two in Melastomaceæ, one in Loranthaceæ, and a *Vanilla*. Looking through the orders, the Leguminosæ are the most abundant, then the Orchidaceæ, Gramineæ, and Melastomaceæ in descending order. The Malpighiaceæ, Sapindaceæ, and Guttiferæ are proportionately well represented, and among the ferns Polypodiaceæ and Hymenophyllaceæ. Some of the more important genera are *Miconia*, *Ipomœa*, *Piper*, *Peperomia*, *Inga*, *Schizæa*, *Vanilla*, and the tropical American genus *Dichæa*. A tabulated comparison is made with the floras of British Guiana, French Guiana, and the Amazon district, showing that about 60 per cent. of the plants of Surinam occur in each of these regions, and that about 14 per cent. are endemic.

In the phytogeographical survey reference is made to a typical mangrove vegetation found in the river estuaries that gives place to a littoral alluvial belt. The vegetation of the river banks is extremely rich, mention being made of the araceous *Montrichardia arborescens*, *Pachira aquatica*, and *Cacoucia coccinea*. Further inland there are plains on higher ground called savannahs; but differing from the true savannahs or from the campos of Brazil, where sedges, grasses, species of *Schizæa*, *Eriocaulaceæ*, and *Melastomaceæ* are abundant. In the primitive forest *Selaginellas* and *hymenophyllaceous* ferns find a suitable habitat, while *Tecoma leucoxydon*, *Mimosa Balata*, *Eriodendron anfractuosum*, and certain *Lecythidaceæ* are amongst the important trees.

In addition, a list of vernacular names is given, and a few illustrations of typical plant formations that are excellent; also figures of the new species are provided and a map of the country. As Dr. Pulle has been at considerable pains to consult the principal collections in Holland and elsewhere, the enumeration is complete, and the volume forms a valuable contribution to the botany of tropical South America.

(4) To bryologists in this country Lindberg's system, in which the cleistocarpous mosses are incorporated with stegocarpous forms, is the most familiar, as Braithwaite and Dixon have both followed this arrangement. On the Continent, Brotherus has also adopted Lindberg's system in his classification of the mosses in the "Naturliche Pflanzenfamilien." Mr. Roth has preferred to conform more closely to Schimper's grouping, and in this respect and others his classification is very similar to that of Limpricht in "Rabenhorst's Kryptogamenflora." He retains a large number of independent genera

instead of uniting several as subgenera under one main genus, here again differing from English authorities. A good instance is afforded by a comparison of the species united under *Weisia* by Dixon with the same species that are referred by Roth to seven different genera; and two of these are quite separated from the others, as they fall under the *Cleistocarpi*. In his treatment of the *Hypnaceæ*, to which family one naturally turns, Roth also differs considerably from Schimper. Dixon collects ten of Schimper's genera under his genus *Hypnum*, but specifies five of them as subgenera. Roth has twelve equivalent genera, but again four genera are placed in a different family, and unnecessarily, although not without reason, the genus or subgenus *Harpidium* is changed to *Drepanocladus*. This is one of the names which, it is hoped, will be sustained when the nomenclature of the cryptogams is discussed at the next International Botanical Congress.

The points of difference between this work and Dixon and Braithwaite's books are so numerous that British moss-workers will refer to the "Europäischen Laubmoose" for contrast rather than for comparison. As a practical handbook for naming mosses the work deserves much commendation, and bears ample evidence that the writer has definite opinions to express. It is a great pity that analytical tables for distinguishing genera are not given, but the descriptions are good, and important characters are thrown into bolder type. References to the most recent discoveries of new localities and new varieties will be found. The illustrations are very numerous, but poor in execution.

PHOTOGRAPHY IN SURVEYING OPERATIONS.

An Elementary Treatise on Phototopographic Methods and Instruments. By J. A. Flemer. Pp. xix + 438. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1906.) Price 21s. net.

THE assistance that photography can render in the laborious work connected with topographical surveys has been repeatedly insisted upon, and the recognition of the fact is being displayed in the construction of a class of instruments admirably adapted for use in the field. With the more convenient instruments that experience will suggest, and with the shortened methods that familiarity will supply, the employment of photography is likely to be still more general, though doubtless it will have to contend against a certain amount of prejudice in favour of older methods.

Mr. Flemer's book is intended to overcome these prejudices and to determine the exact field which the camera can usefully occupy in surveying operations. The method has its limitations. The accuracy of a map constructed from panoramic views must evidently depend upon the precision with which objects can be identified and measured on a photograph or its enlargement. The use of telephoto-lenses or long-focused cameras would increase the accuracy, but at

the expense of convenience. More numerous photographs taken at shorter distances would also have the same effect, but then the labour of collecting and reducing the material would approach that due to the ordinary methods. It is the object of such a book as this to show that photography has distinct advantages peculiar to itself. But in many directions in which extreme accuracy is unnecessary, perspective views can be of essential service. A series of panoramic pictures showing the alteration in the face of the country due to volcanic eruptions, or the recurrent changes in sand dunes caused by winds blowing from certain directions at regular intervals, seem to be peculiarly suitable inquiries for photographic methods. Similarly, the changes in glacier formation and the determination of their motion, alterations in coast-line due to erosion, or the location of rocks and buoys would suggest other applications for the process. In wars and manœuvres, either with or without the use of balloons, the process has a large field of application.

Since the translation of a perspective view or combination of views into maps possessing considerable accuracy of detail is likely to concern many other professions than that of a surveyor, properly so called, it is most desirable to have a treatise in which is set out clearly the methods of construction and of the principles underlying the practice of the process. This want Mr. Flemer's book is intended to supply. That the author is competent to deal with the subject practically we entertain no doubt, but whether he has been successful in conveying his knowledge to others it is very difficult to judge. Surveying is technical work that can hardly be learnt without actual experiment in the field under the eye of a trained teacher. What amount of preliminary information is a pupil supposed to have before tackling the problems the author introduces? Certainly one ought to be accustomed to the use of the plane table and the time-honoured methods of procedure before addressing himself to the study of perspective views. The method should be regarded, not as a substitute, but as an addition, to the recognised processes.

Mr. Flemer's book consists practically of three parts. After a short preliminary historic review to show how the principles have been welcomed in various countries, the author discusses the phototopographic methods that various authorities have recommended. The fact that we have so many varieties of detail shows that the subject has not yet taken that mechanical, stereotyped form which it may be expected to assume when fully developed. The second part opens with a chapter on lenses, which seems hardly necessary to introduce the description of the many photogrammetric instruments now in use. This latter is a really valuable and excellent section. Finally, we have the details of the photographic operations, including the development of the plates and prints. There is not much that is new that can be said here, and the treatment of pinhole photography which is naturally connected with this subject is unfortunately discussed in another place.

W. E. P.

CONVERSATIONS ON CHEMISTRY.

Conversations on Chemistry. First Steps in Chemistry. Part ii., Chemistry of the Most Important Elements and Compounds. By W. Ostwald. Authorised translation by Stuart K. Turnbull. Pp. viii+373. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1906.) Price 8s. 6d. net.

THE original German edition of this book has been already noticed in NATURE (March 9, 1905, vol. lxxi., p. 435). The translation into English will make it accessible to a wider range of teachers, and to them it is to be warmly commended. No one can fail to be interested in seeing how one of the most lucid of German expositors, and one of the most ardent of reformers, presents the material of ordinary inorganic chemistry to the elementary student, and there are probably few people engaged in the business of teaching chemistry who will not find Prof. Ostwald's book of chemical dialogue eminently interesting and suggestive.

A book by so trenchant a critic naturally invites a close scrutiny, and particular interest will be felt in the treatment of certain points of difficulty which in a peculiar way beset the teaching of elementary chemistry. We may cite, for example, the definition or characterisation of an acid. Prof. Ostwald meets the case in a very simple way. On p. 16 it is written, "Only those compounds are acids which give off hydrogen with magnesium," and this is re-affirmed as quite correct on p. 17. We appreciate the advantage of a touchstone, but it may fairly be asked if, in the first place, magnesium is such a touchstone, and, secondly, whether this is the right kind of basis for the characterisation of an acid. In regard to the first point we think there is doubt, for although it is explicitly stated that water gives off no hydrogen with magnesium, and is not an acid, it is admitted later on p. 247 that "the metal has only a very slight effect on water," and, of course, it might be urged that at higher temperatures magnesium will actually burn in steam and liberate hydrogen in torrents. We think that Prof. Ostwald's pupil, who in this book is invested with a degree of zeal and adroitness calculated to make other teachers envious, might have been allowed to persecute his master a little more on the subject, until he had elicited the confession that on this question of acids, as on so many others relating to chemistry, the relativity and transition of things altogether preclude absolute definitions.

It is, perhaps, almost captious to make these remarks, for the way in which the teacher is exhibited in this book as anxious to be questioned is truly admirable, and most points are worked out with great ingenuity and address to an entirely logical conclusion. The allusion to things and phenomena of real human interest and the suppression of pedantry are also to be warmly commended.

The actual work of translation has, on the whole, been well done. The nationality of the translator is betrayed by occasional troubles with shall and will, and there are some positive mistakes in sense. Thus,

"Leimwasser in Fäulnis übergegangen" is rendered "lime-water which has become foul," and on p. 49 the first two lines contain a mistranslation which makes a serious error both in fact and theory.

In conclusion, we may perhaps be permitted to regret that so useful a book has not been issued at a price which would make its wide dissemination among teachers more certain.

A. S.

NENCKI'S COLLECTED WORKS.

Marceli Nencki Omnia Opera. Gesammelte Arbeiten von Prof. M. Nencki. Two vols. Erster Band. Pp. xlii+840. Zweiter Band. Pp. xiii+893. (Brunswick: F. Vieweg and Son, 1905.) Price 45 marks.

THE death of Prof. M. Nencki at the comparatively early age of fifty-four was a great blow to science. He attained a world-wide reputation as an investigator of the first order, and his laboratory at St. Petersburg became a busy hive of earnest workers, all fired with the enthusiasm and thoroughness of their master. The most fitting monument for such a man is the collection of his works presented to us in the two volumes which form the subject of this review. The labour of love in preparing this book for the press has fallen upon two of his most attached colleagues, namely, Nadine Sieber and Prof. J. Zaleski, and they have chosen the German language as that in which to publish his collected memoirs. They have written an account of his life in the introductory pages, but have wisely chosen to make this brief; his work was his real life, and this is allowed to speak for itself.

Nencki's name is best known, perhaps, for his researches that deal with the decomposition products of albumin, with the history of urea and its precursors in the body, and with the chemistry of hæmoglobin and other pigments. Probably few had any idea how varied were the investigations he undertook in other branches of biological chemistry, and how enormous was the output from his laboratory. The total number of papers now published amounts to three hundred and forty-six. They were issued from the year 1869 onwards, and include not only those written by Nencki himself, or in conjunction with his colleagues, but also those published by the workers in his laboratory.

It is interesting to note how with the advance in knowledge the subjects treated vary with the march of the years. An organic chemist at heart, Nencki best loved a research in which he could apply his chemical learning to obtain exact results. But he never lost sight of the application of chemical knowledge to the problems of medicine, pathology, and pharmacology, even although in many cases the results lacked that certainty and neatness which form the chemist's aim. As bacteriology, the giant daughter of physiology, became a specialised branch of study, we see how the resources of his laboratory were given over to the elucidation of its chemical relationships; and in more recent years the new

subject of immunity equally attracted the diligence of the pupils whose work Nencki controlled and directed.

To attempt even an enumeration, still less a review, of the papers contained within the book would be out of place in a brief appreciation of its value. One can only recommend those interested in such subjects as have been indicated to procure this treasure-house of information for themselves.

W. D. H.

OUR BOOK SHELF.

Essais des Matériaux. By H. Bouasse. Pp. 150. (Grenoble: Gratier and Rey; Paris: Gauthier-Villars, 1905.) Price 5 francs.

THE ordinary mathematical theory of elasticity consists mainly in the examination of the consequences of the general principle involved in the statement of Hooke's law, "ut tensio sic vis," or, in other words, the proportionality of stress to strain. In many cases, however, this assumption is far from being satisfied, and the state of strain in a body at any instant depends not only on the actual stresses, but on the changes which have previously occurred in that body.

Prof. Bouasse's treatise consists in large measure of a classification of the various properties arising from the study of strains and stresses, such as permanent deformations, perfectly elastic deformations, viscosity, hysteresis, reversible and irreversible deformations and limits of elasticity. As the author points out, many of the phenomena are of common occurrence, and he instances the displacement of the zero reading of the galvanometer as a simple example. The various effects are illustrated by curves showing the relations between strain and stress. The ordinary theory of elasticity is of course touched on.

The printing of the preface in italics does not favourably impress the English reader at the outset, but everyone must agree with the conclusions at the end, in which the author points out that the subject has not received the attention it deserves, and this at a time when rapid advances have been made in most branches of physics. There is abundant evidence that Prof. Bouasse has given much careful thought and study to the subjects of which he treats, and even if his book does no more than attract attention to a neglected branch of physics it will fill a useful purpose.

The Scientific Roll and Magazine of Systematised Notes. Conducted by Alexander Ramsay. Bacteria. Vol. i. Pp. 528. (Acton, London, W.: R. T. Sharland.) Price 16s.

It is difficult to comprehend exactly what place this work is designed to occupy. The author must have expended an enormous amount of time and labour upon it, but we regret to say we cannot help feeling that much of his work is misapplied. For example, the 200 pages or thereabouts occupied by the tables of bacteria, arranged according to size, can be of little or no value, because the size of bacteria is extremely variable, and because the finer measurements must be very rough. Had this space been devoted to a summary of bacterial characters and reactions, abstracted from original papers, a great deal of scattered material would have been gathered together, and the result would have been most valuable. The bibliography in the earlier parts should be useful, but the summary of characters contained in the later ones is too brief and scrappy to be of much value.

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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.]

Another New Vesuvian Mineral.

IN NATURE of May 31 I gave a preliminary note on a new mineral species *chlormanganokalite*, in speaking of which I made reference to its association with fine crystals of halite that I suggested were likely to prove rich in potash. The latter crystals occur as beautiful cubes often more than a centimetre in diameter, and of a transparent to a milky, opaline tint. They afford on analysis the following results as to their composition:—

KCl ...	87.57	equal to	KCl	87.93
NaCl ...	12.02		NaCl	12.07
Moisture	0.412			
	100.002			100.00

If we adopt the formula $(\text{KCl})_6\text{NaCl}$, we should theoretically expect the following composition:—KCl 88.5, NaCl 11.5, which is sensibly the composition found by analysis as above, especially when we consider the errors inherent to the estimation of these substances.

I think, therefore, we are justified in considering this mineral as a definite double chloride, which I propose provisionally to call *chlornatrokalite*. It is my intention to submit to analysis a number of similar minerals that I have collected at Vesuvius during the last twenty-six years to see if we have to deal simply with mixtures or definite chemical compounds. Spectrum analysis failed to show even traces of calcium, caesium, rubidium, or lithium.

The great amount of potassium compared to sodium is not astonishing when we consider that potash is the dominant alkali in the paste from which Vesuvian lava and its other products are derived.

June 13.

H. J. JOHNSTON-LAVIS.

The Discovery of Logarithms.

IN the review of a book, "Letters from the Dead to the Dead," which appeared in your number of May 31, your reviewer says:—"As another example we may take the notes to Henry Briggs's letter, in particular the supposed proof (p. 75) that Napier's true base is the reciprocal of e and not e itself. As the difference depends entirely on whether $\log \sin 45^\circ$ has a plus or a minus sign attached to it, it is interesting to speculate on how many readers will be deceived by what is after all a somewhat clever hoax." (The italics in the above extract are mine.)

I take it by the use of the words *supposed*, *deceived*, and *hoax*, your reviewer intends to intimate that the formula on p. 75 of "Letters from the Dead to the Dead" is faked, or made by the author to suit his own purposes. Nothing could be further from the truth. I have had the curiosity to make the calculation *de novo*, and I venture to submit that no fair or genuine criticism can be passed upon it. The expression $\log 1/\sqrt{2}$ must have the minus sign. Indeed, I almost wonder whether your reviewer has read the book he is reviewing, because in that book the author quotes from Macdonald's translation of Napier's "Constructio" the statement that e^{-1} is the base required by Napier's reasoning.

I am not concerned whether the book in question is a hoax or not. For my part, I do not believe that it is. On the contrary, I believe it will prove to be one of the great books of history. It raises too many fascinating questions to be non-suited in your summary manner, and the reason why John Napier, knowing in 1614 that logarithms computed to base 10 must supersede all others, went on computing his to the surd $1/2.7182818283$ as base, is an historical mystery that demands a solution. It is ridiculous to suppose—nay, it is impossible to suppose—that the inventor of logarithms did not know that they must have a base.

CECIL SEYMOUR-BROWNE.

THE note under criticism purports to be a "proof" that the base originally used by Napier was the reciprocal of e , and not e itself. In reality, it is nothing of the sort. The arithmetical details are both unnecessary and insufficient for the purpose, and their insertion is unfortunately calculated to deceive many readers by obscuring the real points at issue. The same "proof" might equally well be employed to show that the original base was e instead of its reciprocal, but that the minus sign had been omitted from the logarithms of sines. If your correspondent will read any treatise on the history of mathematics, he will see an account of the train of reasoning which led Napier to the discovery of logarithms before the existence of a base or the connection between logarithms and indices had been suspected. There are doubtless many historical points connected with the discovery of logarithms that deserve closer study than they commonly receive, but the publication of a book of this kind is not likely to advance our knowledge of them. If one could be certain that all readers would take the book for what it is worth, no harm would be done. But there are, unfortunately, many people who possess a "little knowledge" (which is, of course, a "dangerous thing") who will derive a large amount of misinformation from the interpretation they will place on the contents of the book, and this misinformation will be very difficult to eradicate.

THE REVIEWER.

Distribution of the Forms of *Corvus cornix* and *C. corone*.

I SHOULD esteem it a favour if the writer of the review of Ralfe's "Birds of the Isle of Man" (NATURE, May 31, p. 195) would more clearly explain his reference to the dimorphic forms of *Corvus cornix* and *C. corone*, and the "border-line, i.e. along the line from the Firth of Clyde to the Adriatic, &c."

The Firth of Clyde is not the limit of the line where they are known to interbreed. They interbreed north of the Firth of Forth, and as far north as Moray at least.

And as regards the Adriatic, the forms are known to interbreed and produce every variation of crosses or diverse plumages in Siberia.

No doubt your reviewer will be able to explain his meaning, but, as at present expressed, it is somewhat difficult to understand (v. p. 105).

The "carrion crow" (*corone*) seems to me to be the more aggressive of the two, and is slowly but surely pushing north in Britain, as I think references to our series of Scottish faunas will show.

J. A. HARVIE-BROWN.

Dunipace, Larbert, Stirlingshire, N.B., June 2.

THE precise line—if there be one—marking the distribution between the breeding areas of *Corvus cornix* and *C. corone* is of little importance to the "problem" suggested to the readers of NATURE in the review mentioned. Its direction, however, was taken from Newton's trustworthy "Dictionary of Birds," p. 117, where it is stated to be "an irregular line drawn diagonally from about the Firth of Clyde to the head of the Adriatic." The reviewer cited that statement as authoritative, since he has had no opportunity of personal observation on the subject. It is further stated on the page last cited, "it has now been incontestably proved that along or near the boundary where these two birds march, they not infrequently interbreed, and it is believed that the hybrids which sometimes wholly resemble—italics by the reviewer—one or other of the parents . . . pair indiscriminately among themselves or with the pure stock." If these be established facts, then the hybrid wholly resembling the black variety must, if it occur in any considerable numbers, retire to breed "to the south-western part of this quarter of the globe," and the hybrid wholly resembling the "grey neck" "to the north-eastern portion." How has this discrimination been acquired? Two further questions may be asked: Can the wholly black and wholly grey hybrids be recognised after they have left the nest? Can the proportion of pure breeds to hybrids in the general crow-population be determined?

The facts given in Mr. Harvie-Brown's letter seem to

indicate that the crows in their nursery arrangements behave less perplexingly than the reviewer had deduced from the statements he has quoted above. The black and the grey crows may really be, therefore, not dimorphic forms of one species, but two distinct species.

THE REVIEWER.

The Date of Easter.

IN your issue of April 5 an empirical formula is given for determining the date on which Easter falls in any year from 1900 to 2100. Having tried the formula for certain years within the limits stated, I find that it fails in the case of 1954. For that year it gives April 25, whereas the correct date is April 18. Perhaps some of your correspondents may be able to explain the cause of the discrepancy.

ALEXANDER D. ROSS.

Glasgow, June 1.

YOUR correspondent is correct in saying that the empirical formula of Gauss for determining the date of Easter gives April 25 for the year 1954, and I must confess my inability to assign a reason for its failure in this particular instance.

CHAS. LEIGH.

The Victoria University of Manchester, June 12.

Geological Survey of Canada.

IN the issue of NATURE of April 26, under the heading of "Notes," is a paragraph concerning changes in the organisation of the Geological Survey of Canada. This paragraph is liable to be misleading, and I shall be greatly obliged if you will kindly state the facts as they are. On March 27 last Mr. A. P. Low was appointed deputy head and director of the Geological Survey Department, and, at the same time, Dr. R. Bell simply returned to his former position of assistant-director and chief geologist, to which he had been appointed in 1892.

A. P. Low (Deputy Head and Director).

Geological Survey of Canada, Ottawa, Ontario, May 29.

THE FOSSIL VERTEBRATES OF THE FAYUM.¹

A FEW years ago it was the fashion among vertebrate palæontologists to say that, at least so far as the Tertiary period is concerned, the Old World was played out in the matter of their special science, and that the scene of advance was shifted to America, where alone important and epoch-making discoveries were to be expected. All this has been changed by the discovery of the wonderful Lower Tertiary vertebrate fauna—or, rather, series of faunas—in the Fayum, or lake-province, of Egypt, which Dr. Andrews (who, we are glad to say, has now the privilege of adding the letters F.R.S. to his name) has so admirably and lucidly described in the handsome quarto volume before us. Indeed, it is not saying too much to assert that these discoveries have practically revolutionised our conceptions of the mutual relationships of several mammalian groups, and also our ideas on many points connected with the past distribution and migrations of the mammals of the Old World. Perhaps the most important problem which Dr. Andrews has succeeded in solving is the origin of the Proboscidea; and if this had been the only result of his labours he would have been well entitled to undying fame. As it is, this discovery is only one of several of the highest importance in regard to mammalian evolution we

¹ "A Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, Egypt; based on the Collection of the Egyptian Government in the Geological Museum, Cairo, and on the Collection in the British Museum (Natural History), London." By C. W. Andrews. Pp. xxxvii+324; pls. 26, and text-figures. (London: Printed by order of the Trustees of the British Museum, 1906). Price 35s.

owe to him, and in some degree to others who have been working on the extinct Egyptian faunas.

Before proceeding further we may take the opportunity of expressing, on behalf of all palæontologists, our appreciation of the generosity of the Egyptian Government in putting at the disposal of the trustees of the British Museum, for the purpose of this catalogue, the whole of the valuable collection of vertebrate remains from the Fayum preserved in the museum at Cairo. We may likewise respectfully tender to the trustees of the national collection our sense of the benefit they have conferred on science by sanctioning the publication of the work before us. Nor must we omit to mention the name of Mr. W. E. de Winton, who has generously defrayed the expenses connected with some of the visits of Dr. Andrews to Egypt to explore and collect the palæontological treasures of this wonderful district.

It will not be necessary on this occasion to refer in detail to the history of the discovery of fossil vertebrates in Egypt. Suffice it to say that the first discovery was not made by the author of the volume before us, although it appears that he was present when the remains of ancestral proboscideans and other primitive mammals were first brought to light.

With a few unimportant exceptions, the whole of the remains described in the volume were derived from strata of Middle and Upper Eocene age lying on the northern side of Lake Moeris. In the author's opinion it appears that the Fayum strata, as we advance from earlier to later times, were, speaking generally, deposited nearer and nearer to some land-mass.

"In the early Eocene the presence of thick marine beds far to the southward shows that the shores of the Ethiopian continent were still remote from the area now under discussion; and this state of things seems to have continued till the Middle Eocene, as shown by the thick nummulitic beds of the Wadi Rayan series, and the exclusively marine character of the fossils both of those beds, the Ravine beds, and the Birket-el-Qurun series above. In the Qasr-el-Sagha series, on the other hand, there is much evidence that the shore was not far off, the presence of thick beds of clay, often current-bedded and containing numerous impressions of leaves, as well as the occurrence of land-mammals, pointing to this conclusion. In fact, the deposits at this horizon may be regarded as partly marine and partly littoral, there having been many small oscillations of level. In the Fluvio-marine (Upper Eocene) beds above, the near presence of a large land-mass is still more obvious, these deposits being, in fact, almost entirely fluvialite, and probably representing the remains of the delta of a great river which, for various reasons, Mr. Beadnell considers flowed from the south-west. At or near the end of the Eocene period this state of things was interrupted by an outburst of volcanic activity, which gave rise to the interbedded basalt-sheets of the Jebel-el-Qatrani; but after this the fluvialite conditions were again resumed, and appear to have continued with some interruptions throughout the Oligocene, Miocene, and, in part at least, the Pliocene periods. Throughout this vast epoch there seems to have been a general tendency towards a gradual advance of the coast-line northwards, and such interruptions and oscillations as did occur are marked by the presence of interbedded marine, littoral, and perhaps, in a few cases, lacustrine deposits."

Obviously, such a state of things affords just the conditions necessary for the preservation of the remains of a series of faunas, and as a matter of fact such remains have been found in two horizons in addition to those forming the subject of the catalogue.

The mammals may be divided into three groups. First, terrestrial forms, such as ancestral proboscideans, hyracoids, and the remarkable *Arsinoitherium* which appear to have been endemic to the Ethiopian region,

and occur in both the upper and lower beds, and are unknown elsewhere. Secondly, terrestrial types like *Ancodon* and *Hyænodon*, represented in other parts of the world, and found only in the upper beds. Thirdly, primitive genera of sirenians and cetaceans, confined to the lower beds, some of which are widely spread, while others are unknown elsewhere, and may be endemic. All the genera in the first group are ungulates, and, with one exception, belong to that generalised assemblage frequently known as subungulates.

The most striking of all these wonderful ungulates is undoubtedly the huge and powerfully horned *Arsinoitherium* (Fig. 2); but interesting as is this creature morphologically it adds but little to our knowledge of mammalian evolution, although there is a possibility that it may prove to be an offshoot from the hyrax-stock. In any case the occurrence of this and several other specialised types at such an early stage is one of the most remarkable features of the Fayum fauna.

Although *Arsinoitherium* is certainly the most ex-

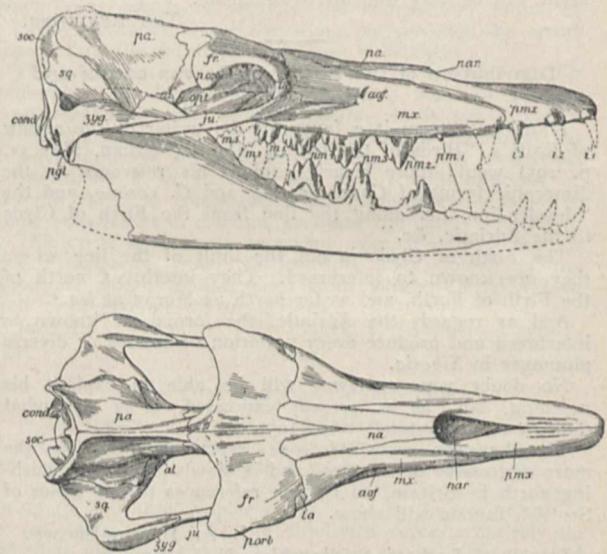


FIG. 1.—Lateral and superior views of the skull of *Prozeuglodon atrox*, a primitive Egyptian Cetaccan. The letters refer to the names of the bones; $\frac{1}{2}$ natural size. From "The Catalogue of Fayum Vertebrates."

traordinary of the Eocene Egyptian ungulates, it undoubtedly yields place in point of interest to the ancestral proboscideans. The probability that Africa would prove to be the original home of the Proboscidea was suggested, among others, by Prof. H. F. Osborn, who also conjectured that the hyraxes and certain other groups might likewise be of Ethiopian origin. In regard to the two groups mentioned, the truth of this bold prophecy has been fully demonstrated by the discoveries and investigations of Dr. Andrews. Since the evolutionary history of the Proboscidea, as revealed by these discoveries, has already been made familiar to the public in several journals—*NATURE* among the number—it will be unnecessary to go over the ground again, and it will suffice to mention that in *Mœritherium*, the earliest known representative of the group, we have an animal but little removed from the generalised common type of primitive ungulates. It may be added that while the Ethiopian origin of the Proboscidea has now been proved, it is nearly as certain that the passage from the mastodons to the elephants took place in

south-eastern Asia, or in a lost land between the latter and Africa.

Next, perhaps, in point of interest is the discovery of comparatively giant forms nearly related to the modern hyraxes, which are now as isolated as the elephants. Unfortunately, these Eocene hyraxes—*Saghatherium* and *Megalohyrax*—throw little or no light on the ancestry of the group, although serving to show that it was certainly Ethiopian in origin. Whether certain Tertiary South American ungulates are related to the group is left by the author an open question.

Of not less importance are the discoveries and conclusions with regard to the origin and relationships of that isolated aquatic group of mammals now represented by the manatis and dugongs. On this point the author remarks that there seems to be much evidence in favour of the original view of de Blainville that the Sirenia are intimately related to the Proboscidea.

"In the first place, the occurrence of the most primitive Sirenians with which we are acquainted in the same region as the most generalised proboscidean *Mœritherium* is in favour of such a view, and this is further supported by the similarity of the brain-structure and, to some extent,

to the contrary that have been expressed, we should naturally expect) are derivatives from a carnivorous ancestral type. On the evidence of specimens obtained from another part of Egypt, Dr. E. Fraas, of Stuttgart, has demonstrated the derivation of the whale-like *Zeuglodon* (Fig. 1) from that group of primitive carnivora known as creodonts. Dr. Andrews not only brings forward additional evidence in favour of this most remarkable line of descent, but he is confident—which Prof. Fraas was not—that *Zeuglodon* itself is an ancestral cetacean, and consequently that whales are the highly modified descendants of creodonts. It must be admitted, however, that the links between *Zeuglodon* and typical cetaceans are at present unknown; but it may be hoped that these will be eventually brought to light from the deposits of the Mokattam Range.

Of the other classes of vertebrates represented in the Fayum series we can say but little. Reference should, however, be made to the occurrence of a presumed ratite bird, which if rightly identified is the earliest known representative of the group, and suggests the Ethiopian origin of some members at least of the ostrich group in Africa. Such an ancestry, as the author remarks, would explain the resemblance exist-

ing between the true ostriches and the extinct *Æpyornis* of Madagascar, and might likewise serve to connect the former with the South American rheas.

Giant land tortoises are likewise proved by the Fayum discoveries to have occurred in this part of the world at a much earlier date, so far as is known, than elsewhere, and it is noteworthy that the extinct Egyptian species are near akin to the recent Mascarene and Malagasy forms. The association of tortoises belonging to the pleurodiran section, now confined to the southern hemisphere, is another fact of prime importance, as tending to throw light on the dispersal of that group and the former relations of the southern continents.

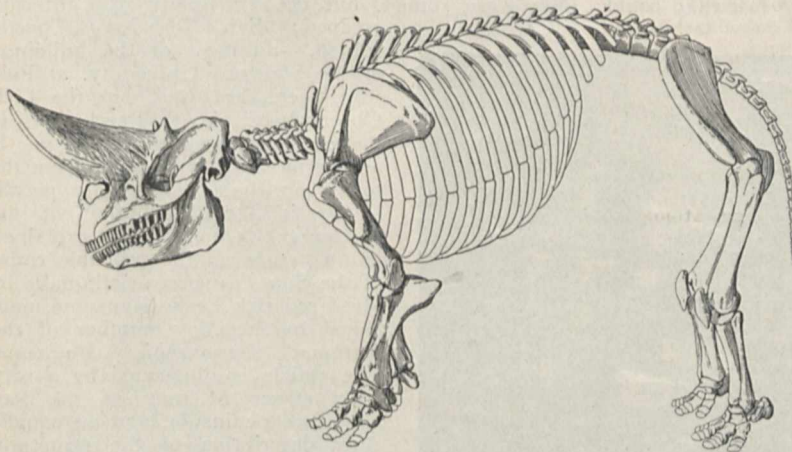


FIG. 2.—Skeleton of *Arsinoitherium zitteli*, $\frac{2}{3}$ nat. size. From "The Catalogue of Fayum Vertebrates."

of the pelvis in the earliest-known members of the two groups. Moreover, in the anatomy of the soft-parts of the recent forms there are a number of remarkable points of resemblance. Among these common characters may be noted the possession of: (1) pectoral mammae; (2) abdominal testes; (3) a bifid apex of the heart; (4) bilophodont molars with a tendency to the formation of an additional lobe from the posterior part of the cingulum. The peculiar mode of displacement of the teeth from behind forwards in some members of both groups may perhaps indicate a relationship, although in the case of the Sirenia the replacement takes place by means of a succession of similar molars, while in the Proboscidea the molars remain the same numerically, but increase greatly in size and number of transverse ridges."

These and certain other facts referred to by the author in a later paragraph point very strongly to the conclusion that not only are the Sirenia and the Proboscidea derived from a single ancestral stock, but that the Hyracoidea—and so *Arsinoitherium*—are also derivatives from the same stock, which must necessarily have been Ethiopian.

While thus definitely establishing the herbivorous ancestry of the Sirenia, Dr. Andrews appears to be equally convinced that the Cetacea (as, despite views

With regard to the latter point, Dr. Andrews comes to the conclusion that the new facts fully endorse the theory of a former land connection between Africa and South America. "Speaking generally, it appears that (1) probably in Jurassic times Africa and South America formed a continuous land-mass; (2) in the Cretaceous period the sea encroached southwards over this land, forming what is now the South Atlantic. How far this depression had advanced southwards at the end of the Secondary period is not clear, but it appears certain that the final separation of the two continents did not take place till Eocene times, and that there may have been a chain of islands between the northern part of Africa and Brazil which persisted even till the Miocene."

It will thus be apparent that from whatever point of view we regard the Eocene vertebrate fauna of the Fayum—whether from the morphological, the phylogenetic, or the distributional—it is practically impossible to overestimate its extreme importance. When we reflect that what has been discovered can only be the mere fringe of a most extensive Eocene and Upper Cretaceous Ethiopian fauna we shall be in a position to realise what a great part Africa has played in the past as a birthplace and centre of dis-

persal of mammalian groups, and how profoundly even the present discoveries have modified our conceptions of the past history of the mammalia and of the globe in general.

After a careful study of the volume before us, we have found no occasion for a single word of hostile criticism. The author knows his subject from every possible point of view in a most thorough manner, and has treated it in a thoroughly philosophic way from first to last, while the introduction is written in a style that will appeal to the general reader as well as to the specialist. It is, perhaps, not too much to say that it is the most important contribution to mammalian palæontology that has ever appeared within our own recollection on this side of the Atlantic, and if the twentieth century were to see no other work on mammals—either recent or fossil—it would still have a vast achievement to its credit.

R. L.

THE CALIFORNIAN EARTHQUAKE OF APRIL 18.

THE accounts which are reaching this country enable us to form a better idea of the character of the Californian earthquake of April 18 last than could

quences of the failure of water were disastrous, and the fire, started by the earthquake, was able to spread unchecked.

Apart from the loss of buildings and lives, San Francisco has lost its most important libraries and scientific collections; the Bancroft library of books and manuscripts relating to the history of the Pacific coast has been saved, as have most of the type-specimens of plants in the collection of the Academy of Sciences, but that is practically all. On the other hand, the Lick Observatory and the University of California have escaped damage, and the working part of the Leland-Stanford University has escaped the complete destruction which has been the fate of the memorial buildings of that institution.

The area over which the earthquake did serious damage was confined to a narrow strip of country extending from the town of Ukiah, on the Russian river, to the town of Salinas, near Monterey Bay. Beyond these limits the country is sparsely settled and may have been vigorously shaken without the fact being reported, but the limits indicated lie about 205 miles apart, or 125 miles north and 80 miles south of San Francisco; within this strip the damage was very capriciously distributed, and died out rapidly to the east and westwards; at Berkeley town many buildings were ruined, but the University of California escaped; San Jose was partly ruined, and most of the buildings of the Stanford University, at Palo Alto, were destroyed, but the Lick Observatory, about fifteen miles to the eastward, was uninjured, nor is any serious injury reported from the towns on the coast. These peculiarities in the distribution of the earthquake damage are explained in an article on the probable cause of the San Francisco earthquake by Mr. Frederick Leslie Ransome, published in the May number of the *National Geographic Magazine*. The article is illustrated by a very clear structural map of the San Francisco peninsula, and an equally clear description of the structural conditions of the region. Probably nowhere in the world have greater displacements taken place in geologically recent times than this district has witnessed; strata of Quaternary age have here been compressed, contorted, and lifted from 1500 to 2000 feet, and right



FIG. 1.—The Burning of the Business District of San Francisco after the earthquake on April 18. From the *Scientific American*.

be done from the telegraphic reports of the daily papers, and one of the most striking facts which stand out is the wonderfully small amount of damage done in San Francisco by the earthquake proper. This does not seem to have exceeded the sixth or seventh degree of the Rossi-Forel scale, and the damage to buildings was practically confined to the overthrow of chimneys and of buildings which were either old and badly constructed, or of a design which rendered them especially liable to earthquake damage. The *Scientific American* of May 12 contains a view of the business part of the city, taken after the earthquake, but before the spread of the fire, in which the buildings show little signs of damage, beyond the overthrow of some of the chimney stacks. Where the city was built on made ground settlements and disturbances of ground level led to fractures of the water-mains, but it is not clear from the accounts which have reached us whether there was not also an interruption of the main conduit at some point between the city and the source of supply. Whatever the cause, the conse-

through the peninsula run three nearly parallel faults, two of which, the Pilarcitos and San Andreas faults, are marked by lines of pools and lakes, proving the recent date of the disturbance to which they owe their origin. The third fault, known as the San Bruno fault, is the most important of the three; it has a throw of more than 7000 feet near San Francisco, and has been traced, with more or less certainty, from Point Arenas, 100 miles to the north-west, through Southern California, where it is known as the "earthquake crack," almost to the Gulf of California. A movement along this fault, and others parallel to it, appear to have been the cause of the earthquake, or at any rate of the curious localisation of damage noticed above. The San Bruno fault passes close to the Stanford University and to the city of San Jose, and crosses the main line of water-supply from the Crystal Springs reservoir to the city of San Francisco; it is, presumably, along this fault that the displacement reported in the newspapers took place. There are indications,

too, of another fault running along the eastern margin of the bay through Santa Rosa and north-westwards along the valley of the Russian river past Ukiah, which may have been concerned in the violence of the earthquake at those places.

Two other articles in the same magazine deal with the times at which the disturbance was recorded by seismographs. From them we gather that the shock was recorded on a self-registering seismograph in the University of California at 5h. 12m. 38s. a.m. Pacific time, equivalent to 1h. 12m. 38s. p.m. Greenwich time. The seismograph of the United States Weather Bureau at Washington, 2435 miles distant from San Francisco, recorded the commencement at 8h. 19m. 20s. eastern time, corresponding to 1h. 19m. 20s. Greenwich time, and the seismographs of the United States Coast and Geodetic Survey at Sitka, Alaska, and Chelten-

successful ever held. The local fund now reaches more than 3000., and the greater part having been already paid up, the fund has been closed. The various committees are meeting regularly, secure good attendance, and the greatest interest and enthusiasm prevails. One of the local secretaries, Mr. Dale, having died, Mr. Henry Craven, who has succeeded him in the office of town clerk, has been appointed his successor.

The following is an epitome of the general attractions included in the programme:—

Wednesday, August 1.—The Lady Mayoress (Mrs. R. H. Vernon Wragge) will be "At Home" at the Mansion House from 3 p.m. to 6 p.m. to receive foreign visitors, members, associates, and lady ticket-holders. President's address in the exhibition buildings at 8.30 p.m.

Thursday, August 2.—The Sheriff of York and Mrs. Bentley will give a garden-party at their residence, Fulford Grange, to all ticket-holders, from 3 p.m. to 6 p.m. Conversazione in the exhibition buildings, by invitation of the executive committee, at 8 p.m. Music will be provided in the museum gardens, which communicate with the building and will be illuminated.

Friday, August 3.—Messrs. Rowntree and Co. will give a garden-party at their works, Haxby Road, to all ticket-holders, from 3 p.m. to 6 p.m. The works will also be open. Discourse on volcanoes, by Dr. Tempest Anderson, in the exhibition buildings at 8.30 p.m.

Saturday, August 4.—The Archbishop of York and Mrs. MacLagan will give a garden-party at the Palace, Bishopthorpe. Evening lecture to the operative classes by Prof. Silvanus Thompson, F.R.S., on the manufacture of light. The president, Prof. Ray Lankester, will take the chair.

Sunday, August 5.—Special service in the Minster.

Monday, August 6.—The council of the Yorkshire Philosophical Society will give a garden-party in the museum grounds, to all ticket-holders, from 3 p.m. to 6 p.m. They have also intimated that the museum and grounds will be open daily to all members and ticket-holders who wish for a quiet resting-place. The president of the society, Dr. Tempest Anderson, will entertain to tea those who attend each afternoon. Discourse on the electrical signs of life, and their abolition by chloroform, by Dr. A. D. Waller, F.R.S., in the exhibition buildings, at 8.30 p.m.

Tuesday, August 7.—The Dean of York and the Canon in Residence will give a garden-party, to all members and ticket-holders, in the Deanery and residential grounds, from 3 p.m. to 6 p.m. Conversazione in the exhibition buildings, by invitation of the executive committee, at 8 p.m. Music will be provided in the museum gardens, which will be illuminated.

Wednesday, August 8.—Meeting of general committee to receive the report of the committee of recommendations, 1 p.m. Concluding general meeting, in the Guildhall, at 2.30 p.m.

It is understood that a large number of important papers has been already promised, and it will be noticed that an unusually attractive series of garden-parties and receptions has been provided. In fact, the number offered has been so large that several very eligible offers of hospitality have had to be reluctantly declined. Practically all the principal residents in York and the neighbourhood have invited members of the association for the time of the meeting, besides a large number of private friends; who will swell the lists of members and associates attending.

The proposed excursion to Norway at the close of the meeting has fallen through, as little interest or support seemed forthcoming. The excursions will therefore be confined to Saturday, August 4, and the following have been definitely fixed:—

Scarborough and Whitby, stopping at Castle Howard.—The Mayor of Scarborough has intimated that he will be "At Home" to a limited number of those taking part in the excursion. Permission has been granted to view the Marine Drive, and the members and associates will be

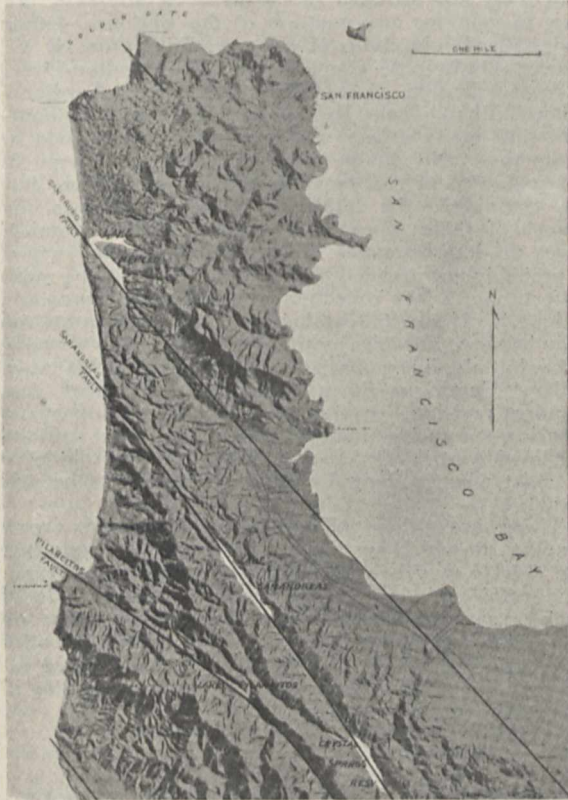


FIG. 2.—Map of the San Francisco Peninsula. From the model by Prof. A. C. Lawson. The principal faults are indicated by heavy black lines. From the *National Geographic Magazine*.

ham, Maryland, also recorded the shock, commencing at 1h. 16m. 56s. and 1h. 19m. 24s. respectively, the distances from San Francisco being 1455 and 2450 miles. The magnetographs at these two places and at Baldwin, Kansas, were also affected by the passage of the earthquake waves, the times, corresponding approximately with those of the arrival of the principal, or third, phase of the disturbance.

THE FORTHCOMING MEETING OF THE BRITISH ASSOCIATION AT YORK.

THE arrangements for this meeting, which will be held from August 1 to August 8, are very well in hand, being at least a month in advance of what they were twenty-five years ago, on the occasion of the jubilee meeting—one of the most

admitted to the Spa on the production of their tickets. It has also been arranged that the train shall stop at Castle Howard to enable any members to pay a visit, but it is understood that only a portion of the house and gardens will be available.

Harrrogate, Brimham Rocks, and Pateley Bridge; conductor, Mr. W. Ingham.

Ripon, Studley Park, and Fountains Abbey.—The Marquess of Ripon has kindly promised to entertain a party of about 100 to luncheon, and the Mayor of Ripon will entertain the same party to tea.

Ilkley and Bolton Abbey.

Coxwold, Byland Abbey, Helmsley, Duncombe Park, and Rievaulx Abbey.—It is expected that the party will be entertained at Duncombe Park by the Earl of Feversham; conductor, the Rev. C. N. Gray.

Wensleydale; conductor, Mr. W. Horne.

Mount Grace, Guisborough, and Whorlton Castle.—Admiral Challoner has kindly invited the party to dinner, and it is expected that the Lord-Lieutenant of the North Riding will provide luncheon; conductor, Mr. F. J. Munby.

Driffild, Kirkburn, Wetwang, &c.; conductor, the Rev. E. Maule Cole.

Aldborough and Boroughbridge.—Three steam launches have been engaged to convey the party; conductor, Mr. A. S. Lawson, who will provide luncheon and tea.

A small guide-book will be prepared for each of the above excursions. It is understood that there will be also the usual semi-private excursions arranged in connection with several of the sections.

The exhibition of South African photographs taken by the members last year promises to be of much interest. There is ample accommodation for it at the reception room, and an active committee has the matter in hand.

KEW PUBLICATIONS.

THE "miscellaneous information" supplied from the Royal Gardens at Kew has ever been welcome to botanists and to those concerned in the utilisation of vegetable products. The earlier publications of Sir William Hooker and of his son and successor, Sir Joseph Hooker, are full of interesting matter with which the botanical and horticultural Press of the day was, owing to limitations of space, hardly able to cope.

Of late years such was the pressure of administrative duties that the publication of the *Bulletin* became very erratic. So much was this the case that we had almost given up the hope of seeing anything but "appendices" to volumes that seemed never destined to appear. In this we were mistaken. Within the last month or two we have received for notice the *Kew Bulletin* for the years 1900, 1901, 1902, 1903, 1904, and 1905.¹

Some of these volumes are of exiguous proportions, but there they are, and the troubles of librarians and bibliographers are, in so far, set at rest. Much of the information is, of course, far from being up to date, and in some cases the gentlemen mentioned as having been appointed to fill certain positions have paid the debt of Nature before their nomination has thus been made public.

In spite of these circumstances we can but rejoice that the publication has been resumed, and that the sequence of the volumes is no longer interrupted. The contents are so "miscellaneous" that they do not lend themselves to anything like systematic review. We can only put the books on our reference shelves and welcome the fact, not only that the old gaps are, to some extent, filled up, but that there is now every prospect of the regular issue of that *Bulletin* to

which we look for an official record of the manifold and most important work done at Kew.

A "Catalogue of Portraits of Botanists Exhibited in the Museums of the Royal Botanic Gardens, Kew," by Mr. James D. Milner, clerk and acting assistant-keeper and secretary to the National Portrait Gallery, has also just been published. The catalogue is introduced with a preface by the late director of the Royal Gardens. To botanists it forms a very interesting, but, we must add, a very incomplete list. Kew probably possesses a much larger number of portraits than are here mentioned, so that it is difficult to understand on what principle the selection has been made. The words "exhibited in the museums" do indeed imply that there are other portraits not thus displayed, but unless we are mistaken, or unless some re-arrangement has taken place recently, there are not a few hanging on the walls of the museums which are not included in the list. At any rate, we look in vain for any mention of the Balfours, father and son, of John Ball, of Broome, Babington, B. C. Clarke, Casimir de Candolle, W. T. Thistelton-Dyer, Eichler, Engler, A. Dickson, Farmer, Gardiner, Munro, Miers, Prain, Reichenbach, Seemann, Williamson, and many others whom it would be tedious to enumerate. No doubt many of these are "kept in portfolios," and can be inspected on application, but the absence in the catalogue before us of even the names of these more or less distinguished botanists gives an impression of serious incompleteness which is probably not justified by the facts. This is the more unfortunate as the collection is stated to be "probably unique." If so, the catalogue is very inadequate, as may be seen, not only by the few illustrations we have cited, but also by comparison with Dr. Wittrock's much fuller "Catalogus Stockholmiensis." The text, too, requires revision. In one place we are told of a bust wearing spectacles, and of another bust "in a ruff and fur-lined coat." On another page we are told of a botanist who graduated eighteen years before he was born!

There are other indications of imperfect proof-reading, to which we direct attention in the hope that the defects may be remedied in a subsequent edition. The catalogue, even in its present condition, is of such great interest that we cannot doubt that no long time will elapse before a second edition is called for, and one which can readily be made more representative of the progress of botany, especially in our own country.

BARON C. R. VON DER OSTEN SACKEN.

SYSTEMATIC entomology has sustained a great loss by the death of Baron Osten Sacken, as announced in *NATURE* of May 31.

Baron Osten Sacken was born at St. Petersburg on August 21, 1828, and at the age of eleven his interest in entomology was aroused by his meeting, at Baden-Baden, a young Russian entomologist, Mr. Shatiloff, who gave him his first instructions in collecting Coleoptera. Between 1849 and 1856 he held an appointment in the Imperial Foreign Office, and published papers on the re-classification of the Tipulidæ, as well as a list of the insects of the St. Petersburg district excluding Lepidoptera. His appointment, in 1856, as secretary of the Russian Legation at Washington opened up the second period of his entomological career in the United States. In 1862 he was appointed Russian Consul-General at New York, a post which he resigned in 1871, remaining, however, in America until 1877.

During this period of twenty-one years the main

¹ "Bulletin of Miscellaneous Information." Royal Botanic Gardens, Kew. (H.M. Stationery Office, 1900-05.)

part of Baron Osten Sacken's entomological work consisted in working up the Diptera of North America, in close collaboration with Dr. H. Loew. This work had for its main object the compilation of a catalogue of North American Diptera of which a first edition was published as early as 1858 by the Smithsonian Institution. It was superseded by a far more complete second catalogue published twenty years later. A great deal of further time was taken up with the self-imposed and, at times, somewhat tedious task of editing and translating Loew's monographs, and, in addition, important papers were published on the Tipulidæ, Tabanidæ, Cecidomyidæ, and Cynipidæ. Between 1871 and 1873 some time was spent in Europe, and in 1876 an expedition was made to California the results of which were published under the title "Western Diptera" in the Bulletin of the U.S. Geological and Geographical Survey. Eleven new genera and 137 new species were described.

In 1877 Baron Osten Sacken came to Europe, and took up his abode at Heidelberg. The present writer first met him there in the summer of 1877, and, being greatly interested in entomology as a hobby, a close friendship sprang up, which soon became a friendship for life. In the years which followed and which constituted the third period of his entomological career, Baron Osten Sacken published numerous critical papers on Diptera, and increased the number of his published writings from 53 to 179. In 1881 he published "An Essay on Comparative Chæototaxy," in which it was shown for the first time that the arrangement of the bristles on the bodies of Diptera afforded a valuable aid to their classification. In 1892 he published one of his most important papers, on the characteristics of the three divisions of Diptera, *Nemocera vera*, *Nemocera anomala*, and *Eremochæta*, in which two important innovations were introduced, one referring to the preservation of the distinction between the Brachycera and Nemocera, the other to the grouping of the families of Diptera into larger groups, for which he subsequently adopted Comstock's name of "Superfamilies."

The "Bugonia" superstition of the ancients regarding the production of bees from the carcasses of dead animals found a ready explanation at Baron Osten Sacken's hands in the close resemblance to a bee of the common drone-fly, *Eristalis tenax*, the larvæ of which live in putrescent matter. In the paper, first published in commemoration of the twenty-fifth anniversary of the Italian Entomological Society in 1893, and afterwards amplified and printed at Heidelberg, Baron Osten Sacken traces in detail the history of the Bugonia in different ages and nations. His last important task was to publish a "Record of My Life-work in Entomology," which he concluded in 1904, to quote his own words, "at the age of seventy-six, in good health, and with unimpaired eyesight."

Baron Osten Sacken took great delight in everything connected with mathematics, especially historical points, and the present writer has an early recollection of a question he proposed relating to the conchoid of Nicomedes. In his later years he made a collection of photographs of paintings of the great masters, and it gave him pleasure to arrange and classify them with the same systematic attention to minute detail that he had so successfully brought to bear on the classification of the Diptera. In his manner of living he was equally methodical, and this spirit is shown in the publication of his "Record." His interest in the work of others won for him many friends, who will greatly miss him. He has given us an excellent example of what can be done by a man

who cultivates some branch of science for its own sake, and who is not debarred by pressure of professional duties from making the study his life-work. For such workers, biological rather than physical subjects in many cases offer the most promising field.

G. H. BRYAN.

NOTES.

PROF. G. VON NEUMAYER, who celebrates his eightieth birthday to-day, will receive the congratulations of many meteorologists and other scientific workers. Nearly a year ago the first part of a third revised edition of instructions and notes on scientific observations for travellers, edited by him under the title "Anleitung zu wissenschaftlichen Beobachtungen auf Reisen," was published, and the last part appeared very opportunely a few days ago. The work has been brought up to date, and is of such a comprehensive nature that justice cannot be done to it in a hurried notice, but we hope to deal with this important contribution to scientific literature in a future issue.

MR. W. DE FONVIELLE informs us that Mr. W. Wellman and his balloon—the *United States*—have left Paris for Spitsbergen by way of Antwerp, where the balloon was shipped to Tromsø, and from there to Magdalena Bay, lat. 79° 40' N. (Danes Island). The last part of the voyage will be executed on board the *Fritjof*, a steamer put at the disposal of the explorer by the American Government. Mr. Wellman hopes to be in Tromsø before June 25, and at Danes Island on July 1. There he will find everything ready for the inflation of his large balloon, measuring 6300 cubic metres, and having a gross lifting power of 7000 kilograms. The necessary preparation will be made by Major Hearsey, of the U.S. Weather Bureau, who left Paris a month ago in order to erect at Danes Island a shelter where the balloon may be housed during the preliminary experiments, which are expected to occupy the whole of July. It is only in August that the departure for the Pole is to take place, if the experiments have proved satisfactory and have been concluded. Mr. Wellman is travelling with Mr. Collardeau, a French chemist, and Mr. Hervieux, a French aéronaut, who is to be the pilot of the polar balloon. In addition to Mr. Wellman, the balloon will have on board Major Hearsey, Mr. Hervieux, and two Norwegian sailors who assisted him in his two previous explorations. A wireless telegraphy system will be established between the two stations of Tromsø and Danes Island. A meteorological station will also be established at the same places, supplied with a captive balloon for obtaining records of the temperature, humidity, direction and force of the wind in the free atmosphere. So for the first time since telegraphy (wire) was utilised in meteorology, American and European meteorologists will have at their disposal observations of the weather in the neighbourhood of the North Pole as well as from tropical stations.

THE second of the two annual conversaciones of the Royal Society was held as we went to press last night.

MR. W. R. COOPER has accepted the position of editor of the *Electrician* in succession to Mr. F. C. Raphael, who will retire on June 30.

It is stated by the *British Medical Journal* that the institute for the experimental investigation of cancer at Heidelberg is now complete. Prof. Czerny is the director; Dr. von Dungern has been appointed head of the scientific department, and Dr. von Wasielewski head of the department of parasitological research.

WE learn from *Science* that Mr. George Eastman, of Rochester, N.Y., has subscribed 200*l.* annually for the next three years to enable the continuance of research work in photography at the Yerkes Observatory of the University of Chicago. The investigations will be carried on by Mr. R. James Wallace, photophysicist at the observatory.

THE death is announced, in his eightieth year, of M. Edouard Piette, the distinguished archæologist. M. Piette was well known for his discoveries of prehistoric remains, among which may be mentioned those in the caverns of Mas d'Azil (Ariège) and of Brassempouy (Landes). Before his death M. Piette presented his invaluable collections to the Museum of Saint-Germain-en-Laye.

H.M. THE QUEEN has extended her patronage to the "Country in Town" Exhibition which will be opened by H.R.H. Princess Christian in the Whitechapel Art Gallery on July 5. The exhibition will be open until July 19, and as admission will be free, contributions are invited towards the necessary expenses. All communications should be made to the honorary secretary, Mr. Wilfred Mark Webb, at Toynbee Hall, Whitechapel, E.

THE *Times* correspondent reports that Dr. Calmette and M. Guérin, of the Pasteur Institute, Lille, have communicated to the Paris Academy of Sciences the results of experiments on protective inoculation against tuberculosis. Having found that dead tubercle bacilli are carried from the digestive tract to distant parts of the body, they made experiments in order to ascertain the immunising effect of dead tubercle bacilli administered in this manner. Young animals, heifers and kids were given by the mouth two doses, with a forty-five days' interval between, of 5 and 25 centigrams of dead tubercle bacilli (or even living bacilli of feeble virulence). A subsequent lethal dose of virulent tubercle bacilli proved innocuous to the animals treated in this way, showing that the dead bacilli had produced an immunity against the living virulent bacilli. Dr. Calmette and M. Guérin conclude that young cattle can be vaccinated by intestinal absorption of bacilli modified by heat, and that this method of vaccination is entirely without danger.

THE council of the Society of Arts has awarded the society's silver medal to the following readers of papers during the session just completed:—Mr. W. F. Mitchell, The commerce and industries of Japan; Dr. William Arthur Aikin, Aspects of voice development; Mr. Leon Gaster, Progress in electric lighting; Mr. Walter Garstang, The fisheries of the North Sea; Captain G. S. C. Swinton, London traffic; Mr. Bernard B. Redwood, Motor boats; Mr. J. B. Millett, Submarine signalling; Prof. Thomas Oliver, Bridge building by means of caissons; Mr. Clayton Beadle, Watermarking; Sir James A. Bourdillon, K.C.S.I., The partition of Bengal; Dr. George A. Grierson, The languages of India; Colonel Sir Arthur Henry McMahon, K.C.I.E., Seistan; the Hon. Rodolphe Lemieux, K.C., French Canada; the Hon. J. G. Jenkins, Social conditions in Australia; Mr. Louis N. Parker, Historical pageants; Mr. H. Yates Thompson, Illuminated manuscripts; and Mr. Harry Powell, Cut glass.

THE death of Herr Eduard von Hartmann is announced from Berlin. Born in 1842, he was intended for a military career, but retired from service in 1865 owing to a malady of the knee which made him a cripple for life. He received the degree of Doctor of Philosophy from Rostock University in 1867, and two years later published "The

Philosophy of the Unconscious," the work on which his reputation chiefly rests. A very voluminous writer—his works contain upwards of 12,000 pages—he published, among other writings, "Phenomenology of Ethical Consciousness" in 1879, "The Religious Consciousness of Mankind in the Stages of its Development" in 1881, and "The Religion of the Spirit" in 1882. About three or four years ago there appeared "Die Weltanschauung der modernen Physik," one of the most important of his later works. His system was an amalgamation of Schopenhauer's doctrine of will with the metaphysic of Hegel, and the "Unconscious" which formed his first principle was but another name of the absolute of the German metaphysicians. "According to von Hartmann," writes one authority, "the Unconscious is the absolute principle active in all things, the force which is operative in the inorganic, organic and mental alike, yet not revealed in consciousness. It is the unity of unconscious presentation and will, of the logical (idea) and the alogical (will). The Unconscious exists independently of space, time and individual existence, timeless before the being of the world. For us it is unconscious, in itself it is super-conscious." The Schopenhauerian side of von Hartmann appealed to the prevailing pessimism of the time, but he himself was no pessimist; full of vigorous ethical feeling, and a strong opponent of the prophets of the *Weltschmerz*, he contributed not a little to the discussion of political and social subjects.

THE Society of German Engineers, which with its 20,000 members is now the largest technical society in the world, celebrated on June 11–14 the completion of the fiftieth year of its existence. The opening ceremony was held in the Reichstag building in Berlin, under the presidency of Dr. A. Slaby. Congratulatory addresses were delivered by the Prussian Home Secretary, the Prussian Minister of Education, the Oberbürgermeister of Berlin, and the rector of the Berlin Technical School, as well as by numerous representatives of kindred societies in Germany and other countries, Mr. Bennett Brough (Iron and Steel Institute) speaking for the British societies and Prof. K. E. Hilgard (American Society of Civil Engineers) for the American. The proceedings terminated with a lecture by Dr. W. von Oechelhaeuser on technical work past and present, in which he compared the engineering works of the ancients with those of modern times, and endeavoured to forecast what the future of engineering would be. On June 12 a lecture was given by Dr. A. Riedler, on the development and present importance of the steam turbine; and on June 13 papers were read by Prof. Muthmann, on methods of dealing with atmospheric nitrogen; and by Dr. Hoffmann, on the utilisation of power in mines and metallurgical works. Throughout the week an elaborate programme of visits, excursions, and social functions was arranged for the 1231 members and 464 ladies who took part in the meeting. The German Emperor honoured the society by accepting the Grashof gold medal, and by conferring decorations on the president and other prominent members. An interesting history of the society is given in *Engineering* of June 8. The growth of the society has certainly been remarkable. It was founded in 1856 at Alexisbad, in the Hartz, by twenty-three young engineers. Friedrich Euler was elected the first president, and Franz Grashof the first secretary and editor, the work of the society being carried on in the secretary's private study. The society now has a stately house of its own and a staff of forty-seven officials. Its weekly journal last year cost 26,162*l.* for publishing and 6425*l.* for postage.

THE fourth part of vol. xxvi. of Notes from the Leyden Museum is devoted to invertebrates, more especially crustaceans and insects, Dr. van der Weele contributing three papers on Neuroptera, Mr. C. Ritzema one on a new Sumatran beetle, while Dr. de Man discusses and figures certain crustaceans of the genus *Palæmon*.

HUNTED for four months in the year over a great part of England, and almost everywhere shot and trapped on every possible occasion, the otter, observes Mr. J. C. Tregarthen in a delightful article in the June number of the *Monthly Review*, yet manages to survive in the British Isles in a manner and in numbers which are truly surprising. The fox, were he not rigorously protected, would disappear from the greater part of England in a very few years, and yet the otter, without the aid of any protection and despite unremitting persecution, continues to flourish in our midst, and this, too, in face of the fact that the female breeds only once a year, and then gives birth to but three or four cubs. The fact that he is here to-day and gone to-morrow—maybe a score of miles away—is, in the author's opinion, the reason of the otter's success in life. It will be news to many of our readers that there are no less than twenty packs of otter-hounds in England and Wales; and now that most of the "methods of barbarism" have been abolished, the author enters a vigorous protest against the attempts of "grandmotherly legislation" to abolish an ancient and exciting sport.

EXTRACTS from two letters written by Mr. T. R. Bell in 1903 and 1904 from India concerning certain butterflies in that country form the most generally interesting portion of the contents of the June number of the *Entomologist's Monthly Magazine*. Special stress is laid by the writer on dimorphism in these insects due to the time of year at which they were developed, the dry-season imagos, owing to what may be described as practical starvation, differing in many cases very markedly from the well-fed wet-season forms. On such differences several nominal species have been founded. Very noteworthy is the fact that in species of the same genus the differences between the dry and the wet forms frequently take quite different lines. "Ocellation" on the under-side of the wings appears, however, to be a distinct character of the wet forms. In breeding certain butterflies, such as some of the "blues," at Kanara it was noticed that males and females came out in equal numbers, whereas in a state of nature the latter are scarcely ever seen, or if observed are found in thick underwood, while the males bask in the open sunshine.

THE *Museums Journal* for May contains the report on the discussion following the papers on the relation of provincial museums to national institutions read at the Museums Association Conference at Worcester last year. The points for discussion ranged themselves under two main headings:—(1) that museums should be taken over by Government, and "run" practically without local assistance; and (2) that all important specimens should go to a national collection. The first proposition met with a direct traverse in one of the papers read, the author of which urged that museums get on much better in proportion as they are independent of Government aid. As regards the second point, which, in the case of zoological museums, related mainly to type-specimens, the question was raised as to the proper places of deposition for such specimens. Should, for example, Indian types go to Calcutta and American to New York, or, on the other hand, should types described in England be placed in the

British Museum and those named in America be transferred to New York or Chicago, and so on? Incidentally, it was mentioned that if a national collection received such a valuable augmentation it ought to do something in return, and it was accordingly suggested that the British Museum should start a zoological loan collection. No definite motion was agreed to on any one of these points.

A NEW salamander from North Carolina, remarkable for its brick-red legs, which contrast with the leaden hue of the body, is described in No. 1457 of the Proceedings of the U.S. National Museum by Dr. Stejneger under the name of *Plethodon shermani*. New crickets and leaf-winged grasshoppers, or "katydids," from Costa Rica form the subject of No. 1459 of the same serial, the author being Mr. J. A. G. Rehn. A species of *Mimetica* has the



FIG. 1.—*Mimetica crenulata*, lateral view of type.

"tegmina," or front wings, of the usual dried-leaf type, and of a form which defies description, although well shown in the accompanying illustration. In part 1458 of the same serial Mr. C. D. Walcott resumes his account of the Cambrian faunas of China, basing his observations on new material. It is anticipated that a fully illustrated report on the subject will be published before the close of the present year.

THE June number of the *Popular Science Monthly* contains several articles of great interest to biologists and geologists. Dr. D. S. Jordan has some suggestive observations on variation in animals and plants. He points out, for instance, that in many cases adaptive characters are older than non-adaptive, as exemplified by the fact that flying-fish flew before the differentiation of the existing genera. Mutation—or saltation, as he prefers to call it—is regarded as only an extreme development of individual fluctuation, the author adding that "while saltation remains as one of the probable sources of specific difference, its actual relation to the process of species-forming in nature remains to be proved." Prof. Carl Eigenmann's article on the fresh-water fishes of South and Central ("Middle") America is worthy of the best attention of all interested in zoological distribution. The leading features brought to notice are:—(1) the variety of the fish-life in tropical South America; (2) the paucity of family-types contributing to this variety; (3) the poverty of the Central American fish-fauna and its essential South American character, except for (4) the isolation of the fauna of the Mexican plateau; (5) the poverty of the Pacific slope fish-fauna and its essentially Atlantic type; (6) the "marine" character of the fishes of Lake Titicaca; (7) the poverty of the Patagonian fauna and its essential distinctness from that of Brazil; and (8) the similarity between the fish-fauna of tropical America and that of tropical Africa. As regards the latter point, the author observes that "a land-connection, whether a land-bridge, intermediate continent, or land-wave, between the two continents is imperative. This land-connection must have existed before the origin of existing genera and before many of the existing families."

As a result of visiting several of the more important herbaria in Europe to study the genus *Eupatorium* and several allied genera, Mr. B. L. Robinson has published some notes on the *Eupatorieæ* in the Proceedings of the American Academy of Arts and Sciences, vol. xlii., No. 1. In addition to the diagnoses of new species of *Eupatorium* and other genera, the pamphlet contains revisions of the genera *Piqueria* and *Ophryosporus*, also a discussion of the genus *Helogyne*.

A SUGAR experiment station was instituted in Jamaica in April, 1904, under the direction of Mr. H. H. Cousins, for investigating problems in connection with the sugar and rum industries. The report for 1905 indicates what is being done in the matter of cultivation experiments to test different manures and varieties and to select new seedling canes. The advantage to be gained by taking new varieties into cultivation is well shown by the results obtained on the Albion Estate, where the Mt. Blanc variety generally grown produces less than any other variety tested, and furnishes less than half the saccharose yield per acre of the seedling B379.

An inquiry into the manufacture of Jamaica rums, by Mr. C. Allan, occurring in the above report, deals with fermentation changes, more especially those that give the quality to *flavoured* rums. It appears that the flavour is due mainly to the large amount and nature of the ethers formed. Premising that the characteristics of Jamaica rum are derived from saccharine liquors rich in albuminous matter fermented by yeasts and bacteria, in the case of the high-flavoured rums bacterial action is greatly increased and special bacteria are developed, producing acids that in combination with alcohol form aromatic ethers. It is suggested that higher alcohols, furfural, and aldehydes may help to give *body* to the spirit.

In a paper read before the National Academy of Sciences, U.S.A., on April 17, the distinguished seismologist Major C. E. Dutton discusses the possible relationship between volcanic action and radio-activity. The theory brought forward is that, in limited tracts at depths of less than four miles, rocks are melted by heat due to radio-activity. As the melting proceeds, the water contained in the rocks becomes explosive and an eruption follows. When all the lava is exhausted the reservoir is closed. In due course more heat is generated, rocks are again melted, and a second eruption takes place. This explains, not only the repetitive character of eruptions, but the comparatively shallow depth at which they originate. The horizon of molten rock, if it is dependent on secular cooling of the world, would be at a depth of 30 miles or 40 miles, while if it is due to radio-activity it may possibly be found at a depth of three or four miles.

An interesting supplement on modern air compressors, covering twenty pages with seventy-three illustrations, is published with the *Engineer* of June 15. It gives an excellent review of the great strides made during the last fifteen years in the use of compressed air. The development of the use of compressed air as a means for transmitting power appears the more remarkable when it is remembered that during the same period the use of electricity for that purpose has grown enormously.

THE Engineering Standards Committee has made arrangements with a firm at Bilston to manufacture commercial sets of standard pipe-flange templates in large quantities. The templates are made, with extreme

accuracy, of thin steel plate painted over with aluminium paint, a small piece being cut out at the extremity of each centre line so as to enable the fitter to see that the centre line of the template coincides with the centre line of his flange. The existence of these templates should enable full advantage to be taken of the standardisation that the committee has sought to effect.

In a note to the *Rendiconti della R. Accademia dei Lincei* (dated April 22 last) Dr. F. Eredia gives the monthly and yearly rainfall values obtained at the Collegio Romano for eighty-one years, 1825-1905. Observations were begun there in 1788, but their continuity and uniformity were not quite satisfactory prior to 1825. The annual mean for this long period is 31.8 inches. The wettest months are October to December; the maximum fall in any month was 14.7 inches, in November, 1878.

THE weather report issued by the Meteorological Office for the week ending Saturday, June 16, shows that the weather for the period was fine and dry generally. The sky was cloudy in the eastern and southern counties of England, and some rain fell in all districts. Thunderstorms occurred in various parts of England on June 12 and 16. Temperature was generally low for the time of year, and in the east of England the mean was 4° below the average. At Dumfries, in the west of Scotland, the thermometer rose to 83°, and in the east of Scotland and in the north-east of England it exceeded 80°. In the north of Scotland the range of temperature for the week amounted to 49°. The winds were mostly from between north and north-east.

An illustrated price-list of echelon diffraction gratings, just issued by Messrs. Adam Hilger, 75a Camden Road, N.W., will be found to be of interest by all practical spectroscopists. The gratings contain from ten to forty plates, the corresponding prices, including suitable mounts, ranging from 13*l.* to 120*l.* The heights of the plates vary from 32 mm. to 40 mm., but can be made higher than this if desired. The standard width of each step is 1 mm., and the thickness of each plate about 10 mm., but this latter dimension may be increased, with a corresponding increase in price, if so desired. The list also contains illustrated descriptions of the more generally used arrangements of the echelon apparatus and of the auxiliary spectroscopes and various accessories employed. Messrs. Hilger make a speciality of the constant deviation spectroscope most usefully employed with echelon gratings, and have just made an important alteration in the adaptation of the telescope and collimator which will greatly increase their rigidity, though the price remains the same.

THE results of a study of the infra-red region of the spectrum, made by M. Milan Stefanik at the Meudon Observatory, appear in the *Comptes rendus* for April 30. While working with the solar eclipse expedition in Spain, M. Stefanik found that, by placing a dark red screen before the slit of his spectroscope, he was able to see to a considerable distance into the infra-red. This led him to continue a research on this matter on his return to Meudon, where he employed a spectroscope having two prisms, containing benzene and carbon bisulphide respectively, and used as the light source an image of the sun projected on to the slit by a lens, after reflection from a silvered plane surface. Screens of various coloured alcoholic solutions were employed, and the best results were obtained when the screen absorbed all the luminous radiations of the spectrum, allowing only the extreme red

and infra-red to pass. M. Stefanik has arrived at the conclusion that if only a limited region of the spectrum be allowed to enter the spectroscope this region is seen much better than if the total light were employed, for, despite the large absorption by the numerous pieces of glass included in his apparatus, he was able to observe and to map easily the spectrum down to 1μ . The group Z was always easily visible, also X, and the lines π , ζ , σ , and τ more rarely. It appears from the variations in the intensities of the lines that some of them are of telluric origin. According to the *Annuaire* of the Bureau des Longitudes the infra-red is visible to 0.795μ , but by the employment of the screens M. Stefanik has extended the limit to at least 0.900μ .

THE Oxford University Junior Scientific Club is to be congratulated on the May number of its *Transactions*. Prof. H. A. Miers gives an interesting account of his recent investigations, in collaboration with Miss Isaacs, of spontaneous crystallisation and the nature of supersaturated solutions, while a paper by Mr. M. H. Godby, on the place of natural science in education, is full of good things, and deserves notice of a larger public.

In a note in the *Physikalische Zeitschrift* (No. 8, p. 257) Drs. Stefan Meyer and Egon von Schweidler point out that Madame Curie, in a criticism of their work, referred to in *NATURE* (vol. lxxiii, p. 549), misinterpreted the tenor of their original communication in assuming that they considered polonium to consist of a mixture of radium D, radium E, and radium F. The conclusion they actually formed (Proceedings of the Vienna Academy of Sciences, February 1) was in reality the same as that arrived at by Madame Curie, namely, that polonium is identical with radium F. In another paper (Vienna Academy of Sciences, *Anzeiger*, No. 12) Drs. Meyer and von Schweidler confirm, however, the view that radio-lead is a mixture of radium D, radium E, and radium F, and describe the separation of these substances by electrolysis. Several determinations of the constant of decay of radium E were made as a means of characterising this substance, and the nature of a new radio-active product from actinium is discussed.

THE transformation of oxygen into ozone at high temperatures is the subject of a paper by Messrs. Franz Fischer and Fritz Braehmer in the *Physikalische Zeitschrift* (No. 9). It is shown that when a platinum wire or a Nernst filament is rendered incandescent whilst surrounded by liquid oxygen, or when an arc lamp or hydrogen flame is played upon liquid oxygen, ozone is formed. When the action is prolonged the amount of ozone formed increases; in one experiment 1 per cent. by weight of the oxygen used underwent condensation. Experiments are adduced to prove that the formation of ozone in these cases is solely a thermal phenomenon, and is not to be referred to an ozonising ultra-violet radiation. When any of the methods of heating described are adopted in ordinary air, nitric oxide appears to be the sole product; in such a case the ozone is not cooled and removed from the sphere of action sufficiently quickly to prevent its decomposition. It is well known that when a hydrogen flame burning in oxygen is played upon water or ice hydrogen peroxide is formed in minute quantity; it is interesting to note that when hydrogen is burnt in liquid oxygen no hydrogen peroxide can be detected. In the former case water is oxidised to hydrogen peroxide, in the latter molecular oxygen is converted into ozone.

OUR ASTRONOMICAL COLUMN.

DISCUSSION OF FACULÆ OBSERVATIONS.—An interesting discussion of the observations of faculæ, in which Prof. Mascari compares the frequency and intensity of these phenomena with the solar activity as indicated by sun-spots and the variation of the total luminous radiation from the solar disc, appears in No. 5, vol. xxxv., of the *Memorie della Società degli Spettroscopisti Italiani*.

Since 1894 the groups of faculæ on the solar disc have been observed, and their number and intensity recorded, on every day that the atmospheric conditions were favourable. The intensities were classified in five groups, viz. brightest (V.V.), bright (V.), ordinary, weak (d.), and weakest (d.d.).

Analysing the results thus obtained, Prof. Mascari finds that the third class (and possibly the second and third classes) decreased in frequency from that year of sun-spot maximum until 1901, sun-spot minimum, and then increased regularly up to the 1905 maximum. The (d.) and (d.d.) classes varied in the inverse sense.

Assigning numerical values to these classes, from 5 for the (V.V.) to 1 for the (d.d.), and taking the grouped mean for each year as the relative annual brightness of the faculæ, Prof. Mascari finds that this mean brightness also varies with the sun-spot activity, being 2.83 in 1894, 1.88 in 1901, and 2.97 in 1905. Combining, as a product, the mean frequency of the faculæ for each year with their relative mean brightness a similar result is obtained, the respective values being 29.80 in 1894, 4.62 in 1901, and 19.63 in 1905.

These results, combined with those obtained by himself in 1901 and Tacchini in 1878 showing that the chromospheric phenomena were less bright at sun-spot minima than at maxima, led Prof. Mascari to the conclusion that the luminous radiation of the sun is greater at the spot maxima than it is at the epochs of minima.

NEW METHOD FOR THE DISCOVERY OF ASTEROIDS.—In No. 4, vol. xxiii., of the *Astrophysical Journal*, Mr. J. H. Metcalf, of Taunton (Mass.), describes a method which he has employed successfully in the photographic discovery of asteroids.

This method is really an adaptation of that employed in the photography of comets, where the observer, instead of following the guiding star in the usual way, regularly moves the photographic plate during the exposure so that it follows the object which he hopes to photograph, and thus obtains a well-defined single image of that particular object, whilst the surrounding stars are represented on the plate by trails.

By moving his plate in a direction parallel to the ecliptic at a rate previously computed for an ideal asteroid, Mr. Metcalf has obtained some excellent, well-defined circular images of several known faint asteroids, and has also discovered some new ones. For example, one of the reproductions which accompany his paper shows a pair of images of an asteroid of the thirteenth magnitude which he discovered on March 22.

RADIAL VELOCITY OF α DRACONIS.—A brief note by Herr H. Ludendorff, published in No. 4088 of the *Astronomische Nachrichten*, confirms the variability of the radial velocity of α Draconis announced by the Lick observers. According to the latter, the radial velocity on June 16, 1902, was 0 km., and on May 4, 1903, and June 19, 1904, it was -42 km.; values of -43 km. and -40 km. were also obtained.

On two plates secured with the Potsdam spectrograph (iv.) on May 23 and 24, 1903, the displacement of the lines λ 4481 and H γ gave the radial velocity of this star as -17 km. and -14 km. respectively.

USEFUL TABLES AND FORMULÆ FOR ASTRONOMICAL COMPUTATIONS.—No. 15 of the Publications of the Gröningen Astronomical Laboratory contains a number of tables for photographic parallax-observations, prepared by Dr. W. de Sitter. Each table gives the parallax factors, for each hour of R.A., for every 10° of latitude, and also shows the limiting dates between which a star of the stated R.A. may be observed photographically.

No. 16 of the same publications is given in the same volume, and contains a number of trigonometrical formulæ

and a table of goniometrical functions for the four quadrants, compiled by Profs. J. C. and W. Kapteyn; additional formulæ, both for plane and spherical triangles where certain elements are small, are also included.

THE LEEDS ASTRONOMICAL SOCIETY.—We have just received No. 13 of the Journal and Transactions of the Leeds Astronomical Society, which gives a brief *résumé* of the work accomplished by the members of the society during the year 1905.

Eight papers read before the society during the session, dealing with popular astronomical subjects, are reproduced in the journal, together with a number of notes contributed by members to various publications.

From remarks made in the report it appears that this society is greatly in need of increased support, financial and general.

METEOROLOGICAL OBSERVATIONS.

FROM the "Jahrbücher" of the Austrian Meteorological Office for 1904 it appears that changes have recently been made in the comprehensive operations of that important institution. A considerable addition to its labours has been incurred by the transfer to it of the observations of earthquake phenomena originated by the Vienna Academy of Sciences; this organisation embraces a large number of stations. Owing to this transfer the office has adopted the title of Central-Anstalt für Meteorologie und Geodynamik. A considerable increase has been made in the number of weather forecasts sent gratuitously to provincial post-offices; in these telegrams an attempt is made to forecast the weather for two days in advance. On the other hand, it has been found necessary greatly to restrict the amount of data published from stations of the second and third order; this materially lessens the bulk of the year-book. The investigation of the upper air by manned and unmanned balloons is actively continued, and the results are published in the Proceedings of the academy. A separate appendix contains a revision of the yearly means of barometric pressure at various stations since 1886, by Dr. Margueles, and a discussion of thunderstorms and hail, by M. Prohaska.

The results of meteorological and magnetical observations at Stonyhurst College for 1905 have just been issued. This useful observatory possesses photographic recording instruments both for meteorology and terrestrial magnetism, and was one of the seven principal stations included in the scheme of the Meteorological Committee in 1868 for the discussion of the meteorology of the British Isles; its observations extend over the long period of fifty-eight years. The most notable feature of the year appears to us to be the shortage of rainfall, amounting to just upon 8 inches. The total rainfall was 38.84 inches; the least fall in any year was 31.25 inches, in 1887. The prevailing wind was between south and west on 237 days. Drawings of solar spots and faculæ were made on 196 days, and the stellar spectrograph was employed on nearly every available night.

The fourteenth report of the Sonnblick Society for the year 1905 contains statistics of several prominent mountain meteorological stations, including an interesting account of the observatory at the summit of Monte Rosa, at an altitude of about 14,960 feet. The Sonnblick station (Salzburg) is about 10,100 feet above the sea-level, and is far from an agreeable residence for its enthusiastic observers. The mean temperature for the year 1905 was 10°.9 F.; the monthly mean was only above freezing point in July and August, the absolute maxima in those months being 56°.8 and 45°.7 respectively. Rain or snow fell on 230 days, amounting to 68.8 inches, and fog occurred on 274 days. On January 1 the thermometer fell to -35°.3, being the lowest observed since the establishment of the observatory, the next lowest reading being -30°.3, in March, 1890; the wind was north-easterly, with high barometric pressure (30.71 inches) over Scandinavia and low (29.53 inches) over Greece.

The twenty-eighth yearly report of the Deutsche Seewarte, for the year 1905, shows a considerable increase in the useful work of that institution; the number of sets

of observations contained in ships' logs exceeded those of the previous year by more than 28,000. These observations are utilised in the publication of monthly charts for the North Atlantic, quarterly charts for the North Sea and Baltic, the preparation of valuable daily synoptic weather charts of the North Atlantic (in conjunction with the Danish Meteorological Institute), and various other investigations. Special mention may be made of the efficiency of the arrangements for the issue of weather forecasts and storm warnings, and of the careful discussion and publication of the observations made at distant stations, including Labrador, the South Seas, the Far East, and German East Africa. The exploration of the upper air by means of kites is actively carried on; 233 ascents were made during the year, the mean of the greatest altitudes being 3910 metres. It has been found necessary to limit the altitudes, except on the days of the international ascents, owing to the frequent loss of the kites; the principal kite (which carries the instruments) broke away on twenty-two occasions, three of which were due to lightning. Unmanned balloons also reached altitudes of 9 to 17 kilometres; the usual inversion of temperature generally occurred between 9 and 11 kilometres. A discussion of the results obtained will be published later on.

The annual summary of the India Weather Review for 1904, which completes the discussion of the meteorology of India for that year, was issued recently. This vast area is, as before, divided into eleven provinces and fifty-seven districts for the purpose of dealing with medical and agricultural statistics respectively. In addition to various tables giving the usual monthly and other values, each element is separately considered under seasons, including the hot, cold, and monsoon periods. We can here only briefly refer to some of the general annual results. The year was characterised by smaller departures from the normal temperature than is frequently the case; the mean of the maxima for the eleven meteorological provinces was 88°.0, of the minima 68°.7, and the mean daily range 19°.4. The Arabian Sea was singularly free from storms; only eleven occurred, and they were all comparatively feeble, and their tracks were less westerly than usual. The rainfall stations now number 2486; the mean amount of rainfall was 57.26 inches, about 1½ inches below the normal. On the Burma coast the fall was 152.65 inches, and in the Indus valley only 7.26 inches. During the year there was a marked increase in the number of sun-spots; the surface of the sun was not free from them on any day. Magnetic disturbances were recorded at Colába on 205 days, but there were only three days on which they were classed as "great."

The report of the Government Observatory, Bombay, for the year 1905 also quotes a remarkable deficit in the rainfall, it being stated as 41.5 inches below the normal of twenty-four years, 1873-1896. The total fall for the year was 33.66 inches only, and the amount for the previous year was 33.42 inches, both of which are record minimum falls, not even excepting that for the famine year, 1899, when 35.9 inches were registered. Milne's seismograph recorded thirty-seven earthquakes during 1905; those on April 4 and 9 and July 23 were very great disturbances. Plague in a severe epidemic form broke out at Alibág, but no cases occurred in the immediate vicinity of the branch magnetic observatory at that place; one case occurred at Colába in the month of April, notwithstanding that all precautions were taken.

The annual report of the Meteorological Department of the Transvaal for the year ended June 30, 1905, was received a few days ago. The central observatory, near Johannesburg, was first occupied in May, 1904, and is situated on an abrupt ridge of hills, nearly 6000 feet above sea-level. The department has been very active in supplying verified instruments, and has already some 250 stations in different parts of the colony, the majority of which record rainfall only; the observers are mostly volunteers, and receive no remuneration. The report, however, contains complete meteorological observations, or monthly results, for a considerable number of places, and very useful maps exhibiting the climatological features of the year in various districts. The diurnal periodicity of rainfall, so far as given, shows that the greater part occurs between noon and midnight. Nearly every fall of rain is

said to be accompanied with thunder and lightning; some of the storms are very heavy, and a lightning recorder has been erected at Johannesburg which gives a permanent record of their intensity and duration. On the High Veldt the mean temperature of the twelve months ranged from 57° at Volksrust to 65° in the Waterberg, the extreme maxima from 87° to 104° , and the extreme minima from 14° to 29° . Telegraphic messages are received and exchanged daily, and the Government has sanctioned the appointment of an assistant, to be trained in weather forecasting at the Meteorological Office in London.

THE THEORY OF FREQUENCY-DISTRIBUTIONS.¹

THREE brief but important notes on the theory of the law of error were communicated to the Royal Academy of Sciences at Stockholm last year by Mr. Charlier, director of the astronomical observatory at Lund. The first of these ("Ueber das Fehlergesetz") is a discussion on the lines, generally, laid down by Laplace. An "error" is supposed to be given by the sum of a large number of elementary errors, each with its own law of frequency; these laws need not be the same, but are subject to the condition that the frequency should not fall off with great rapidity on either side of the mode. On this condition, the law reached is the known expansion in terms of the normal function and its differentials, recently discussed in detail by Prof. Edgeworth (Camb. Phil. Trans., vol. xx.). In his second note ("Die zweite Form des Fehlergesetzes") Mr. Charlier discusses the complementary case, in which the condition stated does not hold, supposing, for instance, that each elementary error can only take the value zero or a , and that the probability of a is very small. The normal function of the former series is now replaced by an auxiliary function of more complex form. These two laws are referred to as Type A and Type B. The third note ("Ueber die Darstellung willkürlicher Funktionen") bears on the general mathematical method employed.

The present memoir, which is written in English, is a sequel to these purely mathematical notes, discussing the practical work of fitting such curves to given statistics and so forth. The method of fitting used throughout is Prof. Pearson's "method of moments," which has proved so widely applicable. The illustrations are numerous; for Type A, frequencies of stigmatic rays in Papaver, Johannsen's distributions of weight in beans, cephalic indices of Swedish recruits, and deaths from typhoid fever in groups of three successive days during an epidemic at Lund; for Type B, De Vries's statistics of numbers of petals in Ranunculus, and Johannsen's figures for sterility in barley. Davenport and Bullard's data for the numbers of glands in the fore-legs of swine are discussed under both heads. These illustrations are followed by a short section on the dissection of a compound curve by Pearson's method (Phil. Trans., 1893). One or two possible cases of approximation are discussed, and an interesting suggestion made as to the employment of a graphic method to lighten the labour of solving the fundamental nomic. The text of the memoir is followed by some tables giving, *inter alia*, the third and fourth differentials of the normal function, and values of the auxiliary function for Type B.

There are several incidental points of interest; a proof of the empirically discovered rule that the difference between mean and median is one-third of the difference between mean and mode for Type A deserves mention, and a suggestion as to an arithmetical check in calculating moments is worth consideration from the practical standpoint. If one may judge from a diagram (Fig. 5), curves of Type A may be bi-modal. Is this so? The point does not appear to receive special attention in the text. The statement on p. 15 that "as a rule it may be advisable

to take the class range smaller than the standard deviation" would seem to be rather incautious. Surely, as a rule, it should be not merely smaller, but a good deal smaller—say one-third of the standard deviation or less?

The memoir and its preceding notes must be commended to the attention of all who are interested in the theory of frequency distributions either from the mathematical or the statistical side.

G. U. Y.

A PLEA FOR AN EXPEDITION TO MELANESIA.

DR. A. C. HADDON, F.R.S., recently brought before the research department of the Royal Geographical Society a plea for the investigation of biological and anthropological distributions in Melanesia. The Melanesian islands constitute a fairly well-marked biological province. Many of the islands are of large size, and there is reason to believe that some of these are vestiges of an ancient land-mass that probably became submerged in the Mesozoic period. The islands of Melanesia have yet to be studied from a geomorphological point of view, and their geology is extremely little known. Botanists would welcome a more ample knowledge of the flora of the district as a whole and of particular portions of it, and many problems of plant structure, distribution, and ecology require detailed investigation on the spot. The same remarks apply to zoologists. Botanists and zoologists alike would welcome an opportunity for extensive or intensive study of the systematic distributional or biological problems of plants and animals in Melanesia.

There are also many anthropological problems in Melanesia that require investigation in the immediate future, since the dying out or modification of arts, crafts, customs, and beliefs that is now taking place, and the shifting and mixing of populations, will soon render their solution difficult and even impossible. On the other hand, there are many districts never yet visited by a white man, and many islands of which science has no knowledge.

There is a certain amount of variation in the physical character of the people of these archipelagoes that requires local study for its explanation. A good deal is known in a general way about the arts and crafts of the Melanesians, but an investigation of the kind proposed would verify existing data, add an immense number of trustworthy facts, and localities could be ascertained of unlocated specimens in our museums, and the uses of doubtful objects could in many cases be discovered. By a combination of these two lines of inquiry, the physical and the cultural, the nature, origin, and distribution of the races and peoples of the West Pacific could be elucidated. Melanesia is peculiarly suitable for studying the stages of the transition from mother-right to father-right, and it would be important to discover the causes that have led to this transformation, and the steps that mark its progress. With this is associated the evolution of the family and the distribution and inheritance of property. Melanesia is also a favourable area for tracing the emergence of government. What are required at the present day are intensive studies of restricted areas, since it is only by careful regional study that the real meaning of institutions and their metamorphoses can be understood. The same applies equally to all the manifold beliefs and usages that are grouped under the term religion. The psychology of backward peoples has been greatly neglected, and the opportunity of a well-equipped expedition would do much to encourage students to undertake this research.

It is superfluous to extend this plea, as all ethnologists will agree that this work requires to be done, and that without delay. The presence of Government officials, missionaries, traders, and of returned indentured labourers tends rapidly to modify or destroy the old customs. Much has already disappeared in many places; we are yet in time in many others if we do not delay.

Dr. Haddon is convinced that the best means of accomplishing the end in view is to organise a prolonged expedition to the Pacific with the absolute control of a

¹ "Researches into the Theory of Probability." By C. V. L. Charlier. Pp. 51. (Meddelanden från Lunds Astronomiska Observatorium, Serie II. Nr. 4. Kongl. Fysiografiska Sällskapets Handlingar. Bd. 16.) (Lund, 1906.)

comfortable and steady steamer. The permanent staff on board should consist at least of the director, doctor, photographer, two stenographers, who should also be typists, and, if possible, an artist. Accommodation should be provided for a number of investigators, but these would not necessarily form part of the permanent staff. They would be conveyed to the district which they were to study and be removed therefrom when it was time to leave. The director would arrange with each investigator when the vessel would return, and the investigator would be left with all the apparatus, food, and trade that he required.

The general routine should be as follows:—an anthropological investigator would be expected to work on the general lines laid down by the director. When the vessel returned, all those on board would be required to help the investigator according to their several abilities; the expedition photographer would be placed at his disposal, and dances and ceremonies would also be kinematographed. The investigator would orally amplify his rough notes and dictate them to the stenographers, and, so far as possible, all notes should be typed in duplicate before the departure of the investigator, and a revision made of them before finally leaving the spot.

The foregoing remarks apply to anthropological investigators, but suitable arrangements could be made for geological, geographical, botanical, or zoological investigators; equal facilities should be given to American and foreign students; investigators should be of either sex.

It is only by an expedition of this kind that the anthropology of Melanesia can be studied as a whole and in detail. It would be an expensive undertaking, but the results obtained would amply justify the expenditure of time, labour, and money, and the data so obtained would constitute a mine of information for the present and future generations of students of man.

In the discussion which followed, Sir George Goldie, the president of the society, Dr. Herbertson, Mr. Chisholm, Dr. Seligmann, Mr. J. L. Myres, Mr. S. H. Ray, Mr. N. W. Thomas, Captain Wilson Barker, Major Darwin, Colonel Church, and the chairman, Sir Thomas Holdich, gave their cordial support to the proposed scheme. Several practical difficulties were pointed out, but none of them was insuperable. Some useful suggestions were also made. More than one speaker recognised that an expedition of this kind would serve as a valuable opportunity for increasing geographical, oceanographical, and meteorological knowledge.

DESTRUCTION OF ANIMALS IN AUSTRALIA.

IN the course of his address to the annual meeting of the Linnean Society of New South Wales, held on March 28, Mr. T. Steel, the president, alluded to a proposed method of destroying rabbits by means of an infectious disease, the precise nature of which is not yet disclosed. The idea, it appears, originated in Paris, and since the necessary funds have been subscribed by stock-owners and agriculturists, it is proposed to commence the experiment on a small island selected for the purpose. After discussing the arguments for and against the proposal, the president considered it highly undesirable that any such disease should be wilfully communicated to any species of animal, by means of which it might be disseminated throughout the country. As to the extermination of the rabbit, that is considered an impossible contingency; but means ought, and can, be found to keep the species in check without recourse to infectious diseases, which may be a danger to the community.

In the course of the same address Mr. Steel alluded to the necessity of special efforts if the native Australian fauna and flora are to be saved from destruction. Poison spread for rabbits is responsible for the destruction of a large number of indigenous mammals and birds, while, sad to relate, there are Europeans who will deliberately shoot down such harmless and peaceful creatures as the koala, or native bear, for the sake of so-called sport. Shooting domesticated sheep, it is remarked, would be equally worthy of such sportsmen.

A very similar note of alarm is sounded in the April issue of the *Victorian Naturalist* in the course of an account of a recent excursion by the members of the Field Naturalists' Club to the reserve for wild animals at Wilson's Promontory. Here the chief destruction is caused by half-wild dogs, which are not true dingoes, but the produce of a cross between the latter and dogs escaped from the fishermen of the district. If these pests are not soon exterminated there will be little hope of preserving any indigenous terrestrial animals in the reserve. With regard to the reserve itself, it is mentioned as a subject for regret that the whole area is cut off from the sea by a narrow strip of land which ought certainly to be added to the protected zone. If this were done, and certain neighbouring sawmills abolished, the reserve would probably flourish, provided it were separated from the mainland by a dog-and-rabbit-proof fence, and certain indigenous animals turned in from the adjacent districts. We wish every success to the movement.

ABERDEEN UNIVERSITY QUATER-CENTENARY CELEBRATIONS.

ACTIVE preparations are being made in connection with the quatercentenary celebrations of the University of Aberdeen, and the new buildings at Marischal College, which His Majesty the King is to open in the last week of September, are approaching completion. The handsome new block—"a dream in granite"—which completes the quadrangle includes new class-rooms and laboratories for physiology, geology, and agriculture; new rooms for education, medicine, modern languages, &c.; a new library for scientific literature, and new offices.

Among the distinguished guests who have accepted the University's invitation are:—Lord Avebury, Sir Robert Stawell Ball, Prof. A. H. Becquerel, Prof. Behring, Sir William Broadbent, Sir Jas. Crichton Browne, Mr. Thomas Bryant, Lord Balfour of Burleigh, Mr. W. S. Bruce, of the *Scotia*, Mr. James Bryce, M.P., Sir William Crookes, Dr. Casimir De Candolle, Prof. Watson Cheyne, Prof. Yves Delage, Dr. Anton Dohrn, Sir Michael Foster, Sir Joseph Fayrer, the Duke of Fife, Sir Edward Fry, Dr. R. T. Glazebrook, Prof. A. Giard, Mr. Jonathan Hutchinson, Prof. Stanley Hall, Prof. Harald Höffding, Mr. R. B. Haldane, M.P., Prof. F. Hueppe, Prof. Jensen, Prof. Joseph Larmor, Sir Norman Lockyer, Prof. Lombroso, Sir Alfred Lyall, Dr. Donald Macalister, Major P. A. MacMahon, Signor Marconi, Prof. Mendeléeff, Prof. Menschutkin, Prof. Alexander Macalister, Prof. A. B. Macallum, Sir Alexander C. Mackenzie, Prof. Hugo Münsterberg, Sir John MacFadyean, Prof. Middleton, Prof. Mahaffy, Sir John Murray, Prof. Wilhelm Ostwald, Sir William Ramsay, Sir Henry Roscoe, Major Ronald Ross, Field-Marshal Earl Roberts, Sir James A. Russell, Dr. D. H. Scott, Dr. J. Hutchison Stirling, Dr. William Somerville, Prof. W. R. Sorley, Prof. Stirling, Mr. Thomas Shaw, M.P., Lord Mount-Stephen, Prof. J. J. Thomson, Dr. Thomas E. Thorpe, Prof. W. A. Tilden, Prof. G. D. Thane, Prof. Henry Turner, Prof. Giuseppe Veronese, Dr. J. A. Voelcker, Prof. Paul Vinogradoff, Prof. J. W. Wijhe, Prof. Weichselbaum, and Sir John Williams.

The following among other universities, colleges, and learned societies are to be represented by delegates:—University College, Bristol, Principal C. Lloyd Morgan; University of Cambridge, Dr. Henry Jackson, Dr. James Adam, and Mr. W. L. Mollison; University College, Cardiff, Dr. E. H. Griffiths; Trinity College, Dublin, Dr. Anthony Traill; Royal Society of Edinburgh, Lord MacLaren; Universities of Edinburgh, Glasgow, and St. Andrews; University of Leeds, Dr. Bodington; Royal Society of London, Sir Archibald Geikie; British Academy, Dr. J. A. H. Murray; Royal College of Physicians, Sir R. D. Powell; Royal College of Surgeons, Mr. Edmund Owen; University of Manchester, Dr. A. Hopkinson; University of Oxford, Dr. W. M. Merry, Prof. Henry Goudy, and Prof. Arthur Thomson; University of Wales, Principal H. R. Reichel; R. Accademia dei Lincei, Rome, Prof. Lanciani.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Harkness scholarship in geology has been gained by B. Smith, of Sidney, and the Wiltshire prize in palæontology by W. A. R. Wilks, of Gonville and Caius.

The Cavendish professor announces a course of demonstrations in physics at the laboratory during the long vacation, beginning on July 4.

The Victoria medal of honour has been awarded by the Royal Horticultural Society to Mr. R. I. Lynch, curator of the Botanic Garden.

A thousand willow-cuttings have been supplied from the garden to the Midlands Re-forestation Association for the planting of waste-heaps in the "Black Country."

In the Natural Sciences Tripos, part i., thirty-eight men and no women obtain a first class; in part ii., twelve men and three women are in the first class, six being distinguished in physics and four in physiology.

MR. H. O. WILLS, of Kelston Knoll, near Bristol, has promised a contribution of 10,000*l.* towards the foundation of a university at Bristol.

The annual garden-party will be held at Guy's Hospital on Wednesday, July 4, when Sir W. Cameron Gull, Bart., will distribute the medals and prizes to the successful students.

A GEORGE COMBE lectureship in general and experimental psychology has been established in connection with the philosophical department of the University of Edinburgh. The funds for the lecturer's salary will be provided mainly by the Combe trustees, who have also contributed 300*l.* towards the equipment of a laboratory.

THE Senate of the University of Dublin has decided to confer, at the summer commencements on July 31, the honorary degree of Sc.D. on Colonel David Bruce, C.B.; Prof. J. H. Poincaré, professor of mathematics and astronomy at the Sorbonne; Mr. E. T. Whittaker, F.R.S., Fellow of Trinity College, Cambridge, Astronomer Royal of Ireland; and Dr. A. E. Wright, F.R.S.

THE *Daily Chronicle* (June 20) announces that Sir William Macdonald has presented an agricultural college and an endowment of two million dollars (400,000*l.*) to the McGill University, Montreal. Sir William founded this agricultural college some time ago, in order to provide the youth of Canada with facilities for a thorough scientific education in agriculture.

AT University College (University of London) on July 3 the dean of the faculty of arts will read a report on the work of the session; the result of the University, scholarship and class examinations will be announced, and prizes and medals will be distributed by Dr. G. Carey Foster, F.R.S. (emeritus professor of physics, and formerly principal of the college). Lord Reay, president of the college, who will preside, will receive for the college from Prof. F. T. Trouton, acting on behalf of the subscribers, the portrait of Dr. G. Carey Foster, painted by Mr. Augustus John, and will present a replica thereof to Mrs. Carey Foster.

A COURSE of demonstrations and practical work in field and laboratory, on the applications of science to rural life and outdoor industries, will be held at the South-Eastern Agricultural College, Wye, about the last week in July or the first week in August. The course will be designed to meet the needs of science masters in rural secondary schools who have to teach various branches of science to country children. The work will be mainly practical investigation into the bearing of science on outdoor life, and lectures will be given to indicate the lines on which science teaching in rural secondary schools could be developed usefully. The cost of the fortnight's course will be 5*l.*, including board and residence in the college. Full particulars may be obtained from the principal, Mr. M. J. R. Dunstan, at the college.

FURTHER generous gifts to education by American men of wealth are announced by *Science*. Mr. David Rankin, of St. Louis, has decided to give 400,000*l.* to found an

industrial and manual training school in St. Louis. Mr. Clarence H. Mackay and his mother have together given 10,000*l.* for the immediate erection of a building for the College of Mines in connection with the University of Nevada. This building is to house the department of mining and metallurgy and that of geology and mineralogy. A recent State appropriation for the metallurgical laboratory has provided the University with a new ore-treating equipment which will be suitable for installing in the new quarters. The building will also contain a geological museum. Furthermore, Mr. F. M. Smith has arranged to provide an income of 200*l.* a year to be used for the support and encouragement of students in the mining school. This will in general be divided into five annual scholarships of 40*l.* each to be known as the F. M. Smith scholarships open to deserving students irrespective of citizenship or residence.

It is satisfactory to know that the attempt made at the meeting of the Liverpool City Council to reduce the grant of 10,000*l.* to the University of Liverpool met with scant support. The grant was renewed by an overwhelming majority. We should like to agree with Sir Charles Petrie, who said at the meeting he could not think the mover and seconder of the amendment were serious, but there is still in this country a widespread want of appreciation of the national value of university teaching and research, and no effort must be spared to bring home to local authorities the duty devolving upon them to assist every grade of education to the fullest extent possible. As Chancellor of the University of Liverpool, Lord Derby has formally accepted from Miss Isabella Gregson, formerly of Liverpool, the gift of the Gregson Memorial Institute and Museum. The gift is to be utilised for university extension purposes, and represents in money value, with an endowment of 5000*l.* added by the founder, about 300,000*l.* It was erected some years ago by Miss Gregson at her mother's request for purposes of scientific recreation in memory of her father, mother, brother, and sister.

IN the foundation oration in connection with the Union Society, delivered at University College, London, on June 13, Sir Arthur Rücker, F.R.S., took for his subject the forthcoming incorporation of the college in the University of London. He emphasised the fact that University College is undenominational, and is to be united to an undenominational university. University College was the first great step towards bringing university teaching into the centre of the great masses of population. It may be said that the University of Cambridge owes indirectly its great physiological school to the college, for it was one of its students who developed there the idea. The college with its large resources has offered itself to the new university, and has made possible an absolute fusion. A sum of about a quarter of a million has been raised with this object in view. It is an open secret, Sir Arthur Rücker continued, that the University is in full negotiation with King's College with the view of that also becoming a college of the University. The University does not intend to injure or destroy University College in any way whatever; the college has a name and a reputation with which none but a madman would attempt to interfere. If the principal educational institutions in London are drawn together, it is hoped that the University will obtain the recognition, appreciation, and loyalty which are required for success. In conclusion, the principal of London University expressed the hope that the members of University College will support all movements for drawing the students of the University more closely together. All wanted to create a great university, and this would be of the very greatest importance to the whole of London.

THE Duke of Devonshire, as president of the National Association for the Promotion of Technical and Secondary Education, took the chair at the annual meeting held on June 15. During his opening speech the president said, in consequence of the exertions of the association in past years the position of technical and secondary education has been completely changed, the Government and the local authorities having taken up the question. The work for which the association was established to carry on has been to a great extent accomplished. The association is

now no longer necessary for stimulating interest in the question of technical education or for promoting legislation. But, in the course of its existence, the association has done more than this; it has become the centre to which local authorities engaged in the work have been accustomed to look for advice, for information, and, to a certain extent, for guidance. Much of the work of the association is capable of being performed by the Government department. But from some communications which he had with the Board of Education a year or two ago, the Duke of Devonshire found that the department did not consider itself then in a position to undertake the whole of what is done by the association. It is, perhaps, possible that the present Treasury may take a different view, and that the Board of Education may be permitted by the Treasury to undertake a part of the work which has hitherto been exclusively carried on by the association. He therefore suggested that during the next year, in which provision is made for the continuance of the efficient work of the association, the executive committee should ascertain, by communication with the Government, how far the Board of Education is in a position to take up any part of the functions which the association has hitherto assumed; and if it should be found that those functions can be more usefully discharged in the future by a private association than by a department of the Government, practical consideration must be given to the manner in which it may be possible to secure a larger amount of assistance from the public. Lord Avebury and Sir Henry Roscoe also addressed the meeting.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 3.—“The Action of Pituitary Extracts upon the Kidney.” By Prof. E. A. Schäfer, F.R.S., and P. T. Herring.

Intravenous injections of saline extract of the infundibular part of the pituitary body produce dilatation of kidney vessels accompanied by increased flow of urine; *i.e.* the extract has a diuretic action.

With the first injection this result is accompanied by rise of blood-pressure and contraction of systemic arteries. With subsequent injections the diuresis is usually attended, not by a rise of blood-pressure, but by a fall. This furnishes evidence that the diuresis is independent of the effects upon blood-pressure, and leads one to suppose that it is produced by a special constituent of the extract.

This conjecture is confirmed by the result of treating the extract with certain reagents which tend to abolish the rise of blood-pressure which is produced by a first injection, but leave the diuretic effect of the extract unaltered.

The diuretic as well as the pressor and depressor constituents of the extract are not destroyed by boiling. They dialyse through parchment paper. They are insoluble in absolute alcohol and ether.

Intravenous injections of extracts from the anterior or epithelial lobe of the pituitary body do not produce diuresis; these extracts exhibit no physiological activity.

It is concluded that the infundibular part of the gland produces an internal secretion which passes into the blood, and which, both indirectly owing to its general action upon the vascular system and directly by its special action on the renal vessels and renal epithelium, assists in promoting and regulating the secretion of urine; in other words, the internal secretion of the gland is ancillary to the renal functions.

May 10.—“A Variety of Thorianite from Galle, Ceylon.” By Wyndham R. Dunstan, F.R.S., and B. Mouat Jones.

Specimens of thorianite from the Galle district of Ceylon were found to contain from 58.84 per cent. to 63.36 per cent. of thoria associated with from 32.7 per cent. to 27.9 per cent. of oxide of uranium. Ordinary thorianite from the Balangoda district contains 78.98 per cent. of thoria and 13.40 per cent. of oxide of uranium. The authors direct attention to the inter-replacement of thorium and uranium in the mineral, and conclude that the oxides of the two elements are present in isomorphous mixture, and are not chemically combined.

Chemical Society, June 7.—Prof. R. Meldola, F.R.S., president, in the chair.—Ammonium selenate and the question of isodimorphism in the alkali series: A. E. H. **Tutton**. Normal ammonium selenate crystallises differently from the seven rhombic normal sulphates and selenates of the alkalis already investigated, namely, in monoclinic prisms or tables. Rhombic mixed crystals of ammonium selenate and sulphate have been obtained, and it is concluded that ammonium selenate is dimorphous, and that the whole series of sulphates and selenates is probably isodimorphous.—The vapour pressures of binary mixtures, part i., the possible types of vapour-pressure curves: A. **Marshall**. By differentiating the equation of Duhem and Margules, $xd \log p_1 + (1-x)d \log p_2 = 0$, it has been found possible to classify the total pressure curves into twelve types, all of which are known to occur. The vapour pressures of the following pairs of liquids have been investigated experimentally:—nitroglycerol and acetone, diethylamine and acetone, ethyl alcohol and methyl ethyl ketone, water and methyl ethyl ketone, water and methyl acetate, water and ether, water and amyl alcohol.—The behaviour of acetylene with electrical discharges of high frequency: H. **Jackson** and D. N. **Laurie**. A semi-solid brown substance is formed when acetylene is subjected to discharges from an ordinary high-frequency apparatus, which sets to a hard and very insoluble solid on exposure to air. It is apparently a polymeride of acetylene. It absorbs oxygen readily up to about 8 per cent.—The behaviour of the vapours of methyl alcohol and acetaldehyde with electrical discharges of high frequency: H. **Jackson** and D. N. **Laurie**. Working with discharges of very short duration, the first change in the vapour of methyl alcohol is the formation of carbon monoxide and hydrogen; in the case of acetaldehyde the greater part of the vapour breaks up into methane and carbon monoxide, but acetylene and water are also produced in smaller quantities.—Note on 4-bromo-2-nitro-1 α -naphthylamine: R. **Meldola** and H. G. **Dale**.—Dinitroanisidines and their products of diazotisation (second communication): R. **Meldola** and F. G. C. **Stephens**.—The action of sulphur dioxide and aluminium chloride on aromatic compounds: S. **Smiles** and R. **Le Rossignol**. The authors have previously shown that thionyl chloride reacts with phenetole in the presence of aluminium chloride, giving rise successively to a sulphoxide and a sulphonium base; it has since been found that this reaction may be brought about by sulphur dioxide with the aid of the same condensing agent.—Action of sodium on α -dichloropropylene: Miss I. **Smedley**.—Resolution of lactic acid by morphine: J. C. **Irvine**. Fermentation lactic acid may be readily resolved into its active components by the crystallisation of the morphine salts.—Brazilin and hæmatoxylin, part viii.: W. H. **Perkin**, jun., and R. **Robinson**.—A study of the reaction between hydrogen peroxide and potassium persulphate: J. A. N. **Friend**. It is shown that solutions of hydrogen peroxide and potassium persulphate interact according to the equation $H_2O_2 + K_2S_2O_8 = 2KHSO_4 + O_2$. The reaction, however, is monomolecular, due to the formation of an intermediate and highly unstable compound.—The action of magnesium methyl iodide on dextro-limonene nitrosochlorides: W. A. **Tilden** and F. G. **Shepherd**. The same compound is formed from the α - and β -nitrosochlorides. It is insoluble in aqueous alkalis and in acids, though easily soluble in the usual organic solvents, and has the formula $C_{10}H_{12}ON_2Cl_2$.—Electrolysis of potassium ethyl dipropyl malonate: D. C. **Crichton**. A concentrated aqueous solution of potassium ethyldipropylmalonate yields on electrolysis the ethyl esters of α -propyl- β -ethylacrylic acid, dipropylglycollic acid, tetrapropylsuccinic acid, and probably dipropylacetic acid.—A new method for the measurement of hydrolysis in aqueous solution based upon the consideration of the motion of ions: R. B. **Denison** and B. D. **Steele**.—The oxidation of hydrocarbons by ozone at low temperatures: J. **Drugman**. Ozone acts slowly on saturated hydrocarbons, and the process is one of gradual hydroxylation. The reaction with an unsaturated hydrocarbon, such as ethylene, is instantaneous, even at temperatures far below 0°. and a very explosive addition compound is first formed.—Reactions involving the addition of hydrogen cyanide to carbon compounds, part v., cyanodihydrocarvone: A. **Lapworth**.—

Thiocarbamide as a solvent for gold: J. Moir. Two new complex gold salts have been obtained by dissolving gold in an acid solution of thiocarbamide. Their formulæ are $C_6H_{20}N_{12}S_8Au_2(SO_4)$ and $C_8H_{26}N_{16}S_8Au_3Cl_3$, respectively.—An improved Beckmann apparatus for molecular weight determinations: J. McConnell Sanders.

Linnean Society, June 7.—Prof. W. A. Herdman F.R.S., president, in the chair.—*Exhibit.*—Tubes showing stages in the metamorphosis of a young flat-fish (*Pleuronectes platessa*), the plaice, leading from the symmetrical larva to the asymmetrical young flat-fish: the President. These fish were hatched and reared in the Port Erin Biological Station. Reference was also made to the operations conducted this year in hatching and liberating some millions of young plaice.—Two new species of *Populus* from Darjeeling: H. H. Haines. *Populus ciliata*, Royle, was re-described, and the two new species characterised, namely, *P. Gamblei*, which may or may not be the species described by Dode from imperfect material, and *P. glauca*, Haines.—Two reports dealing with Biscayan plankton collected during a cruise of H.M.S. *Research* in 1900: Dr. G. H. Fowler. (1) The Cephalopoda: W. E. Hoyle. Among seventeen specimens, five genera and two species were recognised; all but one (750 fathoms to 500 fathoms) apparently belonged to the epiplankton; not a single specimen was captured at the actual surface. (2) The Medusæ: E. T. Browne. As the area investigated was oceanic, the neritic Anthomedusæ were represented by only three species; while the Trachomedusæ and Narcomedusæ, which are essentially oceanic, were represented by seven and three species respectively, three species of Trachomedusæ furnishing 85 per cent. of the total specimens captured. Four rarities were recorded; one Narcomedusan was apparently new to science, and of interest as showing medusa-buds (which were not parasitic) developing as outgrowths of the stomach pouches.—The Conifers of China: Dr. M. T. Masters. The paper described the whole coniferous flora now known, including the discoveries of Messrs. E. H. Wilson and B. Hayata; eight new species are fully set out, five of these being of the genus *Picea*.

Royal Astronomical Society, June 8.—Mr. W. H. Maw, president, in the chair.—The ancient eclipses of the sun: E. Nevill.—Mr. Cowell's discussion of ancient eclipses of the sun: S. Newcomb. The above papers were discussed by Mr. Cowell in reference to his corrections to the secular acceleration. He concluded that, with the exception of the eclipse of Archilochus, which Mr. Nevill had shown to be entirely uncertain, they agreed with the theory, which was also supported by the Chinese eclipses now brought forward by Mr. Nevill.—Errors in the tabular places of Jupiter from photographs taken with the astrographic refractor at the Royal Observatory: **Astronomer Royal.**—Notes on polarisation phenomena in the solar corona, 1905 August 30: H. F. Newall.—Photographs of the corona of 1905 August 30, taken at Sfax, Tunis: **Astronomer Royal.**—In an oral communication Prof. H. H. Turner brought forward some results of his polarisation observations during recent solar eclipses, considered in reference to the constitution of the corona. Father Cortie said that we should consider the effect of explosive outbursts on the solar surface, and not regard the coronal phenomena as due only to the pressure of light.—A spherical slide-rule, consisting of two superposed stereographic projections of the sphere, arranged for solving various problems in spherical trigonometry: W. B. Blaikie.

CAMBRIDGE.

Philosophical Society, May 14.—Dr. Fenton, vice-president, in the chair.—The influence of a very strong magnetic field on the spark spectra of palladium, rhodium, and ruthenium: J. E. Purvis. The strength of the field was 39·980 units, and the general results are:—(1) Most of the lines divide into triplets, and several become quadruplets. (2) The value of $d\lambda/\lambda^2$ was calculated from the measurements of the distances of the constituents, and in several quadruplets the value is the same; the general appearance in intensities and polarisation of the separate constituents is also very similar. This is well seen in the quadruplets

from palladium 3460·4 and 3258·7 when compared with the quadruplets from rhodium 3502·7 and 3474·7. In the triplets there are also lines which may be classified in the same way. (3) The displacements of the constituents of some of the divided lines are simple multiples of one another.—Experiments on the band spectrum of nitrogen in a magnetic field of 41·000 units: J. E. Purvis. The bands in the red, orange, and yellow become very weak, whilst those in the green, blue, and violet are brighter and stronger. But there was no shift of the bands, nor did there appear to be any widening or division of the lines forming the bands.—The ionisation of gases exposed simultaneously to Röntgen rays and the radiation from radioactive substances: T. Noda.

EDINBURGH.

Royal Society, May 28.—Sir John Murray, K.C.B., vice-president, in the chair.—Life in reservoirs in relation to water supply in towns: James Murray. The paper was a detailed discussion of the types of life met with in reservoirs, the time needed for new reservoirs to become stocked with animal life, and the conditions under which such life might do harm to the water. Rise of temperature was always followed by a great increase in the number of animals in the water, but so long as the loch or reservoir was large there was little chance of any serious results. The conditions under which animal life might possibly get into the mains were also discussed, and it was pointed out that Nature herself supplied a preventive in the tendency of free-swimming animals to swim against the current.—The Rotifera of the Scottish lochs: James Murray. Of the 177 species which had been discriminated, five were new. Many new observations on the structure and habits of the various species were recorded.—The Tardigrada of the South Orkneys: James Murray. Fourteen forms, obtained from a single tuft of moss, were more or less fragmentary. Two had been known before, but only three could be described as new.—The temperature of fresh-water lochs of Scotland, with special reference to Loch Ness: E. M. Wedderburn. The paper discussed the temperature distribution in the loch at different times and in different months. In addition to the usual type of sounding thermometer, a platinum thermometer was used in conjunction with Callendar's self-recording apparatus. The record showed on certain occasions the very rapid change of temperature which may take place at depths of 150 feet or 200 feet. This was traced to the slight rise or fall of the layer of water in which the temperature is changing most rapidly with depth, the so-called "Sprungschicht." Clear evidence was also obtained of the temperature seiche, first noticed by Mr. Watson. The observed period was in fair agreement with that calculated from the theoretical formula. At a depth of 5 feet very rapid changes of temperature were sometimes observed during night time, due clearly to convection currents. A sunshine recorder could, when required, be connected with the self-recording apparatus instead of the thermometer. At a few feet depth the effect of the direct action of the sun was very small. At a depth of only 2 feet it was impossible to detect the passage of a cloud in front of the sun. An estimation of the amount of heat which entered the water of the loch during the day was made, and came out at about a sixth or seventh part of the whole amount of solar heat available, according to Knott's calculation.

PARIS.

Academy of Sciences, June 5.—M. A. Chauveau in the chair.—The utilisation of turf for the intensive production of nitrates: A. Müntz and E. Lainé. The authors, continuing their researches on the artificial production of nitrates, find that if the animal charcoal used in their former work is replaced by turf as the medium for the growth of the nitrifying bacteria the yield is multiplied eight times. Fresh salts of ammonia can be added to the weak nitrate solution resulting from the first nitrification, and this again passed through the turf bed, and this process can be repeated until the percentage of nitrate present in the liquor is sufficient for its economical extraction commercially. The possibility of the turf itself furnishing the necessary ammonia compounds is discussed, and a

method of distillation of the turf in superheated steam has been worked out, by means of which the yield of ammonia is greatly increased.—The dry avalanches and mud torrents in the recent eruption of Vesuvius: A. **Lacroix**.—The occurrence of crystals of sylvite in blocks thrown out by the recent eruption of Vesuvius: A. **Lacroix**. The crystals of sylvite (potassium chloride) were remarkable for their size, forming cubical crystals of more than 2 cm. in the side. In several specimens the sylvite crystals were covered with large cubical crystals of halite (sodium chloride). A description is also given of a rare mineral consisting of a chloride of sodium, potassium, and manganese.—Researches of the hydroxides of rubidium, caesium, and lithium; M. **de Forcrand**. The hydroxides of rubidium and caesium obtainable commercially both contain one molecule of water of crystallisation; the anhydrous hydroxides can be prepared from the commercial products by heating in a silver crucible, an atmosphere of hydrogen being necessary in the case of the caesium compound to prevent the formation of higher oxides of caesium. Anhydrous lithium hydroxide is readily prepared from the hydrate. The heats of dissolution of the three hydroxides were measured.—A theorem on plane algebraic curves of order n : G. B. **Guccia**.—An azimuth circle with reading microscopes for technical survey work: Ch. **Lallemant**. The circles are divided into tenths of degrees, and are read by estimation by bent microscopes carrying a cross-wire. The arrangement has the advantage of rapidity and simplicity, and a comparison with the various types of instrument in common use showed that it is only surpassed in accuracy by instruments furnished with reading microscopes carrying a micrometer screw.—The electrical control of synchronised clocks: Jean **Mascart**. A discussion of the possible accidents to a synchronised clock system, and the various means that have been adopted to inform the public that the electrical control of one of the clocks on the system has failed.—An experiment due to Hittorf and the generality of Paschen's law: E. **Bouty**.—The properties of surfaces for which the apparent angle of contact of water is zero: H. **Ollivier**.—The action of silicon chloride on nickel: Em. **Vigouroux**. By the action of silicon tetrachloride upon heated nickel two substances have been isolated, SiNi and SiNi_2 . That the former silicide is homogeneous and free from metallic nickel is rendered probable by the fact that it is not magnetic.—The decomposition of copper sulphate by methyl alcohol: V. **Auger**. A basic copper sulphate is formed, the sulphuric acid removed probably forming methyl-sulphuric acid.—Dibromodimethyl- and dibromodiethyl-amidobenzoylbenzoic acids and their derivatives: E. **Séverin**.—The variations in the size of the particles in colloidal hydrochloric-ferric chloride solutions: G. **Malfitano**.—A new micro-organism producing acetone: L. **Éréaudat**. The chromogenic organism described was found in the drinking water of Saigon, Cochin-China, and is capable of producing acetone from proteid material. The name proposed for the new species is *Bacillus violarius acetonicus*.—Contribution to the study of the soluble albuminoid materials of milk: M. **Lindet** and L. **Ammann**. It is shown that the casein of milk is, in part, dissolved by the calcium phosphate present. Experiments are described throwing light upon the causes of clotting of milk.—Contribution to the cytological study of bacteria: S. **Guilliermond**. The author concludes from his observations that a true nucleus does not exist in bacteria, and considers that the nuclei described by various authors are due to misinterpretation of the facts observed.—A new parasitic copepod of *Amphiura squammata*: E. **Hérouard**.—A new type in the family of the Virgularidae: Ch. **Gravier**.—The excretion of the endogenous purins and uric acid: Pierre **Fauvel**. The quantity of endogenous purins and uric acid is constant even for a subject whose diet is free from purins, and this is still the case whether a milk diet, strictly vegetarian diet, or mixed milk-vegetarian diet be followed. This quantity varies little with the individual, and averages 0.4 to 0.5 gram of purins and 0.28 to 0.35 uric acid in twenty-four hours.—The state of the adductor muscles during life in the cephalopod molluscs: F. **Marceau**.—Pulmonary tuberculosis in the tiger: P. **Achalme**.—A new explanation of glacial erosion: Jean **Brunhes**.

DIARY OF SOCIETIES.

THURSDAY, JUNE 21.

ROYAL SOCIETY, at 4.30.—The Transition from the Liquid to the Solid State and the Foam-structure of Matter: Prof. G. Quincke, For. Mem. R.S.—Experimental Evidence of Ionic Migration in the Natural Diffusion of Acids and Salts: R. G. Durrant.—On the Behaviour of Certain Substances at their Critical Temperatures: Prof. M. W. Travers, F.R.S., and F. L. Usher.—Note on the Phenomenon of Opalescence at the Critical Temperature: Prof. S. Young, F.R.S.—Ionic Velocities in Gases at Different Temperatures: P. Phillips.—The Action of Radium and Certain Other Salts on Gelatin: W. A. Douglas Rudge.—Barometric Variations of Long Duration over Large Areas: Dr. W. J. S. Lockyer.—On the Electric Inductive Capacities of Dry Paper and of Solid Cellulose: A. Campbell.

CHEMICAL SOCIETY, at 8.30.—The Cleve Memorial Lecture: Prof. T. E. Thorpe.—The Constituents of the Essential Oil from the Fruit of *Pittosporum undulatum*: F. B. Power and F. Tutin.—Mobility of Substituents in Derivatives of β -Naphthol: J. T. Hewitt and H. V. Mitchell.

LINNEAN SOCIETY, at 8.—On the Botany of Southern Rhodesia: Miss L. S. Gibbs.—On the Authentic Portraits of Linnaeus (lantern slides): W. Carruthers, F.R.S.—Plantae novae Daweanae in Uganda lectae: Dr. Otto Stapf.—On the Genitalia of Diptera: W. Weschë.

FRIDAY, JUNE 22.

PHYSICAL SOCIETY, at 5.—The Effect of Radium in Facilitating the Visible Electric Discharge *in vacuo*: A. A. Campbell Swinton.—A Comparison between the Peltier Effect and other Reversible Heat Effects: A. O. Allen.—The Effect of the Electric Spark on the Activity of Metals: T. A. Vaughton.—Dielectric Strength of Thin Liquid Films: Dr. P. E. Shaw.—The Effect of Electrical Oscillations on Iron in a Magnetic Field: Dr. W. H. Eccles.

WEDNESDAY, JUNE 27.

GEOLOGICAL SOCIETY, at 8.—Interference-Phenomena in the Alps: Dr. Maria M. Ogilvie Gordon.—The Influence of Pressure and Porosity on the Motion of Sub-surface Water: W. R. Baldwin-Wiseman.

THURSDAY, JUNE 28.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Sex-determination in Hydatina, with some Remarks on Parthenogenesis: R. C. Punnett.—On the Julianiaceae, a New Natural Order of Plants: W. Botting Hemsley, F.R.S.—On Regeneration of Nerves: Dr. F. W. Mott, F.R.S., Prof. W. D. Halliburton, F.R.S., and A. Edmunds.—The Pharmacology of Ethyl Chloride: Dr. E. H. Embley.—The Alcoholic Ferment of Yeast Juice, part II., The Coferment of Yeast Juice: Dr. A. Harden and W. J. Young; and other papers.

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