THURSDAY, JUNE 9, 1910.

HANDBOOKS ON THE FRESH-WATER FAUNA OF GERMANY.

Die Süsswasserfauna Deutschlands, eine Exkursionsfauna. Herausgegeben von Prof. Brauer (Berlin). i., Mammalia, Aves, Reptilia, Amphibia, Pisces, by P. Matschie, A. Reichenow, G. Tornier, P. Pappenheim. Pp. iv+206; 173 figs. Price 5 marks. iii. and iv., Coleoptera, by E. Reitter. Pp. 235; 101 figs. Price 5 marks. v. and vi., Trichoptera, by G. Ulmer. Pp. 326; 467 figs. Price 6.50 marks. vii., Collembola, Neuroptera, Hymenoptera, Rhynchota, by R. and H. Heymons and Th. Kuhlgatz. Pp. 112; 111 figs. Price 2.40 marks. viii., Ephemerida, Plecoptera, Lepidoptera, by Fr. Klapálek and K. Grünberg. Pp. 163; 260 figs. Price 4 marks. ix., Odonata, by F. Ris. Pp. 67; 79 figs. Price 2 marks. x., Phyllopoda, by L. Keilhack. Pp. iv+112; 265 figs. Price 3 marks. xi., Copepoda, Ostracoda, Malacostraca, by C. van Douwe, E. Neresheimer, V. Vávra, and L. Keilhack. Pp. 136; 505 figs. Price 3.50 marks. xii., Araneæ, Acarina, and Tardigrada, by F. Dahl, F. Koenike, and A. Brauer. Pp. 191; 280 figs. Price 4 marks. xvii., Parasitische Plattwürmer, i., Trematodes, by M. Lühe. Pp. iv+217; 188 figs. Price 5 marks. xix., Mollusca, Nemertini, Bryozoa, Turbellaria, Tricladida, Spongillidæ, Hydrozoa, by J. Thiele, R. Hartmeyer, L. von Graff, L. Böhmig, W. Weltner, and A. Brauer. Pp. 199; 346 figs. Price 4 marks. (Jena: Gustav Fischer, 1909.)

THE aim of the editor of these volumes has been to provide a *complete* systematic account of the fresh-water fauna of Germany. In addition to the parts named above, others, on the Diptera, Oligochæta and Hirudinea, Rotatoria and Gastrotricha, Nemathelminthes and Cestodes are promised in the near future; a volume on the Protozoa is not at present in preparation, but may be forthcoming later. There are already other accounts which deal with portions of the fresh-water fauna, the organisms therein considered being selected either because they are the commonest fresh-water animals or because of their special interest from a biological or morphological point of view. But in the volumes before us *all* the known species of each group of fresh-water animals are considered; thus the worker is given the means of identifying any organism he may have under examination provided that it has been already recorded from fresh water in Germany. Whatever piece of work the fresh-water naturalist may desire to undertake, whether it be the study of the life-history of certain animals, their distribution, their behaviour under different conditions of environment, or whether it be the intensive study of the fauna of one pond or the more general study of the fauna of a more extended area, one of the first things necessary will be the determination of the systematic position of the organisms he proposes to investigate. For the first time the naturalist is provided, in this series of handy volumes, each written by a specialist or group of specialists, with the means of identifying his specimens with the minimum of difficulty and trouble, and without the necessity of consulting expensive monographs. The descriptions and diagnoses given are thoroughly trustworthy and practical; they contain the principal morphological characters, and short biological and faunistic notes are added in many cases. These handbooks are not intended to supply, and do not give, lengthy anatomical or biological accounts of the organisms; their function is to enable the worker who consults them to identify his material as speedily as possible. To this end keys are provided, wherever possible, to the families, genera and species, and figures, for the most part in line, are given to illustrate the diagnostic characters.

As there are no definite boundaries between the fresh-water, terrestrial, and marine faunas, it is difficult to decide whether certain animals should or should not be regarded as coming within the scope of these volumes. The editor has included not only animals which live in or upon fresh water, but those which are found on the margins of ponds, lakes, streams, &c., entering into intimate association with the water; others which seek the water only temporarily have been excluded. On the whole, the limits of the fresh-water fauna have been liberally interpreted. In order to give a more complete account, mention has been made in some cases of developmental stages of organisms, although these stages do not actually occur in fresh water; for instance, the larvæ—Leptocephali—of the eel are mentioned and figured. Our knowledge of some divisions of the fresh-water fauna is at present in a very imperfect condition; the adult forms of many animals are well known, while their younger stages are but inadequately described. These volumes, which will reach the hands of the majority of serious workers, will fulfil the purpose, among others, of serving as a record of our present knowledge, and will show the lacunæ which remain to be filled by future observations.

Heft i. deals with the whole of the vertebrates found associated with fresh water in Germany. The treatment of the Amphibia may be instanced as an example of the method adopted in this volume. A table of the diagnostic characters of adult Urodeles is given, by means of which *Salamandra maculosa, Molge alpestris, palmata, cristata,* and *vulgaris* may be distinguished. In the following part, which deals with the Batrachia, there are tables for the identification of (1) the fully adult frogs, *Hyla arborea, Bufo viridis, vulgaris,* and *calamites, Rana temporaria, arvalis,* and *esculenta* (three varieties), *Bombinator pachypus* and *igneus, Pelobates fuscus,* and *Alytes obstetricans*; (2) their spawn; (3) the young tadpoles with external gills; and (4) older tadpoles with internal gills. The third table is accompanied by the suggestion that it should be used only in case of those specimens which die in this comparatively early stage of development, and that it is preferable, wherever possible, to keep the tadpoles alive until the fourth table can be applied, with more certainty, to their identification. These four tables are illustrated by

forty figures, which clearly show the features upon which the diagnosis depends.

Hefte iii. and iv. form a single volume on the Coleoptera. The introductory pages contain useful figures, on which the structures used in diagnosis are named. The order is divided into Adephaga (Carnivora) and Polyphaga; then follow tables for the separation of the families, genera, and species. The true water beetles, that is, those species in which all stages are passed in water, are first considered; afterwards, those species in which the young stages are found in water, the adults being terrestrial; and, finally, those the whole life of which is passed under stones or on plants on the margin of water.

The single volume on the Trichoptera (Hefte v. and vi.) opens with a detailed description of the imago, following which are tables, supported by line figures, chiefly of wings and genitalia, for the separation of families, genera, and species. Six pages are devoted to the description of the egg masses of some families, genera, and species, and there follows a detailed description of the larva and tables for separating larvæ into their respective families, genera, and species. Lastly the pupa is described, and another series of tables enables the worker to identify the family or subfamily to which a pupa belongs, and he may then complete the identification either by reference to the genitalia of the imago (if they are already formed beneath the pupal cuticle) or to the larval cuticle. These excellent systematic accounts of the larvæ and pupæ, which occupy 112 pages, are alone sufficient to secure for the volume a hearty reception and commendation.

The volumes on the other orders of insects (Hefte vii., viii., and ix.) are on a plan similar to that of the two volumes above noticed, as also are the accounts of the Crustacea. For instance, the Phyllopoda (Heft x.) are divided into Euphyllopoda and Cladocera, each section being in turn subdivided into families, genera, and species, separate tables being given, where necessary, of the characters of male and female specimens. Two hundred and sixty-five outline drawings of the carapace, terminal hooks, setæ, antennæ, &c., make clear the references to these characters in the text.

The account of the Trematodes (Heft xvii.) is admirably arranged and complete. Tables giving the characters of the adult, and in some cases also of immature forms, are provided. There are lists of the Trematodes which have been found encysted in those birds, Amphibia, fishes, molluscs, and arthropods which are associated with fresh water, and there is a useful appendix on cercariæ. The utility of the volume would be increased if a "host-index" were added, by means of which the worker could ascertain what parasites had been recorded from the particular host which he happens, at the moment, to be examining.

The numerous figures, many of them original, which illustrate these volumes are of exactly the kind to elucidate the text; only very rarely is a defective figure met with; here and there a shaded drawing has become rather too dark in the course of reproduction, thus causing part of its detail to be obscured. The generic and specific names adopted are thoroughly up to date. Synonyms are given in only a comparatively few cases, such as those in which a well-known name has been recently superseded; a few more cases would have been the better for similar treatment; for instance, such well-known names as Paludina and Cyclas might have been given as synonyms under Viviparus and Sphærium respectively. One regrets the disappearance of many well-established names, *e.g.* Apus is replaced by Triops, and the alteration of others, *e.g.* Daphnia to Daphne, Anodonta to Anodontites, Artemia to Artemisia; these changes in zoological nomenclature seem to be almost endless, and sometimes, as in the last-named case, to be of doubtful value.

The volumes are of handy size, about 8 inches by 4½ inches, suitable for the pocket; they are printed on thin paper, so that the largest (on the Trichoptera, 326 pp.) is only half an inch in thickness.

So considerable a proportion of the fresh-water fauna of Britain is found also in Germany that the student of the British fresh-water fauna may turn to these volumes with the assurance that, in most cases, he will find there the information he requires to enable him to identify his material. These excellent volumes are certain to prove of the greatest service to workers on the fresh-water fauna, not only of Germany, but of a wider area.

CRETAN ARCHÆOLOGY.

Crete, the Forerunner of Greece. By C. H. Hawes and Harriet Boyd Hawes. With a preface by Arthur J. Evans. Harper's Library of Living Thought. Pp. xiv+158. (London: Harper Bros., 1909.) Price 2*s.* 6*d.* net.

MRS. HARRIET BOYD HAWES, better known to us, perhaps, under her maiden name of Miss Harriet Boyd, and her husband, Mr. C. H. Hawes, have written a very useful little book which may be described as a short, popular description of the antiquities of Crete which have been discovered during the last ten years by Dr. Evans, Prof. Halbherr, and by the distinguished author herself. More popular than Prof. Burrows's admirable "Discoveries in Crete" (though, at the same time, in no way less useful to archæologists), and published at half the price of even his book, "Crete, the Forerunner of Greece," should bring the interest and the importance of the Cretan discoveries home to the minds of all. Mr. and Mrs. Hawes have rightly insisted on the fact that the Cretan discoveries should in reality interest us more than similar discoveries in Assyria, or Palestine, or even in Egypt, because the Cretan civilisation of the Bronze age was the forerunner and the ancestor of that Hellenic culture which is ours to-day. In spite of the dark age of mediævalism in Europe, the tradition of Græco-Roman civilisation survived, and we have now returned to it. Greek culture was but a revival, after an analogous dark age of mediævalism, of the great civilisation of the Ægean Bronze age, younger sister, probably, of the ancient culture of the Nile valley. Our civilisation goes back in Greece to the very beginning of things, almost to

the remote epoch when it diverged from the Nilotic culture, and Mr. and Mrs. Hawes's little book is designed to instruct those who wish to know the story of its origins. *Felix qui potuit rerum cognoscere causas.* Religious ideas have largely directed the general interest in our origins towards the "Bible-lands," whence sprang the exotic oriental religious element in our culture, but the growth of knowledge and of civilisation is steadily weaning us from our Semitic and mediæval foster-parents, and interesting us more and more in Greece and Rome, the real parents of our minds and thoughts; and the origin of Greece and of Rome was Crete, and Crete may have sprung from the same common source as Egypt.

Of the Egyptian inspiration which we see in the early art of Crete the authors of this little book say little. They have no space in which to discuss disputed points, and their personal bias is, perhaps, rather away from any even so-called "oriental" influences (we do not admit, by the way, that Egypt was ever "oriental" in the sense that the Semitic world was and is). They merely describe what has been found in Crete and is to be seen there, either in the ruined palaces of Knossos and Phaistos, or in the towns of Gournià and Palaikastro, or in the museum of Candia, where the treasures found in the course of the excavations of these places are preserved. They conclude with a chapter on Cretan (Minoan) art which strikes us as very correctly appreciative of the peculiar genius of the earliest European artists, so unequal in quality, so good, so magnificent in conception and workmanship at times, at others so weak; yet honest and free, unshackled by any of the conventions that bound the artists of Egypt and Assyria (who, but for these conventions, would have done as well as the Minoans), and the worthy ancestors and forerunners of the artistic genius of Hellas. On this we must always insist; the Minoan art of Greece *was* the ancestor of that of the Hellenes, who inherited their artistic genius, not from the Indo-European Greek-speaking northern originators of half their blood, but from their other ancestors, the ruddy non-Aryan Mediterraneans, brothers of the Egyptian and of the Etruscan. It is from these, albeit we ourselves in the north have little or none of their blood in our veins, that we have derived most of what makes us civilised beings.

PRACTICAL CURVE TRACING.

Practical Curve Tracing, with Chapters on Differentiation and Integration. By R. Howard Duncan. Pp. vii+137. (London: Longmans, Green and Co., 1910.) Price 5*s.* net.

THE methods employed in this book, which presents an attractive appearance, are almost entirely independent of the aid of general mathematical principles. For instance, the form of the graph of $y=ax+b$ and its dependence on a, b are explained by plotting graphs of the equations obtained by varying a while b remains constant, and then those obtained by varying b while a remains constant. Naturally greater difficulties occur in handling the equations $y=ax^2+bx+c$, $y=ax^3+bx+c$, &c., by the same method. Inexpert mathematical students of the type for whom the author writes find it very hard to get hold of the notion of a parameter, and a great deal could certainly be done by adopting the plan indicated above, and steadily followed in this book. Even the ordinary student of analytical geometry would probably get at "the facts of the case" sooner if he approached, for example, the equation $x^2+y^2-ax-b=0$ by drawing graphs of the circles of the specified system, keeping b a positive constant and giving a various values, then keeping b a negative constant and varying a.

It is this positive and distinct advantage that is emphasised by the author, and from this point of view are discussed the parabolic, hyperbolic, exponential, and logarithmic curves, together with the sine curve, of the natures of which a good account is given. For students of graphs who have at their disposal algebraic machinery up to division and quadratic equations, the road to a knowledge of the forms of many graphs could be made shorter. The artifices of change of origin and scale-unit, even without those of successive approximation, do not offer a great difficulty to a student of small mathematical ability, and go a long way towards establishing the rough form of the graph of an equation which would appear alarming if it had to be discussed by the plotting of points.

Two chapters on the calculus are added to those on curve tracing. The author knows that "the method of measuring the slope of a curve by actually drawing the tangent is sometimes objected to on the ground of inaccuracy"; but his experience "shows that by good and careful workmanship it is possible to rely on the results so obtained to a degree of accuracy which is sufficient for practical purposes." Yet the degree of accuracy indicated in some of the results tabulated in the chapter on differentiation must be very difficult to attain. Indeed, curves of $y=x^2$, $y=x^3$, &c., are constructed, tangents are actually drawn, dy/dx and x are tabulated and then plotted against one another directly or logarithmically, with so much accuracy that the rules for the differentiation of x_n, e^x, $\log x$, $\sin x$, $\cos x$, are deduced. The reader certainly will have it very definitely impressed upon him that dy/dx measures the slope of a curve. Of course, there remains the difficulty for an engineer, or any other who applies the calculus, of being able to identify the slope with the rate of variation of the corresponding function, and of appreciating the very varied significance of the derivative in its applications; but the book does not profess to enter on this field.

A few examples on each chapter are gathered together at the end of the volume, the purpose of which is evidently that the reader should be clear regarding the facts at the base of the equations and functions discussed before he sets out to equip himself in the practice and applications of the methods explained.

P. P.

AN ALTERNATIVE TO QUALITATIVE ANALYSIS.

Introduction to Experimental Inorganic Chemistry. By H. Biltz. Translated by William T. Hall and J. W. Phelan. Pp. vi+185. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1909.)

THIS book is intended to supply the lack of knowledge of descriptive chemistry which has resulted from the omission of "test-tube work" from the curricula of the schools or its restriction to small classes of advanced scholars. As compared with the "qualitative analysis" which it is intended to precede or to replace, as the case may be, the course now suggested has certain obvious advantages, arising more especially from the fact that the experiments are designed directly for the purpose of supplying a knowledge of the elements and their compounds, instead of serving this purpose only indirectly through the medium of a scheme of work designed originally for an entirely different purpose.

The abuse of the older method, by which a student could be trained to "get out" his salts and pass his examinations without acquiring any adequate knowledge of the processes used in doing this, is well known, but the alternative scheme now suggested is by no means free from faults. One of the most serious accusations that may be levelled against it arises from its monotony. Thus, in dealing with the metals, the student is expected to examine one metal after another, to heat it, dissolve it in acids, and then try the effect of a series of different agents on its solutions. After this has been done for a dozen different metals the student would certainly complain of weariness, and it is doubtful whether his mental faculties would be kept sufficiently on the alert to produce any permanent impression at the end of his course. The loss of the interest which is supplied in qualitative analysis by the incessant stimulus of a problem to be solved is a very serious drawback, and the course which the authors present would need very careful handling to prevent the class from going to sleep over its work or gliding through it without effort and, therefore, without profit.

The best use to which the book could be put would be as a duplicate text-book for a student engaged on qualitative analysis, so that when presented with a new element he might, whilst learning how to detect it, acquire at the same time some systematic experimental knowledge of its properties. If blended in this way with a series of problems, the experiments now described would undoubtedly be of considerable value.

The most noticeable fault in the arrangement of the book is due to an uncertainty on the part of the authors as to whether they are giving instructions for, or supplying a descriptive account of, the experiments. This confusion has resulted in a compromise whereby one experiment is described in the imperative tense and the next as a narrative in the present tense. It is also a characteristic weakness of the scheme that formulæ and equations are given without any hint as to the quantitative experiments on which they must necessarily be based. This lack might doubtless be corrected by a teacher who was aware of the danger that the class might look upon a formula or an equation as an inspired product, to be accepted as a revelation sent down to mankind through the prophetic agency of the writers of text-books; but a course of chemistry which leads off with the words, "Hydrochloric acid, HCl, is a colourless gas. . . ." would (if left to develop its natural effects) be admirably calculated to propagate this all too prevalent heresy.

T. M. L.

THE WELFARE OF WOMEN.

The Health of the Nations. Compiled from Special Reports of the National Councils of Women. Pp. 191. (London: Constable and Co., Ltd., 1910.) Price 1*s.* net.

THE International Council of Women, of which the Countess of Aberdeen is president, was formed in 1888 by "a company of earnest American women" (p. 7). The result of their efforts was a federation of national councils, or unions, or associations, of women working for the common welfare. Mrs. Ogilvie Gordon sketches in this small volume the history of the council, noting the resolutions of its quinquennial meetings in the various countries, and summarising, for the year 1909, certain "special reports" prepared by representative women in Europe, America, and other continents. The movement is ambitious, and it is almost needless to say that the "special reports" here collated are of the most generalised kind. In a brief 200 pages of well-leaded print, it is not possible to give a passable summary of the "health" even of one nation, not to speak of the twenty-one "nations," or countries, here dealt with. But it is gratifying to find some twenty-two national councils of women (p. 12) sufficiently interested in general hygiene to produce even these somewhat sketchy "reports."

The main point is that the nations are thus showing an increasing concern for one another, and the International Council of Women, in focussing attention on the leading features of public-health progress, is doing, *pro tanto*, a real international service. Such reports are intended to excite interest rather than to provide materials for scientific conclusions, and, from this point of view, there is much to be said for them.

It is, however, to be regretted that there is so little reference in detail to extant official or other trustworthy documents. Had the papers each been supplemented by a short list of definite references, the usefulness of the little volume would have been immeasurably increased. As it is, one has difficulty in taking the statements on trust. For instance, in a "report on public health" for the "countries" of "Great Britain and Ireland," one finds it said—and the date of the "preface" is 1909—that "there is no compulsory notification of tuberculosis in Great Britain, but voluntary notification, instituted by local authorities, obtains in many places" (p. 65). Yet at that date, May, 1909, nearly 25 per cent. of the population of Scotland was under "compulsory notification," a fact that could have been obtained without difficulty, either from published blue-books or from

application to the Local Government Board for Scotland. Incidentally, it may be said that the percentage now probably approaches 50; yet a volume on "The Health of the Nations," issued in 1910, contains no clue even to the fact that Scotland is a separate administrative area of Great Britain.

This kind of report is not reassuring as to the other countries; but doubtless the various correspondents will be able to put inquirers "on the track" of more definite information. The work of collation is well done by Mrs. Ogilvie Gordon, and the volume forms a good intellectual point of repair for the many women everywhere concerned to consider and improve the life and labour conditions of women.

PROGRESS OF CHEMICAL AND PHYSICAL SCIENCE.

Fortschritte der Chemie, Physik, und physikalischen Chemie. Neue Folge des Physikalisch-chemischen Centralblattes. Vol. I., 1909. Edited by Dr. Hermann Grossmann and others. Pp. 386. (Leipzig: Gebrüder Borntraeger; London: Williams and Norgate, 1909.) Price 16 marks.

THIS work on the progress of chemistry, physics, and physical chemistry, which represents the first annual volume of a new series of the "Physikalisch-chemische Centralblatt," is issued in monthly parts, and contains a number of interesting reports by specialists on various branches of chemistry and physics, the period under review being 1908 and a portion of 1909.

Two articles on radio-activity and electronics indicate the interest attached to these rapidly developing branches of science, and it is gratifying to find that a substantial part of the pioneering work in this section results from the labours of British chemists and physicists.

The important subjects of spectroscopy, catalysis, thermochemistry, chemical equilibrium, velocity of reaction, and the theory of gases are dealt with in special reports. Recent observations on the influence of light on chemical change are summarised in the article "Photochemistry," by A. Byk.

The study of colloids is a branch of general chemistry now making rapid advances, and the researches of 1908 in this field are discussed by A. Müller, who also deals with the practical application of these investigations to the technical process of dyeing, tanning, photography, and biological chemistry.

The editor, Dr. H. Grossmann, contributes a memoir on complex chemical compounds, in which he reviews the work done in this branch of chemistry during the first half of the year 1909. He groups these so-called "molecular compounds" under four headings:—(1) Compounds with complex cations; (2) compounds with complex anions; (3) auto-complex compounds; and (4) organic-inorganic complex compounds.

One of the most interesting articles in this volume is that on the incandescent mantle industry, written by C. R. Böhm, who describes the rise and development of this important branch of manufacture, and gives a brief outline of the processes involved in the production of Welsbach mantles on a commercial scale.

The report on pharmaceutical chemistry is noteworthy because it includes a description of the synthesis of racemic suprarenine by Stolz and Flächer. The latter chemist has since separated this product into its two optical antipodes. The lævorotatory base is identical with the active base of the suprarenal capsules, and, when introduced into animals by intravenous injection, produces a very marked increase in the blood pressure. The dextrorotatory suprarenine, under similar conditions, is practically inoperative.

In addition to the above mentioned monographs, the volume contains reports on the recent development of chemical science under the various headings of physical, inorganic, organic, analytical, physiological, and agricultural chemistry. These summaries contain the same information, and discuss topics similar to those dealt with in the annual reports on the progress of chemistry published in recent years by the Chemical Society, and are therefore hardly likely to be preferred by the English reader.

OUR BOOK SHELF.

Radium. By J. P. Lord. Third edition. Pp. x+103. (London: Harding, Bros. and Co., 1910.) Price 2*s.* 6*d.* net.

THIS book, to quote from the preface, consists "of a careful compilation of the more material facts needed for an elementary understanding of radio-active phenomena, especially in relation to therapeutic and kindred progress," and the author's aim has been "to steer a middle course between the popular and the scientific literature of the subject, avoiding over-technicality, on the one hand, and on the other, that looseness of which the popular treatment of a scientific matter is peculiarly susceptible." On the whole the book seems fairly well fitted to fulfil its object. The author has successfully avoided over-technicality, but has not been entirely successful in retaining accuracy. In discussing the energy of radium, the view appears to be taken that because the radiations escaping are limited to a thin layer beneath the surface, the heat generated is also limited by the thickness of the layer. The commercially important ratio of radium to uranium in minerals is given as 700 milligrams of the former per ton of the latter, which is more than twice as great as the actual ratio. The present commercial price of radium is given as slightly more than 1000*l.* per grain, which is particularly unfortunate in such a book, since small quantities can be bought at the present time at about one-quarter or one-fifth this rate.

The chief interest of the book is the description and photographs given of certain new mines of autunite (hydrated uranium calcium phosphate) near Guarda, in Portugal, in the exploitation of which the publishers of the book apparently are interested. The deposits are described as occurring in lodes, varying from an inch to three or four feet in thickness, containing the uranium ore in crystals. A set of radiographs taken with the new material, of percentage of uranoso-uranic oxide varying from 39 to 1·5, is included, together with some plates of instruments commonly employed in the measurement of radio-activity. The last three chapters are devoted to the medical uses of radium, on the present state of which the author appears well informed.

Artrópodos Parásitos. By Prof. Daniel Greenway. Con prologo del Prof. Dr. Pedro Lacavera. Pp. viii+230. (Buenos Aires: La Ciencia tredica, 1908.) THIS work, issued in 1908, is mainly a compiled account of some of the various Arthropoda that attack and annoy man and animals, or which are parasites or carry diseases. It commences with a description of the Linguatulidæ and Demodecidæ. Then follows an account of the Sarcoptidæ, especially dealing with the human itch mite (*Sarcoptes scabiei*). Several species of Tyroglyphidæ are figured, and also other mites. Information concerning the Ixodidæ, or ticks, covers twenty-one pages, and two useful tables of the genera are given. The piroplasma-carrying *Boophilus bovis* is shown on three coloured plates in adult male and female and larval stages.

Some poisonous spiders are referred to and figured, including the large *Mygala avicularia*. The insects take up most of the volume, extending from p. 89 to p. 221. After a general account of the Hexapods, the author commences with the parasitic and blood-sucking Hemiptera, dealing almost exclusively with the Pediculi.

The major part of this section concerns the Diptera, including the aphaniptera, or fleas. A good account of the "Jigger" (*Sarcopsylla penetrans*) is given.

This is followed by a description of the tsetse-flies, or Glossinæ, including a table of species, ten being tabulated, including *G. bocagei* (G. Franca, 1902). Notes are also given on the screw worm (*Compsomyia macellaria*), Dermatobia, and other Œstridæ. A considerable space is devoted to a general outline of the family Culicidæ, with a coloured plate reproduced mainly from Arribalzaga's "Diptera Argentina." The central figure (No. 4) of *Anopheles claviger* (*maculipennis*) is scarcely recognisable.

Some misprints may be noticed, such as *colopus* for *calopus* (Fig. 149), *bobis* for *bovis* (p. 181), &c.

F. V. T.

Der Kampf um Kernfragen der Entwicklungs- und Vererbungslehre. By Oscar Hertwig. Pp. iv+122. (Jena: G. Fischer, 1909.) Price 3 marks.

WITH his usual clearness, Prof. Oscar Hertwig sums up the situation as regards the *rôle* of the nucleus in heredity. After stating the foundations of fact on which theories of heredity and development must be built, he enters upon a careful discussion of the important question whether the nucleus is the sole vehicle of heritable qualities. As Fick puts it, Has the nucleus a "Vererbungsmonopol"? The author defends against all-comers the "Hertwig-Strasburger (1884) hypothesis of the localisation of the idioplasm in the nuclear substances," and his arguments are put with much force. They are seven in all, the three best being the equivalence of ovum and spermatozoon as regards nuclear material, the precise partition of nuclear substance in karyokinesis, and the reduction which obviates an accumulation of nuclear material. The case is argued with fairness, and the difficulties which abound are considered carefully, the general conclusion being that the 1884 hypothesis is consistent with a large series of important facts, and that no well-established fact is inconsistent with it.

There is much interesting discussion in the volume, which is conspicuously lucid throughout. We should also refer here to the revised and enlarged edition (Jena: Fischer, pp. 46) of a lecture which Hertwig gave in 1900 on the development of biology in the nineteenth century. It is interesting to notice from the additions that the author is of opinion that actual advances in knowledge necessitate a re-consideration of the theory of natural selection, the Lamarckian theory of direct adaptation, and the recapitulation doctrine.

(1) *Man in Many Lands: Being an Introduction to the Study of Geographic Control.* By Prof. L. W. Lyde. Pp. vii+184. (London: A. and C. Black, 1910.) Price 2*s.* 6*d.*

(2) *Questions on Herbertson's Senior Geography.* By F. M. Kirk. Statistical Appendix by E. G. R. Taylor. Pp. 64. (Oxford: Clarendon Press, 1910.) Price 1*s.*

(3) *Experimental Geography.* By G. C. Dingwall. Pp. vii+168. (London: George Bell and Sons, 1910.) Price 2*s.* 6*d.*

(4) *Cambridge County Geographies. Cornwall.* By S. Baring-Gould. Pp. ix+164. (Cambridge: University Press, 1910.) Price 1*s.* 6*d.*

THOUGH all are intended to assist school pupils to learn geography, these books have very little in common, so far as the methods adopted by the various writers are concerned. The books show vividly the present diversity of opinion as to the best way of teaching geography. The teacher has a difficult task just now in deciding the course his lessons should take, for the examining and inspecting authorities he has perforce to serve are not yet agreed among themselves. Fortunately, there is a growing conviction that the best results are obtained only when the pupils participate actively in the lessons; and the plan is becoming more and more common of setting children to work for themselves exercises designed to bring out some important principle or fact. The second and third of the volumes under notice will assist the teacher in this part of his work; the third especially, though it follows lines which have been laid down by previous books, will indicate ways in which the pupil may be taught to make his own text-book.

Prof. Lyde maintains his reputation as an experienced teacher. His book is an excellent example of the way in which the practical teacher can make geography a valuable instrument for training boys and girls to reason intelligently. The well-selected coloured illustrations add greatly to the attractiveness of the book.

The last volume is well up to the high standard of the series to which it belongs.

Highways and Byways in Buckinghamshire. By Clement Shorter. With illustrations by F. L. Griggs. Pp. xix+344. (London: Macmillan and Co., Ltd., 1910.) Price 6*s.*

A COUNTY or a country may be described from various points of view, and in each case the things seen will depend upon the temperament or sympathies of the observer. In this addition to an admirable series of guide-books, the predominant view is that of prominent persons connected with a county which is rich in historic interest. Of the natural history or geography of the county there is nothing, but the human side, which appeals to a wider circle of readers, is presented in a style that commands attention. A few lines are given to Sir William Herschel in connection with Slough, and mention is made of Sir Kenelm Digby, who first brought Sir Thomas Browne's "Religio Medici" into notice, but little more is said of the association of science with the county. Perhaps the mention of Hester Sandys, who married Sir Thomas Temple, of Stowe, and lived to see seven hundred descendants from the union, will interest biologists. Mr. Shorter acknowledges that he is concerned only with the personal element of Buckinghamshire; so while we may regret the limitations thus imposed upon the county's attractions, it would be unjust to apply to his attractive volume any other standards than those of biography and history. There is no lack of living interest, and the volume is sure to be read widely both within and without the county.

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.]*

Meteorological Observations during the Passage of the Earth through the Tail of Halley's Comet.

I HAVE cursorily examined the records from ten registering balloons sent up from Ditcham Park and Pyrton Hill on May 18, 19, and 20. Nearly all the traces show large fluctuations of temperature; but such fluctuations have been observed before, and there is nothing that leads me to suppose that the passage of the earth through the tail of the comet, if, indeed, it occurred before 7 a.m. on May 20, had any effect on the temperature of the upper air. Five of the balloons reached 17 km. or more, and all exceeded 13 km. W. H. DINES.

June 6.

THE quantity of ozone in the atmosphere at great altitudes, which for some time has been the subject of an investigation by the writer, was estimated on May 18 and 19. It was thought that, in this way, some light might be thrown on the question as to whether any electrical discharges of any magnitude took place in the higher atmosphere during the transit.

The method of conducting these measurements is described in the Transactions of the Chemical Society (1910, xcvii., 868), and consists in the use of a concentrated solution of potassium iodide. It has been found in this work that very dilute ozone reacts with potassium iodide to give iodine, potassium hydroxide, and potassium iodate, the relative amounts of each varying with the temperature. This reaction enables a distinction to be made from oxides of nitrogen, which only give free iodine, and from dilute hydrogen peroxide, which gives iodine and potassium hydroxide, but no iodate.

Three successful experiments were made with the help of the meteorological balloons at about the time of the transit, and the following results were obtained:—

Time of ascent of balloon	Height attained km.	Amount of ozone per cubic metre air mgrm.	
May 18, 9.40 p.m.	17	0·51	(or 1 part in about $2·6 \times 10^6$)
,, 19, 2.10 a.m.	12	0·54	(,, ,, $2·4 \times 10^6$)
,, 19, 6.30 a.m.	20	0·43	(,, ,, $3·0 \times 10^6$)

The above quantities of ozone are not materially different from the amount usually present in the air at these altitudes. Thus the average of three measurements made on March 18 corresponds to 0·72 mgrm. ozone per cubic metre air.

There was also no appreciable change in the quantity of oxides of nitrogen. J. N. PRING.

Physical Laboratory, Manchester University.

Ooze and Irrigation.

AGES have passed since the cultivator first realised the value of rivers as agents in fertilising the soil. The Nile is the classical illustration, and everyone has learned in early life to think of Egypt as being dependent on the life-giving waters for its fertility. But have the reasons for that ever been sufficiently investigated? Probably the majority of people would say that the waters of the Nile bring down vast quantities of soil and disintegrated rock from the heart of Africa, and this earthy matter, held in suspension or carried down by the river in spate, contains the chemical elements which are essential to the growth of plants. I believe that is the usually accepted theory; but does it go to the root of things? Others find the secret in the action of bacteria. I grant the point, but do not think it fully accounts for the facts. I have for some years been engaged in the study of our fresh-water annelids and their place in the economy of nature. I had occasion a few days ago to bring home from the banks of one of our Midland rivers some of the ooze from its banks. When I collected it I found some half-dozen specimens of a common fresh-water worm wriggling about in the slimy mass; but when I came to examine it at leisure, with pocket lens and microscope, I found it to be teeming with life. Vast numbers of tiny annelids (*Tubifex templetoni*, Southern, or an allied species), minute larvæ, and other living things were to be seen, and at once the question arose, Would the ooze, detritus, alluvium, or disintegrated rock of itself be so special a fertiliser if this teeming life were absent? The ooze is enriched both by the passing of the matter through the bodies of the animals and by the nitrogen from their corpses.

It seems to me that there is need for careful study of the alluvium of rivers from this point of view. Life has probably much more to do with the soil of the Nile and other rivers than is generally suspected. It would be a profitable thing for students to examine the mud of rivers like the Nile during the different seasons. It would then probably be found that at low water various annelids and other aquatic life-forms were breeding rapidly. The myriads of young would be carried by the flood into the lands which are irrigated by the river, and here they would not only be the food supply for the larger forms of life, but would help to keep the soil from becoming sour, and supply vast stores of nitrogen for the plants. I should be happy to hear from workers in this field, and give any hints which experience has taught me.

Gt. Malvern. HILDERIC FRIEND.

On the Preservation of Hailstones and the Investigation of their Microstructure.

THE investigation of the microstructure of hailstones in summer having proved very difficult, if not impossible, I constructed an apparatus (Fig. 1) for their preservation

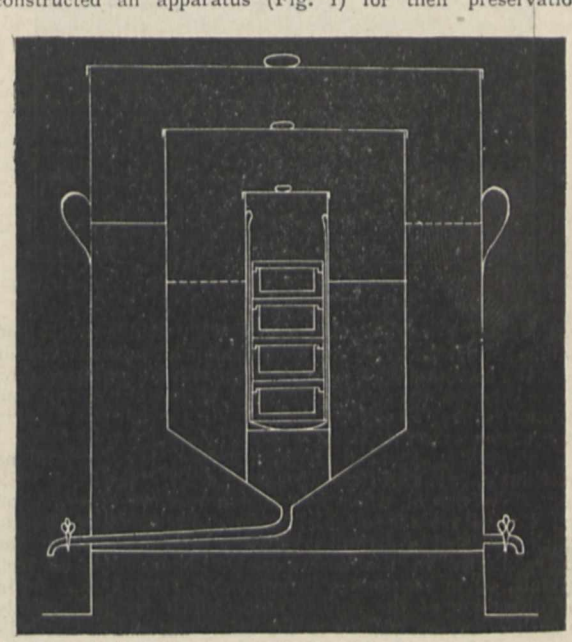

FIG 1.

until winter time. The apparatus consists of three co-axial cylinders; the inner space is intended for hail; the middle space for a mixture of ice and cupric sulphate (approximately in the proportion corresponding to eutectics $t = -1·6°$); the outer space for ice, forming a sort of guard coat.

During the summers of 1908 and 1909 I had only once the opportunity of observing a hailstorm; this was on August 2/15, 1909, when I was at sea near Helsingfors on my way from Åland to St. Petersburg. This hail lasted three to four minutes; the hailstones were very small (2–3 mm. diameter), but I gathered 200–300 grams of them, and, in order to avoid their freezing together, immersed them in glass boxes with a mixture of nearly equal parts of benzol and toluol, which I presumed to be of a density equal to the density of hailstones, but which proved to be lighter. These hailstones I brought later to Tomsk (Siberia), and in December sent them to the twelfth Congress of Russian Naturalists and Physicians in session at Moscow. These facts demonstrate thoroughly the possibility of the preservation and transport of hailstones. My

experiment has also shown that it would be better to preserve one or two hundred hailstones separate from each other than a greater number of them, but partly—especially in lower layers—frozen together. That can be attained by placing the hailstones in some very viscous liquid (*e.g.* cylinder-oil, vaseline, or castor-oil) of a density nearly equal to that of hail.

For the investigation of the microstructure of a separate hailstone Mr. W. Dudecki and I made a thin section of it by first rubbing one side on emery-paper or by melting it with the warmth of a finger. This side was laid upon an object-glass and frozen to it, after touching for some time with a finger the other side of the glass. The other side of the hailstone was then polished in the same manner as the first until the requisite thickness was attained. These operations were made in free air, and were so much easier, as the temperature of the air was below 0°. Still, it was found possible to grind hailstones in the laboratory at the temperature of the room by means of cooling the object-glass, the emery-paper, &c., in double-walled vessels with a mixture of ice and common salt.

For the optical investigation of thin sections in free air a polarising microscope was used, and in a lecture-room a projecting lantern. In the latter case (Fig. 2) the section

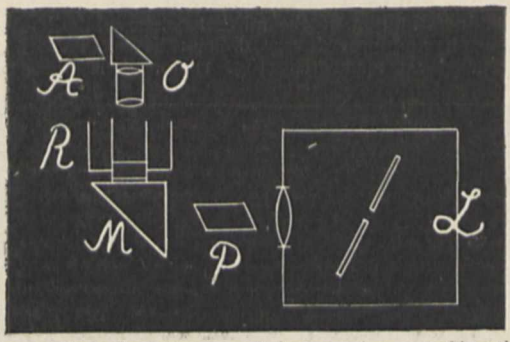

FIG. 2.—L, Projecting lantern; P, polariser; M, mirror; R, refrigerating vessel; O, objective; A, analyser.

was laid in a refrigerating vessel with double walls and double bottom (to avoid the condensation of aqueous vapour from the surrounding air) of plane-parallel glass plates. The space between the walls contained a mixture of ice and common salt. The real image of the section was thrown on a screen or on a photographic ("Autochrom") plate.

The greater part of the hailstones were crystalline individuals, as also was the case with "artificial hailstones"—drops of water frozen in a mixture of cinnamon and linseed oil of suitable density. In those hailstones, which consisted of several crystalline individuals, there was no regularity in the form of the boundaries between crystals, or in the angles between these boundaries, or in the directions of the optical axes, which lay indifferently to each other, as well as to the milky nucleus of the hailstone, which appeared in the section as a number of air-bubbles of different size.

I trust that my attempt will cause similar researches to be undertaken, and I should be very glad if anyone who may be able to preserve or study larger or more peculiar hailstones than I have hitherto done will do so, and in this way improve our deficient knowledge on the origin of hail and the details of its formation. BORIS WEINBERG.

The Physical Laboratory of the Technological Institute of Tomsk, Russia.

Thoughtless Destruction of Wild Flowers.

MAY I ask through your widely circulated paper that those who organise the weekly or fortnightly visits of poor town children to country villages may be requested to instruct these children to pluck only a limited number of wild flowers? It is no uncommon sight to see a dozen or more of these children going along a road or railway embankment and plucking every flower they can find, as well as rooting up those which are small enough. In half an hour the flowers have withered, and are thrown away, when the same process is repeated. GEO. HENDERSON.

Otford, Kent, May 27.

RECENT PROGRESS IN INDIAN FOREST TECHNOLOGY.

THE excellence of the work of any public department depends on the character and ability of the men who direct it, and the Indian Forest Department was singularly fortunate in its first Inspector-General, the late Sir Dietrich Brandis, K.C.I.E., F.R.S. He secured State ownership and State management for the forests both in British India and in the native States, and also a trained staff of forest officers. He placed Indian forest law on a firm basis by selecting as Conservator of Forests, Mr. B. H. Baden-Powell, C.S.I., a member of the Punjab Civil Service, who, after working for a decade of his life in the forest service, became presiding judge of the chief court at Lahore. Baden-Powell drafted the Indian Forest Acts, models of forest law that are followed by all colonial legislators, and his "Manual of Forest Jurisprudence" is the only English book on the subject. No mere forester could have drafted those laws successfully, nor could any mere lawyer, but Baden-Powell was both lawyer and forester.

Brandis also established a forest survey under Lieut.-Colonel F. Bailey, R.E., and Mr. W. H. Reynolds, and their maps gained gold medals at two Paris exhibitions, and were the first Indian maps that showed a good system of contour lines. A forest school for training native members of the provincial and executive staffs of the Forest Department was established in 1881, at Dehra Dun. Useful manuals of forestry, by Mr. E. E. Fernandez, and of botany, were published soon after the establishment of this school for the use of the students. Brandis also published a Forest Flora of Northern India, followed quite recently by his last great work, "Indian Trees," a forest flora for the whole of India. Mr. Kurz had previously written one for Burma and Major Beddome for Madras, while Mr. J. S. Gamble, C.I.E., F.R.S., published a splendid monograph of Indian bamboos. Gamble, under Brandis's direction, published, in 1881, a "Manual of Indian Timbers," and again, in 1901, after collecting material for twenty years, a new and greatly enlarged and improved edition. "The Indian Forester" first appeared in 1876, Dr. Schlich, now Sir W. Schlich, K.C.I.E., F.R.S., being the first editor. Schlich succeeded Brandis as Inspector-General of Forests in 1881, and instituted a proper system of working plans for Indian forests. He came home in 1885 and established a school of forestry at Coopers Hill, and, in conjunction with myself, published a "Manual of Forestry."

The training of men in England for the Indian Forest Service was not at first in accordance with the wishes of Brandis and Schlich. They recommended that the Imperial School of Forestry should be at an English university, and that, as the so-called Civil Service of India is recruited chiefly from university men of good literary and legal attainments, so the Imperial Forest branch of the Civil Service, which manages one-quarter of the land of British India, should be composed of university men of good scientific attainments. But the India Office wished to support the Royal Indian Engineering College at Coopers Hill, and kept the forest probationers there until 1905, the year before the college was closed. In 1905, an Imperial School of Forestry was established at Oxford under Sir William Schlich, and is now training more than seventy men for India, the colonies, and for forest work at home.

Until 1904 very little progress was made in Indian forest technology, for which Brandis had laid such a

splendid foundation. It was found that the class of candidates for the forest service was falling off in numbers and quality, the salaries were not sufficiently attractive, and in 1905 only two candidates appeared for sixteen posts, so that a system of appointment by selection was adopted. The Secretary of State has now raised the pay of the Indian Forest Service, and allows 120*l.* a year to such of the two years' probationers who are B.A.s with honours from any university, so that this year there were sixty candidates for twelve appointments. Besides insisting on the qualification of an honour degree, it is essential to secure that all probationers should join the Oxford School of Forestry, with a sufficient knowledge of English, elementary mathematics (including trigonometry), physics, and chemistry. During the two years' course for a forestry diploma at Oxford, botany, zoology, and geology can be taught, as well as forestry, surveying, and forest law. Strange to say, some of our British universities have such an imperfect entrance examination that men are allowed to enter for and take honour degrees in biology or geology without necessarily knowing more than the rudiments of mathematics, chemistry, or physics, and without passing any test in English. The possession of an honour degree in science at a British university is not, therefore, a sufficient qualification for a forest probationer. A certain knowledge of German also is very desirable for admission to the Oxford School of Forestry, and this is but rarely obtainable from our public-school men. Our best Oxford foresters should be capable of teaching scientific and practical forestry throughout the Empire.

Although the forests of India, between 1885 and 1905, continued to be well managed by a devoted corps of practical foresters, very little, if any, progress in forest technology was made during those twenty years. In 1906, Mr. S. Eardley Wilmot, C.I.E., Inspector-General of Forests, following the initiative of his predecessor, Mr. R. C. Wroughton, established a forest research institute the members of which devote all their time to the study of the various branches of forestry, as well as to zoology, mycology, and the physics and chemistry of forest products. The results of this research are published in "Indian Forest Records." Vol. i., for 1909, of these records contains papers on the lac insect, by E. P. Stebbing; on beetles boring in Chilgoza bark, by E. P. Stebbing and Capt. E. H. James; the development of *Shorea robusta* in volume and money value, and the selection system in Indian forests, by A. M. F. Caccia; Andaman Padank, by B. B. Osmaston; the Cutch trade of Burma, by R. S. Troup; Ngai camphor, and Burmese varnish from the sap of *Melanorrhoea usitata*, by Puran Singh. Several useful and, for the most part, elementary manuals have been prepared by members of the Research Institute and others, the most elaborate of which are "Indian Forest Engineering," by G. M. Rogers, and "Indian Forest Zoology," by E. P. Stebbing.

Unfortunately, the establishment of this institute was followed by a temporary deterioration of the teaching staff in Dehra Dun, for the Government of India did not accept Mr. Wilmot's proposal to retain an adequate staff of instructors there, but handed over the practical teaching to the provincial staff, the research officers considering that their other duties would not allow them time to teach the students. The Dehra Dun Forest School, recently dignified with the title of Imperial Forest College, was overcrowded with students, 120 applications for admission having been received in 1909, and the students had not sufficient respect for their native teachers, so that discipline suffered greatly.

The Indian Universities Act of 1894, which has exerted its influence so widely on higher studies, has failed to reach Dehra. Engineering, medicine, and agriculture, and science generally, have made great advances of late in response to the stimulus of university reform, but at the Imperial Forest College the qualifying entrance examination is still much the same as when it was a school, and its courses still include an amount of rudimentary science that should have no place at a college. This becomes evident when the standards there are compared with those at the agricultural colleges recently established in the various provinces of India. The final examination for the diploma in forestry at Dehra should also be equivalent to those for a B.A. degree, as is the case at agricultural colleges.

The present Inspector-General of Forests, Mr. F. Beadon Bryant, has recognised that the teaching of forest rangers has fallen off since the Research Institute was started, and that it was a mistake to entrust the teaching of classes of sixty students there to members of the provincial service. Research officers in future will give lectures to the students during the four months' monsoon session, and three officers of the Imperial Forest Service are being appointed to teach the students throughout the two years' course for rangers and the three years' course for the provincial staff. Overcrowding at Dehra is to be avoided by the establishment of a school for rangers in the Madras Presidency, with at least two professors from the Imperial staff, and probably another school on similar lines will be established in the Central Provinces. Indian forest schools have to provide foresters for Kashmir, Mysore, Hyderabad, and the other native States, besides for British India, and Mr. Wilmot has recently been deputed to Nepal to organise a suitable forestry department there.

It is evident that schools of forestry, at home, in India, and in the colonies, must be in close touch with the universities; but while Indian universities have a suitable English and scientific entrance examination, this is not yet the case with some of our most important home universities, and this defect calls loudly for reform in the best interests of our Empire. The prospects of forest technology in India are now very high, and it is to be hoped that, following the example there and that of South Africa, where a forest school has been established, the Dominion of Canada, Newfoundland, Australia, and New Zealand will soon bestow sufficient attention on forestry and establish local forest schools. Besides India and South Africa, the scientific forestry of which has been long established, there are regular forestry departments in Ceylon, the Malay States, the Soudan, British East Africa, Mauritius, Cyprus, and in some of the West Indian Islands. W. R. FISHER.

THE TWENTIETH-CENTURY SPORTSMAN.[1]

THIS amazing picture-book (recommendable, among a hundred other reasons, in that, though large in size, it is very light to hold in the hand) will probably *faire école*. That it has made a sensation amongst the reading public interested in Africa is already observable by the reviews of it which have appeared in the leading newspapers, and the vogue it has attained in spite of the conflicting interest of current politics. This is little to be wondered at. The author (who is the brother of the Captain W. R. Dugmore who distinguished himself in Uganda and elsewhere as a soldier-pioneer) had, no doubt, supreme

1 "Camera Adventures in the African Wilds; being an Account of a Four Months' Expedition in British East Africa, for the Purpose of Securing Photographs from Life of the Game." By A. Radclyffe Dugmore. Pp. xviii+231. (London: William Heinemann, 1910.) Price 30*s.* net.

FIG. 1.—Telephoto of Kilimanjaro about eighty miles away. The entire lack of detail on the lower part of the mountain is due to atmospheric effect, which renders distant objects the colour of the sky unless they are above the heated stratum near the earth. From "Camera Adventures in the African Wilds."

FIG. 2.—Large Herd of Giraffe and Grant's Zebra, showing the comparative sizes of the two strongly marked animals. (Telephotograph at about 300 yards.) From "Camera Adventures in the African Wilds."

good luck, but he and his companion, Mr. James L. Clark, were also possessed of singular courage and skill both as photographers and marksmen, and, if need be, mechanicians. Good luck gave them the chance of a telephotograph of Kilimanjaro, eighty miles distant, which is one of the weirdest mountain pictures the present writer has even seen, and confirms his old story of twenty-five years ago that Kilimanjaro, in certain aspects, resembled Swift's floating-island of Laputa. Amongst other episodes of singular good fortune was the photographing of the still very rare black Forest pig. This creature, the existence of which was rumoured by Stanley, George Grenfell, and the present writer in the Congo Forests, was actually first revealed to science by Captain Meinertzhagen and Mr. C. W. Hobley, far away from the Congo basin, on the Nandi plateau and round Mount Kenia (though it was soon afterwards obtained from the north-east Congo, and finally from the Cameroons). But specimens of it are still scarcer than those of the okapi, and to have photographed the creature, *wild and in its forest home,* is an episode that probably Mr. Dugmore never anticipated, even in his rosiest anticipations.

The book gives unrivalled pictures of the fauna of Equatorial East Africa, of that singularly fascinating region between Kilimanjaro on the south and the Guaso Nyiro on the north, the Rift Valley on the west and the Tana River on the east. Here there are long ranges of mountains that only fall just short of the level of perpetual snow, and there are the snowfields and glaciers of Kenya, rendered marvellously well in Mr. Dugmore's pictures. Immense grassy plains, dense thorn scrubs, lakes peopled with flamingoes, splendid equatorial forests recalling those of West Africa, deep water-courses or canyons, broad rivers with great herds of hippopotami and monstrous crocodiles, and patches of camel-frequented desert—all these phases of physical geography are admirably illustrated, in addition to the pictures of beasts, birds, and indigenous mankind. We are getting almost tired of lions since the advent on the scene of the flash-light photographer: the lion and lioness, indeed, seem to be almost like the popular actress or politician in their desire and willingness to be photographed in interesting attitudes. But although this book has some of the best lion pictures I have ever seen, it will probably be more noteworthy for its photographs of charging rhinoceroses, of buffaloes passing through the long grass, or hiding themselves at noon-day in dense forest. Another notable feature is the numerous studies of giraffes, sometimes looking exactly like withered tree stumps, at others suggesting prehistoric monsters. The most striking of these giraffe studies (and the most beautiful) is that where, by means of a telephotograph, a large herd of giraffe, and a smaller herd of Grant's zebra, are shown together in an immense tract of savannah country dotted with acacias. If that does not suggest the Pleistocene at its best, we do not know what does, The geographical scope of the book extends far enough north to include the Samburu and their camels, camels which have suggested to more than one observer, British or Italian, the possibility of their being derived from a wild camel which may still exist in the remotest, as yet completely unexplored, parts of Galaland.

The book opens with an appeal "to the lovers of sport, and perhaps to those who consider themselves as such, but whose only claim is the insatiate love for killing which characterises their idea of sport." The author goes on to state that, like many others brought up to the use of firearms, he considered the man who did not shoot a very inferior person, in fact, unmanly. But as the years went by he himself became more deeply interested in natural history, and the idea of killing for killing's sake lost its fascination. In time he found that the most thrilling sport of all was the studying of the life of animals in their native wilds rather than in the killing of them merely to possess the skin or other trophies. Enough is said in his book to show that he and his companion ran, perhaps, greater risks in their attempt to snapshot charging rhinoceroses, lions, and buffaloes than would the sportsman who was merely out to kill, while the acrobatics necessitated in natural-history photography are enough to prove that the follower of this sport has to be a far more athletic and courageous person than the mere shooter.

Whether Mr. Dugmore will meet with any more success in his appeal than has followed the work of Mr. E. N. Buxton, and others of like persuasion is a moot question. His unsurpassed photographs have revealed once more the wonderland in bird and mammalian fauna represented in Inner East Africa, and already a company, with an office in Piccadilly, has issued a pamphlet on British East Africa, illustrated by some of Mr. Dugmore's photographs, which offers every inducement to persons of both sexes to proceed to East Africa "to shoot." In this pamphlet it is stated that the report about the country being "shot out" is far from the actual truth. (Nothing, so far as I can see, is said about the attractions to the photographer.) In the list of animals which may be shot under the ordinary licence (and in this the pamphlet is not to blame, for it merely quotes official regulations) is given "four egrets of each species." What of its kind can be more monstrous than this? Egrets —white herons—are quite uneatable, they are supremely beautiful, and we now know—or ought to know—that they are large consumers of noxious flies —Glossina (tse-tse), Stomoxys, Tabanus—and all the larger gnats. For this reason alone all these smaller herons should be rigidly protected.

H. H. JOHNSTON.

WIND STATISTICS AND AËRONAUTICS.

THE practical interest shown in Germany in the navigation of the air is widespread, and goes hand in hand with a determination to utilise all auxiliaries that promise to advance the subject. Among such auxiliaries must be included the observations of wind which form part of the stock in trade of the meteorologist. The "Motorluftschiff-Studiengesellschaft" of Berlin, founded in 1907 at the instance of the German Emperor, has accordingly requested Prof. Assmann, the director of the Aëronautical Meteorological Observatory at Lindenberg, to undertake a detailed analysis of the wind data available for the German Empire. The society has provided a large part of the funds required for the work. The results have now been published. They give average values, generally for the twenty years 1886–1905, for forty-nine stations. The original schedules were prepared in the various offices which are responsible for the meteorological work of the component States of the Empire. The final discussion was undertaken at Lindenberg under the direction of Prof. Assmann.

Some idea of the magnitude of the work involved may be gathered from the fact that the preparation of the primary schedules is estimated to have occupied about 2550 hours of clerk's time. It was decided to limit the discussion to the Beaufort estimates of

1 "Die Winde in Deutschland." Im Auftrage der Motorluftschiff-Studiengesellschaft in Berlin. Bearbeitet von Richard Assmann. Pp. iv+48; tafel xiii. (Braunschweig: F. Vieweg und Sohn.) Price 5 marks.

"I Venti in Italia." Estratto dalla Rivista Tecnica di Aeronautica e Boll. della Soc. Aeronautica Italiana. Dott. Filippo Eredia, Meteorologista al R. Ufficio di Meteorologia e Geodinamica. (Roma: Officina Poligrafica Italiana, 1909.)

wind force and direction made at selected stations of the second order. A discussion of the results obtained by anemometer was not attempted, on the ground that differences of exposure and of the types of instruments rendered instrumental results less trustworthy than Beaufort estimates, so far as comparability with one another goes—a striking testimony to the value of the latter, if carefully made. The main tables give for each station the percentage frequency of wind from each of eight principal directions. The winds from each direction are then subdivided according to wind velocity, five gradations ranging up to 15 m.p.s. being distinguished. Values are given for the whole year and for each quarter separately.

The last chapter of the work is devoted to a discussion of the results for the upper air obtained with kites at Lindenberg. Tables of averages, similar to those prepared for individual stations, are given for each step of 500 metres up to a height of 4000 metres.

In "I Venti in Italia" we have a publication which is inspired by much the same idea. It has been prepared at the instigation of the Italian Aëronautical Society, and gives information for 111 stations in Italy. As in the German work, the observations are grouped under the eight principal wind directions, but the subdivision by wind forces is not carried out. To make up for this omission, the results for the country as a whole are shown graphically on a series of coloured plates included in the final section. In a country like Italy, where there is a marked seasonal variation of wind direction, a pictorial representation is very useful. The work has been entrusted to Dr. Filippo Eredia, of the Central Meteorological Office of Italy, whose name is a guarantee of careful workmanship.

We cannot discuss the statistical details; he who is interested in the influence of topography on air currents will find much useful information in the very complete wind-roses given with both works. The results will also be useful to aëronauts when selecting sites for practising grounds or for aërial harbours, or in such matters as the selection of the seasons most appropriate for their experiments.

NEW GUINEA PYGMIES.

IN the last number of *Country Life* (vol. xxvii., p. 797) Mr. W. R. Ogilvie-Grant, under the running title of "The Expedition of the British Ornithologists' Union to the Snow Mountains of New Guinea," published his fourth article, entitled "The Discovery of a Pigmy Race," part of which appeared in the *Times* on June 3. All the information we have at present is that the expedition ascended the Mimika river, and at "an elevation of about two thousand feet they came across a tribe of pigmy people, of whom the tallest stood about four feet six inches, the average height being four feet three inches. Though at present no further details have been received except that they were extremely wild, there can be little doubt that they belong to that distinct division of the human race known as the Negritos." Mr. Ogilvie-Grant added a short account, with illustrations, of the Semang, a Negrito people of the Malay Peninsula.

Although stature cannot be taken as a trustworthy criterion of race, as it is very variable, there are certain peoples who can be described as normally tall, medium, or short; those whose stature falls below 1·5 m. (4 feet 11 inches) are usually termed pygmies, such as the Negrilloes of Central Africa, Andamanese, Semang of the Malay Peninsula and Sumatra, and Aetas of the Philippines, the three latter being usually grouped together as Negritos. The Negritos are characterised by having short ulotrichous (woolly) hair, very dark skin, moderate brachycephalism, and pygmy stature.

In a valuable essay, "The Negritos" (1899), Dr. A. B. Meyer critically examined the evidence of the distribution of this race, and, so far as New Guinea is concerned, stated that

> "A Negritic race side by side with the Papuan race nobody has been able to discover just because it does not exist, and it does not exist because the Papuan race, in spite of its variability, is on the one hand a uniform race, and on the other as good as identical with the Negritos" (p. 85).

When reviewing this essay in NATURE (September 7, 1899, p. 433), I stated that I was inclined to adopt the view that the various types exhibited by the natives of New Guinea "point to a crossing of different elements," and do not "simply reveal the variability of the race," as Dr. Meyer is inclined to believe. While agreeing with Dr. Meyer that the different conditions of existence (p. 80) in New Guinea probably have reacted on the physical characters of the natives (about which, however, we have extremely little precise information), we have now sufficient evidence to prove that the indigenous population, or true Papuans, has in places been modified by intrusions from elsewhere, and of late years data have been accumulating for the probability of the existence of a pygmy population, which may consist of dwarfed Papuans, or more probably represents a Negrito stock.

In *Globus* (Bd. xcvii., May 12, 1910, p. 286), Dr. O. Reche, in describing a journey up the Kaiserin-Augusta River, says that—

> "the population consists of three clearly distinguishable types or races, two of which have long, very narrow skulls, and one a short, broad skull. Inland from the river bank there seems to be in addition to these a pygmy-like people of small growth; at all events, I found in some of the villages situated on the upper river, among other skulls, some which were remarkably small and of a special type which must have been taken from enemies living farther inland."

Dr. Rudolf Pöch stayed from December, 1904, to February, 1905, in the Kai area, which lies inland from Finschafen, also in German New Guinea. In the *Mitt. aus den deutschen Schutzgebieten*, 1907, he writes (p. 225):—

> "During the first part of the time I remained chiefly on the Sattelberg itself, and observed and measured the numerous Kai frequenting the Mission station. In them I became acquainted with a mountain tribe entirely differing from the coast peoples previously visited. In fifty men I found the average height to be 152·5 cm. [5 ft.]; the skulls are, as a rule, mesocephalic to brachycephalic. Towards the coast (Jabim) dolichocephaly becomes more usual, and the type also changes. Very small people are not infrequently met among the Kai. I have already dealt with this remarkable phenomenon elsewhere,[1] and will not repeat myself here, but simply give the figures. Among 300 adult males I found 9 [*sic*] individuals, *i.e.* three per cent., below 146 cm. [4 ft. 9½ in.] in height. The statures measured were: 133 [4 ft. 4½ in.], 135, 138·2, 139, 139·1, 140, 143, 143·1, 143·2, 145·4, 145·5, 145·6 [4 ft. 9¾ in.]. Fig. 1 shows three of these small Kai people. For the present it cannot be determined whether this is merely a variation in stature or whether we have here survivals of an older smaller race not yet entirely merged into the Kai."

In the *Zeitschr. für Ethnol.*, 1907, p. 384, Dr. Pöch states that the median height of the Kai men is 152·5 cm. (5 feet), that 3 per cent. have a stature less than 140 cm. (4 feet 7 inches), and he goes on to say that on the north coast of British New Guinea and in Normanby Island he often came across very small

[1] *Sitzungsbericht der anth. Gesellschaft in Wien*, 1905, p. [40] ff.

people. This agrees with the experience of other travellers.

The English expedition has now discovered a pygmy population in Netherlands New Guinea, which presumably is allied to that inhabiting German New Guinea, and, judging from their stature, which is all we have to go upon, we may regard them as being very little, if at all, mixed with a Papuan element. From the descriptions and illustrations given of t pygmies from German New Guinea, there is little doubt that they are Negritos or Negritos crossed with Papuans, and doubtless the same will be found to be the case for those from Netherlands New Guinea.

Several travellers, such as Guppy and Ribbe, report the occurrence of very short people in the interior of the larger islands of the Bismarck Archipelago and of the Solomon Islands; but there is no evidence of a Negrito race still existing there as such, though the very short statures poin to a Negrito mixture. This conclusion is strengthened by the recent investigations of Dr. R. Thurnwald (*Zeitschr. für Ethnol.*). He refers to very small people in the mountainous interior of Bougainville, and he measured (p. 109) one man from Mari mountain with a stature of 1·39 m. (4 feet 6½ inches). These people speak a non-Melanesian language. He informs us that "In the people nowadays met with in these mountains we have before us, however, no unmixed race, but, besides representatives of a small, short-legged, broad-faced, short-skulled, more hairy, wide-nosed people, we encounter types recalling the Solomon Islanders. . . . Whether this mountain type is really dwarfish, as the legend goes, must remain undecided." Rascher states that the existence of dwarfs is commonly believed in New Britain. They are reported to live in clefts in the rocks and steal fruit from the gardens. They are so tiny that one stands on the shoulders of another, and so on, until they reach the fruit. The fruit is not thrown down, lest a noise would be made, but passed from hand to hand, until it reaches the chief, who is on the ground.

A. C. HADDON.

NOTES.

THE annual visitation of the Royal Observatory, Greenwich, will be held on Saturday, June 18.

AT the request of the Association of American Agricultural and Experiment Stations, Prof. J. C. Ewart, F.R.S., of Edinburgh, will give a course of lectures on the principles of breeding, at Ames, Iowa, in July.

M. DARBOUX, permanent secretary of the Paris Academy of Sciences, has been elected president of the Société de secours des Amis des Sciences, and M. Picard, president of the academy, has been elected vice-president of the society.

WITH the view of collecting material for the life of the late Prof. Alexander Agassiz, we are asked to state that anyone having any of his letters will confer a favour by sending them to his son, Mr. G. R. Agassiz, Museum of Comparative Zoology, Cambridge, Mass., U.S.A. The letters will be copied if desired, and the originals returned to the owner as soon as possible. If any persons are unwilling to part with the original letters, Mr. Agassiz would be glad if they would have copies made at his expense and send them to him at their convenience.

TO-DAY, at the University of Halle, the sixtieth birthday of Prof. W. Roux, the founder of the modern science of experimental embryology, is being celebrated. His numerous pupils and other admirers are expressing their appreciation of the magnificent work which he has accomplished for biological science in the manner customary in German universities, by the publication of a "Festschrift" and the presentation of an address. We do not doubt that we are expressing the feelings of all British biologists in offering to Prof. Roux our heartiest congratulations on this occasion, and in hoping that he will long continue to illuminate the study of animal development by his brilliant investigations.

A SEVERE earthquake occurred in the province of Avellino, east of Naples, at 3.5 a.m. on June 7. The disturbance caused considerable damage in Calitri—about fifty miles east of the town of Avellino—and Calabritto, another small mountain town. The shock was felt also in Naples, Benevento, and other places in southern Italy.

DR. DAVID STARR JORDAN, the president of Leland Stanford Junior University, California, will leave at the end of the academic year for Europe, where he will spend his first vacation for a quarter of a century. He expects to devote some of his time to the two-fold "holiday task" of promoting a zoological congress and assisting the peace movement.

AMERICA has lost a veteran science teacher by the death, in his seventy-fifth year, of Dr. G. F. Barker, who was professor of physics at the University of Pennsylvania from 1872 to 1900. He was appointed U.S. commissioner to the Electrical Exhibitions held at Paris in 1881 and at Philadelphia in 1884, and was a member of the jury on awards at the Columbian Exposition of 1893. In 1879 he was president of the American Association for the Advancement of Science. Prof. Barker was the first person to exhibit radium in America. The death is also announced of Dr. Franklin Clement Robinson, who had held the chair of chemistry at Bowdoin College, Maine, since 1874. He was president of the American Public Health Association in 1906. He was a frequent contributor to the American Chemical Journal, and had written text-books on the metals and qualitative analysis.

DURING the evening of June 2 Mr. C. S. Rolls travelled with a biplane from Dover to Sangatte, and, after circling over the semaphore station there, he returned to Dover, thus making the first double journey across the English Channel. The whole journey occupied 90 minutes, and was made at an average height of 800 feet. The Army experimental airship *Beta* made a successful flight from the balloon works at Farnborough to London and back during the night following June 3. On the journey to London the *Beta* travelled against a light wind from the north-east, and made a speed of 26 miles an hour. The greatest height attained during the flight was 1800 feet, and the mean altitude about 1000 feet. The engines of the airship are of 35 horse-power. The journey back from Southwark to Farnborough occupied 1h. 28m.

A BUST of Pasteur was unveiled in the garden of the École Normale Supérieure, Paris, on June 5. The *Morning Post* Paris correspondent reports that M. Lavisse, of the French Academy, made a speech in the name of the Normal School. He recalled the fact that Pasteur spent thirty-seven years in the famous college, and that his first laboratory consisted of two garrets in its buildings. He spoke of Pasteur's relentless warfare against the forces of nature hostile to man; it was only after five years' study that he discovered the remedy for rabies. Above all things he was an indefatigable worker. "He called the interval of night 'hours of waiting,' which always seemed to him slow to pass." His method was based on two principles: first, on curiosity; secondly, on the determination to discover. M. Lavisse dwelt on Pasteur's faith in science and the fascination of mystery to his mind.

FOLLOWING upon the invitation to the British Association from the Corporation of Portsmouth to hold the annual meeting at that town next year, a public meeting, presided over by the Mayor, Sir William Dupree, was held recently, at which the names of several influential and well-known gentlemen were submitted as vice-presidents. Two local secretaries were appointed in Mr. G. Hammond Etherton, Town Clerk, and Dr. A. Mearns Fraser, Medical Officer of Health, and various preliminaries in preparation for the reception of the association were decided upon. The Corporation of Portsmouth is looking forward to the meeting with considerable enthusiasm, and a large sum of money has been voted to the Mayor for next year in order to enable him to extend the hospitality of the town to members of the association. Owing to the generous dimensions of the Portsmouth Town Hall, the adjoining Technical Institute, and several other large buildings in the immediate vicinity, exceptional facilities will be available for the various meetings of sections, discussions, and public functions, and everything points to a very successful meeting.

MR. J. B. N. HENNESSEY, F.R.S., whose death was announced in NATURE of May 26, was formerly deputy surveyor-general in charge of the Trigonometrical Surveys, Survey of India. He was appointed to the Trigonometrical Survey so long ago as 1844, and for some years worked in most unhealthy parts of India. For the following particulars of his career we are indebted to an obituary notice in the *Times*. While on long leave in 1863–5, Mr. Hennessey entered Jesus College, Cambridge, and worked under Profs. Adams, Challis, and Walton to improve his mathematical knowledge. He obtained sanction not only to learn photo-zincography at the Ordnance Survey, Southampton, but also to take out on return to duty an extensive apparatus, and to establish the process at the survey headquarters at Dehra Dûn. He taught the process to other officers, and the result was that in a few years hundreds of thousands of good maps were printed in place of those made by uncertain pen transfers. Not less important was Mr. Hennessey's work in taking in hand the vast accumulations of material provided by the labours of Lambton, Everest, and Waugh in their unrivalled trigonometrical operations, and reducing them to order by suitable scientific methods. The final results were brought together in fourteen large quarto volumes distributed gratis by the Government of India to scientific departments and associations throughout the world. Mr. Hennessey took a leading share in other scientific operations in India, including the determination of the standard bar, comparison of standards, and the measurement of base lines. He built two of the Indian observatories, and for the Royal Society mapped the telluric lines of the solar spectrum, and made prolonged actinometric observations. He was elected a Fellow of the Royal Society in 1875.

SIR FRANCIS SEYMOUR HADEN, who died on June 1, at ninety-two years of age, was chiefly known to the present generation as an etcher, and it was for his artistic achievements that he was awarded his knighthood. In his earlier days, however, he took a very prominent and important part in the progress of the medical profession. He was educated at University College, London, and continued his studies at the medical schools of the Sorbonne, in Paris, and of Grenoble. He became a Fellow of the Royal College of Surgeons of England, and honorary surgeon to the Department of Science and Art. He worked actively on various international juries dealing with the progress of surgical science. His report for the International Exhibition of 1862 gave an exhaustive review of European surgery. This report was chiefly remarkable for his earnest advocacy of the operation of ovariotomy, which had been ill-received up to that time. He was an active vice-president of the Obstetrical Society of London, and was chiefly instrumental in founding the Royal Hospital for Incurables. His name became prominently known in connection with the subject of burial. His investigations into the condition of the graves in a London churchyard which was in the course of being converted into a public garden showed the state of affairs to be indescribably revolting. He invented the *papier-mâché* coffin, and was a strong advocate of earth burial. He was strongly opposed to cremation, principally on account of its legal difficulties.

WE regret to see the announcement of the death of Dr. Elizabeth Blackwell, in her ninetieth year. She was the first woman to become a fully qualified medical practitioner, and the first woman whose name was placed on the British Medical Register. She lived many years in the United States, but never became denationalised. At the age of twenty-six she obtained entrance into the medical school attached to the University of Geneva, in the State of New York, where her "carefully hoarded earnings" just sufficed for her maintenance during her period of study. The professors declined to take the responsibility of admitting her; they referred it to the students. These were unanimously favourable to her admission, and pledged themselves that no conduct of theirs should cause her annoyance. On the completion of her studies at Geneva, N.Y., her degree was conferred in the presence of a great crowd. She came to England in 1849, and found much prejudice in professional circles. On coming to London in 1850 Mr. Paget (afterwards Sir James Paget), then Dean of St. Bartholomew's Hospital, gave her leave to attend the hospital as a student, and she was admitted to every part of the hospital except the department for the diseases of women! She studied for a year in La Maternité Hospital in Paris, where she had the misfortune to contract purulent ophthalmia from one of her patients. It cost her six months' illness and the sight of one eye, and ended her hope of making surgery her speciality. In 1851 she returned to America, and began practice in partnership with her sister Emily. She felt keenly the want of hospital practice, and established a dispensary, from which, in the course of time, there grew the New York Infirmary for Women, which was a women's hospital officered by women. On re-visiting England she had her name placed on the English register, and immediately afterwards an Act of Parliament was passed excluding the owners of foreign degrees from the register. In London she lectured on medicine as a profession for women. Among her audience was Miss Elizabeth Garrett (now Mrs. Garrett Anderson, M.D.). On the outbreak of the Civil War in the United States Dr. Blackwell returned to New York. She held the chair of hygiene in the Medical School for Women in New York, which was then established, and organised the services of sanitary visitors in the slums of New York in anticipation of modern developments. She returned to England, and had the "pleasure and privilege to encourage Dr. Anderson and Dr. Sophia Jex Blake in their pioneer enterprise in England." When the New Hospital for Women was founded she was on the consulting staff, and later, when the London School of Medicine for Women was opened, she held the chair of gynæcology until her health began to fail.

THE Christiania correspondent of the *Morning Post* contributes to the issue of our contemporary for June 6 some interesting particulars of Captain Amundsen's expedition to north polar regions, which started on that day. The

journey will be made in the *Fram*, which is thus now on her third polar expedition. Among the problems which Captain Amundsen hopes to solve are the extent, depth, and character of the polar basin. He proposes to measure exactly the temperature and salinity of the streams of the polar basin, and to work at tide gauging, ice screw measurement, and wind speed. Captain Amundsen is prepared for seven years' absence. Once across the Atlantic, he will return in August to Christiansand to fetch Eskimo dogs. A few days later the *Fram* will shape its course from Cape Horn to San Francisco, where coal and provisions will be taken in. In June, 1911, a start will be made for Point Barrow. The *Fram* will follow the moving ice over the polar basin, and it is hoped that the actual Pole or its near neighbourhood will be crossed. The object of the expedition is purely scientific. Captain Amundsen expects to reach open water between Greenland and Spitsbergen in 1915 or 1916.

In connection with the annual grant voted by Parliament in aid of scientific investigations concerning the causes and processes of disease, Mr. Burns, the President of the Local Government Board, has authorised the following special researches. (1) A continuation of an investigation into protracted and recurrent infection in enteric fever, by Dr. Theodore Thomson, Medical Inspector of the Board, in conjunction with Dr. Ledingham, of the Lister Institute. (2) A continuation of an investigation into protracted and recurrent infection in diphtheria, by Dr. Theodore Thomson and Dr. C. J. Thomas. (3) A continuation of an investigation into flies as carriers of infection, by Dr. Monckton Copeman, Medical Inspector of the Board, in conjunction with Dr. Graham Smith and Mr. Merriman, of the University of Cambridge, Dr. Nicholl, of the Lister Institute, and Dr. Bernstein, of the Bacteriological Laboratory, Westminster Hospital. (4) A continuation of an investigation on the injurious gases evolved during artificial illumination, by Dr. J. Wade, of Guy's Hospital. (5) A preliminary inquiry into the relationship of certain special types of bacteria to the diarrhœa of infants, by Dr. C. J. Lewis, of Birmingham, Dr. Sheila M. Ross, of Manchester, Dr. Thomas Orr, of Shrewsbury, and Dr. R. A. O'Brien, of the Lister Institute.

The summary of the weather for spring, comprising the thirteen weeks in March, April, and May, just issued by the Meteorological Office, shows that the mean temperature for the period was nowhere very different from the average. The north-east and east of England were the only districts where the thermometer in the shade exceeded 80°; the highest temperature was 83° in the east of England, and the lowest 20° in the north of Scotland and in the south-west of England. The aggregate rainfall for the period varied in different parts of the United Kingdom, the total measurement being in excess of the average in the north and east of Scotland, in the east, south-east, and north-west of England, whilst in all other districts there was a deficiency. With the exception of the north of Scotland, where there was an excess of 3 inches, the difference from the average was nowhere large. The number of rainy days was in excess of the average in all districts except in the east of Scotland and in the Channel Islands. The largest measurement of rain was 12·91 inches in the north of Scotland, which fell on 60 days; the least measurement was 4·87 inches, in the Midland counties, which fell on 47 days. The duration of bright sunshine was nowhere very different from the average; the greatest excess was 28 hours in the south-west of England, and the greatest deficiency 40 hours in the south of Ireland. At Greenwich the mean temperature for the three months was 0·3° above the average, the rainfall was 0·93 inch more than the normal which fell on 45 days, and the duration of bright sunshine was 66 hours more than usual.

In the spring of 1909 the board of governors of the Camp-Fire Club of America decided that the time was ripe for instituting an active campaign for the protection of wild life throughout the United States. With this object in view a legislative committee, consisting of twelve lawyers and a zoologist, was formed. Special attention has been directed to the preservation of the grey squirrel and the fur seal, and to convincing the authorities of the desirability of placing all migratory birds under the control of the Federal Government. We have received a report showing the steps which the club has taken in the direction of saving the fur seal. For fully ten years the fortunes of the Alaskan fur seal, which once furnished a valuable industry, have been rapidly declining. Last November the club decided to appeal to Congress, the President, and the Cabinet for the adoption of a policy that would not only save the seals from further annihilation, but also rehabilitate an industry that, instead of yielding an income, now inflicts an annual loss. The club asked for three things:—no renewal of the lease for killing seals on the Pribilov Islands for commercial purposes; a ten-year close season for the seals; and treaties with Canada, Japan, and Russia for the total suppression of the industry of killing seals at sea. On April 21 a Bill securing some of these ends was signed by the President after having passed both houses of Congress. It is hoped that treaties with the other countries interested will be arranged. It may be predicted that the seal herds, now reduced from 4,000,000 to about 60,000, will have a much needed rest, and that if the killing of seals at sea, called "pelagic sealing," can be stopped by treaty, in ten years' time the herds will breed up to their original strength.

In the May number of *Man*, Mr. N. W. Thomas commences a series of notes on his recent work in Nigeria. In the present instalment he describes one phase of native decorative art, that to be seen on the walls of houses, secular or religious. Human figures, except that of a mischievous imp, Esu, are rare; but numerous animal forms are depicted, and these, particularly when found on the walls of shrines, seem to subserve a magical purpose.

Many suggestions have been made to explain the term Rom or Romani applied to the Gypsy race. The last is that of Mr. Leo Winer in the Journal of the Gypsy Lore Society for April. He points out that the name is coincident with Christian countries only, Europe, America, and Armenia. From the law of Charlemagne it appears that the Gypsies pretended to be pilgrims, and their name was usually connected with that of Rome. Ultimately, he thinks, it originated in the Greek Erimites, "a hermit"; and that when the popular etymology connected all hermits and pilgrims with Rome, all other terms designating pilgrims were so transformed as to bring them into keeping with this new conception.

Mr. C. L. Wragge announces in the *Auckland Standard* of March 7 the discovery at Bay of Islands of a series of engraved rocks, which he supposes to be of enormous antiquity and to be connected with the monoliths of Easter Island, which are a puzzle to antiquaries. Another correspondent, however, states that there are rocks between Whangaroa and Bay of Islands regarding which the Maoris have traditions dating back to the days of Captain Cook, and that a Government geologist who examined them has found that they are naturally decayed basaltic columns.

Mr. Wragge declines at present to give details of his discoveries, and until these are published it is unsafe to venture any opinion in regard to them.

THE Entomological Research Committee for Tropical Africa, appointed by the Colonial Office, has issued the first number of the Bulletin of Entomological Research, on which the committee and the editor (Mr. G. A. K. Marshall) may be warmly congratulated. Nearly half the number is occupied by Mr. W. Wesché's descriptions of the larval and pupal stages of West African Culicidæ, a most useful paper, giving characters for the identification of the larvæ and pupæ of twenty-nine species of mosquitoes, illustrated by seven excellent plates. The collector of the specimens, Dr. W. M. Graham, adds valuable field-notes, and the facts recorded are important alike to the entomologist and the medical man. Dr. Drake-Brockman contributes a short paper on blood-sucking Diptera from Abyssinia, Mr. R. Newstead writes on Coccidæ from Uganda, and Mr. E. E. Austen describes new African fruit-flies and a new Cordylobia—a muscoid genus the larvæ of which are subcutaneous parasites. In a short preface Mr. A. E. Shipley discusses the general work of the committee, mentioning that two experienced entomologists have been sent out for the purpose of research and instruction—Mr. S. A. Neave to Nyasaland and Mr. J. J. Simpson to Nigeria.

THE following interesting communication has reached us from Mr. Christopher Morse, of 3 Gladstone Road, Deal:—"All your readers have, of course, noticed a cat washing its face, but I expect very few have seen the same operation being carried on by a caterpillar. I observed one engaged in this process yesterday, and thought it a matter of interest. The creature was a smooth-bodied Noctuid larva feeding on grass." Of course, it is well known that butterflies often drink up water eagerly, and even bathe in it; while, as regards caterpillars, the drinker moth (*Cosmotriche potatoria*) derives its name from the caterpillars' fondness for water, often plunging their heads into the drops of water on the grass on which they feed (compare Tutt's "British Lepidoptera," iii., p. 167). Mr. Tutt, to whom we have submitted Mr. Morse's communication, thinks that in most cases the true legs of caterpillars would be too short to be used for washing the face (though in some exceptional cases these are long), and adds, "Of course, butterflies do it, and are well provided sometimes with hooks for the purpose, especially for cleaning their antennæ. They often have the appearance you name when thus employed. I think I noticed it particularly in *Rusticus betulae* and certainly some other species." It would be of interest if Mr. Morse could continue his observations, and especially identify the species of caterpillar which he noticed washing its face.

A NEW geological society, already very well supported, styled the Geologische Vereinigung, has been established at Frankfurt am Main, somewhat on the lines of the English Geologists' Association. While international in character, it aims especially at providing summaries of important geological work, which shall reach the increasing number of teachers of geology. By organising excursions, it hopes to come into touch with those who have charge of classes in schools. The subscription is only 10 marks annually, and each member will receive the society's journal, the *Geologische Rundschau*, the first number of which, published on April 26, is now before us. As the six numbers of this journal cost 12 marks a year (Leipzig: W. Engelmann), it is clearly profitable for readers also to become members of the society. The journal is edited by Drs. G. Steinmann, W. Salomon, and O. Wilckens, and is another sign of the activity of already busy men. Two original papers appear in this number which might easily have found a place in the older journals; but the signed reviews of geological knowledge are the main feature, and rank with those on current subjects in the English quarterly, *Science Progress*. The professional worker can, of course, rely on Keilhack's *Geologisches Zentralblatt*, which notices practically everything. The *Rundschau* is at once more literary and more limited in character, and has a critical usefulness of its own.

PROF. E. A. MARTEL makes a vigorous contribution to the controversy regarding the existence of *Grundwasser*, or a water table supported by an impermeable stratum, in the Karst region, in a recent number of *La Géographie*, p. 126. Prof. Martel considers that definite proof of the non-existence of such an underground reservoir feeding the subterranean rivers of the Karst is now available, and that the question is finally settled.

IN NATURE of May 12 (p. 319) reference was made to the important additions made to the monthly meteorological charts of the North Atlantic issued by the Meteorological Committee by the publication of current daily weather charts of barometrical pressure, temperature, and wind, compiled from reports by radio-telegraphy and through other sources. The value of these data is still further enhanced in the chart for June by a short discussion of the predominant features indicated by the maps. These show, *e.g.*, that from May 5–11 inclusive an area of high barometric pressure occupied a considerable portion of the Atlantic, and, in connection with the low pressure existing over these islands and Europe, was responsible for the abnormally cold and squally weather then experienced over this country. At the close of the period the advance of an anticyclone, shown to be moving from Barents Sea to Scandinavia, and the shifting of continental disturbances towards north-west, tended to modify those conditions. The unique reports of ice received by the committee show that icebergs were being sighted with increasing frequency between 42° and 52° N. latitude, and 39° and 52° W. longitude.

IN two papers contributed to the Proceedings of the American Academy of Arts and Sciences (xlv., 8, 9) Mr. Harvey F. Davies discusses the applicability of the law of corresponding states to the Joule-Thomson effect in water and carbon dioxide, with special reference to temperatures above 100° C., and gives a new formula for the total heat of saturated steam, which holds good within limits of error between 65° and 190° C. This formula really represents the difference of the total heat from that at 100° C., the value of which is assumed from previous work.

AT the 1908 Mathematical Congress at Rome Profs. C. Burali Forti and R. Marcolongo were appointed to draw up a report on the various notations of vector analysis with a view to unification. A critical review of their publications on this subject is contributed to the May Bulletin of the American Mathematical Society. It appears that the writers propose to avoid the use of the familiar "nabla," observing that this operator has different meanings as applied to scalar and vector functions; but this and the other points raised in the paper do not admit of adequate discussion in the present brief reference. The subject is of interest both to mathematicians and physicists, but it is clear from Prof. E. B. Wilson's reviews that much remains before a final system can be adopted.

IT is now more than twenty years since Profs. Hertz and Hallwachs showed that when a metal plate charged with negative electricity and insulated is illuminated by ultra-violet light it loses its charge, and the rate of loss under standard conditions decreases with time. To the latter effect the title "photo-electric fatigue" was given. It was thought by some to be due to oxidation of the surface, by others to the direct action of the impinging light. Although Hallwachs disproved both these views six years ago, a considerable amount of work has been done recently by experimenters, who apparently still approach the subject from the point of view of the direct action of light, *e.g.* Dr. Aigner, of Vienna, Dr. Allen, of London, and, according to the *Résumé des Communications* of the Société française de Physique for May 6, M. Eugène Bloch, of Paris. All doubt as to the possibility of the incident light being the direct cause of the fatigue appears now removed by the experiments of Dr. Ullmann (*Annalen der Physik*, 1910, No. 6), who has traced it in the case of both copper and zinc to the formation of ozone in the air surrounding the plate by the passage of the light through it.

MESSRS. F. DAVIDSON AND CO., 29 Great Portland Street, W., have given us an opportunity of examining the thermo-generator—a new form of the old thermopile—of which they are the agents for England and the colonies. The thermo-electromotive-force is produced by copper-antimony couples, fifty of these couples being connected in series. Each couple consists of a vertical, hollow, cylindrical copper tube, to the top of which is soldered a flat strip of antimony, which passes horizontally inwards and then downwards around a block of a porcelain-like substance. The copper tubes are arranged in two parallel rows of twenty-five each, and the antimony strips approach one another at the top. These strips are heated by means of a horizontal burner running the whole length of the apparatus immediately beneath the antimony strips. Gas or methylated spirit vapour is used for producing a number of jets, and the heat is retained in the white blocks which are in close contact with the antimony strips. An electromotive force of about 4 volts is obtained, and this is sufficient to illuminate a small lamp for medical or other purposes, or to run a small model lathe or fan. A total current of 3 amperes can be obtained through a galvanometer provided there be no appreciable external resistance. Less than one minute is required to heat the apparatus sufficiently to give its full yield. A slight deposit of oxide forms upon the surface of the antimony in the course of time, and requires to be removed by running a stick lightly between the rows while the apparatus is hot; otherwise it appears to give no trouble whatever. The thermo-generator may be used for hours continuously, and takes the place of dry batteries for running small illuminating lamps.

SIR WILLIAM WHITE contributes an interesting article on marine steam turbines to the *Engineer* for May 27. In reference to the excessive complication which has been charged against the Parsons type, and the greater simplicity credited in some quarters to the German arrangements, the author points out that, after large experience in the great Cunarders and in swift armoured cruisers, no serious practical difficulty has been experienced with Parsons turbines. Their advantages in regard to economy of steam consumption, greater ease of handling the engines, and smaller individual weights to be lifted when opening out turbines, have been proved to be considerable. Sir William is convinced that, on the whole, the Parsons type of turbine still maintains its superiority for marine purposes; but he is also of opinion that neither it nor any other type will secure universal adoption or be absolutely the best suited for all the varied cases which occur in practice.

AN account of the trials of the Brazilian battleship *São Paulo* appears in *Engineering* for June 3. This ship is the product of Sir W. G. Armstrong, Whitworth and Co. and Messrs. Vickers, Sons and Maxim. The full speed on trial—21·623 knots—was realised with 28,645 indicated horse-power, while the guarantee was for 21 knots. Of special interest are the gunnery trials, which took place on June 1 off the Clyde. A complete broadside of eleven 4·7-inch guns was fired simultaneously with a broadside of ten 12-inch guns, establishing a record in the way of broadsides. Admiral Bacellar, the president of the Brazilian Naval Commission, pressed the firing key which fired this tremendous broadside; every one of the twenty-one guns responded. Excellent practice was also made at a target. Another important feature was the firing of two 12-inch guns in an upper turret, laid horizontally and fore-and-aft directly over a lower turret. Several Brazilian and two British officers remained in the lower turret during this test, and were able to state that they were not inconvenienced by any concussion. The ship is fitted with an electrical firing system, which renders it quite impossible to fire any gun in a position which is dangerous to any other gun or any ship's fitting.

WE have received from Mr. E. Merck, of Darmstadt (and 16 Jewry Street, E.C.), his catalogue of chemical preparations for April, 1910. The list is remarkably complete, and it would be difficult to name any preparation required for general laboratory use which is not included. Many additions have been made to the last list, especially in therapeutical and bacteriological preparations.

THE current number of the Bulletin of the Société d'Encouragement pour l'Industrie nationale (April, 1910) contains a very readable and interesting paper by Capt. Nicolardot on the rare earths and incandescent lighting. The pioneer work of Auer is described in detail, together with the history of the search for ceria and thoria, and an account given, with illustrations from photographs, of the manufacture of a mantle, starting with the quarrying of the monazite sand, and finishing with the burning off and fixing the mantle. The chief types of burner are also figured and described, including the latest forms of inverted burner.

A CATALOGUE of the first eight hundred negatives made by the Geological Survey to illustrate subjects of geological interest, and of which prints or lantern slides are supplied at a fixed tariff, has just been published by the Board of Agriculture and Fisheries. The districts included lie chiefly in Cornwall and Devonshire, South Wales, and the counties of Cardiganshire, Derbyshire, Leicestershire, and Nottinghamshire. Copies of the catalogue may be obtained from any agents for the sale of Ordnance Survey maps, or directly or through any bookseller from the Ordnance Survey office, Southampton, price 6*d.* each.

MESSRS. HEYNES MATHEW, LTD., of Cape Town, have sent us a copy of a very complete illustrated catalogue of scientific apparatus, pure chemicals, and reagents. The list shows strikingly the improvement which has taken place in recent years in the supply of apparatus and material for scientific work in distant parts of the Empire. Messrs. Mathew have established a depôt in Cape Town where a full range of laboratory requisites can be obtained from stock. That they find it worth while to do this is suggestive testimony to the growth of science teaching in South African schools and colleges.

MESSRS. HARPER AND BROTHERS announce for publication during June "The Science of Happiness," Dr. Henry S. Williams; "The Elements: Speculations as to their Nature and Origin," Sir William A. Tilden, F.R.S.; "Religion and Art in Ancient Greece," Prof. E. A. Gardner; "Electric Trains," H. M. Hobart; and "Continuous Current Machine Design," W. Cramp.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JUNE:—

June 9. 5h. 3m. Neptune in conjunction with the Moon (Neptune 4° 40′ S.).
,, 16h. 16m. Mars in conjunction with the Moon (Mars 3° 6′ S.).
15. 1h. 56m. Jupiter in conjunction with the Moon (Jupiter 3° 9′ S.).
17. 2h. 0m. Mars at greatest heliocentric latitude N.
19. 1h. 0m. Venus at greatest heliocentric latitude S.
,, 14h. 0m. Mercury at greatest elongation (22° 43′ W.).
21. 19h. 49m. Sun enters sign of Cancer.
24. 3h. 58m. Uranus in conjunction with the Moon (Uranus 3° 50′ N.).
27. 17h. 0m. Jupiter at quadrature to the Sun.

HALLEY'S COMET.—With clear intervals between clouds during the past week, Halley's comet has not been a difficult naked-eye object for anyone who knew its position approximately.

Mr. Langton Cole reports that it was well seen at Sutton, Surrey, on May 22 and 31, and on the former occasion a short tail was visible to the naked eye; he estimates that on May 31 the comet was about as bright as a star of the third magnitude. At Gunnersbury on June 1 a naked-eye observation revealed the comet as early as 9·15 p.m., when it was apparently fainter than η Leonis (mag. 3·6).

A number of interesting notes on observations of the comet at various European observatories appears in Nos. 4413 and 4414 of the *Astronomische Nachrichten*. In the earlier number Dr. Franz records that on May 13, at the Breslau Observatory, the comet did not appear to be so bright as on earlier days; a variability of brightness is suggested, and it will be interesting to see if this is confirmed by other observers.

In No. 4414 many observers record that no trace of the comet could be detected on the solar disc during the time of transit. Dr. Wolf directs attention to the Bishop's rings surrounding the sun and moon on May 19, and suggests that they were more intense than if due solely to atmospheric effects. Meteors and auroræ were looked for at the Königstuhl Observatory, but were not seen.

Polariscope observations at several observatories gave similarly negative results. Prof. Franz records that on May 19 two bright arcs of light were seen in the north-west at Breslau, and may have been due to the comet. According to a telegram from Prof. Sykora, the projection of the comet on the sun was observed at Tashkent at 21h. on May 18. An increased intensity of the twilight at Odessa on May 18 is ascribed by Prof. Donitch as possibly due to cometary matter. Herr Archenhold reports a second comet-like object 1° south of Halley's comet at 9h. 30m. (Berlin M.T.) on May 22, but the observation is not confirmed by special reports from Bergedorf and Heidelberg. At Sonnwendstein, where, at an altitude of 1523 metres, several German observers had gathered for observations of the comet, the tail was observed from May 12 to 19. During this period its apparent length increased from 32° to 140°; its apparent position was the same on May 19 as on May 18. Dr. Hartmann, who was one of the party at Sonnwendstein, submits a special report dealing with the various aspects of the tail, and directs attention to the yellowish colour of the nucleus on May 20.

A number of notes dealing with observations of the comet were read at the meeting of the Paris Academy of Sciences on May 30, and appear in No. 22 of the *Comptes rendus*.

M. E. Marchand reports that observations made on the Pic du Midi and at Bagnères-de-Bigorre were badly interrupted by clouds. No striking special phenomena were witnessed on May 18 and 19, but it was noted that the dawn was especially bright and the sky tinted, as though there were an exceptional amount of dust in the atmosphere; the appearance is likened to that which was observed in 1902 and 1903 after the Martinique eruption. The unusual halos around the sun and moon support this view, as do also the observations of solar radiation subsequently made at the Pic du Midi station. Observations of the sun and of terrestrial magnetic and electrical effects revealed no abnormal condition attributable to the presence of the comet.

M. Popoff reports on the observations made at the Sofia Observatory (Bulgaria), and could not detect the comet projected on the sun's disc.

Further observations made at Athens are dealt with by M. Eginitis, who describes the forms of the nucleus and tail on May 18–20. No extraordinary atmospheric effects were recorded, and only two meteors were seen during the night of May 18. A splendid bolide was observed in Thessaly at 13h. 15m. (M.T. Athens), but is not connected with the comet. Between 7 p.m. and 8 p.m. on May 20 the comet's tail was seen with the equatorial, and was still apparently directed towards the west. The curvature was so great that the earth could not pass through the tail before the night of May 20.

MM. J. Baillaud and G. Demetresco describe photographs taken at the Paris Observatory on May 23, 24, and 28. Only very short exposures (thirty seconds to five minutes) were possible, and the tail is not shown. The nucleus is shown as an ellipse, the axes being 18″ and 14″ long. On May 23 this ellipse, otherwise uniformly dense, showed a condensation of 6″ diameter at its N.E. extremity, but this had disappeared on May 24. The nebulosity surrounding the nucleus showed changes from one day to another, and on May 24 recalled that surrounding the Pleiades star Maia.

THE SPECTROSCOPIC BINARY β AURIGÆ.—In No. 22, vol. i., of the Publications of the Allegheny Observatory Mr. R. H. Baker discusses at length the observations of β Aurigæ as a spectroscopic binary. Since the duplex character of this star was announced by Miss Maury in 1889, many observations have been made at Harvard, Potsdam, Pulkowa, and Allegheny in an endeavour to remove certain apparent anomalies from the observed orbit. Assuming that the period was 3·9838 days, Miss Maury found, from the discussion of some 200 plates taken at Harvard, that there was an apparent reciprocal variation of intensity between the two components, but Mr. Baker now shows that this is not so; owing to the assumed period being slightly in error, the two components were alternately misidentified. The discussion of the Allegheny observations with those previously published shows that the orbit is practically circular ($e = 0{\cdot}0 \pm 0{\cdot}0057$), and that there is probably a slight variation in the period, amounting to 0·000010 day, or 0·86s. per annum. The period now given is 3·960027 days + $0{\cdot}000010t \pm 0{\cdot}000004$ days, the present elements being referred to the epoch 1905 September 11·7324, G.M.T.

An investigation of the secondary oscillation found by some observers is not confirmed, nor was Mr. Baker able to find evidence for the dispersion of light during its passage through space from β Aurigæ to the earth.

THE BRIGHTNESS OF THE SKY.—Commenting upon M. Fabry's recent determination of the brightness of the sky, Mr. Gavin Burns brings together, in No. 422 of the *Observatory*, the results obtained by various observers; they are as follows, each value being the brightness of one square degree of non-galactic sky expressed in terms of a fifth-magnitude star:—Newcomb, 1·15; Burns, 2; Townley, 2; Yntema, 5·76; Fabry, 1·46. Mr. Burns remarks that if, as seems probable, the brightness is a variable quantity, the results obtained by different observers are bound to vary considerably *inter se*.

THE ACCURACY OF RADIAL-VELOCITY DETERMINATIONS.—In No. 4, vol. xxxi., of the *Astrophysical Journal* Prof. Frost issues a timely warning against attributing too great an accuracy to present-day determination of radial velocities. A tabulation of twelve values recently obtained by various observers for Arcturus, a simple problem, shows that they vary between −3·7 km. and −6·6 km., whilst the extreme range for any one observer varies from 1·2 km. to 4·5 km. Prof. Frost questions if we know the radial velocity of any star to the nearest kilometre.

MARS DURING THE RECENT OPPOSITION.

So far as can be judged from those yet published, the results accruing from the observations of Mars made during the opposition of 1909 are, in a sense, disappointing. The favourable conditions of the opposition, as regards the altitude and the apparent diameter of the planet, engendered the hope, in many minds, that most of the outstanding problems in the Martian enigma would be solved more or less definitely. Yet the camps into which areographers are divided are still at issue, and the differences appear to be at least as sharply accentuated as before. To the one side the *canali* are still continuous channels, set out with a rectitude more or less geometrical, and having "oases" around the reservoirs upon which they appear to converge; but to the opposition these clearly cut channels are but alignments of dark spots merged into apparent continuity by a physiological illusion.

However, many of the larger features are beyond dispute, and many valuable observations of their appearances and changes have been made since July last. One very remarkable phenomenon was noted, and has been discussed by practically every observer, viz. the apparent veiling of the planet's surface during the earlier part of the opposition.

In June, July, and August the details, and even some of the larger features, were not discernible; there was a general lack of contrast between the light and the dark areas. Thus M. Antoniadi, using the 24-cm. refractor at Juvisy, reported (*Bull. de la Soc. astron. de France*, September, 1909, p. 386) that, on August 11 and 12, the surface of Mars was hardly recognisable, and it was with great difficulty that he assured himself that it was the region of the Mer de Sablier on which he was looking. M. Jarry Desloges also emphasised the unusual appearance of the planet, which he illustrated (*Comptes rendus*, vol. cxlix., No. 17, p. 666) by two charts (Fig. 1), on one of which M. Fournier had recorded the features seen during June, July, and part of August, whilst the other showed the increased contrast of the same features later in August and during September.

It was not until the beginning of the latter month that the accustomed contrasts and details completely reasserted themselves and permitted the work of confirmation and discovery to proceed normally.

M. Antoniadi suggests that this masking effect was caused by the interposition of light, cirrus cloud in the planet's atmosphere, such cloud being filmy in structure and yellowish in colour, so that it reduced the usual contrasts without totally obscuring the features. This is in accordance with Prof. W. H. Pickering's observations in 1895, when he found that his photographs suggested some such yellow screen.

The importance of the acknowledged existence of clouds must not be lost sight of in the discussion as to the aqueous

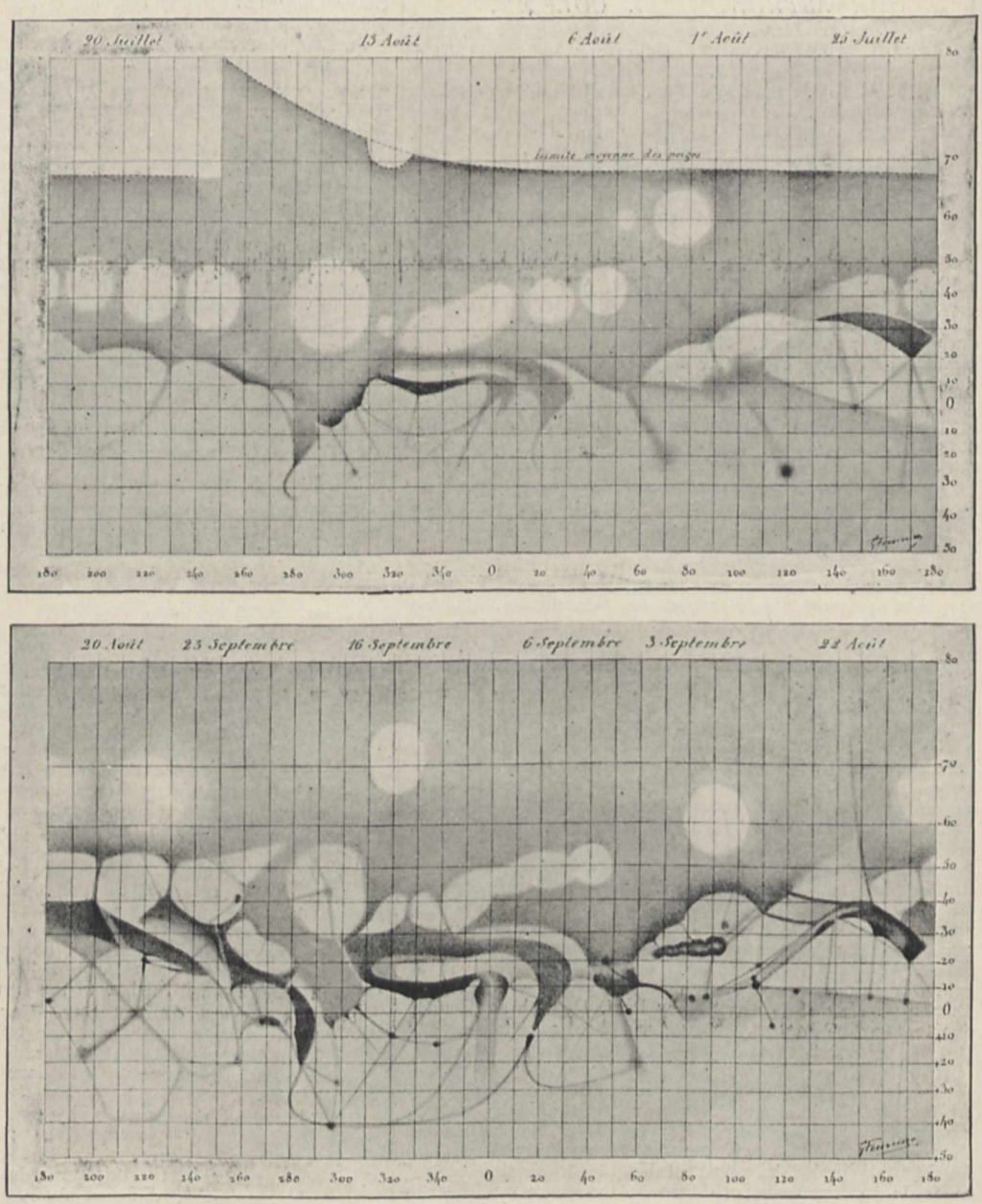

FIG. 1.—Comparison of the appearance of the surface of Mars on different dates in 1909.

contents of the planetary atmosphere. The observations of Beer and Mädler, Secchi, Lockyer, Denning and others, of apparent changes caused by clouds have been generally accepted as strong evidence for the existence of the cloud-producing compound of our own atmosphere.

Turning now to the actual observations of features, and their modifications, during the recent opposition, we find

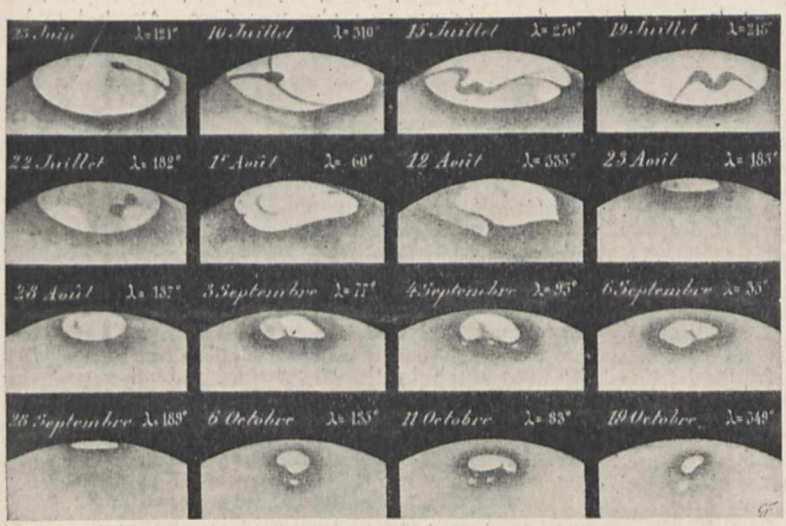

FIG. 2.—Changes in the southern polar cap of Mars.

that the diminution and transfiguration of the southern polar cap was recognised quite early in the season.

M. Jarry Desloges, observing with a 29-cm. refractor at Massegros (Lozère), recorded (*Astronomische Nachrichten*, No. 4340) a dark cutting—shown on the first drawing in Fig. 2—in longitude 190° on June 20–23, and at the Revard station Lowell's crevasse in long. 350° was easily seen, cutting right through the cap. A large and probably indications of inequalities in the relief of the polar areas.

M. R. Jonckheere, observing with a 14-inch refractor at the Hem Observatory (Roubaix), also directs attention to this feature. On August 12 he observed (*Astronomische Nachrichten*, No. 4354, p. 159) a "land" become detached from the cap, although itself still covered with ice, and identified it as Schiaparelli's Novissima Thyle. On these grounds he suggests (*Comptes rendus*, No. 22, vol. cxlix., p. 970) that the "lands" remain covered with ice much longer than do the "seas," thus producing apparently irregular variations in the measured diameters of the cap; when, by the planet's rotation, such an ice-covered "land" is brought to the extremity of the apparent ellipse, the major axis will appear to be longer than when the "land" is carried further round. M. Jonckheere's measures of the cap show the following progression:—July 16, 32° (Martian arc); August 15, 18°; September 17, 9·3°; October 18, 11·8°; November 18, 10·2°. On September 2, Argyre II. was seen, and its position determined as long. 60°, lat. −80°; this is nearer the pole than it has hitherto been placed, and M. Jonckheere deduces, generally, that the latitudes ascribed to the polar lands are usually too small. Another mass was seen, on the same evening, in long. 120°, lat. −84°, which apparently had not been recorded before, and to this M. Jonckheere gives the name "Stella," on account of its brightness. "Thaumas" is the name given to another new land which suddenly appeared in the Aonius Sinus, touching Thaumasia, long. 100°, lat. −43°.

According to Prof. Lowell (*Astronomische Nachrichten*, No. 4371, p. 47), the first snowfall of the season in the Martian antarctic region took place on November 17—about two months after the summer solstice—when two

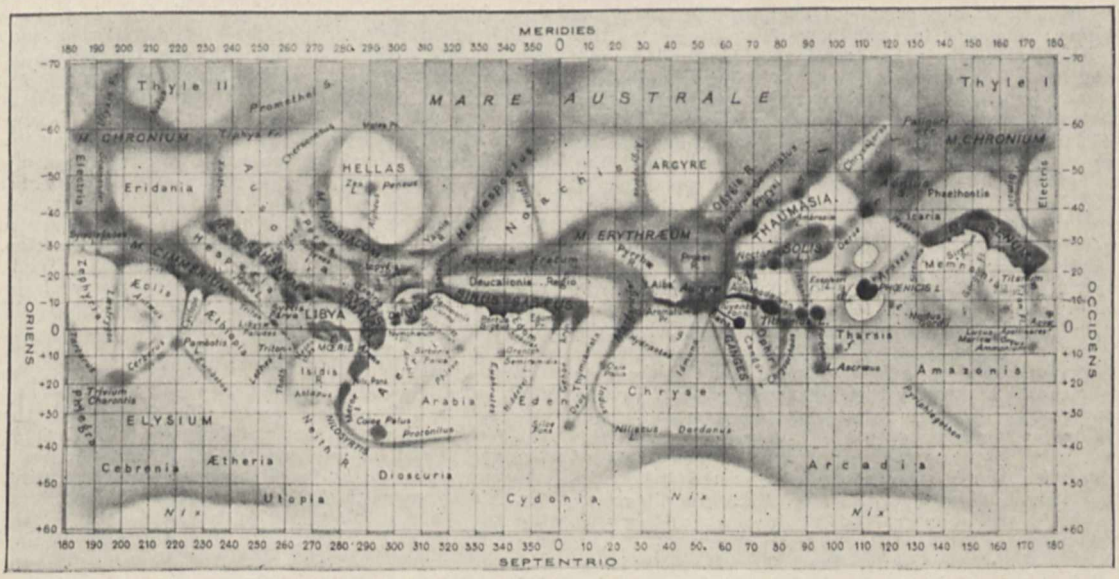

FIG. 3.—Chart of Mars as observed by M. Antoniadi.

brilliant spot near the edge of the cap, in long. 30°, was also seen on July 4. The progressive diminution in size and the changes in form, as observed by M. G. Fournier at the Revard Observatory, are shown in Fig. 2, reproduced from a note by M. Desloges (*Comptes rendus*, No. 26, vol. cxlix., p. 1347), who remarks on the increased rate of diminution about August 15, and suggests that the variations in detail and the time of disappearance are patches in latitude −65° were seen in longitudes 100° and 190°.

M. Antoniadi also made observations, at the invitation of M. Deslandres, with the 33-inch refractor of the Meudon Observatory, the third largest refractor in general use. He observed on thirty nights between September 20 and November 9, but on about five nights only were the atmospheric conditions really good. The results of his

observations are shown in the chart here reproduced (*Comptes rendus*, vol. cxlix., No. 20, p. 837), Fig. 3. The most noticeable change since 1907 was in the Syrtis Major, which he found had returned to its form of 1864 and 1877. The Lac Mœris, too, had reappeared as a large, indefinite dark patch, and a multiple island was seen in the eastern part of the Mare Cimmerium.

The Solis Lacus region also presented many striking features, and, among others, M. J. Comas Sola devoted special attention to it (*Bull. de la Soc. astron. de France*, November, 1909, p. 497). In his opinion, the recent opposition "peut être considérée comme la déroute définitive du *réseaux géométrique* des canaux."

It is in regard to these all-important "canali" that the battle of observers rages most intensely. Among European observers, at least, there appears to be consensus of opinion that the term should be used in a more restricted sense, or should only be employed as a generic term embracing several species. There is too great a diversity between the broad, persistent, half-tone patches and the narrow, evanescent streaks, glimpsed for one fraction of a second to be lost the next, for them all to be grouped under the one designation. M. Antoniadi strongly insists on this point (*Comptes rendus*, vol. cxlix., No. 20, p. 836), and classifies eight varieties. Even then he does not include the fugitive right lines, visible only for the fraction of a second, which he considers may be illusions; but he very definitely negatives the existence of any geometrical *réseaux*, of which he finds no trace. At intervals of exceptionally good seeing he sees considerable structure, visible for several consecutive seconds, on the continental areas, and this he describes as "a grey irregular marbling, complex and cloudy, such as only an artist could render."

The Rev. T. E. R. Phillips, observing at Ashtead with his 12-inch Calver reflector, was led to substantially the same conclusions (the *Observatory*, No. 416, p. 463) as M. Antoniadi regarding the canals.

The necessity for the classification of these features is also advanced by M. Desloges, who suggests (*Comptes rendus*, vol. cxlix., No. 17, p. 664) three species, and also directs attention to numerous changes observed during this opposition. The fine *canaux* of his third class were apparently the most affected by the seasonal changes, and M. Desloges finds it difficult to disbelieve their objective existence; one argument advanced in its favour is that they all appear to start in small gulfs, just as the broad, indubitable, dark bands, of the first and second classes, generally have their origins in the larger gulfs.

An encouraging feature of the opposition, which in future developments may lead to a settlement of this vexed question of "objective" and "subjective" phenomena, is the advance made by photography in the recording of the planet's markings. On Prof. Hale's striking photographs (Monthly Notices, vol. lxx., No. 2, p. 175) the contrast between the dark and light areas is remarkable, the bolder features standing out with a distinctness usually seen only on carefully prepared drawings.

Results of great interest were also obtained by MM. de la Baume Pluvinel and Baldet (*Comptes rendus*, vol. cxlix., No. 20, p. 838) at the Pic du Midi Observatory, where the conditions are especially favourable for such observations. The observers intend to make a detailed study of the 1350 images recorded on their set of eighty plates, but, from a brief survey, they are able to state that anyone conversant with Martian topography would immediately recognise nearly all the features observed visually. The canals of the first order, the broader bands such as the Indus, the Ganges, Araxes, Cyclops, Euphrates, &c., are all recognisable, but there is no trace of the geometrical network of fine canals recorded visually by many observers.

Whilst in London recently, Prof. Lowell pointed out that while many of the recent photographs form striking pictures by reason of their strong contrasts in the large areas, the treatment which brings out these contrasts is not that calculated to show also the finer details.

Thus the evidence for the actual existence of the canaliform "canals" is still "mixed." A number of experienced, careful observers still proclaim, with no lack of decision, that they exist; others just as emphatically state that they are, at the most, but the physiological integration of the elements of a mosaic groundwork which covers the planet. Prof. Frost states that the 40-inch refractor at Yerkes is "too powerful" to show them, and Prof. Hale refers to Prof. Barnard's description of 1894 (Monthly Notices, vol. lvi., No. 4, p. 166, 1896) as describing exactly what he sees with the 60-inch reflector at Mount Wilson.

This question of aperture is not a simple one. Thus Prof. Lowell has repeatedly stated that a large aperture is not infrequently a positive barrier to the seeing of such fine details as occur on planetary discs. Attached to his 24-inch refractor he has a system of diaphragms, and the first operation in making an observation is to determine what aperture is most suitable for the conditions obtaining at the moment. A similar procedure was followed by Dawes, whose observations in the 'sixties of last century did so much to forward areography. When discussing the work with Sir Norman Lockyer—who also, at that time, was making valuable drawings of Mars—Dawes repeatedly referred to the conditions of seeing as "a 5-inch night" or "a 6-inch night," &c. Asked for an explanation, he stated that he often found it necessary to reduce his aperture, which normally was 8 inches.

We also learn from Sir Norman Lockyer that when his drawings were discussed at the Royal Astronomical Society, some doubt was expressed because some of the details shown thereon were not shown on the drawings made at the same epoch by the observer using Lord Rosse's reflector; yet when the Leyden drawings arrived, later, these details were confirmed.

Thus Prof. Frost's somewhat enigmatical statement may, logically, be understood to convey a meaning other than that which has generally been ascribed to it, and the failure of the 60-inch reflector to show the straight, hard, sharp lines may not be conclusive evidence of their non-existence.

So far, the employment of the photographic plate has not provided the hoped-for solution of this special question, because the exposures necessary are too long. Each image on the plate is an integration, the moments of fine seeing are overlaid by periods of tremor, and, by their very nature, *fine* lines would be the first to disappear; it is a case where negative evidence is of little value. Nor does it seem logical to say that these lines do not exist because their appearance can be explained otherwise—physiologically, for instance. Their recognition in the same positions by independent observers, at different times, points to the existence of some material objects, and their changes with the change of season exclude the proposition that they are completely solid markings. Even the suggestion that they are alignments of darker spots does not *prove* that they are disconnected items. In desert areas the streams dry up, leaving "water holes"—apparently disconnected if viewed from a great distance—and these holes are surrounded by vegetation throughout the dry season, becoming, therefore, isolated objects; but the river bed is there, and in due season—as on Mars—is filled with water and edged by vegetation.

But their great size, their prolific distribution, and their rectilinear character, even when seen away from the planet's central meridian, are phenomena which are difficult to explain in the case of the Martian canals; and the problem yet remains.

A suggestion made by Dr. Aitken, of the Lick Observatory, might possibly solve this vexed question to some extent. Prof. Lowell's unanswerable argument is that, as the "canals" are so near the limit of vision, it is only in the very finest atmosphere that they can be seen. All observers agree as to the first part of this statement, and Dr. Aitken suggests that the second part might be put to the test by arranging that such experienced protagonists as Prof. W. H. Pickering, M. Antoniadi, and Prof. Barnard should foregather at the Flagstaff Observatory and, with Prof. Lowell, observe Mars during the next favourable opposition. The 24-inch refractor is, as Prof. Lowell has demonstrated, a superb instrument, and for astronomical observations of this character the Arizona atmospheric conditions are unexcelled. The suggestion is a most excellent one, and, could the arrangements be made, the meeting would no doubt lead to an illumination of what, at present, is a very obscure problem.

There are some problems in astronomy which seem to be indeterminate. First, we get a positive solution in one

direction, and then appears the amendment, which is a direct negative; as an example one might cite the rotation periods of the inner planets; but one that is nearer to the present question is the problem as to the spectroscopic evidence for the existence of water vapour in Mars.

Since Huggins compared the Martian and lunar spectra in 1867, a number of observers have made similar observations under various conditions, and with contradictory results. The summarised history of the research is given by Prof. Campbell in a recent Bulletin (No. 169) from the Lick Observatory, and the majority of the conclusions are in favour of the presence of water-vapour bands; whether the conclusions were supported by the evidence, when adequately analysed, is the question. Observations made at Mount Hamilton in 1894 demonstrated to him that, to obtain satisfactory evidence, they should be repeated at an altitude sufficient to escape the greatest possible proportion of the terrestrial atmospheric effects, and, to this end, he examined the conditions obtaining on the summit of Mount Whitney, the highest point in the United States, in 1908. The preliminary survey satisfied Prof. Campbell as to the atmospheric conditions, and he decided that, if the necessary money could be obtained for shelters and equipment, an expedition from the Lick Observatory should take advantage of the favourable opposition of 1909 to carry the research a step further. As is usual in, and, one might say, peculiar to, America, funds were forthcoming, with the result that, at the end of August, 1909, the summit of the mountain was occupied by an especially equipped expedition ready to take spectrograms when the conditions of Mars and the moon were favourable.

FIG. 4.—Temporary Observatory on Mount Whitney, for the investigation of water-vapour in the atmosphere of Mars.

Such spectrograms, six in number, were secured on the nights of September 1 and 2, and it is to the discussion of the evidence afforded by these that Bulletin No. 169 is devoted. This evidence does not appear to be positively conclusive, but Prof. Campbell deduces "that the quantity of any water vapour existing in the equatorial atmosphere of Mars at the time these observations were made was too slight to be detected by present spectrographic methods. . . . it is difficult to conceive that the quantity of vapour above unit area on Mars could exceed or equal the quantity of terrestrial vapour above the same area of Mount Whitney."

It should be remarked here that the altitude of the summit of Mount Whitney is 14,501 feet, and, according to Hann's empirical formula, 0·79 of the terrestrial water vapour would be below. A photograph of the shelter and part of the equipment is reproduced, from the Journal of the Royal Astronomical Society of Canada, in Fig. 4.

Prof. Campbell expressly states that it is not contended that Mars has *no* water vapour, and that polar caps composed of hoar-frost, demanding a small quantity of vapour, would probably not be out of harmony with his observations. In Bulletin No. 43 of the Lowell Observatory Mr. Abbot's report is quoted to the effect that he and Prof. Campbell were on Mount Whitney during unusually unfavourable weather, under conditions which would probably not be met with at that season one year in ten. This is important, because, no matter how much of the theoretical water-vapour content of the terrestrial atmosphere was left below, it is absolute evidence that water vapour was present, in quantity, above.

The Mount Whitney plates, at the most, only afford negative evidence, and it is not contended that they do more. Thus the question of water vapour becomes one of amount rather than of existence or non-existence, and its settlement is rather academic than practical. There is no doubt as to the difficulty of securing absolute evidence—so many variables have to be eliminated before the sought-for residual is attained.

But, as stated above, the question is now generally accepted as settled in favour of the presence of water vapour in the Martian atmosphere. The darker edge of the melting "snow" caps, the proved existence of clouds, and the changes of intensity and shape of many features, point definitely to the existence of a fluid material, and, without any violent assumptions, to that fluid being water. We note that Prof. Campbell suggests that the observed yellowish colour of the clouds may indicate for them some other chemical compound than H_2O, but, if this is so, should not the spectrum of Mars indicate some other absorption which is not mentioned?

WILLIAM E. ROLSTON.

THE RESEARCH DEFENCE SOCIETY.

THE annual meeting of the Research Defence Society was held on Friday, June 3, at the Royal College of Physicians, and was very largely attended. The chair was taken by the Earl of Cromer, president of the society. The other speakers were the Hon. Sydney Holland, chairman of committee, Sir Richard Douglas Powell, Sir David Bruce, Mr. Anthony Hope Hawkins, and Mrs. Scharlieb. The work and the literature of the society are by this time well known to the public, and the annual report shows a great increase in the membership and in the extent of the work.

Perhaps, of all the speeches, the most interesting was Sir David Bruce's account of his observations on the African sleeping sickness and other African diseases. In 1903 it had been hard or impossible to persuade the Uganda chiefs that the sleeping sickness is carried by the tsetse-fly. "But these same so-called uncivilised natives, whose untutored minds could not perhaps at once grasp the position, a few years later were so convinced of the truth of what we told them that they cleared the lake-shore and islands of their inhabitants, with the result that, so far as I am aware, at present not a single new case of sleeping sickness is being contracted in Uganda proper, and the toll of human lives to this plague has ceased to be paid. This toll has been estimated at 200,000 out of a population of 300,000. In one island alone, Buvuma, with a population of 32,000, 18,000 are reported to have perished." From this fact Sir David Bruce went on to speak of experiments which had shown how long the fly, once infective, may remain infective, and of the question of the infectivity of animals. Then he referred to a disease which destroys 70 to 80 per cent. of the calves born in Uganda; the cause and the nature of this disease had been discovered by experiments on animals. "By animal experimentation we found out the nature of several of the most important diseases of the

domestic animals in Uganda, and on more than one occasion nipped an epidemic in the bud, thus earning, if they had known it, the gratitude of the animals themselves."

Of no less interest was his account of "muhinyo," a fever among the Uganda natives, which had been mistaken, by clinical observation, for diverse other fevers. The Sleeping Sickness Commission, by animal experimentation, proved it to be, practically, Malta fever, and further proved that the germs of muhinyo were present in some of the goats from an infected district. The evidence thus appears complete that the fever, like Malta fever, might be transmitted in the goat's milk.

Finally, Sir David Bruce spoke of the discovery that the common sand-fly is capable of transmitting simple continued fever. Here the experiments were made on volunteers in the cause of science. "The study of the habits of the sand-fly is being pursued with energy, and I hope that within a short time simple continued fever will have disappeared as completely from Malta as Malta fever has done." Of the completeness of the disappearance of Malta fever from our army in Malta, since the goat's milk was prohibited, the following figures are proof:—in 1905 there were 643 cases; in 1906, 147; in 1907, 11; in 1908, 5; in 1909, 1; and in 1910, thus far, 0.

We hope that the Research Defence Society will see to it that such a record of the experimental study of diseases shall not be allowed to drop out of the public mind.

METEORIC FIREBALL OF JUNE 1.

ONE of those brilliant meteors which often appear in the twilight of our midsummer skies was seen on Wednesday, June 1, at 9.40 p.m. The atmosphere was fairly clear, and the object formed a fine spectacle to many persons in the southern counties of England. Excellent descriptions of the apparent path it traversed have come in from various places, including Coventry, Bristol, Cheshunt (Herts), and Ealing, Sydenham, and Herne Hill, London.

The meteor was much more brilliant than Jupiter, and as it sailed slowly along it apparently changed its colour from electric blue to gold, and threw off a short trail of reddish sparks. Viewed from the metropolis, the observed flight was a descending one from west to north-west, and the whole trajectory occupied about four seconds.

There is no doubt that the meteor was directed from a radiant near Antares, in Scorpio, which has furnished many June fireballs in past years. Its height was from about 62 to 48 miles, and the path of some 100 miles, traversed at a velocity of about 25 miles per second. First visibly appearing over a point near Chippenham, it passed to north-west, crossing the Severn, and disappearing south of Montgomery, in Wales. Other reports will doubtless come to hand, and enable this result to be tested, but it cannot be far wrong. The fireball supplies further corroboration of the activity of the Scorpiid shower, and of the almost unique brilliancy of its meteors. There was a fireball seen in Scotland by several observers on May 24, at 11h., and this had a height of about 70 to 44 miles over the sea north of Ireland. This object also was directed straight from the radiant in Scorpio.

W. F. DENNING.

INTERNATIONAL CONGRESS ON TROPICAL AGRICULTURE AND COLONIAL DEVELOPMENT.

A NOTE on the organisation of this congress was published in NATURE of April 7, and it is only necessary to say now that the congress was arranged by the International Association of Colonial Agriculture, with the assistance of the Belgian Society for the Study of Tropical Agriculture. British contributions to the congress were provided for by a British committee, including agricultural and forestry officials throughout the Empire, and of which Prof. Wyndham Dunstan, F.R.S., was president, and Dr. T. A. Henry secretary.

The congress met from May 20 to May 23 in the Palais de Congrès of the Brussels Exhibition. The date of the first meeting coincided with the funeral of the late King, so that the president, Colonel Thys, merely declared the congress open, and the meeting was adjourned as a mark of respect to the memory of His late Majesty.

The work of the congress was divided into three sections, (1) dealing with agriculture and forestry; (2) with animal industries; and (3) with labour, transport, and trade. Altogether nearly 200 reports and papers were presented to the congress, and of these more than one-third were submitted through the British committee. It is only possible to refer briefly to a few of the more important matters discussed.

In July, 1909, the International Association appointed "General-Reporters" to collect information on various subjects connected with tropical agriculture, and to present reports on them to the congress, and the reading and discussion of these reports occupied much of the time devoted to sectional meetings.

Prof. Dunstan submitted a general report on the practical results of cotton cultivation in various countries, with observations on the scientific and economic causes of its success or failure. He pointed out that the successful development of cotton cultivation in West Africa and other suitable territories in the future will depend on the establishment of a variety of cotton suited to the country and to the requirements of manufacturers, and that this can best be achieved by persistent scientific work carried on by Government. The position of cotton cultivation in the United States, Egypt, India, and other producing countries was then reviewed. Prof. Dunstan also presented special reports from countries in which cotton cultivation is carried on commercially or experimentally, each of these recounting the difficulties met with and the experimental work in progress in the area considered. These reports were contributed by authorities on cotton cultivation in each of the countries dealt with.

A similar inquiry on the rubber plants of tropical countries resulted in the presentation of a number of reports, each of which dealt with the rubber plants, native or introduced, of the country considered, the methods of obtaining rubber therefrom, and, in most cases, the improvements needed in native methods of preparation. Reports from the following countries were submitted:—Belgian Congo (MM. Kindt, Pynaert, and Ghislain), French West Africa (M. Yves Henry), British West Africa (Mr. H. Brown), British East Africa (Mr. A. C. Macdonald), German African colonies (Dr. Warburg), Java and Sumatra (Prof. Berkhout), Mexico (Señor Flores), Brazil (Señor Argolo), &c. Special papers were also contributed by Dr. Heim (Rational study of rubber plants) and Prof. Carmody (New method of preparing Castilloa rubber).

Other inquiries undertaken were the place of botanic gardens in agricultural research in the tropics, and legislation against the spread of insect pests and fungoid diseases; but comparatively little progress was made with these, though special reports in connection with the first-named were submitted by M. Capus for Indo-China, and by Profs. A. Engler and G. Volkens, of Berlin.

Apart from these reports, many papers were submitted on more general subjects. Mr. A. E. Humphries read a useful paper on the wheat requirements of the United Kingdom, in which he outlined the characters which millers in this country seek in imported wheat. Mr. I. B. Pole-Evans described the results of investigations undertaken in the Transvaal with a view to the development of rust-resistant cereals, and Mr. Guthrie, of New South Wales, submitted two papers, one describing chemical investigations in connection with the production of improved wheats and the other giving an account of the work of the late W. J. Farrer, who initiated wheat-breeding work in New South Wales. Only two papers on tobacco were submitted, one by Mr. Odlum, of Rhodesia, describing the cultivation of bright pipe tobacco, and the other by Drs. Henry and Auld on the burning quality of tobacco, in which they pointed out that defective burning quality is one of the first difficulties met with in growing tobacco in a new country, and showed, as the result of numerous analyses of tobacco ash, that good burning depends on the nature and quantity of mineral constituents in the leaf, and

eventually, therefore, on the composition of the soluble components of the soil and the manures applied. Mr. R. N. Lyne presented a paper on the causes contributing to the success of the Zanzibar clove industry, in which the importance of soil and climate in this connection was insisted on, and not less the success of the Arab proprietors of the plantations in accommodating their business methods to the habits of the native population.

Dr. S. S. Pickles submitted a paper in which the characters and composition of the essential oils obtained from a large number of Cymbopogon grasses grown in Ceylon were given. These results are of great importance in connection with Dr. Stapf's recent botanical revision of this genus.

In section 2 the principal topic of discussion was the essential factors in the acclimatisation of European cattle in the tropics, on which useful reports were submitted by M. Meuleman, who is General-Reporter for this inquiry, M. Douarche, of Tonquin, M. Peralta for Costa Rica, Mr. Jarvis for Rhodesia, and Prof. Carmody for Trinidad. The only general paper read in this section was one by Mr. Barwick, of the Imperial Institute, on African wild silks.

The papers submitted in section 3 were of economic and administrative importance rather than of scientific interest, though reference may be made to the reports, mainly by officials in British colonies, submitted by M. Batalha-Reis on agricultural labour conditions in the tropics.

During the congress a special meeting of the International Association of Colonial Agriculture was held, at which Prof. Wyndham Dunstan, director of the Imperial Institute, was elected president of the association in succession to M. de Lanessan, formerly Governor of Indo-China, who had held this office since the foundation of the association in 1905.

INDIAN PALÆONTOLOGY.

THE Geological Survey of India continues to publish well-illustrated and exhaustive memoirs on the fossil invertebrate faunas of the region with which it deals. Two more on the Himalayan Trias have lately appeared, and are of much interest for study in connection with recent work on the Triassic fossils of other areas. The first memoir (*Palaeontologia Indica*, ser. 15, vol. vi., No. 1, 1909), on the Lower Triassic Cephalopoda from Spiti, Malla Johar, and Byans, was begun several years ago by the late A. von Krafft, who collected much of the material. It has now been revised, completed, and brought up to date by Prof. C. Diener. It begins with a synopsis of the marine Lower Triassic formations of the Himalayas, which are proved to constitute a remarkably complete series. The detailed descriptions of the fossils which follow show that at least four distinct and successive faunas occur in the rocks of the district under consideration. Of these, the lowest or earliest is perhaps the most interesting, because it seems to represent the dawn of Triassic life in the sea. It is noteworthy for the complete absence of the numerous types of Palæozoic Brachiopoda, which are the predominating element in the Permian rocks of the Salt Range and the Himalayas. Both in the Alps and in the Himalayas the Permian and Trias are connected by an uninterrupted sequence of sedimentary deposits. The second memoir, by Prof. Diener (*loc. cit.*, No. 2), is more special, treating of the fauna, chiefly Cephalopoda, of the Thaumatocrinus Limestone of Painkhanda. He returns to a discussion of the age of this limestone, and shows that enough of its ammonites are identical with (or closely allied to) species found in Europe to justify its correlation with the Julic horizon, or zone of *Trachyceras aonoides*.

Another memoir just received from the Geological Survey of India, though dated 1908, contains a valuable description of the Devonian faunas of the northern Shan States, by Mr. F. R. Cowper Reed (*Palaeontologia Indica*, N.S., vol. ii., No. 5). The fossils are chiefly corals, Bryozoa, and Brachiopoda, with only few representatives of other groups, but they constitute the richest collection of Devonian age hitherto described from south-eastern Asia. Most of them were obtained from Padaukpin, and many appear to be identical with European species which characterise the lower part of the Middle Devonian. The marine faunas of Middle and Upper Devonian times prove to have been remarkably cosmopolitan; but in all cases, as at Padaukpin and other places in eastern Asia, there is also a local element giving them a special character.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. R. H. Rastall, of Christ's College, has been appointed additional demonstrator in geology from June 1, 1910, to May 31, 1915.

The electors to the Frank Smart studentship in botany give notice that they will shortly proceed to the election of a student. Any graduate of the university is eligible for the studentship, provided that not more than fourteen complete terms have elapsed after his first term of residence. The successful candidate must devote himself to research in botany under the direction of the professor of botany. The studentship is ordinarily tenable for two years. The student is in special cases eligible for reappointment for a third year; he may be appointed for one year only. The value of the studentship is 100*l.* per annum. A candidate must send his name, with a statement of the course of research which he proposes to undertake, and such evidence of his qualifications as he thinks fit, to the Vice-Chancellor, Pembroke College Lodge, on or before Tuesday, June 21.

OXFORD.—In a convocation held on Tuesday afternoon, June 7, in the Sheldonian Theatre, the Chancellor of the University, Lord Curzon of Kedleston, presiding, the honorary degree of D.C.L. was conferred on ex-President Roosevelt, who then proceeded to deliver the Romanes lecture. Taking as the subject of his discourse "Biological Analogies in History," Mr. Roosevelt enlarged upon the phenomena of the rise and extinction of species, especially instancing the history of the mammalian fauna of South America from the Eocene epoch onwards, and drawing parallels between the changes taking place in the course of evolution among the lower animals, and the vicissitudes of human political societies. The treatment of the subject was interesting and suggestive, and the lecturer met with a cordial reception.

A TELEGRAM from the *Times* Ottawa correspondent on June 2 announced that a commission has been appointed by Federal authority to investigate the need for technical education in Canada. Mr. J. W. Robertson, late principal of the McDonald Agricultural College, has been appointed chairman of the commission.

THE current issue of the *Battersea Polytechnic Magazine* is a double number, with an unusually varied and interesting table of contents. Instances are given in one of the articles of the lively interest shown by King George and the late King in the work of the polytechnic. Among other contributions are an account of Brennan's monorail, and the biological disposal of sewage. The reports of the doings of the clubs and societies of the polytechnic are good evidence of the activity of the institution.

BY the will of the late Mr. Isaac C. Wyman, of Salem, Mass., a graduate of Princeton College, who died on May 18 last, most of his estate, says *Science*, is bequeathed to Princeton University. The daily papers estimate the value of the bequest to be from 400,000*l.* to 2,000,000*l.* From the same source we learn that the Jefferson Medical College of Philadelphia has received a gift of 12,000*l.* from Mrs. M. G. Horwitz, daughter of the late Prof. S. D. Gross, to endow the "Samuel D. Gross Chair of Surgery."

THE fifth issue of the "Girls' School Year Book (Public Schools)" is now available, and it may be remarked that the annual is, for the first time, the official book of reference of the Association of Head Mistresses. The book continues to be useful, providing parents, schoolmistresses, and girls themselves, as it does, with trustworthy information respecting secondary education for girls. The second part of the work deals chiefly with the future career of girls on leaving school, and will appeal specially to parents and guardians, since the particulars given are of a thoroughly practical nature.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 2.—Sir Archibald Geikie, K.C.B., president, in the chair.—L. S. **Dudgeon**, P. N. **Panton**, and H. A. F. **Wilson**: The influence of bacterial endotoxins on phagocytosis (preliminary report). Extracts were prepared from most of the common pathogenic organisms by grinding them up in the presence of sterile sand or glass, and adding a definite amount of sterile salt solution; this was then centrifugalised at high speed, and the final supernatant layer employed as the endotoxin. *The Action of the Endotoxic Substance on the Leucocytes.*—The authors' experiments, although limited, failed to indicate that there was any direct action on the leucocytes, as in no instance was there any appreciable variance from the control experiments. *The Action of the Endotoxic Substance on the Serum.*—The following facts were evident as a result of these experiments:—(1) that the endotoxic substance was capable of exerting a *specific action* on the serum in a large proportion of cases; (2) that the endotoxic substance was unaffected by heat; (3) that dilution of the endotoxic substance correspondingly diminished its toxic effect upon the serum, but in a few instances, when diluted, it appeared to play the part of "stimulin," so that the degree of phagocytosis was far greater than in the control experiments.—Prof. H. E. **Armstrong** and E. Frankland **Armstrong**: The origin of osmotic effects. III.—The function of hormones in stimulating enzymic change in relation to narcosis and the phenomena of degenerative and regenerative change in living structures. When a leaf of cherry-laurel is exposed to the vapour of an anæsthetic, hydrogen cyanide is at once liberated; as this is easily detected by means of Guignard's sodium-picrate paper, the liberation of the cyanide affords a delicate indication of the occurrence of enzymic change in the leaf. Not only the common anæsthetics, but most organic vapours, appear to act as excitants, *e.g.* toluene, volatile alcohols, and especially ethereal salts of acids of the acetic series. Ammonia is very active, and it is noteworthy that even carbon dioxide, hydrogen cyanide, and benzaldehyde condition the breakdown of the cyanophoric glucoside in laurel leaves. When solutions are used, it is found that weak solutions of mineral acids, alkalies, and most salts are inactive, but the simpler organic acids, mercuric chloride, cadmium iodide and sodium and potassium fluorides all pass into the leaf from solutions. Apparently, the behaviour of the laurel leaf resembles very closely that of the barley grain (*cf.* Adrian J. Brown, Roy. Soc. Proc., B, 1909, vol. lxxxi., p. 82). It is proposed to divide substances other than colloids into two subclasses, according as they will or will not pass through differential septa such as occur in the barley grain and the laurel leaf; also to apply to the former the term *hormone* introduced by Starling. The change brought about by hormones may be attributed largely, but not entirely, to the influence they exercise in causing alterations in concentration of the fluids within the leaf. Experiments are adduced showing that water actually passes into the leaf, together with the hormone; also that not only is hydrogen cyanide liberated and water absorbed, but that the amount of reducing sugar in the leaf is increased. The hypothesis is advanced that when substances which are not attractive to water are introduced into the living cell they exercise stimulative effects that are primarily mechanical, molecules of the hormone being interposed between the molecules in the cell and the activity of the medium raised by the change in the osmotic state, so that a flux of water from other regions takes place. Possibly the mere dilution thus effected is determinative of change; contact being established between hydrolyte and hydrolyst, degenerative changes are set up which tend to increase in intensity as the products of change in turn exercise a similar stimulative influence; gradually enzymes are set free which can attack the various hydrolytes stored in the cell. The phenomena of change in living structures, especially muscle and nerve tissue, are considered from this point of view; also the phenomena of narcosis, the regulation of respiration, and the physiological effect of alcohol and of drugs generally. It is pointed out, also, that the hypothesis may afford an explanation of a number of more recent observations on plant metabolism. Partially sterilised soils, for example, which Russell has shown to be so fertile, are rich both in carbon dioxide and ammonia: it is suggested that these are two factors of prime importance as stimulants of plant growth; for a similar reason, sulphate of ammonia may have special value in comparison with other nitrogenous fertilisers. The deleterious effect of grass growing over the roots of fruit trees may be more or less due to the removal, which the grass effects, of ammonia, and the consequent withdrawal of the stimulus which this hormone affords to the roots of the trees.—Dr. R. D. **Kleeman**: The direction of motion of an electron ejected from an atom by ultra-violet light. Experiments were carried out to see whether the kathode radiation from substances exposed to ultra-violet light moves initially in the direction of propagation of the light. The amount of kathode radiation from a platinum film deposited on a quartz plate in a discharge tube was measured with the film facing the source of ultra-violet light, and with it facing in the opposite direction. It was found that if the intensity of the pencil of light used is denoted by unity, the intensity of the light after passing through the quartz plate and film is 0·55; and if we denote by unity the intensity of the kathode radiation from the film when it faces the source of light, the intensity of the radiation when the film faces in the opposite direction is 1·15. Since the intensity of the light decreases as it passes through the quartz plate and platinum film, it follows that the larger leak in the latter case than in the former would not be obtained if the kathode rays were ejected equally in all directions, but might occur if they have a component in the direction of propagation of the light.—Sir William **Crookes**: Scandium, part ii. This is a continuation of the paper read in April, 1908, in which, after describing the mode of extracting scandia from the mineral wiikite, the principal salts, twenty-three in number, were described, their formulæ and analytical results being given in detail. The scandia used in the preparation of some of the salts now described was not absolutely pure. Chemically, no other earth could be detected in it, but the spectrograph revealed traces of yttria and ytterbia. These traces could have been removed by one or more operations, but the author thought it advisable to leave them in, for the following reasons: in each operation of purification some loss is unavoidably incurred, and when chemical reactions are insufficient to find the other earths it is not worth diminishing his lessening stock of scandia for the sake of academic purity. The chief reason, however, for leaving these traces in is that they might afford evidence of a difference of behaviour between one earth and another in the presence of some of the acids used. After each quantitative determination the scandia was dissolved in acid, and a spectrogram taken to see if yttria or ytterbia were present. The residual earth was then collected from the mother-liquor, and a photograph taken of its spectrum. A comparison of the pair of spectra shows at once if any separation has been effected between the earths present. When separation is apparent, further experimentation on a larger scale is reserved to a future occasion. The following salts are described, and details of their analyses given:—scandium borate, scandium mono-chloroacetate, scandium lactate, scandium fumarate, scandium αβ-dibromopropionate, scandium citrate, scandium orthochlorobenzoate, scandium metanitrobenzoate, scandium phthalate, scandium tetrachlorophthalate, scandium 2-nitrophenyl-4′-tolylamine-4-sulphonate, and scandium octamethyltetraminodihydroxyparadixanthylbenzenetetracarboxylate. More than once the author has been asked why he chose such out-of-the-way acids wherewith to prepare scandium salts. He gives his chief reason. Attempts on several occasions have been made to discover a means of separating some of the "rare earths" from their companions by forming compounds with weak organic acids. Thus, in 1897, Kosmann employed citric acid in the separation of thoria. Urbain used acetylacetonate of sodium for the same purpose. Metzger tried maleic acid, cinnamic acid, picric acid, phthalic acid, and fumaric acid. In 1904 Neish tried many organic acids for the separation of the rare earths, chiefly thoria. Among other acids he tried gallic, tannic, citric, salicylic, oleic, linoleic, paratoluic, oxyisophthalic, benzoic, meta-, ortho-, and para-nitrobenzoic, and fumaric. Of

these, metanitrobenzoic acid proved most effectual, the process being capable of accurate quantitative results. Soon after those experimental papers appeared the author commenced similar researches, hoping to find an organic reagent which would be a precipitant for some of the yttria earths—if not with quantitative accuracy, at all events with sufficient separation to allow a fractionation method to be based on the reaction. His results, not being sufficiently definite, were never published; but as the organic acids were in his laboratory when the scandium research was commenced, he preferred to use these acids, of which the purity and the history were known, rather than start afresh with acids of unknown history.—J. **Eustice**: Flow of water in curved pipes. Experiments were made on a flexible tube with the object of ascertaining the increased resistance to the flow of water which is due to the curvilinear motion of the water in coils of uniform radius. The tube, which was about 0·37 cm. internal diameter in its normal condition, was sufficiently small to admit readily of experiments both below and above the critical velocity. In order to separate the effect of curvature and change of cross-section, special apparatus was employed to change the section of the straight tube from circular to oval form. Comparisons were made between the flow in the straight tube and the flow in the tube when it was coiled, the straight tube and the coiled tube being of the same form and area of section. The results obtained show that:—(*a*) The flow in a straight flexible tube of circular section follows the laws of flow in metal tubes as investigated by Prof. Osborne Reynolds, and that the velocity at which turbulence commences is given by Reynolds's formula. (*b*) The critical velocity, which is so well marked in the flow in a straight tube, appears to be entirely absent when the tube is coiled, that is to say, the index law for straight tubes does not hold for coiled tubes. (*c*) The increased resistance due to the curvature of the tube length is represented by the formula $(\Delta V/V)^n = CR^{-1}$, where ΔV is the loss of velocity due to coiling the tube, V is the velocity in a straight tube of the same form and area of section, R is the radius of the coil, and C is a constant for any given velocity V, but both n and C vary with V.—Prof. A. **Dendy** and G. E. **Nicholls**: The occurrence of a "mesocœlic recess" in the human brain and its relation to the sub-commissural organ of lower vertebrates, with special reference to the distribution of Reissner's fibre in the vertebrate series and its possible function. The authors find in the adult human brain a small cavity, lined by a characteristic columnar epithelium, imbedded in the roof of the *iter* at the back of the posterior commissure, and in close relation to this another irregular cavity, which apparently represents the remains of a communication with the lumen of the *iter*. In the five months' fœtus this communication is still widely open, and the cavity in question is evidently part of a structure lying beneath the posterior commissure, and corresponding to the so-called "ependymal groove" of lower vertebrates. For this structure the authors now propose the more distinctive term "sub-commissural organ." It consists, in the human fœtus, of two bands of high columnar epithelium with deeply situated nuclei, invaginated posteriorly into the roof of the *iter* to form a "mesocœlic recess," as in certain lower vertebrates. In the adult man it is in a vestigial condition, being represented by the mesocœlic recess alone. In the chimpanzee the sub-commissural organ is better developed than in man, and the mesocœlic recess still opens into the lumen of the *iter* in the adult, the recess itself having a diameter nearly ten times as great as in the human subject. The condition of the sub-commissural organ in the cat and the mouse is also described and figured for purposes of comparison. In these two types it is very well developed, and there is also a Reissner's fibre. The latter, in the cat (and probably also in the mouse), breaks up into slender branches, which are connected with the modified epithelium of the sub-commissural organ, exactly as in lower vertebrates (*e.g.* lamprey, frog). Considering this well-defined relation of Reissner's fibre to the sub-commissural organ, it seems highly improbable that in man, where the sub-commissural organ is reduced to a mere vestige altogether shut off from the remainder of the cavity of the brain, a Reissner's fibre exists. It is maintained that these observations support the view already put forward that Reissner's fibre has a mechanical and not a nervous function, and that, in connection with the sub-commissural organ, it forms an apparatus for automatically regulating (in lower types) the flexure of the vertebral column; this function is supposed to have become obsolete with the assumption of the erect position and the loss of the tail.

Zoological Society, May 24.—Dr. Henry Woodward, F.R.S., vice-president, in the chair.—D. G. **Lillie**: Observations on the anatomy and general biology of some members of the larger Cetacea. This paper was the outcome of seven weeks spent at the Irish whaling station during the summer of 1909. The object of the visit was to make a preliminary survey of the opportunities which are now offered for a study of the larger Cetacea by the recent establishment of whaling stations off the shores of the British Isles. A list was given of the species captured at the Irish station during the two years of its existence, with notes on the species *Balaenoptera musculus*, Linn., *B. sibbaldii*, Gray, and *Physeter macrocephalus*, Linn., which were seen by the author. The paper also contained observations on the occurrence of hairs in whales, the auditory organ of the Balænoptera, the asymmetry of the odontocete skull, and a few remarks upon the habits of whales. In conclusion, attention was directed to the present difficulty in obtaining information as to their method of copulation, period of gestation, rate of breeding, &c., and a means of overcoming this difficulty was suggested.—C. F. **Rousselet**: Collection of rotifera made by the third Tanganyika expedition, 1904–5. Amongst the specimens brought back by Dr. W. A. Cunnington were a number of tubes containing fine surface plankton nettings from Tanganyika and other lakes of that region. These the author searched for rotifera, and the result was contained in the present paper. From Lake Tanganyika only eleven species were obtained, all already known in other parts of the world, whilst the River Lofu, which enters the lake at its south-western corner, yielded twenty-three species, one of which is a very remarkable new kind. In Lake Nyassa only six species were found, and a single gathering of Victoria Nyanza yielded nine species. This collection is interesting and important from the fact that no previous record of rotifera from Lake Tanganyika had been made, and very few species were known from the Central African region.—J. **Ritchie**: (1) The hydroids of the Mergui Archipelago, collected by Mr. J. J. Simpson and Dr. R. N. Rudmose Brown; (2) the hydroids of Christmas Island, collected by Dr. C. W. Andrews, F.R.S. The chief interest of these two papers was faunistic. In the former thirty species were recorded, in the latter thirteen. It was apparent that the hydroid fauna of the eastern Indian Ocean, of which hitherto little had been known, lacked distinctness, and that its closest affinities were with the faunas of the neighbouring Malay Archipelago and Australian areas.

Institution of Mining and Metallurgy, May 26.—Mr. Edgar Taylor, president, in the chair.—T. J. **Hoover**: A standard series of screens for laboratory testing. This paper represents an attempt on the part of the author to reconcile the conflicting elements in the existing series of screens, such as the "common" series, Rittinger's, Richards's, De Kalbs's, and the I.M.M. Standard Screens, and to present in their place a "cube root" series, for which he claims merits hitherto wanting; also to present a practical mechanical method of making screen analyses. With these ends in view, after a brief reference to the functions required in laboratory screening, the author proceeds to analyse in detail the various series of screens mentioned, and of his proposed substitute, and to compare them with silk bolting cloth. Subsequently he directs attention to a machine calculated to simplify the operation usually accomplished by means of hand-sizing tests. An ample bibliography concludes the paper.—H. **Stadler**: Grading analyses and their application. This paper gives in detail the results of a number of tests made by the Mines Trials Committee in South Africa, from which the author proceeds to show how the various portions of certain standard sizes of particles may be valued in units of energy which will allow of an exact expression of the efficiency of the crushing operation for purposes of useful comparison. He claims that the most rational and logical system of

classification into grades is undoubtedly to base it on the reduction of the volume or weight of the particles, and for this purpose he reduces the cube of the unit successively by one half its volume, thus obtaining a reduction scale in the "common" ratio of 2, or by eliminating alternate grades preferably in the ratio of 1/4. The scheme does not standardise the screens as such, but establishes an unerring standard for the sizing and classifying of the screen products into grades, and is consequently valid for screens of any description, independent of purely practical and commercial considerations. An examination of the practical application of grading analyses follows, and, as a result of the trials made, the author states that investigators are now in a position to determine with a comparatively high degree of accuracy the relative merits of different crushing appliances or the mechanical efficiency of one and the same machine working under varying conditions.—T. A. **Rickard**: Standardisation of English in technical literature. The author protests against the corruption of the English language, and pleads for more exact definition in technical literature. He deals in detail with various aspects of the subject, giving examples of the faults to which he makes objection, as, for instance, "spurious" words adopted from other callings, vulgarisms or slang terms, and the practice of giving variable meanings to words, all these tending to destroy the proper significance of language, and so enfeebling it. Objection is taken to the use of the "unnecessary" plural in such words as slimes, sands, concentrates, middlings, tailings, &c.

CAMBRIDGE.

Philosophical Society, May 23.—Dr. Fenton, vice-president, in the chair.—Prof. **Pope** and J. **Read**: The resolution of externally compensated bases into their optically active components.—Prof. **Pope** and C. S. **Gibson**: The resolution of dihydropapaverine.—Dr. **Sell**: Further study of the products of chlorination of α-picoline.—Dr. **Fenton** and W. A. R. **Wilks**: Formation of uric acid derivatives.—C. T. **Heycock**: Water of crystallisation in calcium phosphate.—S. **Ruhemann**: (1) The diketopyrrolines and their analogues; (2) the formation of α- and γ-pyrones from acetylenic acids.—H. O. **Jones** and J. K. **Matthews**: The reduction of nitrosyl chloride.—W. A. R. **Wilks**: Absorption of bromine by lime.—F. **Robinson**: Note on the absorption of acids by carbohydrates.—Sir George **Greenhill**: A hollow vortex in a polygon.—R. T. **Beatty**: A dissymmetry in the emission of kathode particles excited by homogeneous Röntgen radiation. Homogeneous radiations were allowed to pass through a thin silver leaf, and the ionisation due to kathode particles emitted from the leaf on the emergent and incident side respectively was measured. On allowing for the absorption of the homogeneous radiation in the leaf, this ionisation was greater on the emergent side; and this dissymmetry, while but slight for soft radiation, increased with the hardness. The same values for the dissymmetry were found when a copper leaf was substituted for the silver leaf. The results show that the dissymmetry is unaltered whether much homogeneous radiation be excited in the leaf or not.—J. A. **Crowther**: Note on the transmission of β rays. The author has recently shown that the absorption of a beam of homogeneous β rays by aluminium follows a law approximating to that lately suggested by Sir J. J. Thomson. The absorption of such a beam in platinum, however, follows an exponential law. This result is ascribed to secondary β radiation excited in the platinum. It is now further shown that the absorption by aluminium of a pencil of homogeneous β rays, after transmission through a small thickness (0·001 mm.) of platinum, is also exponential, resembling the absorption law obtained for the rays from a single radio-active substance.—A. Ll. **Hughes**: The mobilities of the ions produced in air by ultra-violet light. The experiments show that air is ionised by ultra-violet light of very short wave-length. The mobilities of the ions so produced are found to be identical with the mobilities of the ions produced by X-rays.

MANCHESTER.

Literary and Philosophical Society, May 3.—Mr. Francis Jones, president, in the chair.—H. **Sidebottom**: Report on the recent Foraminifera from the Bay of Palermo, Sicily. A special account was given of the genus Lagena, which comprises many very elegant flask and decanter-shaped chambers. Some of the members of this genus adhere together at their bases in clusters of three or more, and others show the peculiarity of having two or three slender necks instead of the normal one. Examples of these clusters were shown under the microscope, and many beautiful drawings were exhibited.—C. **Bailey**: A third list of the adventitious vegetation of the sandhills of St. Annes-on-the-Sea, North Lancashire, Vice County 60.—H. **Bateman**: The physical aspect of time. The point of view adopted was that our ideas of space and time were part of our interpretation of the processes of electromagnetism, and were purely relative inasmuch as any measurement of them involved some properties peculiar to the mode of measurement. The transition from one interpretation to another must depend upon a transformation which leaves the fundamental equations of electromagnetism unaltered in form. A brief discussion of the nature of these transformations may be based upon a consideration of the conditions which must be satisfied in order that at a given time an observer may be in a position to witness an event which occurred at some other point at a given previous time. A transformation may be compared to a translation of a poem from one language to another; the words may be different in the two cases, but the ideas are the same. It is somewhat similar in the case of two different interpretations of the same electromagnetic process.

DUBLIN.

Royal Dublin Society, May 24.—Prof. Sydney Young, F.R.S., in the chair.—R. J. **Moss**: An improved method of milk analysis. The milk is dried on tinfoil, which is then rolled up, and the fat is extracted in a Soxhlet apparatus. The non-fatty solids are dried at 100° C. in a vacuum with the aid of sulphuric acid. These solids are obtained in a form suitable for further examination. The process occupies from three to four hours.—Prof. W. **Brown**: Magnetism and torsion in iron, in which some results were given for iron wire of different degrees of hardness, and when under different longitudinal loads.—Prof. J. **Wilson**: The separate inheritance of quantity and quality in cows' milk. The author made use of the recently published report of the milk-testing scheme carried out among Ayrshire cattle in 1908. There were more than 8000 cows tested; but, in order to have a fair comparison, all under four years old, and all that had milked for less than thirty or more than forty weeks, were eliminated. That left about 3000 cows. When these were divided into four groups, viz. those giving less than 500 gallons of milk, those giving from 500 to 600 gallons, those giving from 600 to 700 gallons, and those giving more than 700 gallons, it was found that the qualities of the milk given by all the cows in all groups was the same; that is to say, of the numbers of cows giving all the various qualities of milk, from that containing about 2·7 per cent. of fat up to that containing about 5·5 per cent., the resulting curve starts at zero near 2·7, rises to a maximum of about 3·6, and declines again to zero near 5·5 per cent., and exactly similar curves were given by the cows in the other three groups. The author infers that the proportion of fat in a cow's milk is unconnected with the yield.

PARIS.

Academy of Sciences, May 30.—M. Émile Picard in the chair.—The president announced the losses sustained by the academy by the deaths of Robert Koch and Sir William Huggins.—E. **Bouty**: The dielectric cohesion of neon and its mixtures. The dielectric cohesion of neon is very low in comparison with that of other gases, and upon this fact is based a delicate quantitative method for measuring the amounts of impurities in neon. Mixtures of neon with carbon dioxide and air were studied, the increase of the cohesion due to the addition of either of the latter gases being somewhat greater than that calculated from the ordinary mixture law.—Armand **Gautier**: Some remarks, from the geological and chemical point of view, relating to the action of heat upon carbon monoxide. Experiments are described which lead the author to the conclusion that at a temperature of 1300° C., and at the ordinary pressure, carbon monoxide in porcelain tubes, and in the absence of organic matter and of metal, undergoes no sensible dissociation, and no carbon is set free.—A. **Lacroix**: The

optical properties of the holocrystalline phosphorites of Quercy.—A. **Müntz**: The struggle for water between living organisms and natural media. Different soils require different amounts of water for saturation, and if the water actually held is under the saturation figure no water can be absorbed by a seed, and no germination takes place. Several cases are considered at length.—Albert, **Prince of Monaco**: The twelfth scientific campaign of the *Princesse Alice*, and also the oceanographic work of the Monaco Museum.—M. **de Forcrand**: The heat of formation of cæsium peroxide. A thermochemical study of the solution of cæsium peroxide in water and dilute acids.—Lecoq **de Boisbaudran**: Can the truffle be replanted? The separation from the mycelium hinders the growth of the truffle, but does not altogether stop it.—M. Pérez was elected a correspondant for the section of anatomy and zoology in the place of the late M. Lortet.—Ernie **Marchand**: Phenomena observed at the Pic du Midi on May 18–19 (passage of Halley's comet across the sun). From the whole of the observations no clear conclusion can be drawn as regards the possible electric action of the cometary material.—K. **Popoff**: Observations of Halley's comet made at the Observatory of Sofia, Bulgaria, May 18, 1910.—D. **Eginitis**: Observations of Halley's comet made at the Observatory of Athens. The changing aspect of the tail is discussed from the point of view of its curvature and the change in the curvature on approaching the sun. No sign of the comet was visible as it crossed the sun's disc.—Jules **Baillaud** and G. **Demetresco**: Photographic observations of Halley's comet at the Paris Observatory. The conditions were unfavourable, photographs being possible on May 23, 24, and 28 only.—P. E. **Gau**: The search for the intermediate integrals of the equation $s=f(x, y, z, p, q)$.—S. **Lattès**: Taylor's series with recurring coefficients.—J. **Le Roux**: The distribution of torsion in the infinitesimal deformation of a continuous medium.—H. **Larose**: Two sets of solutions of the equation of telegraphists.—W. **Duane** and A. **Laborde**: Quantitative measurements of the radium emanation. The relation between the initial value of the saturation current due to the presence of a given amount of the radium emanation, the interior surface and volume of the condenser given by W. Duane in 1905 has been confirmed, and the constants in the equation re-determined. When these constants are known for a given condenser, a single determination of the initial saturation current is sufficient to determine the amount of radium emanation present.—L. **Boutan** and J. **Feytaud**: Stereoscopic colour photography and its scientific applications. The arrangement described permits the use of artificial light; photographs in colour of a medusa and of a branch of coral were made.—Maurice **de Broglie**: The electrification of the air by the carbon monoxide flame and by the radium rays; comparison of the mobilities of the ions present in the two cases. The ions liberated by chemical action and high temperature in the combustion of carbon monoxide and those which are produced by the radium rays have very similar mobilities, and are probably identical.—M. **Driot**: Some six zinc oxychlorides have been described, but by the direct action of zinc oxide upon solutions of zinc chloride only two distinct substances have been indicated, according to the author's experiments. These are

$$ZnCl_2,4ZnO,6H_2O \text{ and } ZnCl_2,ZnO,1{\cdot}5H_2O.$$

—Gustave **Vavon**: The rotatory power of pinene hydrochloride. The results given are in complete accord with the hypothesis first put forward by Semmler, and developed by Ahlström and by Aschan, according to which the α and β pinenes give the same solid hydrochloride. The yields furnished by the two hydrocarbons are the same.—P. L. **Viguier**: α-Bromocrotonic aldehyde. Crotonaldehyde is treated with bromine, and then the product distilled with a solution of sodium acetate. From the distillate the bromocrotonic aldehyde can be isolated. The yield is not very good, about 25 per cent., but the method is rapid. The oxidation and condensation of the bromaldehyde with malonic acid is described.—Fr. **Reverdin**: A trinitro-*p*-anisidine.—L. **Tchougaeff** and W. **Fomin**: Some cholesterin derivatives. Two cholesterylenes have been prepared by heating methyl cholesterylxanthogenate, and formulæ given for the constitution of these hydrocarbons.—Paul **Becquerel**: Experimental researches on the latent life of the spores of Mucorineæ and Ascomycetes.—J. E. **Abelous** and E. **Bardier**: The influence of bleeding on the resistance of animals to urohypotensine.—M. **Lioret**: The transformation of phonograph traces into curves.—L. **Cuénot** and L. **Mercier**: Studies on the cancer of mice. Heredity and sensibility to cancerous grafting.—Pierre **Girard**: The electrostatic mechanism of the semi-permeability of living tissues to electrolytes.—J. **Chaine**: Spinal curvature.—Armand **Dehorne**: The number of chromosomes in batrachians and in the parthenogenetic larvæ of the frog.—Jules **Courmont**, Th. **Nogier**, and M. **Rochaix**: Does water sterilised by the ultra-violet rays contain hydrogen peroxide? The sterilising power of hydrogen peroxide. The first question is answered in the negative, and it is shown that considerable proportions of hydrogen peroxide acting for some hours are not equivalent to the sterilising power of ultra-violet light acting for a few minutes only.—L. **Fortineau**: The curative treatment of anthrax by pyocyanase. The injection of pyocyanase has a curative effect on malignant pustule.—A. **Besredka**: A means of avoiding anaphylactic accidents.—Marcellin **Boule** and R. **Anthony**: The encephalus of the fossil man of La Chapelle-aux-Saints.—Fr. **de Zeltner**: The decorated grottos of the French Soudan.—A. **Quidor**: Protandry in the Lernœopodidæ.—Louis **Gentil**: The Tertiary movements in the Moroccan Haut-Atlas.

NEW SOUTH WALES.

Linnean Society, March 30.—Mr. C. Hedley, president, in the chair.—**C. Hedley**: Presidential address. The submarine slope of New South Wales. (1) *The Notonectian Current.*—Past Sydney there flows south a warm and rapid current well known to sailors and fishermen. Neither its origin nor its conclusion has been satisfactorily determined. Two recent maps give contradictory views of its course. It has been assumed, rather than proved, that this current is derived from the south equatorial current, the path of which, after encountering the Melanesian Islands, is indefinite. The investigation of this current is the largest, most fruitful, and fascinating problem within the reach of the Sydney marine biologist. (2) *The Continental Shelf.*—The continental shelf may be defined as that area extending outwards from the land to a depth of about one hundred fathoms. This distinction is not arbitrary, for at or about this point the sediment alters to finer, and the slope of the sea-floor to steeper. These features indicate the approaching limit of sediment. Wherever the profile of the New South Wales coast be examined, a terrace is found to project from the beach to the hundred-fathom line, whence the ground quickly changes to a steeper grade. Compared with most other coasts, the continental shelf is here exceptionally narrow, resembling in this respect that of western South America. Off Cape Dromedary the shelf contracts to a dozen miles, and off Newcastle it broadens to thirty-four. This narrowness of the shelf renders it impossible that extensive trawling grounds may be discovered in the waters of the State. It is now suggested that the continental shelf of New South Wales owes its profile to the Notonectian current. (3) *The Continental Base.*—In illustration of the slope below the shelf, here termed the continental base, a profile is selected extending seventy miles east-south-east of Ulladulla, and produced backwards to include the coast range. Without excluding faulting as a minor agent, it is suggested that the whole sweep of the diagram portrays an earth-fold of the first magnitude—*that it represents the further wall of a pressure-trough driven by a thrust from the east*, a gigantic buckle which is bending down the whole eastern coast of Australia. If so, it must be a component of a vast system. The uniform and recent subsidence which extends from Torres Strait to Tasmania is in harmony with this suggestion.—Dr. R. **Greig-Smith**: The slime of the household bath-sponge. The formation of slime is due to the action of bacteria attacking spongin, the chief constituent of the sponge, and producing a slime. One of those which produced the phenomenon in experimental sponges is described. The slime contains one of the galactan class of gums.—Dr. R. **Greig-Smith**: The bacterial flora of rachitic stools.

April 27.—Mr. C. Hedley, president, in the chair.—E. J. **Goddard**: Contribution to a knowledge of Australian

Hirudinea, part v., leech-metamerism.—E. J. **Goddard**: Contribution to a knowledge of Australian Hirudinea, part vi., the distribution of Hirudinea, with special reference to Australian forms, and remarks on their affinities, together with reflections on zoogeography.—H. J. **Carter**: Revision of the genera Sympetes and Helæus, with descriptions of new species of Tenebrionidæ.

CALCUTTA.

Asiatic Society of Bengal, May 4.—A. C. Sen: "The fight for the cows" in the Rigveda. The prevailing opinion is that "the fight for the cows by the Angirases," mentioned in the Rigveda, is a highly anthropomorphosed description of the monsoon storm in the Panjab. The author of the paper has tried to prove that the story refers to an actual fight for cows between two people, the Indo-Aryans, commanded by their king *Trita*, and a non-Aryan people called the *Panis*, under the leadership of their chief Vala.—Rev. H. **Hosten**: Who planned the Táj? The subject has come up for discussion several times of late years. Mr. Havell, in particular, is of opinion that the Italian or French origin of the Táj cannot be held. The present paper advocates a return to the traditional view, and offers the contemporary evidence of Friar Sebastian Manrigue (1670) to show that Shâh Jahán approved of the plans of Jerome Verones, a Venetian architect. Mr. H. G. Keene in his "Turks in India" and his "Handbook of Agra" had come to the same conclusion from a study of Manrigue. His conclusion has been set aside. A full translation of Manrigue's Spanish account is now presented, and it is hoped that the evidence will be found satisfactory.

DIARY OF SOCIETIES.

THURSDAY, JUNE 9.

ROYAL SOCIETY, at 4.30.—The Distribution of Velocity in the β-Rays from a Radio-active Substance: J. A. Gray.—The Decrease of Velocity of the β-Particles on Passing through Matter: W. Wilson.—Rate of Emission of α-Particles from Uranium and its Products: J. N. Brown.—The Accumulation of Helium in Geological Time. IV.: Prof. The Hon. R. J. Strutt, F.R.S.—The Effect of Small Traces of Water Vapour on the Velocities of Ions produced by Röntgen Rays: R. T. Lattey.—On the Variation with Temperature of the Viscosities of the Gases of the Argon Group: Dr. A. O. Rankine.—The Effect of Pressure upon Arc Spectra. Part II., No. 4. Gold: Dr. W. G. Duffield.—On Radiation in a Gaseous Explosion: Prof. B. Hopkinson, F.R.S.

MATHEMATICAL SOCIETY, at 5.30.—(1) A New Method in the Theory of Integration; (2) On Semi-integrals and Oscillating Successions of Functions: Dr. W. H. Young.—The Composition of Finite Screw Displacements: G. T. Bennett.—Note on the Theory of Linear Differential Equations: Prof. M. J. M. Hill.—The Generation of Cubic Curves by Apolar Pencils of Lines: W. P. Milne.—On Geiser's Method for the Bitangents of a Plane Quartic Curve: Miss M. Long.—The Transformation of the Equations of the Theory of Electrons for Quasi-stationary Motion: H. R. Hassé.

ROYAL INSTITUTION, at 3.—Malaria: Major Ronald Ross, F.R.S.

FRIDAY, JUNE 10.

ROYAL INSTITUTION, at 9.—The Progressive Disclosure of the Entire Atmosphere of the Sun (in French): Dr. H. Deslandres.

PHYSICAL SOCIETY, at 8.—A Galvanometer for Alternate Current Circuits: Dr. W. E. Sumpner and W. C. S. Phillips.—The Positive Electrification due to Heating Aluminium Phosphate: A. E. Garrett.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Photographs of Nebulæ made with the 60-inch Reflector of the Mount Wilson Observatory: G. W. Ritchey.—Note on Sodium in Comets' Tails: T. W. Backhouse.—Remarks on Mr. Backhouse's Paper: A. Fowler.—The Long-period Variable V Cassiopeiæ: A. N. Brown.—Note on a Paper on Periodic Orbits: Sir G. H. Darwin.—Quantitative Applications of Radiation Pressure to Cosmic Problems: A. F. and F. A. Lindemann.—The Systematic Motions of the Bradley Stars: S. S. Hough and J. Halm.—Results of Micrometer Measures of Double Stars made in 1909: Royal Observatory, Greenwich.

MALACOLOGICAL SOCIETY, at 8.—A Revision of the Species of the Family Pyramidellidæ occurring in the Persian Gulf, Gulf of Oman, and the North Arabian Sea: Dr. J. Cosmo Melvill.—The Anatomy of *Hemiplecta foulkeyi* from New Guinea: R. H. Burne.—Further Notes on the Dates of Issue of Sowerby's "Conchological Illustrations": A. Reynell.

SATURDAY, JUNE 11.

ROYAL INSTITUTION, at 3.—Electric Heating and Pyrometry: Prof. J. A. Fleming, F.R.S.

MONDAY, JUNE 13.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Land of the Incas: Sir Clements R. Markham, K.C.B., F.R.S.

TUESDAY, JUNE 14.

ZOOLOGICAL SOCIETY, at 8.30.—On the Cutaneous Scent-glands of Ruminants: R. I. Pocock.—(1) On a Pair of Wapiti Antlers and a new Muntjac; (2) On Three African Buffaloes: R. Lydekker.—On Two New Antelopes: A. Cabrera.—The Plumage of the Grouse: Dr. E. A. Wilson.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—The Ekoi of Southern Nigeria: P. A. Talbot.

WEDNESDAY, JUNE 15.

GEOLOGICAL SOCIETY, at 8.—The Natural Classification of Igneous Rocks: Dr. Whitman Cross.—The Denudation of the Western End of the Weald: H. Bury.—An Earthquake Model: Dr. J. W. Evans.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Alcyonarians collected by Sir Ernest Shackleton's Antarctic Expedition: The President.—On the Resolution of New Detail in a *Coscinodiscus asteromphalus*: E. M. Nelson.—Note on the Use of the Mercury Vapour Lamp in Observing the Rings and Brushes in Crystals: E. B. Stringer.—New Fine-adjustment for Body and Substage of Microscopes: E. B. Miller-Williams.

ROYAL METEOROLOGICAL SOCIETY, at 4.30.—England—Abyssinia—the South Atlantic: a Meteorological Triangle: J. I. Craig.

THURSDAY, JUNE 16.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Experimental Researches on Vegetable Assimilation and Respiration. VI. Some Experiments on Assimilation in the Open Air: D. Thoday.—A Case of Sleeping Sickness studied by Precise Enumerative Methods: Regular Periodical Increase of the Parasites Disclosed: Major R. Ross, F.R.S., and David Thomson.—The Recognition of the Individual by Hæmolytic Methods (Preliminary Communication): Dr. Charles Todd and R. G. White.—Receptors and Afferents of the Third, Fourth, and Sixth Cranial Nerves: Miss F. M. Tozer and Prof. C. S. Sherrington, F.R.S.—Trypanosome Diseases of Domestic Animals in Uganda; (1) *Trypanosoma pecorum*: Colonel Sir D. Bruce, F.R.S., and others.—The Lignite of Bovey Tracey: Clement Reid, F.R.S., and Eleanor M. Reid.

LINNEAN SOCIETY, at 8.—Inheritance of Sterility in Potatoes, with Remarks on the Shapes of the Pollen: Dr. Redcliffe N. Salaman.

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