THURSDAY, JUNE 20, 1912.

INTRODUCTIONS TO BIOLOGY.

(1) *Outlines of Evolutionary Biology.* By Prof. Arthur Dendy, F.R.S. Pp. xiv+454. (London: Constable and Co., Ltd., 1912.) Price 12*s.* 6*d.* net.

(2) *Lebensweise und Organisation: Eine Einführung in die Biologie der wirbellosen Tiere.* By Prof. P. Deegener. Pp. x+288. (Leipzig and Berlin: B. G. Teubner, 1912.) Price 5 marks.

(3) *Einführung in die Biologie.* By Prof. Otto Maas and Dr. Otto Renner. Pp. ix+394. (München and Berlin: R. Oldenbourg, 1912.) Price 8 marks.

(4) *The Life of the Plant.* By Prof. C. A. Timiriazeff. Translated from the revised and corrected Seventh Russian Edition by Miss Anna Chéréméteff. Pp. xvi+355. (London: Longmans, Green and Co., 1912.) Price 7*s.* 6*d.* net.

(1) PROF. DENDY regrets that so little encouragement is given in this country to the study of biology in the strict sense—the study of the general principles underlying the special sciences of botany, zoology, protistology, and the like. We fear that there is too much truth in this, for while there may be a considerable leaven of general ideas in the course the medical student gets, whether it be a little botany and a little zoology, or the conjoint "bean and dogfish" scheme, it must be confessed that he has little opportunity for "a philosophical treatment of the subject." It is customary to say that he is not at the age and stage to appreciate it, but this is probably in the main an erroneous assumption, and we welcome Prof. Dendy's book because it supplies an effective introduction to biological conceptions without adding greatly to the burden of facts which the student is expected to bear about with him for a season. In reality, of course, it gives the burden a balance, which lightens it.

But besides medical students there is another constituency—and a rapidly increasing one—of men and women who wish to think biologically, because they have already learned to think clearly. They wish in particular to understand the bearing of biological conclusions upon human problems, and they are aware that the only way to get a grip of general principles is to submit to discipline in the concrete. Regular laboratory work is out of the question, and many remain platitudinarian. But, as Prof. Dendy points out, "We are apt to forget that in reality we all of us spend our lives in a biological laboratory, where we are surrounded by living organisms which we can hardly avoid studying. In this way we learn much of the nature of living things, and are to some extent prepared for the study of biological principles." To serious students who wish to understand the biological laboratory in which they live, Prof. Dendy's book will be a trustworthy and stimulating guide. We wish that he had been able to do even more in the way of indicating the biological significance of our familiar animate environment, but we cannot suggest what might be omitted to make room for this.

The first part of the book deals with the essential functions of the living body, the unicellular grade of organisation, the transition to the multicellular grade, the meaning of differentiation, and the cell theory. The second part deals with the evolution of sex and with reproduction, the third with variation and heredity, the fourth with the theory and evidences of organic evolution and with adaptations in plants and animals. The fifth part discusses the factors of organic evolution. It is all admirable; indeed, we do not know how it could be done better. It is packed with interesting material, old and new; the style is clear and vivid, yet the reader is continually being pulled up to think; there is a pleasant absence of dogmatism in regard to debated questions; there are numerous effective illustrations, many of which are new. The good qualities of the book stand out prominently in the chapter on the inheritance of acquired characters, in which the author admits the difficulty of saying yea or nay, warns the student against dogmatism, sets a good example of unbiassed examination of the evidence, concludes that "characters which are due to the continued action of some external stimulus, extending perhaps over many generations, in the long run become so firmly impressed upon the organism that they affect the germ-cells as well as the somatic cells, and thus become truly blastogenic," and then suggests an hypothesis—not perhaps to be pressed just now—that modifications of somatic cells may, by altering the character of the vibrations in the determinants of their own nuclei, affect the corresponding determinants in the distant germ-cells in a similar manner, in some way analogous to wireless telegraphy.

(2) The aim of Prof. Deegener's book is also to introduce the serious student to biological conceptions; the method is to take a survey of the invertebrates, using the diverse types in illustration of particular points. Thus the author uses the myonemes of Stentor and the like to illustrate division of labour within the cell, Volvox to throw light on the beginning of sexual reproduction, Hydra as a peg for a discussion of regeneration, the Trematodes as instances of adaptation to para-

sitic life, and so on. In a few lines often, with the aid of clear figures, he makes his point; thus the Echinococcus tapeworm is very small and with few joints, therefore relatively less prolific than usual, therefore (an indirect "therefore," of course) the bladder-worm stage has taken on a prolific multiplying function, which is most unusual. The studies of earthworm and pond-mussel are admirable, the familiar facts being used to illustrate general ideas. In the chapter on Crustaceans there is naturally a discussion of "moulting," of transformations of appendages, of special adaptations as in Leptodora, of larval stages, and so forth; while in the final chapter, which deals with insects, the author is very happy in his illustration of the adaptation of structure to particular conditions of life, which is, indeed, the general theme of the whole book. Prof. Deegener says in his preface that he has no wish to pander to easy-going readers who wish to be amused, but none the less his book is as interesting as it is instructive. The illustrations are mostly good; we wish, however, to direct attention to the fact that a number of well-known figures are referred, not to their original sources, but simply to the text-book from which they have been directly taken. This common practice seems to us to be very undesirable.

(3) Dr. Renner and Prof. Maas supply the botanical and the zoological parts respectively of an introduction to biology, primarily designed for teachers in the "Mittelschule." In some respects it may be put alongside of the late Prof. T. J. Parker's well-known "Elementary Biology"—a book which it would be hard to beat—but there are interesting differences in plan and method. The botanical half starts off with the parts of the plant, working down to the cell; then follow chapters on the structure and life of Thallophytes, Mosses and Ferns, and Flowering Plants; another section deals with nutrition in green plants and in saprophytes; the remaining chapters discuss inter-relations, habitats, power of movement, and the relations between plants and their environment. The book is full of interesting material, which is clearly and tersely dealt with; and the text is illustrated by a large number of original figures, which it is a relief to see. Dr. Maas begins again with the animal cell and goes on to the Protozoa. From animal organisation at the single cell level he proceeds to the "tissue-level" in Cœlentera, and to the "organ-level" in worms. After a condensed chapter on classification and the evidences of evolution, the book takes a different turn, dealing with the various systems, nutritive, respiratory, vascular, excretory, muscular, nervous, and sensory. It culminates in short chapters discussing development, regeneration, fertilisation, heredity, and the factors of evolution. As one would expect from Prof. Maas, this zoological introduction to biology is a sound piece of work, clear and up-to-date, but it will surely require a good deal of boiling down before being naturally suitable for the erudite youths of the "Mittelschule." It appears to us that more "natural history," and less analytical biology, would have been more appropriate, but this, of course, was not what Dr. Maas intended to supply. Most of the illustrations are good and many of them fresh.

(4) Prof. Timiriazeff's "Life of the Plant" was delivered as a course of lectures in Moscow in 1876, and has passed through seven Russian editions. Its aim was to make the life of the plant intelligible to a popular audience, and the author expressed in his preface to the first Russian edition his sense of the difficulty of his undertaking. In a popular exposition it is impossible to tell the whole truth, and with a young science like plant physiology it is difficult to tell nothing but the truth. Moreover, in popular exposition, the expert must step back a little from his science to see what it looks like at a distance. Prof. Timiriazeff thinks that his book "not only in its general tendency, but even in the choice of matter and in the order of exposition," may "answer the present requirements of English schools as formulated by so eminent an authority as Prof. Armstrong."

When a master of a craft condescends to write popularly, we look out for something "big," and there is no doubt that Timiriazeff's book stands head and shoulders above most of its fellows. It has a wide sweep, beginning with the analysis of flour and culminating in the Darwinian theory; it is very objective in its treatment; it skilfully utilises the familiar, and works Socratically; it is demonstrative rather than informative, giving the reader the delicious illusion that he is himself at work building up the science of plant physiology; it has a masterly simplicity of style to which the translator has surely done justice. The book will be of great service to teachers, in showing, for instance, what a lot can be made of relatively simple experiments; in showing, too, how a certain restraint and severity in the process of intellectual construction leads in the end to a very vivid picture of the living plant. It is after the patient course of induction that we come to perceive, in the depths of numberless cells, "protoplasm in ceaseless motion like the tide of the sea"; "the root buried deep in the ground, imbibing its liquid food and corroding the particles of the soil all along its course of many miles"; "the insigni-

ficant chlorophyll granules, wherein takes place the wondrous process of the transformation of the sun's rays into chemical energy, source of all the manifestations of life on our planet"; the flowers in illustration of "the wonderful ties which bind together the two kingdoms of Nature" and the forest as the sublimest picture of struggle and elimination and survival. In one respect we confess our disappointment that Prof. Timiriazeff should have seen fit to lend the weight of his authority to the side of the mechanistic biologists, and should have thought it necessary to refer to "Neovitalism" as a "morbid outgrowth."

MODERN MATHEMATICS FOR TEACHERS.

Monographs on Topics of Modern Mathematics Relevant to the Elementary Field. Edited by J. W. A. Young. Pp. viii+416. (London: Longmans, Green and Co., 1911.) Price 10*s.* 6*d.* net.

RECENT work on the first principles of mathematics has been so far-reaching and revolutionary that most, if not all, of those acquainted with the results are anxious to bring them to bear upon general education. For this there are two main reasons: in the first case, it cannot be right to go on pretending to teach a subject in a strictly logical way when all sorts of assumptions, many of them wrong, are being tacitly made; and secondly (this is still more important), the philosophical side of the new theories is bound, sooner or later, to have a profound effect upon educated thought. It is, for instance, a great achievement that mathematicians have now got definite concepts of three distinct "infinite numbers," as contrasted with the vague "∞" of former times; that they have proved the possibility of three distinct geometries, in two of which the axiom of parallels does not hold good; and that there is some prospect of bringing the theories of electricity and gravitation under one comprehensive hypothesis—it may be by a restatement of the laws of motion, or even by the assumption of a sort of four-dimensional space.

The trouble is that the treatises which deal with these matters scientifically are full of strange symbols and elaborate detail, so that it is hopeless to expect an average mathematical teacher to study them. Prof. Young and his colleagues have therefore done a real service by providing for secondary-school teachers chapters on nine important topics, partly but not wholly demonstrative, and mainly designed to give them a reasonably sufficient account of what has been done, so that in the light of their new knowledge they may modify their teaching.

The most important chapters are undoubtedly i.–iii., which treat of the foundations of geometry, modern pure geometry, and non-Euclidean geometry. They ought to make plain the character of a complete system of axioms and postulates, the notions of order, congruence, segment, and so on; the principles of duality and projectivity, and the properties of the elementary figures; and finally the justification of introducing the two non-Euclidean geometries. The treatment of the last-named is (quite rightly, we think) in great measure analytical; the fact is that our false intuition of space is so ingrained that few of us will give it up until we are faced by a consistent set of fundamental formulæ.

Chapter iv., on the foundations of algebra, is perhaps the most rigorous of the nine. A set of twenty-seven postulates is drawn up, suited for ordinary complex algebra, and it is shown that they are sufficient, consistent, and independent. An appendix contains a note on Dedekind's theory of cuts and Cantor's method of sequences. What seems to us a defect in this chapter is that it assumes ordinary complex algebra as the most comprehensive one, and this is remarkable as coming from a compatriot of the Peirces. Surely in a chapter on general algebra some reference should have been given to quaternions, and to those systems where $ab=0$ does *not* require that either a or b should be 0. And we do not agree without reservation to the remark on p. 200, "both the arithmetical and the geometrical systems are equally entitled to stand as representatives of the type of algebra in question." To justify this, we must at least assume the Dedekind-Cantor postulate.

Chapter vi., on the function-concept and elementary notions of the calculus, does not go very far, and may, perhaps, be taken to give more value to the "graph" than it really does; but it is lucid and interesting, and, at any rate, gives Dirichlet's definition of a one-valued function, and refers to Weierstrass's proof that a continuous function need not have a differential coefficient. Curiously enough, in dealing with maxima and minima the author omits to notice the case when dy/dx is infinite, and does not bring out the real point that dy/dx must change sign. There is some rather vague talk about different ranges of the independent variable; for analytical purposes the range must be some definite one-dimensional arithmetical field, and clearness would be gained by saying that, for strict differentiation, it must be a segment of the arithmetical continuum. For instance, let $f(x)=1$ when x is rational, and $f(x)=0$ when x is not: this is a definite one-valued function, and if the field of x is the field of

rationals (or irrationals) $f'(x)=0$, whereas, if the field of x is the continuum, $f'(x)$ does not exist.

The remaining chapters are rather of the nature of recreations; at least, they deal with less controversial matters. The one on algebraic equations is very good; that on the theory of numbers is rather old-fashioned, but a good introduction to standard treatises; there is one on the problem of the regular polygons; and finally a very interesting one on the transcendence of e and π. The proofs given here are remarkably simple, considering the difficulty of the problem, and ought alone to give the book a wide circulation.

In conclusion, emphasis should be laid on the fact that none of the writers propose, and many of them expressly deprecate, any attempt to make school teaching of mathematics strictly logical in the present sense of the term. Teachers, we hope, will bear this carefully in mind. It will do them infinite good to appreciate these new discoveries, and it will do their pupils good to have some of them stated, without any attempt at proof. The main improvement, however, to be immediately expected is that the teacher should more frequently say, "I am going to assume" so-and-so, instead of either tacitly assuming it or else dogmatically treating it as a necessary truth.

G. B. M.

IMPRESSIONS OF A GUIANA FOREST.

Under the Roof of the Jungle: a Book of Animal Life in the Guiana Wilds. By Charles L. Bull. Pp. xiv+271+60 plates. (London: Duckworth and Co., 1911.) Price 6*s.* net.

THE author, having come across a copy of Waterton's "Wanderings in British Guiana," was so much impressed with it that he "went to Demerara, well equipped with sketch-books and colour-box, and wandered through the jungle, the splendid, colourful, weird, living jungle." Having sailed up the great rivers to make detailed studies of the landscape and to watch the timid wild creatures come stealthily forth from their hiding-places, he tells us that he climbed up among the tangle of lianas into the very roof of the jungle until he could look out and watch the sun set over it, and watch the birds and beasts of the day disappear whilst the night-wanderers came forth. We are not told how long and how often he stopped there, but he cannot have wasted his opportunities, else, with more luck than is enjoyed by other ardent naturalists in a tropical forest, he could not have watched so many scenes from start to finish which he describes in his pleasantly written chapters.

The burden of the book is that "life in the jungle is a tragedy; everywhere the killers lurk or roam"; and dominant in the solemn chorus to the multitudinous tragedies is the tolling note of the bell-bird, which is described as the "sexton of the jungle."

Without exception the many creatures are well characterised and described without any scientific pretences. Monkeys, capybaras, anteaters, harpies, king vultures, savannah birds, anacondas, and crocodiles, they all disclose their most intimate feelings, although in all fairness be it stated that these are not talking-animal stories. "The red brigade," namely, the scarlet ibis, is a touchingly-told tale of the doings of that pest, the plume-hunter.

Naturally the big cats take a great part in the book. A jaguar plays with a coiled-up armadillo as a kitten plays with a ball, slays a peccary, and then travels for half a mile over the jungle-roof, catches a spider-monkey which with many others flashed past him, frightened by a boa in an orchid-clad tree. A fight between the cat and this snake ends with the death of the reptile, but after many further adventures retaliation comes through the deadly bite of a bushmaster snake. Another jaguar attacked a tapir, which shook off the enemy by taking to the river, but whilst still in midstream the tapir was soon finished by the dreaded Carib fishes.

The book is embellished with numerous illustrations, sixty full-page plates "from drawings from life by the author," who obviously belongs to the impressionist school, and some of these drawings seem at first sight ludicrously overdone. But they are not. The creatures themselves are represented in the most lifelike attitudes, all very characteristic and correct to detail; whilst the vegetation, the immediate environment, produce exactly that bewildering impression which one receives whilst attention is fixed upon the main thing, the creature crouching or moving in a gloomy light.

BODY AND SOUL.

Body and Mind: a History and a Defence of Animism. By Wm. McDougall. Pp. xix+384. (London: Methuen and Co., Ltd., 1911.) Price 10*s.* 6*d.* net.

THIS is a thoroughly exhaustive treatise presenting to the reader the arguments which through the ages have been advanced for and against the existence of "the soul," and the most captious critic could not accuse the author, while revealing himself as an animist, of being unfair to the opponents of animism.

No fewer than 148 pages are devoted to propounding the arguments against animism, how this view held the field in the most ancient times and among the most ignorant savages and was gradually beaten back by the advance of learning, especially during the last half-century when the functions of the brain and their relationship with mental processes were submitted to physiological research.

The author then critically examines the various anti-animistic hypotheses, demonstrates wherein they are inadequate and shows, in a scholarly study of the various mental faculties, how parallelism, associationism and various mechanistic doctrines fail to explain the facts of mentation; and his conclusion is that, since none of these views is satisfactory, we are driven back time after time to the conception of "the soul."

We have learned a very great deal from careful perusal of Dr. McDougall's book, but in the end are bound to say that we lay it down unconvinced. The knowledge of the anatomy and physiology of the nervous system has increased enormously of recent years, but every physiologist, psychologist and neurologist knows only too well that that knowledge is still a very long way from complete. To argue, therefore, from our ignorance that our inability to explain certain phenomena postulates the existence of a soul is to take up the position of the animists of fifty years ago, from which they have been driven over and over again by the advance of science.

Moreover, Dr. McDougall's arguments, based on profound knowledge and careful thought as they undoubtedly are, are all negative. We had hoped to find a positive argument in his chapter on "the bearing of the results of 'psychical research' on the psycho-physical problem," but all that the author himself can claim for this evidence is that

"one of the advantages of the animistic solution of the psycho-physical problem is that its acceptance keeps our minds open for the impartial consideration of evidence of this sort, . . . whereas parallelism (including under that term all forms of the anti-animistic hypotheses) closes our minds to this possibility."

The book is worth reading for the historical part alone, inasmuch as it condenses into a most readable form a full account of the various psycho-physical doctrines for the past 3000 years; and the fascinating manner in which the author presents the animistic position of the present day is sure to earn for the volume a place on the bookshelf of every psychologist, be he professional or amateur.

OUR BOOKSHELF.

Der Malvenrost (Puccinia malvacearum, *Mont.*): *Seine Verbreitung, Natur und Entwickelungsgeschichte.* By Jakob Eriksson. Kungl. Svensk. Vetenskap. Handl., 47, No. 2. Pp. 125+Taf. 1–6. (Upsala and Stockholm: Almqvist and Wiksells; London: W. Wesley and Son, 1911.)

DR. ERIKSSON has given an exhaustive account of his researches, extending over many years, of the distribution, nature, and life-history of the well-known Hollyhock rust. The point of greatest interest generally is that dealing with the spread of the fungus and its continuance in time, which turns, as those conversant with the author's views would expect, on the presence of mycoplasm in the cells of the host. This conception is generally scouted in England, owing to experiments conducted along wrong lines, and accepted as a refutation. Hollyhock seeds containing mycoplasm are very abundant; if such are sown the resulting plants at the age of about three months are badly attacked by rust, the outcome of mycoplasm present in the seed, which passed along with the growing plant. This is termed the primary eruption, and is independent of outside infection. The spread of the disease now subsides for a time, and the host plant continues its growth.

Eventually a second wave of disease attacks the plant, due in this instance to the dispersion of the spores produced during the primary eruption. From this time onwards the disease is spread by the liberation of spores. The spores produced by the first and second eruptions, although morphologically indistinguishable, are biologically quite distinct. In the second wave of infection spores of two kinds are produced; in other words, the spores germinate in two different ways. Some spores on germination produce the well-known stout promycelium, which gives origin to secondary spores. Other spores on germination give origin to a long, thin, straight filament, the tip of which gives off minute conidia. When leaves are infected by means of the secondary spores, the disease appears after an interval of from ten to twenty days, whereas when leaves are infected with conidia, no disease in the form of spore pustules results, but the leaf-cells become charged with mycoplasm.

The various phases from infection by means of conidia to mycoplasm in the seed or permanent parts of the host-plant, and the gradual conversion of the mycoplasm into tangible mycelium, producing the first wave of disease, are fully described, and figured on six beautifully illustrated plates.

Life and Health, with Chapters on First Aid and Home Nursing. (Health Reader III.) By Dr. C. E. Shelly and E. Stenhouse. Pp. viii+237. (London: Macmillan and Co., Ltd., 1911.) Price 1*s.* 8*d.*

OF the many books due to the demand for teaching in hygiene and temperance in public elementary schools, this is one of the best. It is designed to meet the suggestions in the Education Code of 1909, and is specially adapted to children of twelve

to fourteen years of age. The first volume of the series is adapted to children of nine to ten, and the second to children of ten to twelve.

In the preparation of such a book, the author is always confronted with the difficulty of adapting technical knowledge without sacrificing accuracy; but in this volume the difficulty is well overcome. From a simple, yet sufficiently minute, study of typical plants, the exposition passes to the problem of breathing and reproduction in plants, and, by a natural transition, to the study of the human body. There are lessons on the general skeleton, the bones, the muscles, foods, digestion, water, drinks, and stimulants, and also special lessons on respiration, the voice, the senses, the skin, the liver, the blood-vessels, the blood, the nervous system, and education.

These subjects are included in the first 160 pages, which form Part I. Part II. contains some 70 pages, which treat of the leading points of first aid and nursing. The volume is profusely and carefully illustrated, and will serve at once the purpose of a school reading-book and of a handbook for the teacher. It is a virtue that the technicalities are not over-explained—a fact common in books "written down" to children.

(1) *Vorbereitungsbuch für den Experimentalunterricht in Chemie.* By Prof. Karl Scheid. Pp. viii + 620 + 2 tables. (Leipzig and Berlin: B. G. Teubner, 1911.) Price 13 marks.

(2) *Chemisch-technisches Praktikum.* Uebungsbeispiele aus der chemisch-technischen Analyse für Studierende an technischen Hochschulen und Universitäten. By Dr. W. Moldenhauer. Pp. vii + 206. (Berlin: Gebrüder Borntraeger, 1911.) Price 6 marks 80 pfennigs.

(3) *Bücher der Naturwissenschaft.* Herausgegeben von Prof. Dr. S. Günther. 11 Band, Chemie und Technik. By Dr. G. Bugge. Pp. 190 + 7 plates. (Leipzig: Philipp Reclam, jun., n.d.)

(1) A LECTURE assistant with Prof. Scheid's book at his disposal is provided with ample means for demonstrating the chief phenomena of chemistry. The book is compiled with the fullness of detail characteristic of the country from which it comes, and describes the methods used in carrying out some 3000 experimental demonstrations. Many of these are marked as suitable for use by a class, so that the book serves to some extent also the purpose of a laboratory manual.

(2) Dr. Moldenhauer's book on technical analysis deals with coal, water, gas, sulphide-ores, nitrates, vitriol, soda, Weldon-mud, Stassfurt salts, superphosphates, basic slag, manures, iron and iron-ores, zinc and zinc-ores, galena, oils, fats, and waxes, soaps, glycerin, and lubricants. The book also contains a short introductory chapter and a series of density tables. The chapter on nitrates includes a photograph of the "imposing Rjukan power station," the only lighter touch in a book which should be of standard value to the chemist engaged in the analysis of "heavy" chemicals.

(3) A small semi-popular manual of applied chemistry in thirteen chapters. A notable feature of the book is the series of seven admirable quarter-plate photographs, ranging from blast furnaces to bacteria, which form the frontispiece.

The Great Star Map: being a Brief General Account of the International Project known as the Astrographic Chart. By Prof. H. H. Turner, F.R.S. Pp. vii + 159. (London: John Murray, 1912.) Price 2*s.* 6*d.* net.

PROF. TURNER'S labours and interest in the making of the greatest star map, now approaching at least partial completion, eminently fits him for the position of historian, while his characteristic lucid and cogent style makes his history readable by, and interesting to, even the general reader.

The introduction briefly states the purpose of the work, reviews the previous attempts to survey the heavens, and recounts the improvements in instruments and methods which rendered possible the hopeful undertaking of so stupendous a task. Prof. Turner's account of the first Paris Conference, in 1887, is characteristically full of interest, while the discussion of the various schemes proposed, the unselfishness of collaborators, such as Dr. Common, in sinking their own pet schemes, and the method of measuring the plates, holds the reader enthralled by the display of that true scientific spirit which has been a feature of the whole work.

Further on we read of some of the important results already accruing, such as the "solar cluster" and its possible analogues, the ratios of stars of different magnitudes, the relative efficiency of various optical systems, &c.

But it is by future generations of astronomers that the principal harvest will be reaped, and on this account the form in which the results of the measures are recorded is of primary importance. Prof. Turner gives a very simple account of the trend of the earnest discussions of this matter, and the conclusions which have been arrived at from time to time.

The Statesman's Year Book, 1912. 49th Annual publication. Edited by Dr. Scott Keltie. Pp. 1428 + lxxxiii + 9 plates. (London: Macmillan and Co., Ltd., 1912.) Price 10*s.* 6*d.* net.

THE utility of the "Statesman's Year Book" increases with every issue. The forty-ninth volume contains the usual compact and accurate information to which we are accustomed, and handles current events as admirably as usual. Maps show the census returns of the United States and India, the changed boundaries in Africa, as well as the parts of the United States and Canada which have been surveyed. The introductory tables provide an important statistical summary of the resources and productions of the British Empire.

The results of recent censuses have been included so far as possible. The volume as a whole tends to make one wonder what improvement can be made to celebrate the approaching jubilee of this valuable annual.

LETTERS TO THE EDITOR.

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

The Effect of Grass on Plants.

IN a review of the thirteenth report of the Woburn Fruit Farm which appeared in NATURE a short time ago, special reference was made to some of our experiments which seemed to prove conclusively that the injury done to trees by grass growing above their roots must be due to something excreted from, or resulting from the growth of, the grass, and not to its abstracting anything from the soil, or interfering mechanically or physically with the tree roots. In these experiments the trees were grown in plots of soil or sand, on which rested pans of soil or sand with grass growing in them. The pans had perforations in the bottoms covered by fine wire gauze. The trees used for comparison had, of course, similar pans placed above them, but without grass growing in them. The deleterious effect of the grass in these circumstances was nearly as great as when it was growing in the medium in actual contact with the roots.

These experiments are now being repeated on plants other than fruit trees, namely, tobacco, tomatoes, and barley; the plants are in every case growing in soil, but the pans contain soil in some cases, and sand in others. Where they contain soil the effect of the grass growing in them has been most marked, especially on the tobacco, where the plants are not one-quarter the size of those without grass; where the pans contain sand the effect has been much less, being noticeable chiefly by the paleness of the plant leaves, rather than by the stunting of growth. This indicates that the toxic effect varies considerably with the nature of the medium in which the grass is growing, and harmonises with previous observations that the effect of grass on trees varies considerably with the nature of the soil. With barley no certain effect of grass has yet been noticed, and it is quite possible that grass may not be deleterious to plants of the same order as itself.

It was observed that in all cases the plants with grass above them appeared just at first to do rather better than the others. This is consistent with other observations on this subject, and also with the recognised stimulating effect of toxins in minimal doses.

These experiments have not been completed, but the publication of a note on them may give others the opportunity of repeating them during the present season. SPENCER PICKERING.

The Local Races of Burchell's Zebra.

IN NATURE for June 6 (p. 364) there is a summary of a paper on zebras by Major Stevenson Hamilton, which was read before the Zoological Society on May 21. The author pointed out that it was possible to shoot in one herd in the Transvaal specimens exhibiting features claimed to be distinctive of such races as *E. burchelli wahlbergi*, *E. b. transvaalensis*, and *E. b. chapmanni*. From this circumstance Major Stevenson Hamilton concluded that the subspecies or local races in question had been based upon inadequate museum material.

Presumably the zebras observed, since they were shot in the Transvaal, belonged to the race named *transvaalensis*. It is not surprising therefore that they presented the characters of that form. Moreover, since the Transvaal lies between the areas of South Africa occupied respectively by *E. b. wahlbergi* and *E. b. chapmanni*, the occurrence of zebras there showing features possessed by those two subspecies is precisely what one would expect. For the subspecific rank assigned to the two forms in question implies the known, or expected, existence of intermediate forms in an intermediate geographical area.

Hence the value of Major Stevenson Hamilton's contribution to the question at issue lies in the proof it supplies, not of the unsoundness, but of the soundness, of the conclusions reached by museum systematists, at all events so far as the races of zebras under discussion are concerned.

Zoological Society, June 12. R. I. POCOCK.

Boulder Clay in Essex.

THE extensive deep sewerage works now being carried out under Mr. H. Tooley for the Essex County Council at Harlow have disclosed facts of considerable interest to students of glacial geology. The main sewer from Potter Street cuts through the hill of Boulder Clay between that place and Harlow at depths ranging up to 32 ft. The excavations and tunnels are entirely in the Boulder Clay, which assumes here an extraordinary till-like character, more so than in any exposure which has come under my observation in southern England. It is a black (rather slimy) clay, such as may well have been derived from the pounding up of Kimmeridge Clay, or Oxford Clay (as the latter is worked at the extensive works of the London Brick Company at Fletton, near Peterborough). Through this numerous chalk fragments are dispersed, and in the lower portions boulders (rounded, subangular, angular, and often beautifully striated) are met with in great quantity.

Among the erratics rocks have been recognised from the Carboniferous Limestone (abundant), the Rothliegendes, the Magnesian Limestone series, the Bunter (pebbles), the Lias, the Great Oolite, the Oxford Clay (by fossils), the Kimmeridge Clay (by fossils), the Chalk and the Eocene (sarsens and septaria), Jurassic fossils (Ostræa, Gryphæa, and five species of Ammonite), are sparsely distributed in fragments through the "till." Details are reserved for the B.A. Committee on "Erratic Blocks."

No trace of any crystalline rock (Scandinavian or otherwise) has been seen.

Referring to "Geology of Oxford and the Valley of the Thames," by the late Prof. John Phillips, F.R.S. (p. 461), one sees that the "northern drift" column receives ample confirmation from the facts stated above.

Taking into account the topography, it would appear that both the Harlow drift and the drift of the Upper Stort Valley have reached their present latitude through the "Elsenham Gap" (B.A. Report, 1910, p. 616), and it may perhaps be fairly inferred from all the facts to hand that the "till-like" Boulder Clay has been composed of material brought thus far south by a tongue of the inland ice of the Chalky Boulder Clay stage, while the drift deposits of the Upper Stort Valley represent in the main the later work of floating ice. A. IRVING.

Bishop's Stortford, June 14.

Campaign against Rats.

I BELIEVE that it is now unanimously admitted that the rat, both black and brown, is an unmitigated nuisance, both on account of the damage these rodents do and also because of the danger of plague and other diseases being spread by them.

The Sheffield and District Working Terrier Association has for the last two years been doing its best to lighten the scourge in this district; but, of course, isolated effort is useless. Why should not ratting clubs be formed in various parts of the country to try

to deal with the pests? An appeal in the daily Press has brought us inquiries as to the formation of clubs from Newcastle, Darlington, Blackburn, Walsall, Burton, Hull, Grimsby, Birmingham, Shrewsbury, and Bristol, whilst in the Manchester district such a club is already in being. We should be very glad to put any of your readers in touch with the local men in these districts, or to aid others to form similar clubs. Everything we can do to forward the destruction and thinning out of rats all over the United Kingdom we shall be only too happy to do.

WALTER HUTTON, Hon. Sec.

81, Clarkehouse Road, Sheffield.

THE PROGRESS OF RADIOTELEGRAPHY.[1]

THE volume opens with an interesting *résumé* by Prof. Ferdinand Braun of his contributions to wireless telegraphy, the paper being, in fact, a Nobel lecture delivered in Stockholm in December, 1909. The first question of importance which the author touches on is the invention of the transmitter with coupled circuits, *i.e.* the use of a primary with large capacity to excite the aerial by induction instead of charging the aerial directly as was done by Marconi at that date. Prof. Braun's historical notes are interesting in connection with recent litigation in this country. Among other researches which he describes, the most important are probably those on directive telegraphy. He ends with a quotation from his first lecture in 1900:—

Wireless telegraphy has so far been called spark-telegraphy, and no doubt it has hitherto been impossible to avoid having a spark in some part of the apparatus . . . what I have attempted to attain is, however, what one might call sparkless telegraphy.

The first number also contains papers by Prof. J. H. Nicholson, P. Barreca, and H. Rau. The substance of Nicholson's paper has already been published in English. In Barreca's paper we have a description of a method of measuring the radiation from an antenna and instances of the application of Barkhausen's method of using a Braun's oscillograph for the determination of the power in a high-frequency current circuit. The chief result is a measurement of the sum of the ohmic resistance and radiating power of a particular station, and a proof that for geometrically similar antennas the non-ohmic part remains constant.

H. Rau gives interesting photographic records of the primary and secondary discharges in ordinary spark telegraphy and in shock excitation. In the practical section of this number the greater part of the space is given to descriptions, in considerable detail, of the new Telefunken system and recent Marconi apparatus.

Among papers throughout the volume on the transmission of electrical waves over the earth's surface are those by Somerfeld, Epstein, Schmidt, and Uller. Somerfeld's paper is one of the most important that has hitherto been published on this subject. The whole question of the effects of different characters of earth surface in the propagation of electrical waves is very thoroughly discussed, among other things the question of surface waves and waves in free space being satisfactorily worked out.

Epstein contributes a method for determining the actual lines of force propagated over various soils, with diagrams showing their forms in several cases; while Schmidt deals with experimental measurements of the resistance of sea-water in the North Sea, and Uller extends these to the Baltic, giving conductivities in terms of a formula in which the variable is the concentration of sodium chloride.

The volume contains a number of interesting articles by Nesper and others on detectors, and there are numerous papers on methods of measurement by various authors. The papers dealing with the production of high-frequency current are mainly concerned with the shock-excitation method, with the notable exception of those dealing with Goldschmidt's alternator.

In addition to Rau's article, mentioned above, there is a paper by Max Wien on shock-excitation with quenching tubes, *i.e.* vacuum tubes in series with the spark-gap in the primary, or shock, circuit. The result is an increase of primary damping and of efficiency. Nesper discusses the employment of shock-excitation for wireless telephony, and particularly the advantages of a controlled exciter giving a uniform spark rate over an irregular discharge. A paper by Eccles and Makower on the efficiency of quenched spark methods and a number of smaller articles complete the contributions on this subject.

Goldschmidt gives an exceedingly interesting description of his remarkable high-frequency alternator, and Rausch discusses it from the mathematical point of view.

There are a number of articles on a subject which has recently been very rapidly developed in practice, viz., the transmission of musical tones and methods of acoustic tuning for the improvement of selectivity. Abstracts of patent specifications, reviews, and notes on practical problems are also included, and the whole volume forms an excellent review of the year's progress in technical matters.

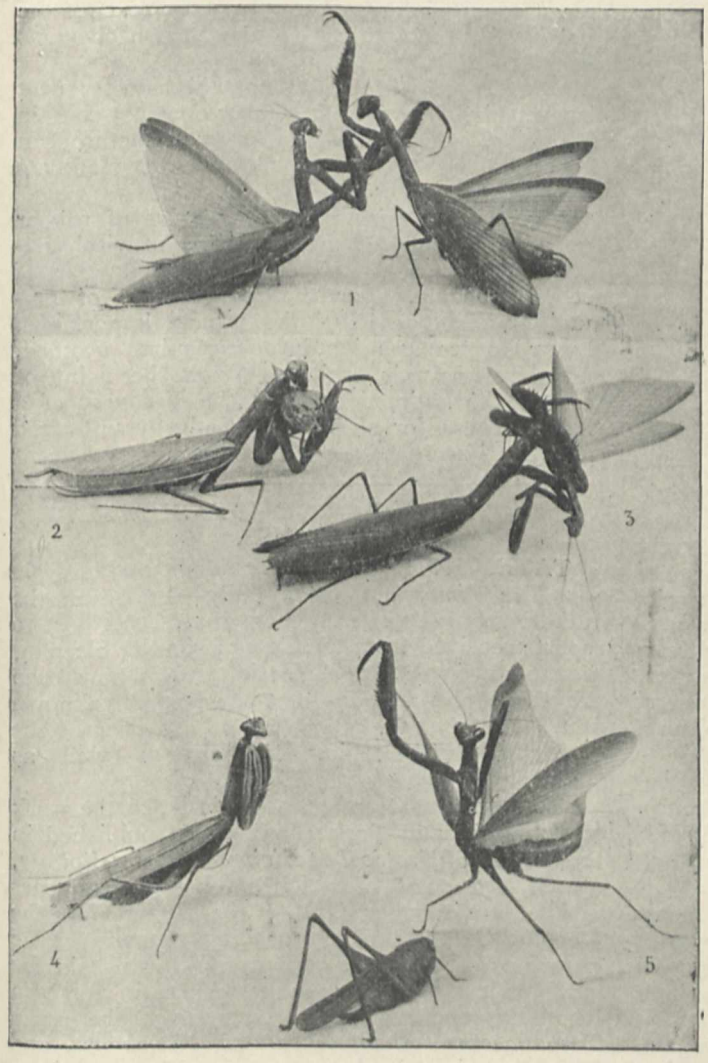
In quality and arrangement of the matter, as well as in printing and illustration, the "Jahrbuch" attains a very high standard. The only criticism which suggests itself is whether its utility and circulation would not be considerably increased if space could be found for more articles dealing with the engineering and even the commercial side of wireless telegraphy. At present the contents are largely academic in character, and are mainly theoretical and experimental investigations into first principles rather than discussions of actual problems and what has been accomplished towards their solution. A certain number of engineering notes are given, and it is the amplification of this section that appears advisable to the present writer, so that it may include not only descriptive matter, but also discussions of the problems occurring in everyday engineering practice.

J. ERSKINE-MURRAY.

[1] "Jahrbuch der drahtlosen Telegraphie und Telephonie." Unter besonderer Mitwirkung von Prof. Dr. J. Zenneck. Herausgegeben von Dr. G. Eichhorn. Band 4, Heft 1-6. Pp. 664. (Leipzig: J. A. Barth, 1910-11.) Price 20 marks.

FABRE AND THE INSECT WORLD.[1]

WE have before us a fresh proof of the genius of the author of "Souvenirs Entomologiques." His true tales from the Midi stand in a place by themselves, whether we consider them as science or as literature. Fabre is not only on terms of extraordinary familiarity with cigale and mantis, scarabee and crickets, and how many more, but we feel that he has got far into an understanding of a type of mental life which is on lines very different from ours. He has a Dickens-like power of disclosing convincingly to others the *vie intime* of insects which has become so real to him in the course of a lifetime of patient observation. In this volume, the title of which is not very apposite, Fabre tells the story of the insects we have mentioned above, and of the sisyphus beetle, the bee-hunter Philanthus, the emperor moth, the oak eggar, the truffle-hunter Bolboceras, the elephant-beetle, the pea-weevil, the haricot-weevil, and the pine-chafer. But how can these names suggest the exciting and romantic tales Fabre has to tell? Let us take an instance briefly:—



The mantis. 1. A duel between females. 2. Devouring a cricket. 3. Devouring her mate. 4. In her attitude of prayer. 5. In her "spectral" attitude. From "Social Life in the Insect World."

The bee-hunter, *Philanthus apivorus* (four times misprinted *aviporus*), is a brigand who attacks and kills hive-bees. The invariable situation of the fatal wound is on a white soft spot under what we may call the chin of the bee. Why is that spot chosen when there is a wider defenceless breach in the region of the corselet? Observation supplies the answer that the blow under the chin means stabbing the head ganglia, means the sudden immobility of the mouth-parts.

If the object of the Philanthus were merely to cause paralysis she would plunge her sting into the defective corselet, as does the Cerceris in attacking the weevil, whose armour is quite unlike the bee's. Her aim is to kill outright; she wants a corpse, not a paralytic. . . . What art, to destroy a miserable bee! In what fencing school did the slayer learn that terrible upward thrust beneath the chin? And as she has learned it, how is it that her victim, so learned in matters of architecture, so conversant with the politics of Socialism, has so far learned nothing in her own defence? As vigorous as the aggressor, she also carries a rapier, which is even more formidable and more painful in its results. . . . For centuries and centuries Philanthus has stored her cellars with the corpses of bees, yet the innocent victim submits, and the annual decimation of her race has not taught her how to deliver herself from the scourge by a well-directed thrust.

The hive-bee seems to be careless in the presence of Philanthus—assassin and future victim often drink from the same flower-goblet—and when it is caught it thrusts without method, at random. It only kills by accident. When the Philanthus has delivered the fatal stroke, it remains for some time quiet, clasping the bee—perhaps because the corpse retains for some minutes the reflex use of the sting. Then it begins in an extraordinary way to bruise and pound the bee's body, but with never another wound. What does it all mean?

These various manipulations, above all, the compression of the throat, lead to the desired result: the honey in the stomach of the bee ascends to the mouth. The atrocious meal lasts often half an hour or more, and repeated manipulation is resorted to until the last trace of honey has disappeared.

The book is full of similar stories, most of them, we must observe, of a less lurid character. Mr. Bernard Miall is to be heartily congratulated on his successful rendering of Fabre's style.

[1] "Social Life in the Insect World." By J. H. Fabre. Translated by Bernard Miall. Pp. viii+327. (London: T. Fisher Unwin, 1912.) Price 10s. 6d. net.

PRODUCTION OF SYNTHETIC RUBBER.

ON Monday, June 17, Prof. W. H. Perkin read a paper of very great interest before the Society of Chemical Industry. It has long been the desire of chemists to synthesise rubber by a method which would permit of cheap production on a large scale, and very many attempts have been made to do this. When the extraordinary boom in rubber set in a year or two ago, everyone was looking about for new sources of the material, and artificial rubber after artificial rubber was brought out. The term artificial was, indeed, the right one to apply, because the substances were none of them synthetic—in fact, as a rule, contained greater or less quantities of natural rubber, mixed with other substances. On Monday night, however, Prof. Perkin was able to announce that rubber has actually been synthesised, and that this synthetic rubber can be placed on the market at a price to compete with plantation rubber.

From long and arduous research work it was known that if isoprene, divinyl, and similar compounds could be obtained cheaply, it would be possible to polymerise them and convert them into rubber. But here was a very difficult problem. Turpentine could be used, but the price of turpentine was too high. The aim was to endeavour to find a substance from which rubber might be manufactured at about 1*s.* per lb. For this purpose the only substances which it seemed possible to use were wood, starch, sugar, petroleum, or coal. The product finally chosen was starch, which can so readily be obtained in the form of cereals, maize, or tubers at a price which works out at less than one penny per pound. By a process of fermentation, fusel oil can be obtained from starch and starchy material. It was, however, necessary to devise a cheap fermentation process, and Prof. Fernbach, of the Pasteur Institute, was, after eighteen months of laborious work, able to produce a fermentation process for the production of fusel oil from any starchy material. The process is now so satisfactory that the higher alcohols can be obtained at a cost of not more than 30*l.* per ton.

Having produced isoprene cheaply, the next consideration was how to polymerise it and convert it into rubber satisfactorily. The discovery of the cheap method for preparing isoprene was first suggested by Dr. Matthews. In 1909 Mr. E. Halford Strange, of Messrs. Strange and Graham, technical research chemists, directed his organisation of chemists, headed by Dr. Matthews, to the problem of the synthetic production of rubber. Dr. F. E. Matthews suggested one method for preparing isoprene in which acetone was one of the raw materials, and later on one in which fusel oil was the starting product.

Prof. Perkin was then asked to cooperate, and later on Sir William Ramsay joined the group as consultant. Afterwards Prof. Fernbach, of the Pasteur Institute, also cooperated. In July, 1910, Dr. Matthews left some metallic sodium in contact with isoprene, and on returning from his holidays in September found that the isoprene had turned into a solid mass of rubber. On further investigation it was found that sodium is a general polymerising agent for this class of material.

Strangely enough, the first announcement of this discovery was made by Prof. Carl Harries, of Germany, who had made the same discovery independently, about three months later. Owing to the English patent not having been published, Harries was unaware that his discovery had been anticipated. It is interesting to note that the competition in other parts of the process has been almost equally keen. The two parties reached the goal by different paths, but the British chemists were there first.

One very great point about this most recent discovery is that synthetic rubber does not contain impurities, and the process of manufacture can be carried out either in the cold or at moderate temperatures.

In connection with the manufacture of rubber another discovery of great, almost of vital, importance has also been made—the production of acetone cheaply. For the manufacture of ammunition, acetone is of the utmost importance. Every Government in Europe requires acetone, and the supply is limited. From the point of view of the national defence, the discovery of a cheap process for obtaining practically unlimited supplies of acetone cannot be overestimated.

THE TRANSMISSION OF SLEEPING SICKNESS.

STATEMENTS have been published recently in *The Times* and other daily papers, on the authority of Reuter's Agency, that, according to reports received from the Commission on Sleeping Sickness working in Rhodesia, it has now been proved beyond a doubt that the tsetse-fly known as *Glossina morsitans* can act as a carrier of the "bacillus" of sleeping sickness as well as *G. palpalis*.

These statements refer, apparently, to the work of Kinghorn and Yorke, which was published in the *Annals of Tropical Medicine and Parasitology*, March, 1912, and of which a full report appears in the last number (37) of the Bulletin of the Sleeping Sickness Bureau. Kinghorn and Yorke experimented with the trypanosome which is the pathogenic agent of sleeping sickness in northern Rhodesia, and which has been given the name *Trypanosoma rhodesiense* by Stephens and Fantham, since it shows certain differences from the typical *T. gambiense* of sleeping sickness in Uganda. They found, by experiments both with laboratory-bred flies and with flies caught wild and naturally infected, that *G. morsitans* can transmit the trypanosome to monkeys and other mammals.

Approximately 5 per cent. of the flies become infective, acquiring this power after a non-infective period of about fourteen days, during which the parasite is doubtless passing through a developmental cycle in the fly; the fly then retains the power of transmitting the disease during its life, and is infective at each meal. The authors

also found trypanosomes in about 30 per cent. of the wild game—namely, in the waterbuck, mpala, hartebeest, and warthog—but not in the elephant, rhinoceros, zebra, bushpig, or hunting dog; the trypanosomes found comprise three species—namely, *T. pecorum*, *T. vivax*, and *T. rhodesiense*, of which only the last-named is a human parasite.

The work of Kinghorn and Yorke thus confirms and greatly extends the previous results of Taute (*Zeitschrift für Hygiene*, lxix., 1911, p. 553), who, by laboratory-experiments carried on in the Tanganyika district, found that *T. gambiense* could be transmitted by *G. morsitans*. There can now be no longer any doubt that the infection of sleeping sickness can be conveyed by *G. morsitans* as well as by *G. palpalis*, which was thought formerly to be alone capable of transmitting the disease. Consequently the fact is established that sleeping sickness is not confined necessarily to regions coextensive with the distribution of *G. palpalis*, but can have a vastly wider range. From the administrative point of view this is a conclusion of the utmost importance, and, combined with the apparently widespread occurrence of the trypanosome as a harmless parasite of wild animals in nature, one which greatly complicates the problem of checking the spread of sleeping sickness.

NOTES.

THE list of honours on the occasion of the King's birthday, which was celebrated on June 14th, includes the name of only one fellow of the Royal Society, Lieut.-Col. D. Prain, director of the Royal Gardens, Kew, who has been knighted. Among others upon whom a like honour has been conferred are Mr. B. G. A. Moynihan, professor of clinical surgery at the University of Leeds; Mr. C. H. Read, president of the Society of Antiquaries; Mr. J. Bland Sutton, the distinguished surgeon; Dr. St. Clair Thomson, professor of laryngology and diseases of the throat at King's College Hospital. Another honoured member of the medical profession is Mr. R. J. Godlee, president of the Royal College of Surgeons, who has been created a baronet. The Companions of the Order of St. Michael and St. George (C.M.G.) include Dr. A. Balfour, director of the Government Research Laboratory, Gordon Memorial College, Khartoum; Mr. J. Currie, principal of the same college; and Mr. J. M. Macoun, assistant botanist and naturalist, Canadian Geological Survey. Dr. G. A. Grierson and Dr. M. A. Stein have been appointed Knight Commanders of the Order of the Indian Empire (K.C.I.E.), and among the new Companions of the same Order (C.I.E.) are Mr. B. Coventry, director of the Indian Agricultural Research Institute; Mr. A. Chatterton, superintendent of industrial education, Madras; and Dr. P. C. Ray, professor of chemistry, Presidency College, Calcutta. Mr. C. E. Fagan, assistant secretary of the British Museum, has been made a Companion of the Imperial Service Order (I.S.O.).

THE annual conversazione of the Institution of Electrical Engineers will be held at the Natural History Museum, South Kensington, on Thursday, June 27.

THE twenty-third annual conference of the Museums Association will be held in Dublin on July 8–12, under the presidency of Count G. N. Plunkett, director of the National Museum of Ireland. The honorary secretary of the association is Mr. E. E. Lowe, The Museum, Leicester.

WE regret to see the announcement of the death, at seventy-two years of age, of M. C. André, director of the Lyons Observatory and correspondant of the Institute of France; also of Prof. H. F. Weber, director of the Physical Electrotechnical Institute at Zurich, at sixty-nine years of age.

IN reply to a question asked in the House of Commons on Tuesday, June 18, Mr. Runciman said that the duties of the new horticultural branch of the Board of Agriculture and Fisheries will embrace all sections of the horticultural industry. The head of the branch will be Mr. A. G. L. Rogers, and he will have the assistance of an entomological expert, eight other expert outdoor officers with various technical qualifications, and an adequate clerical staff.

WE are informed that the Crocker Land expedition, which, as described in NATURE of April 25, p. 207, was to have gone northward this summer under the leadership of Mr. George Borup and Mr. D. B. MacMillan, has been postponed to the summer of 1913, on account of the lamentable death of Mr. Borup and the impracticability of finding a substitute for him in the short time remaining before the expedition was to start.

THE death is announced on June 13 of Dr. Shadworth H. Hodgson, at the age of seventy-nine years. Dr. Hodgson was distinguished as a metaphysician and philosopher, and was the author of the following works, among others:—"Time and Space: A Metaphysical Essay," issued in 1865; "The Theory of Practice," an ethical inquiry published in 1870; "The Philosophy of Reflection," in two volumes (1878); and "The Metaphysic of Experience," published in four volumes in 1898. He was the first president of the Aristotelian Society, and held the office for fourteen years. He was also an honorary LL.D. of Edinburgh, a corresponding member of the French Academy of Moral Sciences, and a fellow of the British Academy.

FULL particulars are now available of the annual meeting of the Société helvétique des Sciences naturelles, to be held at Altdorf on September 8–11, as already announced in NATURE. The meetings will be presided over by Dr. P. B. Huber, and the first general meeting will be held on September 9, when the president's address will be delivered and lectures given by Prof. Wiechert, of Göttingen, on atmospheric electricity, and by Prof. G. Bertrand, of Paris, on the chemical composition of living organisms. The second general meeting will be held on September 11, when Prof. Weiss, of Zurich, will lecture on atoms and molecules in the light of recent magnetic researches; Dr. P. Arbentz, of Zurich, on the structure of the Central Alps; and Dr. Paul Sarasin, of Bâle, on the Swiss National Park. Numerous excursions

and social gatherings have been arranged, and there is every prospect of a successful meeting.

The Daily Chronicle of June 11 contains an account of the skeleton of a mammoth which has just been set up in the museum at Stuttgart, and is stated to be larger than any other known specimen. The skeleton was found at Steinheim, in Swabia, in the summer of 1910. The tusks are of no very great size, measuring 7½ feet; but the skeleton is remarkable for the great relative length of the legs, especially the front pair, as well as for the great width of the molars. We understand that this skeleton is about to be described as representing a distinct local race of the mammoth. Somewhat curiously, a second mammoth skeleton has recently been set up in the Völkerkunde Museum at Leipzig. This skeleton, which is nearly complete, has been described by Dr. J. Felix, in the *Veröffentlichungen der Städt. Mus. für Völkerkunde* for the present year. It was discovered in December, 1908, under a considerable thickness of sand and clay, near Borna, its presence being revealed by the tip of one of the magnificent tusks. The skeleton stands 3·20 metres in height.

THE summer has opened with very different weather from that which characterised the early part of the summer last year. During the first half of June the highest temperature at Greenwich was 71°, whilst last year there were in the corresponding period three days with the thermometer above 80°. There were fifty-six fewer hours of bright sunshine this year, whilst the principal difference has been in the rainfall. In the first fifteen days of the month the rainfall at Greenwich was 1·96 in., which is 0·02 in. more than the average for the whole month, whilst last year for the corresponding period the total rainfall was 0·04 in. At Kew the rainfall for the first half of June this year was 2·38 in., at Camden Square 2·46 in., and at Hampstead 2·61 in. The summary of the weather issued by the Meteorological Office for the first two weeks of June shows that the rainfall was largely in excess of the average over the entire kingdom, the greatest excess occurring in the English districts. In the midland counties the rainfall for the two weeks was 265 per cent. of the average, in the south-east of England 254 per cent., in the south-west of England 245 per cent., and in the north-west of England 244 per cent. of the average. The duration of bright sunshine for the two weeks was everywhere largely in defect of the average.

AN exhibition of non-ferrous metals, organised by Mr. F. W. Bridges, with the aid of an influential advisory council, presided over by Sir Gerard Muntz, was opened on Saturday, June 15, at the Agricultural Hall, Islington. This is the first exhibition devoted to non-ferrous metals which has yet been held, and the exhibits, although not very numerous, are of a striking and interesting kind, including a series of products which represent the most advanced achievements of metallurgy. Several exhibits are of considerable scientific interest. Thus the increasing demand for vanadium in the metallurgy both of steel and of other metals furnishes an example of the practical use to which metals are now put which, but a short time ago, were never seen outside the showcases of chemical museums. Incidentally, the production of vanadium from its ores has also resulted in the production of uranium as a by-product, and the exhibit of the International Vanadium Company illustrates these products in a striking manner. Another fine exhibit is a very large slab of "star" antimony, upon which the dendritic crystals of that metal are exhibited in a very beautiful way, by Messrs. Cookson, of Newcastle. The same firm also shows crystals of antimony closely resembling those of bismuth, which can be obtained by pouring off the residual liquid when a slowly cooling ingot has formed a crust. The examples of antimony crystals obtained in this way which are shown at the exhibition are remarkably fine. More strictly utilitarian are the various exhibits of "ribbon metal" produced by allowing molten metal to run in a thin stream upon the surface of a rapidly revolving iron drum; some of the many uses of such material, such as the caulking of pipe joints and for the chemical reactions which occur in gold cyaniding, are illustrated.

THE tenth annual report of the director of the Bureau of Science at Manila, Dr. Paul C. Freer, for the year ending August 1, 1911, has been received. It is an excellent record of scientific work done in the Philippines, and covers so wide a field that it is impossible here to attempt an enumeration of the researches completed. One instance of the useful character of the work accomplished by the Bureau may be cited. In August, 1910, a plan was devised whereby a temporary anti-mosquito brigade was established to eradicate the brown mosquito, *Culex fatigans*, Wied, in Manila, and incidentally to lessen the day mosquito, *Stegomyia persistans*, Banks. The director reports that the brown mosquito has been practically exterminated, and it is now almost impossible to secure specimens of it for experimental purposes. Other examples, by which silk culture has been developed and improved, and the growing of tobacco has been made more satisfactory and more profitable, are dealt with fully in the report. Indeed, the Bureau of Science has in the ten years of its work so extended its activities that it is in close contact with the life and industries of the Philippines in every direction.

IN the many investigations that have been carried on with regard to the transmission of trypanosomes by tsetse-flies, the frequent presence, in the digestive tracts of flies caught wild in nature, of flagellate parasites known comprehensively as *Trypanosoma grayi* has been a standing puzzle. The name was given by Novy on the evidence of microscopical preparations sent to him from Uganda by Gray. Earlier investigators, including Koch, regarded these flagellates as stages of *T. gambiense*, the trypanosome of sleeping sickness. Minchin, who disproved this notion, regarded *T. grayi* as representing possibly the developmental stage of a bird-trypanosome in the tsetse. Kleine brought forward experimental evidence to show that it was the trypanosome of the crocodile. Most recently Roubaud has brought forward new observations in favour of the opinion, first expressed

by Novy, that *T. grayi* is a parasite peculiar to the fly itself, without a vertebrate host of any kind, and refers it to his genus, Cystotrypanosoma. The whole question is discussed in the recently published bulletin, No. 37, of the Sleeping Sickness Bureau, where it is suggested that possibly two species of flagellates are in question, the one a parasite of the tsetse alone, the other the developmental stage of the crocodile-trypanosome.

WE have to acknowledge the receipt from the publisher—Hugh Rees, Ltd., Regent Street, S.W.—of a copy of a "Diary" for collectors of birds' eggs, which appears to be well suited to its purpose. Collectors are advised not to take more than a single egg from any one nest save in exceptional circumstances.

IN describing a new race of bighorn sheep from the Sierra Nevada, Mr. J. Grinnell (Univ. Cal. Zool. Pub., vol. x., No. 5) points out that the desert-haunting forms of these sheep have larger ears than those which dwell among more genial surroundings. As a similar feature occurs in other desert mammals, it may doubtless be regarded as an adaptive provision, thereby indicating a difference in the intensity of sound-transmission in the two environments.

TO the third part of vol. xii. of the Proceedings and Transactions of the Nova Scotian Institute of Science, Mr. W. S. Brodie contributes an article on certain peculiar mounds which border the shores of Grand Lake, Cape Breton, and other lakes in the province. Attaining a maximum elevation of from 5 to 6 ft. above the level of the lake, these mounds have been regarded as the work of beavers, but the author gives reasons for considering them as glacial, and more or less nearly akin to "eskers."

IN the report on the progress of the U.S. National Museum for the year ending June 30, 1911, occasion is taken to give a *résumé* of its history, followed by an account of the completion and occupation of the new building, which took place on June 20 of the year under review, six years after the excavations for the foundations were commenced. The resources of the zoological department were heavily taxed during the year in coping with the great collections of mammal skeletons and skins obtained by the Roosevelt and other expeditions; no fewer than 3000 skulls were cleaned while more than 300 skins of the larger mammals were tanned. The collection of North American mammals made by Dr. C. H. Merriam, previous to his entering Government service, which contains many type specimens, was secured during the year.

THE present condition and future prospects of the great herds of wapiti which visit that portion of the valley of the Snake River in Wyoming known as Jackson Hole every winter, after passing the summer in or near the Yellowstone Park, are discussed by Mr. E. A. Preble in U.S. Dept. Agriculture Biological Survey Bulletin No. 40. The number in these herds is estimated at not fewer than 20,000, and until recently the deer have apparently found no great difficulty in supporting themselves; but increasing settlement, coupled with three unusually severe winters, has produced disastrous results, so that recourse to artificial feeding was found necessary. And it is evident that if the herd is to be maintained, assistance must be continued regularly.

MR. F. N. WILLIAMS has published the ninth part of his useful "Prodromus Floræ Britannicæ (C. Stutter, Brentford; price, by post, 2*s*. 9*d*.), containing diagnoses of fifty-three species of Dicotyledons. The descriptions and notes will doubtless render this work, when completed, of great interest and value to systematic botanists. It is much less likely, however, that the author's somewhat aberrant views regarding the larger groupings of orders or cohorts, as expressed in his system of classification, will meet with general acceptance.

PROF. J. W. BEWS, Natal University College, has written an interesting general account of the vegetation of Natal (Annals of Natal Museum, ii., 1912), evidently as a preliminary to a more detailed ecological survey of this colony. His paper, which is illustrated by ten fine plates made from photographs, is divided into two parts. In the first part, the author describes and discusses the various factors influencing plant-life in Natal—geological structure, soils, rainfall, mist, temperature, light, winds, fires, and animals. Under the last heading some interesting details are given concerning the effects upon the vegetation due to termites—"the scavengers of the forests"; to the giant earthworms, which may be a yard long and bring up very large amounts of soil as castings; to various rodents; and to the destructive native himself. The second part is devoted to a general sketch of the various plant associations, which are grouped under the three headings of shore, bush, and veld vegetation.

MR. C. BECKENHAUPT, in a tract entitled "Witterung, Erdoberfläche und Leben" (Humboldt-Bibliothek, Dr. W. Breitenbach, Brackwede i. W., 1912, price 2 marks), refers the ocean basins to the concentration of water in certain portions of the globe, whereby the primitive plastic crust became depressed. Such regions were at first equatorial, since the crust cooled there more slowly, and was therefore more capable of yielding. The formation of a basin leads to the upthrust of a continent, on which the growth of vegetation encourages further precipitation. The water runs off into the basin, and this consequently deepens, while the land adjacent to it rises. The author discusses, none too clearly, the causes that led to the rearrangement of the continents and oceans in a north-and-south direction, and urges that stability was given to the position of the earth's axis of rotation as continental land increased in height.

THE second volume of the Bulletin of the Seismological Society of America opens with papers of greater length and value than its predecessor. Prof. H. F. Reid, writing on the choice of a seismograph, enumerates the conditions which all such instruments should satisfy, and gives illustrated descriptions of the principal forms, with such useful details as the name of the maker and the price. Mr. N. F. Drake

contributes a catalogue of 528 destructive earthquakes in China from B.C. 1831 to A.D. 1911. In all the principal districts they are most frequent in the summer months, a fact which Mr. Drake attributes to rapid and strong variations of atmospheric pressure, assisted by the heavy rain-storms which occur in summer. The enormous loss of life attributed to some earthquakes (such as more than 830,000 in 1556) is probably exaggerated, but Mr. Drake remarks that it may not be greatly overstated. The dense population is grouped in closely built cities, the houses are usually built of brick or stone, and are roofed with heavy tiles or earth, which becomes soaked after long-continued rains.

THE Aëronautical Society has issued, in the form of an illustrated pamphlet of fifty-two pages, a short history of the society from the date of its foundation (1866), combined with an account of the progress of aëronautics during that period. Many books have been written in which the latter subject is treated in a popular way, but an exposition tracing the connection of our Aëronautical Society with these developments is a useful addition to the list. In view of the recent death of Mr. Wilbur Wright, the sections dealing with the work of the Wright Brothers are interesting. As a matter of fact, the original Wright experiments received little credence in this country, and the principal authentic records of them were, it is here stated, contained in a letter to Mr. Patrick G. Alexander in 1905. It is perhaps unfortunate that popular attention was directed to the feats of later aviators before the authenticity of these previous flights was generally admitted.

IN a paper on the methods of measuring association between two attributes (*Statistical Journal*, lxxv., 6), Mr. G. Udny Yule considers the interpretation of data such as the following:—In a small-pox epidemic at a place—say, Sheffield—given the numbers of recoveries and deaths among vaccinated and unvaccinated patients, to find a measure of the association between vaccination and recovery. The author shows that the ordinary test fails to give consistent results in comparing different sets of observations, say, at Sheffield and Leicester, and he proposes to interpret them by constructing a "symmetrical table" from the observed data. If the values of these data be denoted by p, q, r, s, the numbers in this table are proportional to the square roots of ps and qr, and the measure of association derived from the symmetrical table will thus be a function of the ratio of the ratios of p to q and r to s, as it should be. The investigation, however, covers a much more extensive ground than this, and allied investigations by Pearson and Heron are criticised at considerable length.

THE April number of the Journal of the Royal Meteorological Society contains a description of a new dew-gauge by Mr. S. Skinner, which appears to be both effective and simple. It consists of a Dewar vacuum goblet enclosed in a box, the top of which is flush with the edge of the goblet. When exposed at night the inside surface of the goblet cools by radiation and the moisture in the air in contact with it is deposited on the glass. In the morning the diameter of the drop of water collected at the bottom of the goblet is measured with a pair of compasses, and the volume of the drop determined by reference to a curve. The instrument is used in conjunction with a rain-gauge, so that a proper allowance may be made for water entering it as rain. As the result of observations made during 1909 and 1911 it appears that from 1 to 2 in. of dew falls in this country in the course of a year.

PROF. PLANCK'S address to the German Chemical Society on December 16, 1911, has been published separately by the Leipzig Akademische Verlagsgesellschaft. After showing how the two laws of classical thermodynamics lead to an expression for the change of the energy of a body in terms of the heat absorbed and the work done on the body, Prof. Planck explains how, when changes take place at constant temperature, the "free energy" of Helmholtz, and when, in addition, the pressure is constant, the "thermodynamic potential" of Duhem, serve as the most convenient means of investigation. He then describes the theory introduced by Nernst six years ago that the entropy of a body at the absolute zero of temperature is zero, and shows how this leads to several further conclusions which have been verified by observation. In the last section of the address he announces that he has given up the idea of the atomic structure of energy, and has substituted for it the idea that the range from zero to unity of the probability of the condition of a material system is divided into discreet ranges each of finite length.

THE Society for Promoting Christian Knowledge has added to its "Romance of Science Series" a volume entitled "Chemical Research in its Bearings on National Welfare." The book is written round the lecture delivered on January 11, 1911, by Prof. Emil Fischer, of the University of Berlin, on the occasion of the inauguration of the Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften, in the presence of the German Emperor. The lecture was printed in NATURE of February 23, 1911 (vol. lxxxv., p. 558), and is utilised in the volume before us. The editor provides an introduction, in which the importance of scientific research to national well-being is insisted upon, and a running commentary to the paragraphs of the lecture serves to give the general reader an admirable view of the importance of progress in chemical science.

IN a paper read before the Manchester Geological and Mining Society, and recently published by the Institution of Mining Engineers, Dr. John Harger makes some novel suggestions for the prevention of explosions in mines. He states that in discussions on the effect of coal dust in causing explosions, although in such explosions two factors are concerned—the composition of the dust and that of the air surrounding it—attention has been unduly concentrated on the former, and the influence of the surrounding atmo-

sphere has been left out of account. He describes an apparatus used for testing the degree of inflammability of coal dusts in different atmospheres, and proves the importance of the percentage of oxygen. Thus a certain coal dust gave no ignition in an atmosphere containing 18 per cent. of oxygen, partial ignition with 18½ per cent., and full ignition with 19 per cent. of oxygen. The results are suggestive, and are applied by the author to explain the contradictory results obtained by previous workers on the same subject. In particular, it is pointed out that a given coal dust can only be tested as to safety when in presence of air of the same composition as that of the mine. Dr. Harger suggests that if an atmosphere containing 17½ per cent. of oxygen could be supplied to mines coal dust ignitions would be rendered impossible, and explosions of any kind quite out of the question. He holds that such an atmosphere would be quite as good for respiration. Practically, an atmosphere containing 19 to 19¼ per cent. of oxygen and ¾ to 1 per cent. of carbon dioxide would suffice for the majority of mines.

Engineering for June 14 contains an illustrated description of a ferro-concrete sludge-pumping pontoon for the Manchester Ship Canal. The pontoon measures 100 ft. long by 28 ft. wide by 8·5 ft. deep from the keel to the main deck, and is the first example of a ferro-concrete vessel in this country. The designs, on the Hennebique system, are the work of Messrs. L. G. Mouchel and Partners, Westminster. Reasons for the selection of ferro-concrete construction were lower initial cost, elimination of maintenance charges, and readiness of repair. There are four transverse and two longitudinal watertight bulkheads, thus amply providing for the security of the vessel. The work of construction was commenced in August last, and all ferro-concrete work was completed on March 9. The water-tight compartments have since been tested by filling with water. The pontoon is now ready for launching, an operation which will take place in the course of a few days.

WE have before us a number of attractive little volumes, in which many branches and aspects of science are successfully surveyed. The books belong to three distinct series, namely :—(1) Manuals of Science and Literature, published by the Cambridge University Press, at 1*s.* net a volume; (2) The Home University Library of Modern Knowledge, published by Messrs. Williams and Norgate, at the same price; and (3) The People's Books, published by Messrs. T. C. and E. C. Jack, at 6*d.* net each. Some of the volumes in the first two series have been noticed separately in our review columns, and they may be regarded as typical of the rest. The Cambridge books are mostly too technical for general readers, but for students who have some acquaintance with the subjects with which they deal, they are admirable. The books in the Home University Library are somewhat more popular, and are all on a high level of excellence. The People's Books represent an independent and significant venture, which we cordially hope will meet with success. In this series we are provided for the modest sum of sixpence each with dainty volumes of about ninety-six pages, written by people whose lives have been devoted to the subjects which they survey. With such an abundance of accurate and authoritative knowledge available, everyone who desires can be put into touch with the present position of fact and opinion upon all scientific subjects of outstanding importance. Whatever demand exists for cheap books upon the various departments of natural knowledge is satisfactorily met by the volumes in this series, and we trust the enterprise of the publishers will meet with decided success. That there should be three comprehensive series of more or less popular books in which the volumes dealing with branches of science are written by men and women of distinction may, we hope, be taken as an indication of increased interest in scientific work.

MESSRS. JOHN WHELDON AND CO., 38 Great Queen Street, Kingsway, W.C., have just issued a classified zoological catalogue, comprising faunas of all countries, and including extensive collections of works on ornithology, mammalia, reptilia, fish and fisheries and general zoology.

OUR ASTRONOMICAL COLUMN.

CONSTITUTION OF THE MILKY WAY.—At this epoch when many theories as to the construction of our universe are being propounded, the collection and correlation of the available data is a labour of great value, and such works as Prof. Charlier's "Studies in Stellar Statistics" become invaluable.

His first memoir, appearing as No. 8 of the *Meddelanden från Lunds Astronomiska Observatorium*, deals with the constitution of the Milky Way, and although not generally suitable for popular treatment, contains a very striking exposition of the difficulties which beset the investigator, chiefly because the data are, as yet, so few. In this memoir he deals with the number of stars in different parts of the galaxy, and the distribution of their luminosities; subsequent memoirs will deal with the problems from other points of view. Dividing the sky into forty-eight squares of equal area, he finds *inter alia* that a certain square in the Milky Way contains between 30,000,000 and 250,000,000 stars, while in a square containing the pole of the Milky Way the corresponding limits are 600,000 and 2,000,000. The wide limits well illustrate the uncertainty produced by the paucity of the data available. Similarly, Prof. Charlier finds that the limiting distance of our stellar system, in the direction of the plane of the Milky Way, may be put between 600 and 1400 "siriometers," the "siriometer" being a distance equal to a million times the sun's mean distance from the earth.

THE SOLAR ECLIPSE OF APRIL 17.—The current number (53–54) of the *Gazette Astronomique* contains a large number of observations of the solar eclipse of April 17, made by the various parties organised by the energetic astronomical society of Antwerp to observe at Silenrieux, in the province of Namur. The results show that the central line passed exceedingly close to, or over, Silenrieux. A memoir embodying the complete results of the observations and their discussion is being prepared for publication by the society.

Other important results are published in *L'Astronomie* for June, and are illustrated by many interesting diagrams and photographs. Among the latter are three by M. Rudaux, who observed in the Pyrenees, the first showing the dark moon projected on the lower corona beyond the northern cusp of the

sun, the second and third showing the difference in the illumination of the Pic d'Arlas produced by the interception of the sun's most actinic radiations by the dark moon.

No. 4574 of the *Astronomische Nachrichten* also contains a number of communications concerning the eclipse, in one of which Prof. Hartmann states that the observations made at Göttingen show that the eclipse took place 25·7 seconds earlier than the time calculated from the data given in the Nautical Almanac; this, he states, would give a correction of +10·3″ to the moon's place as there given.

MAGNITUDES OF NOVA GEMINORUM NO. 2.—No. 4574 of the *Astronomische Nachrichten* contains a number of observations of the magnitude of Nova Geminorum from the time of its discovery, March 13, to May 15. The observations made at the Copenhagen Observatory, and communicated by Dr. Strömgren, give the magnitude on March 13 as 4·22 on the P.D. scale, and show apparent brightenings on March 24 (4·72) and April 17 (6·52); the magnitude from May 13 to May 15, the final observation, was 7·81.

DESIGNATIONS OF NEWLY-DISCOVERED VARIABLE STARS.—In No. 4579 of the *Astronomische Nachrichten* the variable-star commission of the Astronomische Gesellschaft publishes the permanent designations of 141 variable stars discovered in recent years. In addition to the provisional number, they give the 1900 position, the precession, and the range of magnitude for each object.

SOME RECENT WORK IN PALÆONTOLOGY.

CHESTER A. REEDS has examined the fauna of "The Hunton Formation of Oklahoma" (*Amer. Journ. Science*, vol. xxxii., p. 256), and concludes that this so-called formation contains two Silurian and two Devonian series. Calceola occurs in the lowest series. A table is given of species that range over several divisions, and there is at once seen to be a marked faunistic change between the two Silurian series. The author divides the former "Middle Hunton" series along a similar break, based on the difference in the species that are absolutely characteristic of its lower and upper portions. The upper portion now goes into the Devonian.

M. Yokoyama describes "Some Tertiary Fossils from the Miike Coal-field in S.W. Japan" (Journ. College of Science, Tokyo, vol. xxvii., article 20), which were discovered during the sinking of a shaft. The familiar *Pholadomya margaritacea* and *Aturia zic-zac* of Europe occur here, with a number of Cainozoic molluscs, and the coal-bearing series is regarded as Palæogene, i.e. Lower Tertiary. A new species, *Venericardia nipponica*, proves to be very characteristic. Two new crustacean species are described, and are drawn among the excellent illustrations by Ishizaki.

Franz Toula ("Paläontologische Mitteilungen aus den Sammlungen von Kronstadt in Sibenbürgen," *Abhandl. k.k. geol. Reichsanstalt*, Vienna, Bd. xx., Heft 5, price 12 kronen) describes, in a handsome folio memoir, a number of things that he found in various hands when visiting Kronstadt (Brassó), in Transylvania. He discusses a fauna of Liassic age from Neustadt, and another from a bed three metres thick near Alsó-Rákos. Several of the poorly preserved ammonites from the latter may prove to be new species. Perhaps the most striking plate is furnished by *Rhynchonella* (*Peregrinella*) *multicarinata*, from Zajzon, a form originally known from the Lower Cretaceous of France, and measuring some 75 mm. high, 85 mm. broad, and 50 mm. thick. Some notes on Pliocene vertebrates conclude the memoir, which certainly does justice to somewhat obscure material.

Coming now to papers on particular groups of fossils, we note that M. C. Stopes has investigated the "Dragon Tree," or Dracæna, of the Kentish Rag (Lower Cretaceous of England), and concludes that it is not an angiosperm. Seward had already suggested a relationship to the cycads. The author has now found crumbling wood in certain specimens, from which she has successfully isolated tracheids, and she refers the tree to the higher conifers under the name of *Coniferocaulon Benstedii* (*Geol. Mag.*, 1911, p. 55).

G. R. Wieland (*Amer. Journ. Sci.*, vol. xxxii., 1911, p. 133) continues his elaborate studies of American fossil cycads, and is able, on the basis of new material, to give a very detailed exposition of the structure of the seeds of Cycadeoidea. He believes that in this plant "we deal with a genus of world-wide distribution and long persistence in time." Numerous references are naturally made to European workers.

E. W. Berry describes the "Flora of the Raritan Formation," a Cretaceous series in New Jersey (Geol. Surv. New Jersey, Bull. 3, 1911). The beds are regarded as slightly older than the Dakota series, but also Cenomanian (p. 21). The paper is written in an explanatory style, which makes it far more pleasant reading for the geologist than many others on fossil botany; and surely the geologist has a primary interest in such matters. The flora is represented mainly by the leaves of dicotyledons, and a distribution from the Arctic area is suggested (p. 51).

E. Heron-Allen and A. Earland have completed their studies of the "Recent and Fossil Foraminifera of the Shore-sands at Selsey Bill, Sussex," the first part of which appeared in 1908 (Journ. Roy. Microscop. Soc., 1911, pp. 298 and 436). The tabular list of species shows the patient care required for such work. It would have been convenient if the fossil forms had been marked off in these concluding pages from the recent (see also NATURE, May 23, 1912, p. 290).

Richard Schubert contributes a folio memoir on "Die fossilen Foraminiferen des Bismarckarchipels" off New Guinea to the *Abhandlungen der k.k. geologischen Reichsanstalt* (Bd. xx., 1911, Heft 4). The material was collected by the geographer Karl Sapper during an official German expedition, and represents Cainozoic deep-water deposits. Some of the forms were studied in thin sections of the consolidated ooze, of which interesting photographs are given on Plates i. and v. The author regards the upraised Globigerina oozes (pp. 38 and 39) as having been formed in Pliocene times in water not less than 1000 metres deep, and probably between depths of 2000 and 3000 metres (say, 1200 fathoms). Some of them are now lifted 1000 metres above the sea. It is suggested that some oozes consisting of closely packed Globigerinæ, all of one size, represent material washed up into lagoons and separated into distinct grades by the waves. The deposits studied range in age from Lower Oligocene (marked by species of Nummulites) to Pliocene.

F. Springer, in "The Crinoid Fauna of the Knobstone Formation," treats of a number of pelmatozoan genera that bear upon the stratigraphy of the Lower Carboniferous beds in Kentucky and adjacent States (Proc. U.S. Nat. Mus., vol. xli., 1911, p. 175).

Ray S. Bassler has brought the experience gained among the rich material of America to bear on the "Early Palæozoic Bryozoa of the Baltic Provinces"

(Smithsonian Institution, Bull. 77, 1911, pp. xxii. and 348). The United States National Museum has generously sent an almost complete set of the species described to the British Museum, while the British Museum has supplied in exchange a series of Ordovician bryozoa collected by F. A. Bather in Öland. It appears that bryozoa have not yet been traced back beyond the Lower Ordovician, but from that epoch their abundance makes them serviceable in stratigraphical work. The author reviews the relations of the Cambrian and Silurian strata of Baltic Russia to those of the United States, and correlates the Richmond series of America with the Borkholm Limestone as earliest Gotlandian ("earliest Silurian" of the author). A species of Fenestella (p. 175) is found as far back as the Borkholm Limestone. A new genus of Batostomellidæ, Esthoniopora, is established (p. 259) for two species of Middle Ordovician age. Rhabdinopora (Eichwald) is definitely referred (p. 348) to the hydrozoan Dictyonema. The drawings of structure throughout this important memoir are clear and abundant.

The Geological Survey of Great Britain (Memoirs, Palæontology, vol. i., part iii., 1912, price 3s.) issues a paper by G. W. Lee on "The British Carboniferous Trepostomata." The author observes that the forms are likely to have a zonal value.

Charles Schuchert has usefully discussed the "Palæogeographic and Geologic Significance of Recent Brachiopoda" (Bull. Geol. Soc. America, vol. xxii., 1911, p. 258). He shows how the inarticulata, when "large, thick-shelled, and abundant," indicate water of less depth than 100 ft., and he incidentally illustrates the extraordinary vitality of Lingula in Japan, under the most adverse conditions of sedimentation near a shore. The facts quoted from Yatsu (p. 263) go far to explain the persistence of this venerable genus. In the geographical part of the paper, the present distribution of genera is shown to harmonise with the existence and shore-line of the Gondwana continent across what is now the South Atlantic Ocean. We have read the following sentence from the conclusion several times (p. 275), and it surely needs some expansion to make it clear:—"Gondwana appears to have existed until middle Eocene times; the deciding land barrier between the northern and southern hemispheres and the inter-hemisphere shallow-water genera followed either its shores or those of Oceanica and the northern Pacific bounding lands." Is it only the punctuation?

A. R. Horwood ("On the Layers of the Molluscan Shell," *Geol. Mag.*, 1911, p. 406) shows that shells consisting of aragonite may be preserved in their original mineral condition from as far back as Jurassic times. He adds several examples to those already noted by G. Cole and O. H. Little. We are not aware on what authority he differs (p. 411) so widely from Sorby, who determined the nacreous layer of Nautilus—by far the greater part of the shell—to be aragonite. The statement in the same table that the fossil cephalopods are preserved in aragonite is, of course, a slip. The paper, however, is too full of slips or unusual modes of expression. The chemical composition of a specimen of calcite (p. 416) is said to include carbonic acid 42·2 and carbonate of lime 54·4 per cent., while a detailed analysis of some particular sample of aragonite is quoted for comparison. Surely both minerals might have been given as calcium carbonate 100 per cent. We do not like to call (p. 411) a material that consists of calcite "pseudo-calcite," and we feel tempted to quote a sentence at the top of p. 408 as being far more difficult than that given above from Schuchert.

R. Bullen Newton, in his presidential address to the Malacological Society, showed how molluscs have been utilised in marking stratigraphical zones (Proc. Malac. Soc., vol. ix., 1911, p. 282).

P. Bartsch reviews recent and fossil forms of Alvania (a round-mouthed and reticulated genus cut off from Rissoa) from the west coast of America (Proc. U.S. Nat. Museum, vol. xli., 1911, p. 333). Eighteen of the thirty-five species described are new, but the only fossil forms, both of them new, are *A. pedroana* and *A. fossilis*, from sand-rock in California, the age of which is unfortunately not stated.

J. Nowak (*Bull. internat. de l'Acad. des Sciences*, Krakow, 1911, p. 547) examines the cephalopoda of the Scaphites group in the Upper Cretaceous of Poland. The paper is written in German. He criticises Yabe's reliance on the character of the internal saddle in distinguishing a new genus, Yezoites, and compares the three Polish species of Scaphites from several points of view. He places the familiar species *aequalis* under a new genus, Holcoscaphites (p. 564), thus indicating its descent from Holcostephanus. *Acanthoscaphites tridens* and *Hoploscaphites constrictus* similarly record descent from Acanthoceras and Hoplites. The known species from other countries are distributed among these genera. The Polish forms, which are here reproduced by photography, seem by no means so aberrant from the ordinary ammonite type as are the Scaphites familiar in England.

The late Victor Uhlig, in the third fasciculus of his work on "The Fauna of the Spiti Shales" (Mem. Geol. Surv. India, ser. xv., vol. iv.), completed his description of the Ammonites with several new species of Perisphinctes, and an account of a possible Bochianites (p. 381). Another rare genus, Diploconus, seems to be indicated among the Belemnoidea.

C. D. Walcott is enabled, by the discovery of the genus in the top of the Lower Cambrian of North America, to assign an horizon to the trilobite Olenopsis, hitherto known only from Sardinia (Smithsonian Miscell. Coll., vol. lvii., 1912, p. 239). He also discusses a number of new Middle Cambrian Crustacea, Trilobita, and Merostomata (*ibid.*, p. 145), in which he is especially successful in detecting limb-structures. It appears that the photographic illustrations, as in previous cases, are from specimens in which the outlines and delicate features have been emphasised by painting on the slab.

Anton Hardlirsch, of Vienna, records "New Paleozoic Insects from Mazon Creek, Illinois" (*Amer. Journ. Sci.*, vol. xxxi., 1911, p. 297). He has found it necessary, from a sample of the rich material in the Upper Carboniferous ironstone nodules, to establish forty new species, twenty-three new genera, nine new families, and a new order. The possibilities before future research are shown by the fact that "rarely has one and the same species been represented by more than a single specimen."

H. W. Fowler describes the "Fossil Fish Remains of the Cretaceous, Eocene, and Miocene Formations of New Jersey" (Geol. Surv. N.J., Bull. 4, 1911). The elasmobranchs figure largely among the Cretaceous forms. We regret to see that we are asked to write Lepisosteus for our old American friend Lepidosteus, especially as the order remains known as Lepidostei (p. 148).

S. W. Williston has been given access to unworked Permian material in the Yale Museum, and describes the Limnoscelidæ, a "New Family of Reptiles from the Permian of New Mexico" (*Amer. Journ. Sci.*, vol. xxxi., 1911, p. 380). The skull is happily complete, and is exceptionally long, with highly developed conical incisors. The species on which the family is established is called *Limnoscelis paludis*, on account

of its presumed marshy habitat, and is placed near Diadectes, with affinities with Pareiasaurus.

In the Proceedings of the Liverpool Geological Society, vol. xi., H. C. Beasley describes (p. 108) a group of footprints from the Keuper of Storeton, which may perhaps be reptilian. F. T. Maidwell (p. 140) publishes "Notes on Footprints from the Keuper of Runcorn Hill," laying especial stress on their webbed character.

J. C. Merriam (Mem. Univ. California, vol. i., 1911, p. 199) proposes to investigate the Pleistocene fauna accumulated in an asphalt swamp at Rancho La Brea, in the Los Angeles district. He describes the deposit in this first paper, and attributes the abundant remains of carnivores (p. 211) to the attraction offered to them by struggling animals caught in the tarry pools. This selective process, by which carnivorous birds and mammals become themselves entrapped, may be seen in operation in the locality at the present day. G. A. J. C.

THE ISLE OF WIGHT BEE DISEASE.

DURING the last five years a feeling approaching consternation has prevailed among British bee-keepers on account of the rapid spread of the epidemic known as "Isle of Wight Disease." Bee-keepers and students of protozoology will alike welcome the comprehensive report ("Supplement to the Journal of the Board of Agriculture," vol. xix., No. 2) which has lately been issued on the subject. This report represents the combined work of Drs. Graham Smith, H. B. Fantham, Annie Porter, and W. Malden, and Mr. G. W. Bullamore. It deals with the history and symptoms of the disease, the means by which it is spread, and the methods of treatment and prevention which may be adopted. It also gives full details, with excellent figures, of the life-history of *Nosema apis* (a microsporidian parasite closely allied to the organism that causes the "Pébrine" disease of silk-worms), which "is the agent responsible for most cases in which the symptoms of the Isle of Wight disease have been noticed."

An examination of the available records has convinced Dr. Graham Smith that the present prevalence of the disease in Great Britain cannot be traced entirely to the outbreak in the Isle of Wight in 1906, but that "from its commencement the epidemic was more widespread than was at first supposed, and that the disease has been endemic in parts of the country for many years." It is well known that the disease causes the death of large numbers of adult bees, often exterminating an entire stock; usually the affected insects crawl on the ground in front of the hive unable to fly. In most cases examination of the chyle stomach reveals the presence of stages in the life-cycle of *Nosema apis*. The parasites, swallowed as spores, enter the epithelial cells of the chyle stomach and multiply there, ultimately giving rise to resistent spores which pass into the intestine and are voided with the excrement. Thus food and water become contaminated and the disease is spread. From the nature of the infection it is evident that the ruthless destruction of diseased stocks and the thorough disinfection of apiaries must be carried out. The bee-keeper's difficulties are not lessened by the warning that probably "partially immune stocks exist, which can only be caused to suffer from the disease with difficulty, but which may harbour the parasite and act as centres of infection for susceptible stocks."

Unfortunately this report has appeared too late for inclusion in the "Historical Notes on the Causes of Bee Diseases," by Drs. E. F. Phillips and G. F. White, lately issued by the United States Department of Agriculture (Entom. Bulletin, No. 98). This bulletin contains summaries of a selection of important memoirs and papers on bee diseases, arranged chronologically from Schirach's "Histoire naturelle de la Reine des Abeilles" (1771) to Zander's "Handbuch der Bienenkunde" (1910–11). As many of the papers summarised were published in little-known Continental journals devoted to bee-culture, the compilation will be most valuable to English-speaking students. How much work remains to be done on the subject of bee diseases may be inferred from the authors' opinion that American foul brood is the only infection which has been as yet decisively traced to a definite micro-organism (*Bacillus larvae*). In view of the work of Fantham and Porter on *Nosema apis*, the "Isle of Wight" disease must now be added to this select list.

THE KINEMATOGRAPH IN SCIENCE TEACHING.

ON June 12 the proprietors of *The Bioscope* gave a very interesting demonstration at Cinema House for the purpose of illustrating the scientific and educational value of the kinematograph as applied to the study of natural science. Some of the films shown were very remarkable, and the various firms concerned in their production are to be heartily congratulated on the high degree of perfection to which they have already brought the art of kinematography. It appears to us that there are two main directions in which this process is likely to assist materially the progress of natural science. In the first place, it should be an invaluable aid in the actual investigation of phenomena which take place either too quickly or too slowly for convenient study by direct observation. This was well demonstrated by a number of films showing the germination and growth of plants taking place at some thousands of times the normal rate, and by a similar series of the early stages of the developing chick. The movements of seedling plants viewed in this manner are highly instructive and very curious, and no less remarkable is the growth of the chick embryo with its neural folds, mesoblastic somites, &c. We should like to know in the latter case how the film was taken, and whether or not it had to be in any way "faked." We should also like to have had the film stopped at intervals in order to analyse the processes which were going on.

In the second place, the kinematograph will evidently be of great use in popular lecturing, and such a film as that entitled "The Fly Pest" is of the highest educational value. For ordinary teaching, however, it appears to us doubtful whether, if brought into extensive use, it will do more good than harm. Nothing can replace satisfactorily the direct contact with nature which is the essence of all really satisfactory teaching in natural science, and it is doubtful whether a moving picture is even as valuable from this point of view as a series of good wall diagrams, or blackboard drawings, which are long enough before the eye to create a permanent impression. One of the films shown, "A Lesson in Liquid Air," seems to us to indicate very clearly the danger that kinematography may be put to an illegitimate use in teaching. We have here a series of pictures of experiments, and of the experimenter. The pictures are certainly instructive, but they form but a poor substitute for the actual experiments; if the students cannot perform these for themselves they ought at least to be able to see them actually carried out before their eyes. For serious teaching the kinematograph cannot replace the real demonstration any more than the phonograph can replace the real teacher.

ICEBERGS AND THEIR LOCATION IN NAVIGATION.[1]

Origin of the North Atlantic Ice.

THE icebergs each year met with in the North Atlantic are almost entirely derived from western Greenland. The interior of Greenland is covered by a large ice-sheet forming an enormous glacier, which gradually moves outwards, meeting on its journey mountains and islands which form a fringe varying in width from a mere border up to eighty miles. This mountainous belt is penetrated by deep fiords, through which the ice passes towards the sea. As the huge ice-sheets are forced into the sea they are broken off and set adrift as bergs. The "calving," as it is called, may take place in a number of ways.

Von Drygalski distinguishes three classes of bergs; those of the first class are the most massive of all, and separate with a sound like thunder from the entire thickness of the glacier front. They result from the buoyant action of the water as the glacier pushes out into the deep water. They usually regain their equilibrium after rhythmic oscillation, and float away in an upright position. Bergs of the second class are broken off under water from time to time. They rise and often turn over before they gain equilibrium, displaying in this way the beautiful blue colour of the lowest layers of ice. Bergs of the third class form almost continuously, and consist of large and small fragments which separate along the crevasses and fall into the sea.

According to the report of the U.S. Hydrographic Office, the size of the pieces of ice set adrift varies very much, but bergs 60 to 100 ft. to the top of their walls, with spires and pinnacles from 200 to 250 ft. high, are most often found. The length of such an average berg would be from 300 to 500 yards. The depths of these masses under water is variously given as from seven to eight times the height, but this is not always the case. It is possible to have a berg as high out of the water as it is deep below the surface, since the submergence depends entirely on mass, and not on height. It is possible to find bergs with a pinnacle rising high out of the water, but offering little weight to the mass below. Besides the icebergs formed from the Greenland glaciers, a few come around Cape Farewell from the Spitsbergen Sea, and some may be traced from Hudson's Bay.

Movement of Ice from the Arctic Regions.

The Labrador current flows southward along the coasts of Baffin Land and Labrador. The average rate is from ten to thirty-six miles per day, but occasionally it ceases altogether (U.S. Hydrographic Report, 1909). Its rate is influenced by the wind, especially near the coast. As soon as free the icebergs find their way into the Arctic current and float gradually southward. The journey is by no means an easy one, and few bergs survive. There are many mishaps, such as grounding in the Arctic basin with ultimate breaking up, stranding along the Labrador coast, where destruction takes place, and falling to pieces entirely in the open sea. Only a small percentage ever reach the Grand Bank and the routes of the Transatlantic liners, so many delays attend their journey. It is well known that many bergs seen in any one season may have been produced several seasons before. Taking the Labrador current as ten miles per day, a berg once formed and drifting freely would make the journey southward in from four to five months. The difference in time of two bergs reaching a low latitude may cover a period of one or two years, even when these start on the same day, so devious are the paths into which chance may direct these floating masses. Undercurrents affect the largest icebergs, and frequently they are seen to move backward against the wind and surface water. Extensive field-ice offers an obstruction to the movements of the bergs, hence the number met with from one season to another must depend on the mildness or severity of the previous summer in the north.

[1] Abridged from a discourse delivered at the Royal Institution on Friday, May 31, by Prof. Howard T. Barnes, F.R.S.

Field-ice and its Distribution in the Gulf of St. Lawrence during the Winter.

Icebergs are not alone in causing an obstruction to navigation in the Labrador current. Field-ice, which may extend over wide areas, presents great difficulties. This ice is salt water frozen in the bays and inlets along the shore, as especially in the Gulf of St. Lawrence. Immense fields are formed of pieces blown by the wind and massed together in an irregular way. Change of wind and tide causes the fields to float away. When several fields are blown shorewards together they grind and crush together, forming irregular ice many feet thick. Frost and spray soon cement this together into a hard mass, almost impossible to break. Floating again, these agglomerated ice masses, often many miles in extent, are carried out to sea, there to produce great danger to navigation. While the Gulf of St. Lawrence never freezes over entirely, there is to be found all the winter floating areas, which take up their position with the direction of the wind. As the spring advances these fields become weaker, and finally disappear. The last to open is the Straits of Belle Isle, where towards the end of June it becomes sufficiently free for ships to navigate.

Limits of Region of Icebergs and Field-ice.

From the reports carefully compiled by the U.S. Hydrographic Office, it has been found that in April, May, and June are to be found the greatest number of icebergs and the largest extent of field-ice. They have been seen so far south as the thirty-ninth degree of latitude, and so far east as longitude 38° 30′. In general, it may be stated that floating ice may be met with anywhere in the North Atlantic Ocean, northwards of the fortieth degree of latitude, at any season of the year.

Surface Temperature of the Labrador Current in Winter and Summer.

During the winter months the surface temperature of the Labrador current often falls to the freezing point of salt water, about 28° F., but it is more often at 29° or 30° F. As the spring advances the line of low temperature advances further north, until in July or August the temperature on the Grand Banks towards the Straits of Belle Isle reaches 40° or 45° F., and gradually falls northwards to 29° F. in Hudson's Straits. The surface temperature varies considerably, depending on the proximity of ice or land, as will be explained shortly. No measurements have been made north of the Banks in winter or spring, when the Straits of Belle Isle are ice-bound. Reports of the temperature of the ice track are frequently made by sea captains. Results as low as 22° F. have been given to me; but I believe this to be impossible, and due to some error of measurement arising from the crude method now in vogue on our Atlantic liners.

Pettersson's Theory of Ice Melting.

Dr. Otto Pettersson has for some time shown experimentally that ice melting in salt water produces

three currents. When the ice melts it cools the salt water, which sinks down by convection. A stream of warmer salt water moves in towards the ice, giving rise to a horizontal current. The melted ice consists of fresh water, which does not mix with the salt water on account of the difference of density. This fresh water rises around the ice and spreads out over the surface. Very soon the ice is seen to be surrounded by a layer of fresher water, which tends to remain on the surface. As the ice moves the fresh water moves with it. Pettersson believes that this circulation has an important influence on the currents in the sea.

Icebergs which have been left high and dry on the shore by the tide show the action of the melting. Bergs which become top-heavy and turn over also bear evidence to the underwater current producing the melting. The form of the ice shows a deep furrow running all around where the melting process has proceeded, and this is often the cause of the rolling over of a berg to find equilibrium in some other position.

Signs of the Proximity of Ice.

Before ice can be actually seen there is a peculiar whiteness observed around the berg on a dark night. This is called by mariners the ice "blink." It is caused by the reflection of the scattered rays of light from the sky from the white surface of the berg. Thus it is a contrast between the black absorbing water, which reflects none of the light, and the ice, which scatters nearly all. It is stated that on a clear day over the ice on the horizon the sky will be much paler or lighter in colour, and may be distinguished from that overhead.

During foggy weather ice can sometimes be made out on account of its darker appearance. In this case it is a contrast effect again, but this time it is the shadow of the berg against the white shadowless fog particles.

Icebergs are sometimes detected by the echo from the steam-whistle or fog-horn. They are also frequently heard for many miles by the noise they make in breaking up and falling to pieces. The cracking of the ice or the falling of the pieces into the sea causes a noise like thunder.

The absence of swell or waves is sometimes a sign of ice or land, and the presence of flocks of birds far from land is an indication of ice. The temperature of the air usually falls as ice is approached, and mariners describe a peculiar damp cold, as distinguished from the cold caused by a change of wind.

Failure of Previous Efforts to make Use of Temperature Changes in the Sea.

Navigators place no reliance on temperature measurements. As a matter of shipboard routine, the temperature of the water is taken, but very little, if any, attention is paid to it. The method is to dip a canvas bucket over the side and bring up a sample of sea water. The quartermaster then inserts a good household thermometer in the water, waits for a few minutes, and then reports the reading to the bridge. The thermometer is usually graduated in two-degree intervals, representing a length of stem about one-eighth of an inch. The interval of time between the dipping of the water and the report of the reading may be anything from five to ten minutes. In the meantime, the ship has sailed some miles beyond the point of observation.

The Recording Micro-thermometer and its Use in Locating Ice.

For many years I have been studying the effect of ice on the temperature of the St. Lawrence River. I found that the ordinary thermometer was useless in finding the small changes in the water, and it was only through the use of exceedingly delicate electrical instruments that the temperature changes were observed. It was my desire to make use of one of these sensitive thermometers to test the influence of an iceberg on the water temperature. I accordingly devised a practical form of electrical-resistance thermometer which was capable of recording thousandths of a degree of temperature. This instrument, which I have called the micro-thermometer, works on the well-known principle of the electrical-resistance thermometer. The thermometer coil is composed of a large-size iron wire, silk covered, wound between concentric cylinders of copper. The connecting wires pass through a cable to the observing room, where a recorder gives the temperature-curve and variations on a chart. The relay galvanometer is of special design to be independent of vibration, and is exceedingly strong and quite portable. I placed this instrument on one of the Canadian Government ice-breaking steamers in charge of my assistant, Mr. L. V. King, who rendered most valuable and efficient service in helping me in its operation. Through the kindness of the Canadian Government a passage was secured for Mr. King in one of the hydrographic survey-boats sailing to Hudson's Bay in 1910. One of the thermometers was placed over the side of the ship immersed to a depth of about 5 ft., and a record of temperature was made through the Straits of Belle Isle, along the Labrador coast to Hudson's Bay. Several icebergs were passed in the northern journey at a distance of about half a mile, and these were recorded on the chart by a rapid fall of temperature of from one to two degrees as the bergs were approached. It was found as the ship drew near the berg that *a rise of temperature* took

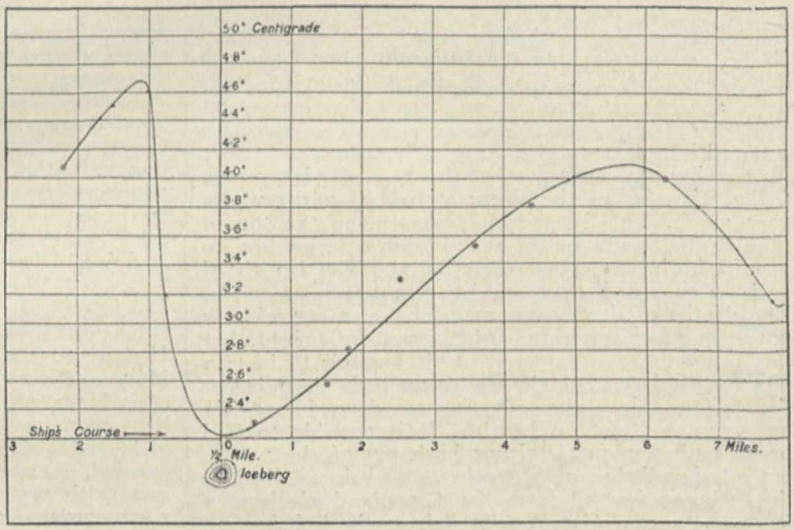


FIG. 1.—Temperature gradient near an iceberg.

place first, followed by a rapid fall. On the micro-thermometer the effect was clearly shown, but would have been missed entirely on an ordinary thermometer. I have called this peculiar rise and fall of temperature the "iceberg effect," and it seems to be characteristic, and easily distinguished from the small oscillations of temperature found in the open sea. It is evident that the iceberg effect is caused by the fresh water observed by Pettersson in his tank experiments. This fresh water in flowing out from the berg starts colder than the sea, and gradually becomes warmer as the distance from the berg increases. At the fringe of this fresher water the temperature is actually higher than the sea temperature owing to the absorption of the sun's heat. (Charts showing these effects are here reproduced from a communication by me to NATURE of December 1, 1910.) In the open sea the warming

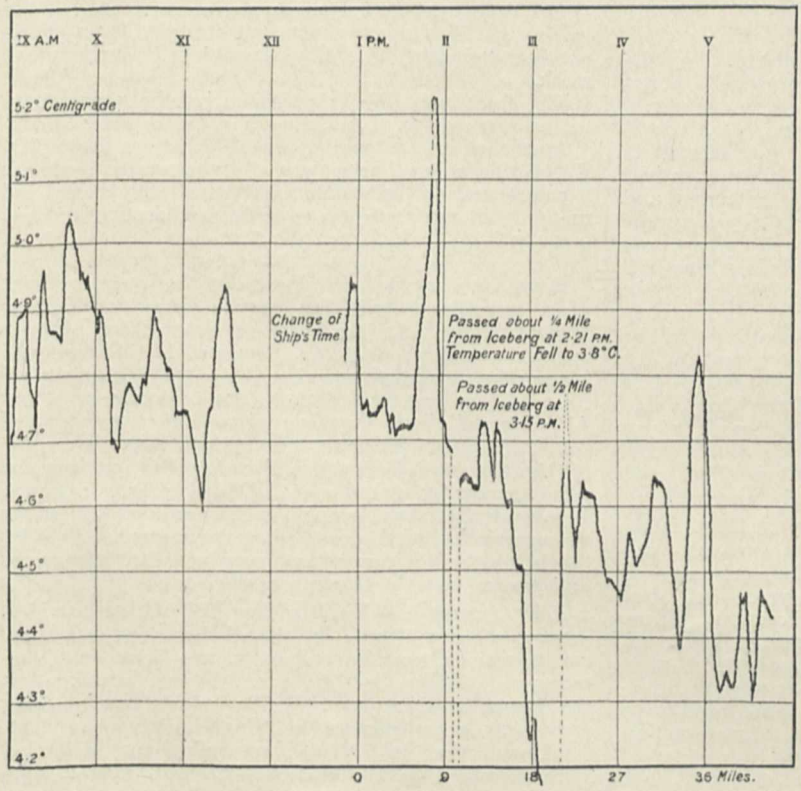


FIG. 2.—Microthermogram of the temperature of the sea.

of the sea by the sun is offset by the vertical circulation, but in the fresher and lighter water this is impossible, and the warmer water remains on the surface. It may be possible to tell the presence of the fresher water by the change in electrical conductivity, and I have designed a recorder to show this, which I hope to have a chance to try at some future time.

Disturbing Influence of Land on the Temperature of the Sea.

One of the most interesting results of the Hudson Bay experiments was the effect of land on the temperature of the sea. The coast of Labrador appears to exert an influence in turning up the colder undercurrents of the Arctic stream. Thus whenever the ship steamed in towards the coast-line the temperature was found to fall one or two degrees. The limit of the influence appears to be about five miles. It has been shown by Dr. Dawson that the shoals in the Bay of Fundy influence the surface temperatures, and this is in accord with the present results. Taking this into consideration, it appears that the micro-thermometer may be of great service in telling the presence of land and shoals from a ship at sea.

Recent Experiments with the Micro-thermometer.

During the trip of the Canadian northern steamer *Royal George* from Halifax to Bristol, I had an opportunity of obtaining a record of the sea temperature across the Atlantic. The thermometer was placed in the circulating water drawn in by the pumps. Several interesting facts have been observed. The iceberg effect was obtained clearly shown, even in the water drawn from a depth of 16 ft. below the surface. The sudden change of temperature on passing out of the Labrador current into the Gulf Stream was observed. Here a rise of temperature of nearly 10° was recorded in about an hour. The great steadiness of the temperature of the Gulf Stream was remarkable, since for hundreds of miles the variations were not more than a quarter of a degree. The complete absence of any diurnal variation of temperature was very marked. One of the most interesting records was in passing over the great wall separating the shallower water about 400 miles west of the Irish coast. The bottom of the ocean rises here very quickly from about three miles to about one-third of a mile. Just over this wall the temperature rose sharply to a peak about $1\frac{1}{2}$° warmer than the surrounding sea, and immediately fell again. A possible explanation of this may be found in the presence of a vertical current of warm water along this wall, heated either by the greater temperature of the earth at these great depths or by a submerged crater. No other explanation can be given for the remarkable and sudden change here observed. As the depth of the ocean gradually becomes less towards the Irish coast, the variations of surface temperature become more marked. This commenced about 100 miles off the coast-line. As the coast was approached the temperature rose steadily until the ship passed at a distance of four miles from the Fastnet Lighthouse, when the temperature fell about a degree. It rose again as the land was left behind through the Irish Sea.

On approaching Lundy Island the next morning the temperature again rose rapidly, to be followed by a sharp fall as the ship passed the island at a distance of about 300 yards. As soon as the ship steamed up the Bristol Channel, within two miles of the Somersetshire coast, the temperature took a rapid fall below the open sea temperature, exactly as had been observed along the Labrador coast.

The rise of temperature on approaching the Irish coast and on approaching Lundy Island were very similar, and may be characteristic of the influence of

this coast-line. That the temperature fell rapidly within five miles of both places is similar to the Labrador coast results. The results for the Fastnet are not so marked as for Lundy Island, but the ship passed the former place at a greater distance.

A solution of the iceberg problem seems near at hand, but the greater value of a means of locating land cannot be overlooked.

An exceedingly sensitive self-recording instrument such as the micro-thermometer is essential for the work described. The conflicting experiences of North Atlantic sea captains alone testify to the uselessness of individual observations. It is to a knowledge of the *rate and characteristic of the temperature variation in the sea*, rather than to the actual temperature itself, that we must look for means by which the safety of navigation may be increased.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The death of the master of Gonville and Caius College removes from Cambridge University one of its most loyal and hard-working members. He obtained his degree in the first class in the Classical Tripos forty-three years ago. He was elected to a fellowship at his college in 1870, and since then had devoted himself whole-heartedly to its interests and to those of the University. Mr. Roberts was for some time University lecturer in comparative philology, and his "Introduction to Greek Epigraphy" is a standard work on the history of the Greek alphabet. He always took the greatest interest in promoting new subjects of study, and played a prominent part in the establishment of the teaching of forestry, and in the development of modern languages. He was also a most active member of the board of the Cambridge Association, and of the Appointments Board, where his wide and minute knowledge of the outer world were of the greatest importance. Cambridge and Caius have indeed lost one who served them well.

OXFORD.—It is the opinion of many resident members of the University that reforms on the plan initiated by Lord Curzon as Chancellor some two or three years ago have either not proceeded fast enough, or have not taken the right direction. These views have found expression in a memorial addressed to Lord Curzon in favour of the appointment of a commission to inquire into changes that may be desirable in regard to the constitution and legislative machinery of the University, and the administration of the resources of the University and the colleges. The answer received from the Chancellor shows that he is to some extent in sympathy with the views and aims of the memorialists. At the same time, he makes it clear that he would regard the demand for a commission at the present time as inopportune, and that he would himself withhold his support from a movement for its appointment.

On June 18 Convocation passed a decree authorising the Vice-Chancellor to apply, on behalf of the University, to the Board of Agriculture and Fisheries for a grant of 300*l.* a year for the expenses of agricultural research relating to the soils of Oxfordshire and parts of the adjacent counties, to be conducted in the School of Rural Economy under the direction of the Sibthorpian professor (Prof. Somerville). On the same day a decree passed Congregation authorising the Curators of the University Chest to receive from the Development Commissioners the sum of 900*l.* to be applied in aid of the investigations into the economics of agriculture, and to provide a sum of 300*l.* a year for three years for the same purpose if the Development Commissioners shall in each of the three years make a grant of not less than 600*l.* towards the same object. In introducing this decree, the president of Magdalen announced that Mr. W. Morrison, of Balliol College, in addition to his other benefactions, had promised 25*l.* a year for three years towards this object, and that further contributions of a similar kind were expected.

LONDON.—At the meeting of the Senate on June 12, Dr. W. P. Herringham was elected Vice-Chancellor for the year 1912–13, in succession to Sir William Collins. Dr. Herringham is a physician of St. Bartholomew's Hospital, and is one of the representatives of the faculty of medicine in the Senate.

Dr. W. H. Eccles has been appointed to the new University readership in graphics, tenable at University College.

Prof. J. Norman Collie, F.R.S., has been appointed director of the chemical laboratories at University College in succession to Sir William Ramsay.

The degree of D.Sc. in chemistry has been granted to Rev. L. A. Levy, an external student, for a thesis entitled "Studies in Platinocyanides," and other work.

The late Lady Welby's library has been presented to the University.

A gift of 1400*l.* a year for three years from Mr. Ratan Tata has been gratefully accepted for the "endowment of research into the principles and methods of preventing and relieving destitution and poverty."

SCARCELY a week passes without the announcement of a munificent gift for higher education in the United States. In the issue of *Science* for May 31 last it is reported that Mr. Clarence H. Mackay and his mother have given 30,000*l.* to the University of Nevada, making their total gifts 80,000*l.*; and that Allegheny College has completed the raising of 80,000*l.*, thereby securing the 20,000*l.* conditional gift of the General Education Board. This makes the total productive endowment of the college 205,000*l.* President Crawford stated in his announcement on the completion of the fund that the immediate results would be the addition of two new assistant professors and several new instructors to the staff.

A FRANCHISE and Registration Bill, which provides, among other matters, for the abolition of university constituencies, was introduced in the House of Commons on Monday by Mr. J. A. Pease, President of the Board of Education. There are at present three university constituencies in England, two in Scotland, and one in Ireland, returning the following nine members to Parliament:—Oxford, Right Hon. Sir W. R. Anson, Bart., and Lord H. Cecil; Cambridge, Mr. J. F. P. Rawlinson and Sir Joseph Larmor, F.R.S.; London, Sir Philip Magnus; Edinburgh and St. Andrews, Right Hon. Sir R. B. Finlay, G.C.M.G.; Glasgow and Aberdeen, Sir Henry Craik, K.C.B.; Irish University, Right Hon. Sir E. H. Carson and Right Hon. J. H. M. Campbell. The number of university electors returning these nine representatives is 46,670, of whom about 20,000 return the five English university members, 21,000 the two Scottish members, and 5000 the two Irish members. It is proposed by the Bill that the university vote and representation shall cease, as being inconsistent with the principle of "one man, one vote."

IN the House of Commons on June 12, Sir Philip Magnus asked the President of the Board of Education whether the Royal Charter granted to the Imperial College of Science and Technology imposed on the governing body of the College an obligation to carry on the work of the Royal College of Science, London; and, if so, whether the obligation would be

consistent with the restriction of the teaching at the Imperial College to post-graduate research work. Mr. Pease replied that the answer to the first part of the question was in the affirmative so far as the purposes referred to in Article II. were concerned. When there was any proposal on the part of the governors to confine the work to post-graduate research, a question of the interpretation of the charter would arise, upon which he might have to express his opinion as visitor on behalf of the Crown. Until then he did not think he should be called upon to answer the question. In reply to a further question, Mr. Pease stated that no immediate alteration in substance was contemplated in the conditions for Royal scholarships or other awards in science.

THE Board of Education has recently issued a circular detailing the changes in the regulations respecting the grants to be paid to technical schools for the session 1912–13 (Grant Regulations for Technical Schools, &c., Circular 795, Board of Education). The changes deal mainly with, first, the withdrawal of certain of the grants for agricultural education formerly paid by the Board of Education, and, secondly, certain modifications in the regulations respecting the minimum length of "group courses" and the method of determining the minimum average attendance to be made by students at "group courses." With respect to the first of these, "in consequence of the greatly increased amount of State aid which is now made available for agricultural education in county areas by the advance made to the Board of Agriculture out of the Development Fund," the Board of Education will not pay grants for technical instruction in agricultural subjects by any teacher recognised by the Board of Agriculture and Fisheries as a member of the staff of an agricultural college or of a county agricultural staff. The alterations in the regulations respecting group courses are in the direction of less stringency and more freedom to the institutions. Under the present regulations, no grant is made for instruction in any subject or course in which less than twenty hours of instruction is given in the year. The new regulations permit of courses in any subject for a less number of hours, provided that such instruction forms part of a "grouped course," which must occupy, as at present, "at least four hours a week and eighty hours in all for the whole session." In addition, short courses of not fewer than ten hours each may be approved "in certain subjects (other than arithmetic, English, &c.) if they consist of concise and suggestive instruction given to students whose previous general familiarity with the subject enables them to profit by instruction of this kind."

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 13.—Sir Archibald Geikie, K.C.B., president, in the chair.—C. T. R. **Wilson**: An expansion apparatus for making visible the tracks of ionising particles in gases, and some results obtained by its use. The method of making visible and photographing the tracks is essentially that described in a previous communication. The apparatus has been enlarged and otherwise improved. The paths of alpha-particles are generally straight or nearly so until within about a mm. of the end (in air at atmospheric pressure) where they become bent. Portions of the tracks of beta-particles from radium have been photographed, the individual ions set free being made visible by the cloud particles condensed upon them, so that they may readily be counted. The photographs of the clouds formed when a narrow beam of X-rays is sent through the cloud chamber show the tracks of kathode or beta-particles starting within the primary beam and extending for some distance beyond it. There is no indication of any action of the X-rays other than the production of the corpuscular rays. The corpuscular rays appear to start in all directions, showing no preference for that of the primary beam.—Hon. R. J. **Strutt**: Chemically active modification of nitrogen, produced by the electric discharge. IV. (1) Active nitrogen is a highly endothermic body, but its energy is of the same order of magnitude as that of other chemical substances. (2) In the reversion of active to ordinary nitrogen, the number of atoms ionised is a very small fraction of the whole number concerned in the change. The ionisation is a subordinate effect, and may be due to light of very short wave-length emitted in the reaction. (3) Additional experiments are described to prove that the change of active nitrogen is more rapid at low temperatures. This is thought to be connected with the monatomic character of the molecule, and to throw light on the connection between temperature and velocity of reaction in other cases.—Prof. J. C. **McLennan**: The series lines in the arc spectrum of mercury.—Prof J. C. **McLennan**: The constitution of the mercury green line $\lambda=5461$ AU; and on the magnetic resolution of its satellites by an echelon grating.—Prof. W. H. **Young**: The convergence of certain series involving the Fourier constants of a function.—Prof. W. H. **Young**: Classes of summable functions and their Fourier series.—H. G. **Moseley**: The number of β-particles emitted in the transformation of radium. The number of β-particles emitted at the disintegration of each atom has been determined by measuring the current carried in vacuo by the radiation from a known quantity of active material. It is found that one atom of radium B and an atom of radium C together emit 2·20 β-particles on an average; that an atom of radium B emits the same number of particles as an atom of radium C, and that an atom of radium E appears to emit less than one β-particle. From measurements of the ionisation produced by active deposit of radium emitting a measured number of β-particles, the number of ions produced by a β-particle per cm. of path in air has been calculated. This number varies approximately as $\lambda^{\frac{1}{3}}$, where λ is the absorption coefficient of the radiation for aluminium.—S. D. **Carothers**: Portland experiments on the flow of oil. The paper was primarily the outcome of an attempt to obtain from the results of a series of experiments, which came into the writer's hands, a relation between velocity and resistance for oil. It was seen that a considerable number of the results of the experiments followed the capillary law, and attention was directed to determining where this broke down.—G. B. **Jeffery**: A form of the solution of Laplace's equation suitable for problems relating to two spheres.—A. Ll. **Hughes**: The emission velocities of photo-electrons. This investigation was undertaken to determine the relations between the maximum velocity with which electrons are emitted from metallic surfaces illuminated by ultra-violet light and (*a*) the wave-length of the light and (*b*) the nature of the metal.

Physical Society, May 31.—Prof. C. H. Lees, F.R.S., vice-president, in the chair.—Prof. G. W. O. **Howe**: The calibration of wave-meters for radio-telegraphy. Wave-meters consisting of a variable air-condenser and a set of coils can be calibrated approximately by calculation from the known capacity of the condenser and the inductance of the coils. The most probable source of error is that due to the capacity from turn to turn of the coil. This can be allowed for, with sufficient accuracy for all practical purposes, by finding the natural frequency of the coil alone, and

calculating its effective or self-capacity on the assumption that the whole steady current inductance of the coil is effective even when it is oscillating freely. This capacity is then added to the capacity of the air-condenser. Another method of finding the required correction by comparison of the results obtained on the overlapping portion of the ranges of two coils is also described. The correction can be made small by suitably designing the coils.—Dr. W. H. **Eccles**: Applications of Heaviside's resistance operators to the theory of the air-core transformer and coupled circuits in general. In circuits possessing constant inductance, resistance, and capacity the differential equations for the currents and the voltages are linear with constant coefficients, and may therefore be solved by aid of the known simple properties of symbolic operators. The symbolic operator method proves to be very compendious in problems concerning the determination of the primary and secondary currents and voltages of transformers whenever the applied E.M.F. can be expressed as an exponential function of the time, or when it consists of a sudden application of a constant or an exponential function, and also when it is impulsive. In the paper the method is first applied to a pair of "indirectly" coupled circuits—*i.e.* circuits that are insulated from each other.—C. R. **Darling**: The movements of semi-oily liquids on a water surface. The effect produced when a drop of liquid is placed upon a clean water surface is considerably modified if the liquid be slightly soluble. Whereas a drop of oil spreads and forms a permanent film, slightly-soluble liquids form films which afterwards break into globules, which, if a certain minimum size be exceeded, break up into smaller globules, until a state of equilibrium is reached. The division of the films or globules is produced by indentations which spread until partition has taken place. This indentation gives to globules a reniform shape; and in certain cases the distorted globules are projected violently across the surface of the water. The effects differ in intensity with different liquids, and phenomena peculiar to a given liquid may also be noted.—G. L. **Addenbrooke**: Surface leakage experiments with alternating currents. Experiments on dielectrics at different temperatures and over a wide range of periodicity showed that the losses found were in some cases partly due to surface leakage. When this latter was eliminated and the data obtained with the surface leakage and without were compared, it did not seem as if the portion of the losses due to surface leakage could be accounted for by assuming that it was constant at all periodicities, as is the case with the losses in metallic conduction. Measurements were therefore made to ascertain the behaviour of the surface leakage alone. The relative losses with an alternating current of 42 periods and a continuous current were measured, the pressure being the same in both cases. In the case of glass the relation losses with continuous and alternating currents were about as 1 is to 3, 4, or 5. A much higher ratio for the losses was found for ebonite—namely, 1 : 40. Further experiments show that the moisture present must be in a very attenuated state for the differences in the losses found to become sensible. Ordinary water, even in very thin films, does not show the effect.

Zoological Society, June 4.—Mr. E. G. B. Meade-Waldo, vice-president, in the chair.—Mr. E. G. B. **Meade-Waldo** introduced a discussion on the preservation of the native fauna of Great Britain, in which Mr. A. Heneage Cocks, Dr. F. G. Dawtrey Drewitt, and Mr. Stewart Blakeney (who sent a written contribution) joined. The necessity of creating public opinion on the matter was urged. It was agreed that the laws with regard to birds were sufficient, if administered strictly. With regard to mammals, it was the opinion of those present that the use of steel traps, instead of snares, for catching rabbits was chiefly responsible for the extermination of wild cats, martens, and polecats in many parts of the country, and ought to be suppressed.—R. **Lydekker**: A new local race of giraffe from the Petauke district of north-east Rhodesia.—Miss Helen L. M. **Pixell**: Polychæta from the Pacific coast of North America. Part i. This paper contained a description of Serpulidæ from the Straits of Georgia, chiefly the Departure Bay Region of Vancouver Island, together with some specimens from Victoria and Puget Sound, eighteen species in all, of which five were new.—R. I. **Pocock**: Antler growth in the Cervidæ, with special reference to Elaphurus and Dorcelaphus. It was pointed out that the growth of the individual antler in Elaphurus, as shown by a series of sketches supplied by Lord Tavistock, proved that the anterior and posterior branches of the antler of Elaphurus were homologous with the brow-tine and beam of the Sambar's antler, and that in Dorcelaphus the sub-basal snag was the homologue of the brow-tine in the old-world deer, as Sir Victor Brooke claimed.—Dr. Hans **Gadow**: The one-sided reduction of ovaries and oviducts in the Amniota, with remarks on mammalian evolution. The reduction began with the oviduct, and a first cause of the invariably right-sided bias had to be looked for in the turning of the embryo upon its left side, a position which influenced the growth and relative position of the stomach and primary intestinal loops, these being stowed in the abdomen in such a way that they were less disturbed by an egg passing through the left than through the right oviduct. In the Monotremes also only the left ovary and duct were functional, although those of the right side were structurally not affected. This was not a case of reptilian inheritance. Proto-, Meta-, and Eutheria represented a continuous, monophyletic line of evolution, with the Monotremes and Marsupials as offshoots.—Dr. F. E. **Beddard**: An asexual tapeworm, obtained from the musquash (*Fiber zibethicus*). This showed a new form of asexual propagation; a sexual worm believed to be the mature form of the same tapeworm was also described.—Dr. W. **Nicoll**: Two new Trematode parasites from the Indian cobra (*Naja tripudians*). The first was found in the gall-bladder and was made the type of a new genus of the family Dicrocoeliidæ. The second was found in the ureters, and represented a new species of the genus Styphlodora.—Dr. R. **Broom**: Some new fossil reptiles from the Permian and Triassic beds of South Africa.—Prof. S. J. **Hickson**: The Hydrocoralline genus Errina. The genus was founded by Gray in 1835, and since that date two other genera (Labiopora and Spinipora) closely related to Errina had been described. An analysis of the characters of these three genera was given. Two new species were described, one from New Zealand waters and the other from the Cape of Good Hope.

Linnean Society, June 6.—Prof. E. B. Poulton, F.R.S., president, in the chair.—Prof. A. **Meek**: The development of the cod, *Gadus morrhua*. The author sought to demonstrate by photographs of sections that the gastrula arises by the delamination of the dorsal entoderm, and that the latter is at once differentiated into an embryonic and a yolk-sac portion (periblast).—C. **Hedley**: Palæogeographical relations of Antarctica. It is suggested that a link between Antartica and Tasmania was the latest extension of the southern continent, existed during the last warm phase, and transmitted to Australasia a fauna and flora of South American origin; that Antarctica then supported a

subtropical vegetation on the coast and an alpine flora on the mountains of the interior; that during the period of refrigeration the fauna and flora were gradually expelled to Australasia through Tasmania, first the warmth-loving plants and animals, last the alpine or subantarctic forms; that a penultimate expansion of Antarctica reached New Zealand, but not Australia. By it an exchange operated between New Zealand and South America, though in the subsequent phase the gifts of Patagonia to Tasmania were not reciprocated.

Mathematical Society, June 13.—Dr. H. F. Baker, president, in the chair.—H. **Hilton**: Some properties of symmetric and orthogonal substitutions.—F. R. **Moulton**: Closed orbits of ejection and related periodic orbits.—W. H. **Young**: (1) A certain series of Fourier; (2) the Fourier series of bounded functions.—G. N. **Watson**: Some properties of the extended zeta-function.—H. P. **Hudson**: Curves of contact of any order on algebraic surfaces.

PARIS.

Academy of Sciences, June 10.—M. Lippmann in the chair.—J. **Boussinesq**: The resistance met by an ellipsoid in slow uniform translations through a viscous liquid, calculated by an extension of the method previously successfully applied to slow movements of translation of the sphere.—Henry le **Chatelier**: The law of mass action. The fallacy in a recent criticism of Colson is pointed out, and the results recalculated for the dissociation of hydriodic acid, using the more accurate data of Bodenstein.—A **Haller** and Eug. **Benoist**: The action of sodium amide and alkyl halides upon benzoyltrimethylene.—S. A. S. the Prince of **Monaco**: Bathymetric map of the oceans.—El. **Metchnikoff** and Eug. **Wollman**: The view is advanced, contrary to the generally accepted view, that indol and its derivatives are toxic. An experimental study of diet has been made from the point of view of indol excretion, and the administration of an amylolytic bacterium suggested.—J. **Clairin**: The transformation of Imschenetsky.—Jean **Chazy**: The divergent asymptotic developments which represent the integrals of certain differential equations.—Ph. A. **Guye**, J. **Kovacs**, and E. **Wourtzel**: The weight of a normal litre of air at Geneva. The weight of a litre of dry, pure air taken at different places on the same day may vary by some tenths of a milligram.—A. **Pérard**: The measurement of the Johansson standard by an optical method. 1, 5, 25, 50, and 100 mm. standards were examined; in one case (100 mm.) the error was $0{\cdot}2\mu$, in five $0{\cdot}1\mu$, and in five $0{\cdot}0\mu$.—Albert **Colson**: Dissociation at constant volume and the law of mass action.—J. **Carvallo**: The law of Guldberg and Waage in the case of the dissociation of gases.—M. **Jouniaux**: Cryoscopy in camphor. For the cryoscopic constant K in camphor a mean value of 495 was obtained, leading to 8·24 cal. as the latent heat of fusion of camphor. The vapour pressures, combined with Clapyron's equation, lead to an identical value.—M. **Hannover**: Porous metals.—Daniel **Berthelot** and Henry **Gaudechon**: The function of wave-length in photochemical reactions. The analogy of the photo-chemistry of high frequency. Vibrations with the chemistry of high temperatures.—E. **Kohn-Abrest** and **Rivera-Maltes**: The influence of impurities on the activity of aluminium.—A. **Besson**: Observations on the hydrogen silicides.—H. **Baubigny**: Researches on the mode of decomposition of copper sulphite.—Camille **Matignon**: The spontaneous and progressive destruction of certain leaden objects. The presence of chlorides much facilitate the destruction of leaden antiquities by atmospheric action; the oxidation is partially, but not completely, prevented by a coating of transparent varnish.—Paul **Lebeau**: The decomposition of uranyl nitrate by heat.—G. **Darzens** and **Séjourné**: The esters of dichlorosuccinic acid and their stereochemical isomers.—Mme. **Ramart-Lucas**: Isopropyl-diphenylacetic acid.—G. **Bouchard**: The chromogenic materials and nitrogenous substances contained in fatty bodies.—P. **Lemoult**: The leucobases and colouring matters of diphenylethylene. The preparation of some amido-alkyl ethylene derivatives.—Marcel **Godchot** and Felix **Taboury**: Some cyclopentane glycols.—G. **André**: The evolution of the nitrogen, phosphorus, and sulphur in the course of the growth of barley.—L. **Camus** and E. **Gley**: The mechanism of the hæmolytic action of the serum of the eel.—**Ancel** and P. **Bouin**: The determinism of accouchement.—R. **Robinson**: The action of adrenaline and of choline on the determination of sex in some mammals.—Charles **Nicolle**, L. **Blaizot**, and E. **Conseil**: The etiology of recurrent fever and its mode of transmission.—Anna **Drzewina** and Georges **Bohn**: The effects of the inhibition of oxidation on the spermatozoids of *Strongylocentrotus lividus* and on the development.—Ph. **Dautzenberg**: The marine molluscs arising from the scientific expedition of M. A. Gruvel in western Africa, 1910–11.—Albert **Berthelot** and D. M. **Bertrand**: Researches on the intestinal flora. The isolation of a micro-organism capable of producing β-imidoazolethylamine from histidine.—L. **Massol**: The action of the ultra-violet rays upon starch.—Gabriel **Bertrand** and Arthur **Compton**: The supposed reversibility of the diastatic hydrolysis of salicin.—F. **Kerforne**: A clay facies of the lower Ordovician in Brittany.—J. **Vallot**: Hail and ice deposits on Mt. Blanc.—A. B. **Chauveau**: Observations on the atmospheric electricity during the eclipse of April 17, 1912.—M. **de Broglie**: The solar eclipse of April 17 and the penetrating radiation measured by the natural ionisation of the air in a closed vessel.—M. **Verschaffel**: A seismic movement which occurred during the night of May 30–31, 1912.—Louis **Roule**: The distribution of the bathypelagic fishes in the Atlantic Ocean and in the Mediterranean.

BOOKS RECEIVED.

Nature Study Note-Book. By G. H. Green. Pp. 63. (London: J. M. Dent and Sons, Ltd.) 6*d*. net.

A Laboratory Note-Book of Physics. By S. A. McDowall. In four sections. Pp. 20, 20–62, 64–112, 114–166. (London: J. M. Dent and Sons, Ltd.) 9*d*. net, 1*s*. net, 1*s*. net., and 1*s*. net respectively.

Neue Lehre vom zentralen Nervensystem. By Dr. E. Rádl. Pp. vii+496. (Leipzig: W. Engelmann.) 12 marks.

Handbuch der vergleichenden Physiologie. Edited by H. Winterstein. 22 Lief. Band I. Zweite Hälfte. Pp. 160. (Jena: G. Fischer.) 5 marks.

Cambridge County Geographies: Dumfriesshire. by Dr. J. K. Hewison. Pp. ix+176+map. Renfrewshire. By F. Mort. Pp. ix+177+maps. Perthshire. By P. Macnair. Pp. xii+180+maps. (Cambridge University Press.) Each 1*s*. 6*d*.

Examples in Numerical Trigonometry. By E. A. Price. Pp. v+90. (Cambridge University Press.) 2*s*.

Numerical Trigonometry. By J. W. Mercer. Pp. x+157. (Cambridge University Press.) 2*s*. 6*d*.

Gomera die Waldinsel der Kanaren. By W. May. Pp. ix+214. (Karlsruhe: G. Braun; London: Williams and Norgate.) 3 marks, or 3*s*. net.

Principles and Methods of Municipal Trading. By D. Knoop. Pp. xvii+409. (London: Macmillan and Co., Ltd.) 10*s*. net.

Across Australia. By Prof. B. Spencer and F. J. Gillen. 2 vols. Pp. xiv+254; xvii+515. (London: Macmillan and Co., Ltd.) 21*s*. net.

La Pression Osmotique et le Mécanisme de

l'Osmose. By P. Girard. Pp. 18. (Paris: A. Hermann et Fils.) 1 franc.

Conférences sur les Alliages. By Rengade, Jolibois, and Broniewski. Pp. 36. (Paris: A. Hermann et Fils.) 2 francs.

Traité de Métallographie. By F. Robin. Pp. 464. (Paris: A. Hermann et Fils.) 30 francs.

Le Gout et l'Odorat. By J. Larguier des Bancels. Pp. 94. (Paris: A. Hermann et Fils.) 3.50 francs.

Les Parathyroides. By L. Morel. Pp. 344. (Paris: E. Hermann et Fils.) 10 francs.

Man and his Conquest of Nature. By Dr. M. I. Newbigin. Pp. viii+183. (London: A. and C. Black.) 2*s*.

Bees shown to the Children. By E. Hawks. Pp. xii+120+plates. (London and Edinburgh: T. C. and E. C. Jack.) 2*s*. 6*d*. net.

Yorkshire Type Ammonites. Edited by S. S. Buckman. Part vii. (London: W. Wesley and Son.) 3*s*. 6*d*. net.

Laboratory Instruction Sheets in Elementary Applied Mechanics. By Prof. A. Morley and W. Inchley. Pp. v+50. (London: Longmans and Co.) 1*s*. 3*d*. net.

The Physiology of Protein Metabolism. By Dr. E. P. Cathcart. Pp. viii+142. (London: Longmans and Co.) 4*s*. 6*d*. net.

Handbuch der bautechnischen Gesteinsprüfung. By Prof. J. Hirschwald. Zweiter Band. Pp. xvi+388–923. (Berlin: Gebrüder Borntraeger.) 32 marks.

Algebra for Beginners. By C. Godfrey and A. W. Siddons. Pp. xi+272. (Cambridge University Press.) 2*s*. 6*d*.

Mededeelingen van de Rijksopsporing van Delfstoffen. No. 4. Beiträge zur Kenntnis der marinen Mollusken im west-europäischen Pliocänbecken. By Dr. P. Tesch. Pp. iii+05+plate. (Freiberg in Sachsen: Craz and Gerlach.) 6 marks.

DIARY OF SOCIETIES.

THURSDAY, JUNE 20.

ROYAL SOCIETY, at 4.30.—An Investigation into the Life-history of *Cladothrix dichotoma* (Cohn): Dr. D. Ellis.—The Relation of Secretory and Capillary Pressure. I. The Salivary Secretion: Leonard Hill and M. Flack.—The Origin and Destiny of Cholesterol in the Animal Organism. Part IX. On the Cholesterol Content of the Tissues other than Liver of Rabbits under Various Diets and during Inanition: G. W. Ellis and J. A. Gardner.—A Note on the Protozoa from Sick Soils, with some Account of the Life-cycle of a Flagellate Monad: C. H. Martin.—Further Observations on the Variability of Streptococci in Relation to Certain Fermentation Tests, together with some considerations bearing upon its possible meaning: E. W. A. Walker.—The Chemical Action on Glucose of a Variety of *B. coli communis* (Escherich) obtained by cultivation in presence of a Chloroacetate (Preliminary notice): A. Harden and W. J. Penfold.—The Action of Enzymes on Hexosephosphate: V. L. Harding.—The Oxydases of *Cytisus Adami*: Prof. F. W. Keeble and Dr. E. F. Armstrong.

LINNEAN SOCIETY, at 8.—Les Enorthoptères des Seychelles: Señor Ignacio Bolivar.—Diptera: Loncheidæ, &c., of the Seychelles: C. G. Lamb.—The Coleoptera of the Seychelles: Hugh Scott.—Terrestrial Isopoda, particularly considered in relation to the Distribution of the Southern Indo-Pacific Species: the late Dr. G. Budde-Lund.—Selection of Coloured Drawings of Alpine Flowers by Mr. George Flemwell: H. Stuart Thompson.—On some Indian Jurassic Gymnosperms: Miss Nellie Bancroft.—The Ferns of the Seychelles and Aldabra: Carl Christensen.

MONDAY, JUNE 24.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Year's Exploration in the Sonora Desert, Mexico: Dr. Carl Lumholtz.

WEDNESDAY, JUNE 26.

CHEMICAL SOCIETY, at 8.30.—Camizzaro Memorial Lecture: Sir William Tilden.

THURSDAY, JUNE 27.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Electrical Vibrations on a Thin Anchor Ring: Lord Rayleigh, O.M.—The Molecular Statistics of some Chemical Actions: Hon. R. J. Strutt.—Morphological Studies of Benzene Derivatives. III. Para-Dibromo-benzene-sulphonates (isomorphous) of the "Rare Earth" Elements—a Means of Determining the Directions of Valency in Tervalent Elements: Prof. H. E. Armstrong and E. H. Rodd.—Optical Rotatory Dispersion. Part I. The Natural and Magnetic Rotatory Dispersion in Quartz of Light in the Visible Region of the Spectrum: Dr. T. M. Lowry.—On the Apparent Change in Mass during Chemical Reaction: J. J. Manley.—On the Diurnal Variations of the Electric Waves occurring in Nature, and on the Propagation of Electric Waves round the Bend of the Earth: Dr. W. H. Eccles.—Report on the Total Solar Eclipse of April 28, 1911: Rev. A. L. Cortie, S. J.—And other papers.

FRIDAY, JUNE 28.

PHYSICAL SOCIETY, at 5.—Hysteresis Loss as affected by Previous Magnetic History: Prof. E. Wilson, B. C. Clayton, and A. E. Power.—The Efficiency of Generation of High-frequency Oscillations by means of an Induction Coil and Ordinary Spark Gap: Prof. G. W. O. Howe and J. D. Peattie.—Dielectric Hysteresis at Low Frequencies: Prof. W. M. Thornton.—The Resistance to the Flow of Water along a Capillary Soda Glass Tube at Low Rates of Shear: Dr. A. Griffiths and Miss C. H. Knowles.—Self-Demagnetisation of Steel: S. W. J. Smith and J. Guild.

FORTHCOMING CONGRESSES.

JUNE 19–26.—Optical Convention. London. President: Prof. Silvanus P. Thompson. Secretary: J. W. Gordon, 113 Broadhurst Gardens, Hampstead.

JULY 1–6.—South African Association for the Advancement of Science. Port Elizabeth. President: Dr. A. Theiler, C.M.G.

JULY 2–5.—Congress of the Universities of the Empire. London. Secretary: Dr. Alex Hill, University of London.

JULY 15–19.—Celebration of the 250th anniversary of the Royal Society. London.

JULY 24–30.—First International Eugenics Congress. London. President: Major Leonard Darwin. Secretary: Eugenics Education Society, 6 York Buildings, Adelphi.

JULY 25–28.—Congress of the Royal Institute of Public Health. Berlin. Address: Russell Square, W.C.

JULY 29–AUGUST 3.—Royal Sanitary Institute. York. Address: 90 Buckingham Palace Road, S.W.

AUGUST 5–10.—International Congress of Entomology. Oxford. President: Prof. E. B. Poulton. General Secretary: Dr. Malcolm Burr, c/o The Entomological Society of London, 11 Chandos Street, W.

AUGUST 22–28.—(i) International Congress of Mathematicians, and (ii) International Commission on Mathematical Teaching. President: Prof. Klein. Treasurer: Sir J. Larmor, F.R.S., St. John's College, Cambridge.

SEPTEMBER (first week).—International Congress of Anthropology and Prehistoric Archæology. Geneva.

SEPTEMBER 4–11.—British Association. Dundee. President: Prof. E. A. Schäfer, F.R.S. Assistant Secretary: O. J. R. Howarth, Burlington House, London, W.

SEPTEMBER 4–13.—International Congress of Applied Chemistry. Washington, D.C. President: Dr. W. H. Nichols. Secretary: Dr. B. G. Hesse, 25 Broad Street, New York City, U.S.A.

SEPTEMBER 8–11.—Société Helvétique des Sciences Naturelles. Altdorf. President: Dr. P. B. Huber. Secretaries: Prof. J. Brülisauer (German) and M. P. Morand Meyer (French), Altdorf.

SEPTEMBER 23–28.—International Congress on Hygiene and Demography. Washington. President: Dr. H. P. Walcott. Secretary-General: Dr. J. S. Fulton, Army Medical Museum, Washington, D.C.

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