THURSDAY, AUGUST 29, 1912.

AN INTRODUCTION TO ARISTOTELIAN SCIENCE.

Aristotle's Researches in Natural Science. By Dr. T. E. Lones. Pp. viii + 274. (London: West, Newman and Co., 1912.) Price 6*s*. net.

THIS is a very interesting book, and we commend it heartily to the readers of NATURE. Even had we at hand, what we have not as yet, a series of translations of all Aristotle's works on natural and physical science, it would be no easy task for the student to lay hold of the great mass of scattered facts therein contained, to deal with the many repetitions and the not infrequent contradictions, and to set in order in his mind the range of ancient science as represented by Aristotle. This is the task that Dr. Lones has undertaken, and he has brought to bear upon it a great deal of learning and much patience and editorial skill.

After some introductory chapters on Aristotle's general method and on the consecutive order of his books, Dr. Lones proceeds to deal with Aristotle's conception of the Cosmos, and with his account of celestial, atmospheric, and terrestrial phenomena. This account is based chiefly upon the "Meteorology," a book of very great interest, of which we have an old but admirable edition from the hands of that learned astronomer Ideler. From Dr. Lones's brief epitome, we may learn much of Aristotle's curious knowledge regarding such subjects as the rainbow, and comets, and mock suns, and periodic winds, and earthquakes and volcanoes, and all the varied lore of ancient physical geography. The somewhat obscure treatise commonly called the "Physics" is next treated, and here we are introduced to Aristotle's conception of *phlogistic*, and to the various phenomena of heat and sound, of light and colour.

The rest, and the greater portion, of the book deals with the inexhaustible subject of Aristotle's "Natural History." We begin with a discussion of life itself, of that "vital principle," or ψυχή, with which philosophers more ancient than Aristotle had dealt, and the varying aspects of which in plants, animals, and man Aristotle describes with admirable insight and brevity. And so through the study of tissues and organs and the functions of organs, through the physiology of locomotion and generation and of development, the book leads us easily and clearly on to an account of Aristotle's classification of animals, and to his descriptions of the structure and habits of all manner of invertebrates and vertebrates, or, as he called them, creatures lacking or provided with blood.

Let us glance for a moment at one chapter only, that in which Dr. Lones deals with the fishes of Aristotle. Here, beginning with the Selachia or cartilaginous fishes, we hear what Aristotle has to tell us about skates and sharks of various kinds, and how he confused, on account of its cartilaginous skeleton, the Batrachos, or fishing-frog, with these Selachians, or, as we now call them, the Elasmobranch fishes. We find an account of the torpedo and its numbing power, of the angel-fish with its rough skin and viviparous habit, of the sting-ray and its spiny tail, and of the smooth dog-fish and the placental nourishment of its viviparous young, which Johannes Müller re-described in a classical memoir. Passing to the bony fishes, we read what Aristotle has to say of the Scarus, or parrot-fish, with its great teeth, and browsing or so-called ruminating habits; of the breeding habits and curious spawn of the perch; of the pipe-fish, and how its eggs are carried in the brood-pouch of the male; of the hermaphrodite Serranoid fishes; of the "Glanis" or Silurus, from which account Gesner conjectured, and Agassiz proved, that Aristotle was acquainted with a second species of that genus, inhabiting the rivers of Greece, and unknown to later naturalists until Agassiz rediscovered it.

In one point only in this interesting chapter does Dr. Lones seem to me to have fallen into error, and the point interests me the more because I fell into the same error myself. Aristotle mentions a certain nest-building fish under the name of *Phycis*—the only sea-fish, "so they say," that makes a nest and rears its young therein. Blindly following Cuvier and Olivi and other writers, I identified this fish as one of the gobies, when I was writing my translation of Aristotle's "Natural History." My book was scarcely out when, in a learned paper on the fishes of Ovid, a German scholar adopted the same identification, and Dr. Lones does the same thing now. But we are all of us wrong, as that most learned ichthyologist, Dr. Theodore Gill, soon pointed out to me. The nest-building fishes which Aristotle speaks of are undoubtedly wrasses. The breeding habits of some of these are still unknown to naturalists, though they may perhaps be well known to Mediterranean fishermen; but in some cases, as in the little Ctenilabrus, the nest, as described by M. Gerbe, is now familiarly known, and its whole story tallies with Aristotle's description. One day last summer, on the pier at Yarmouth in the Isle of Wight, I met a fisherman who had just caught some of these little wrasses to use for bait, and I found that the whole story of their nesting habits was familiar to him.

The identification of Phycis, by the way, is

notably helped by a fragment of Speusippus, Plato's pupil and successor. This philosopher wrote a treatise περὶ Ὁμοίων, which most scholars, I fancy, take to have been a discussion of broad likenesses and unlikenesses, in other words, an account of the principles of the classification of animals. From the few fragments that remain, I believe, on the other hand, that the book simply dealt with isolated cases of unexplained resemblance between creatures obviously and essentially different; it was, in fact, a foreshadowing of our discussions on mimetism. In it Speusippus mentions that the Phycis resembled Perca and Channa, and these we know to have been Serranoid fish, probably *S. scriba* and *S. cabrilla*. The statement is not inappropriate to the wrasse, but is altogether inapplicable to the goby.

After this parenthesis, we must now take leave of Dr. Lones's book. In bringing what Aristotle has written into something of the shape and order of a modern text-book and into modern verbiage, we cannot but lose much of the charm of the original, the archaic method of description and the personal element of Aristotle's style; but, on the other hand, we have a practical gain. If we want an easy and a pleasant glimpse into Aristotelian science, we have it here; and the compilation has been done with due care and adequate learning, and in the earnest spirit of a scholar.

D'ARCY W. THOMPSON.

RECENT BOTANICAL PUBLICATIONS.

(1) *A Textbook of Botany for Colleges and Universities.* By Members of the Botanical Staff of the University of Chicago—Drs. J. M. Coulter, C. R. Barnes, and H. C. Cowles. Vol. ii., "Ecology." Pp. x+485–964+*a*–*q*. (New York: American Book Co., n.d.)

(2) *Sub-alpine Plants:* or Flowers of the Swiss Woods and Meadows. By H. Stuart Thompson. Pp. xv+325, and 33 coloured plates. (London: George Routledge and Sons, Ltd.; New York: E. P. Dutton and Co., 1912.) Price 7*s*. 6*d*. net.

(3) *Botany:* Chapters on the Study of Plants. By G. S. Boulger. Pp. viii+119; illustrated. (Halifax: Milner and Co., n.d.) Price 1*s*. net. (Twentieth Century Science Series.)

(4) *Allgemeine Botanik.* By Prof. A. Nathansohn. Pp. viii+471. (Leipzig: Quelle and Meyer, 1912.) Price 10 marks.

(1) THE second volume of the Chicago text-book of botany, which deals with ecology, is a very clear exposition of plant-structures in relation to their environment. It is a wide subject of which to treat, and one is immediately struck with the way in which the authors have managed to deal with it in the comparatively limited space of 480 pages, including numerous illustrations. That this treatment has been eminently successful is due to a directness of expression combined with a simplicity of presentation. The chapters are concise but lucid, and the arrangement of the subject-matter is very good.

The general physiological ideas of the authors are placed before the student very clearly. The conception of the green plant as a manufacturer of its own *food* from raw materials is maintained in this volume as in vol. i., and the important point of view that this manufacture must not be confused with "assimilation" is one with which most biologists will have much sympathy. It leads at once to the same general conception of assimilation in all living organisms, and emphasises the fact that whereas both plants and animals are *consumers* of organic substances, only plants are *producers* of that organic substance from raw materials. As a general principle it is an excellent conception of nutrition which is applicable to all living organisms, and the authors are to be congratulated on the boldness with which it is set forth.

Emphasis is again laid upon the view that transpiration, if not a necessary evil, is "the greatest danger to which plants are exposed, and the harm that it entails certainly far exceeds any incidental good." Careful consideration cannot but admit the logic of this view, which is so different from what is usually taught in this country and from what is set forth in the "Bonn Text-book."

The statements (on p. 593) that "Batrachospermum, when grown in weak light, develops only the embryonic or juvenile stage, known as the separate genus Chantransia," and that in Stichococcus "high concentration induces the development of filaments of elongated cells, once referred to the genus Rhaphidium," are rather misleading in the light of modern knowledge of the algæ concerned.

In the section of chapter v. dealing with "reproductive behaviour in the seedless plants" pp. 803–824), mention might with advantage have been made of the evolutionary series of the Volvocaceæ.

The issue of the second volume of this work completes much the most important botanical text-book of recent years. It is a work of an exceedingly high order of merit, and can be recommended without the slightest hesitation to all English-speaking students of botany.

(2) In the volume on "sub-alpine" plants, the author gives short descriptions and the distribution of about 850 species of flowering plants which occur in the woods and meadows of the Swiss valleys. Both the descriptions and the notes concerning the habitats of the plants are good. There are 168 illustrations on thirty-three coloured plates. Some of these drawings are good, but many of them are rather too small to be of much aid in identification. The introductory part of the book consists of six chapters containing much information with regard to the habitats, the collection, and the preservation of alpine plants. There are also some very useful hints on the cultivation of alpines, an interesting account of some of the alpine gardens recently established in Switzerland, and a comparison of the Swiss and British floras. The book will be found very useful to all those visitors to the Alps who are interested in field botany.

(3) Mr. Boulger's small volume on botany, which forms one of the twentieth-century science series, is an elementary primer which the young student will find helpful in many ways. The chapters on the "Beginnings of Botany" and "Botanists' Methods" are sure to hold his attention, and others of the twelve chapters into which the book is divided will also prove stimulating. It is a pity that in the chapter on "Primitive Plants" the green type selected should have been "Protococcus," particularly as the author writes under that name a combined account of Pleurococcus and the volvocine genus Sphærella, a mistake which is largely due to the extraordinary statements regarding Protococcus which are found in nearly all botanical text-books. The author should also be reminded that Engler's arrangement is by no means the latest classification for all groups of plants.

(4) The text-book of general botany by Dr. Nathansohn will be very useful to the student who wishes to go just beyond the more elementary parts of the subject. It is divided into two main sections, the first dealing with the vegetative life of plants, and the second with reproduction. The general treatment is good, and one of the best features of the book is the way in which the physiological aspect of the subject is kept constantly before the reader. There are numerous illustrations, for the most part very good, but one would like to have seen more original figures. One or two of the photographic plates are excellent. A number of errors in the spelling of plant-names occur, but on the whole the book is well written, and will meet with the approval of most students.

SCHOOL MATHEMATICS.

(1) *Macmillan's Reform Arithmetic.* By P. Wilkinson and F. W. Cook. Book i., pp. 48; 3*d*. Book ii., pp. 48; 3*d*. Book iii., pp. 48; 3*d*. Book iv., pp. 48; 3*d*. Book v., pp. 64; 4*d*. Book vi., pp. 64; 4*d*. Teacher's Books i.–iv., 9*d*. each; Book v., 1*s*. (London: Macmillan and Co., Ltd., 1911.)

(2) *Analytical Mechanics.* Comprising the Kinetics and Statics of Solids and Fluids. By Prof. E. H. Barton. Pp. xx+535. (London: Longmans, Green and Co., 1911.) Price 10*s*. 6*d*. net.

(3) *Elementary Trigonometry.* By F. T. Swanwick. Pp. xv+243. (Cambridge: University Press, 1911.) Price 4*s*.

(4) *Geometry for Schools.* By W. G. Borchardt and the Rev. A. D. Perrott. Vol. i.: Stages I. and II. Pp. viii+52+iii. Price 1*s*. Vol. ii.: Stage III. (Section i.). Pp. viii+53–162+iv. Price 1*s*. 6*d*. (London: G. Bell and Sons, Ltd., 1911.)

(5) *The Elements of Plane and Spherical Trigonometry.* By J. G. Hun and C. R. MacInnes. Pp. vii+205. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1911.) Price 6*s*. net.

(6) *An Elementary Treatise on Cross-ratio Geometry.* With historical notes. By the Rev. J. J. Milne. Pp. xxiii+288. (Cambridge: University Press, 1911.) Price 6*s*.

(7) *Junior Mathematics.* Being a Course of Geometry and Algebra for Beginners. By D. B. Mair. Pp. viii+200. (Oxford: The Clarendon Press, 1911.) 2*s*.

(8) *Plane Trigonometry.* (Strictly according to the Syllabus prescribed by the Indian Universities.) By Prof. L. K. Ghosh. Pp. viii+271. (Calcutta: G. N. Halder, 1911.) Rs.1/8.

(9) *Poliedri, Curve e Superficie secondo i metodi della Geometria Descrittiva.* By Prof. Gino Loria. Pp. xv+235. Milano: Ulrico Hoepli, 1912.) Price 3 lire.

(10) *Elementary Graphic Statics.* By Dr. W. J. Crawford. Pp. viii+131. (London: Charles Griffin and Co., Ltd., 1911.) Price 2*s*. 6*d*. net.

(11) *A Treatise on Hydromechanics.* By Dr. W. H. Besant, F.R.S., and A. S. Ramsey. Part i., Hydrostatics. Seventh edition. Pp. vi+275. (London: G. Bell and Sons, Ltd., 1911.) Price 7*s*. 6*d*. net.

(1) THE authors of this work include, and in our opinion rightly, under the heading of arithmetic, the elements of algebra and practical geometry. The course is arranged in six parts, each of which contains material for three terms'

work. There is very little explanatory text in the pupil's edition, which consists of a series of carefully graduated sets of examples; but the volume designed for the teacher contains not only the answers and additional oral exercises, but also illustrations of the methods recommended for use and a large number of useful hints and cautions, the full value of which will be realised only by those who are acquainted with the varied difficulties of the beginner. The teaching of elementary arithmetic is a harder task than many people admit, and requires more skill and care than is often recognised. Success can be achieved only by a careful formulation of the scheme of work and of the methods to be employed. In this, the teacher's edition should be most useful. It is thoroughly sound and trustworthy, and full of excellent suggestions.

(2) The contents of this volume are best explained by enumerating the headings of the six parts into which it is divided. These are (1) Introduction; (2) Kinematics; (3) Kinetics; (4) Statics; (5) Hydromechanics; (6) Elasticity. It is assumed that the reader possesses an elementary knowledge of the methods of the calculus, and is not entirely unacquainted with the ideas of mechanics; the more elementary parts of the subject are therefore treated in outline, and are intended mainly for revision or reference.

The section on kinematics opens with a discussion of the properties of vector quantities. This is followed by chapters on rectilinear motion, which includes the case of variable acceleration, motion in a curve subject to a central acceleration, analysis of plane rotations, motion in space with fixed and moving axes, consideration of different forms of linkages, and a brief but lucid account of the theory of strains. The treatment of kinetics is prefaced by a valuable and most interesting account, mainly historical, of the physical conceptions upon which the theory is based. The discussion of the motion of rigid bodies in this section and of the theory of attraction and general conditions of equilibrium in the next follows the customary lines. Only forty pages are devoted to hydrostatics and hydrokinetics, and about twenty pages to elasticity. There is an admirable collection of miscellaneous examples at the end of the book.

(3) This book is intended for use with beginners; but either the author is not in sympathy with the recent changes in connection with the teaching of elementary trigonometry, or else he is writing for students who take up the subject at a late stage in their course. Now that it has become the custom for boys in the middle divisions of public schools to start trigonometry at a time when formerly they would have still been occupied with complicated arithmetical problems and algebraic manipulation, it is both necessary and instructive to lay great emphasis on the numerical aspect. Identity work and applications to the geometry of the triangle are unsuited to the purpose which this change in the curriculum serves. The present volume opens with a chapter on contracted arithmetic; the second chapter defines the trigonometric ratios, and gives rather more than thirty identities as examples on the fundamental formulæ; this is followed by the ratios of special angles and the solution of equations; numerical applications to the right-angled triangle are consequently postponed to the fourth chapter, and even here the examples are far from adequate. Part i. closes with chapters on logarithms and the solution of oblique triangles. The subjects dealt with in the second part are circular measure, ratios of obtuse angles, addition formulæ, and applications to the triangle. The concluding part deals with the general angle, methods of proof by projection, and properties of the triangle and quadrilateral. The author has the gift of writing simply and clearly, and the printing is well up to the high standard of the Cambridge University Press.

(4) The authors have followed the suggestions made in the Board of Education's circular on the teaching of geometry. The fundamental concepts and theorems of geometry are illustrated by experimental methods, and a varied collection of numerical exercises is supplied. Formal proofs are reserved for the second volume, which contains the substance of Euclid I. 1–34. In our opinion, the value of this method of exposition is seriously affected if riders of a simple character are excluded from the preliminary stage. If the student is restricted to numerical work, he will be slow to appreciate and assimilate the elementary properties of geometry. The disadvantage of opening with a formal course lies in the inherent difficulties of the proofs of the early theorems. But if the results of these are assumed, a very numerous set of applications can be made.

(5) This volume contains in rather less than a hundred pages a brief account of the elements of plane and spherical trigonometry. It is written for the student who requires only a practical knowledge of the methods of the subject. No attempt is made to give analytical dexterity, and all discussion of geometrical applications is omitted. But great care is taken to impress on the reader the supreme importance of methodical arrangement of numerical work. Tables of logarithms and the trigonometric functions occupy the second half of the book. It is both curious and regrettable that spherical trigonometry is included in

very few school courses. The educational value of solid geometry is gradually becoming recognised, and it is not improbable that this change of attitude may affect the teaching of trigonometry.

(6) This is a book which should prove of deep interest to all students of geometry. The author has been able, by confining himself to the methods of cross-ratio, to attain a thoroughness of treatment which has been impossible for previous writers, who have combined the theory of cross-ratio with other methods of projective geometry. There is much in this volume that is original, and numerous references are given to other works. One of the most valuable features is the insertion of copious historical notes. The author has made a special study of ancient geometry, and all who are interested in the development of the subject will value highly the results of his researches.

The book falls into two parts: the first deals with pencils and ranges of the first order, and contains a comprehensive account of the theory of homography and involution, special attention being directed to the practicability of constructions; the second gives a selection of the applications to the conic, in particular the theory of ranges of the second order and conics having double contact. There are, in addition, two appendices, one of which gives Pappus's account of the Porisms of Euclid, and the other a proof of Pascal's theorem by the methods of Euclid and Apollonius.

The treatment goes considerably beyond the requirements of the ordinary scholarship candidate, so that pressure of work will probably not admit of its being read at school. But we hope that it will find a place in the course of reading at the university, for it is essentially a scholarly treatise.

(7) This volume contains an introductory treatment of algebra and geometry, the latter predominating. The chief feature of the book is the admirable nature of the examples. There is a greater variety of form and freshness of character than we have seen in any other text-book of this kind. The intrinsic difficulties are few, the pupil being required to show common sense and self-reliance rather than technical skill. Probably the better plan would be to use it in conjunction with other text-books rather than by itself. We hope it will become widely known.

(8) This is a text-book of the old-fashioned type. There is little numerical work, the general angle is introduced at an early stage, the formulæ for sums and products and for multiple angles precede the solution of triangles, and there is no simple work on heights and distances. The quality of the paper used is distinctly poor.

(9) This volume presents in a fairly compact form a course of solid geometry, mainly practical and descriptive; but some analytical work is also included. No claim is made to any originality in treatment. The book is divided into three parts: the first contains a discussion of the solid angle formed by three planes, the representation in plan and elevation of the regular solids in simple positions and problems on sections; the second deals with plane and tortuous curves with special reference to the helix; and the last with surfaces of revolution, cylinders, and ruled surfaces, the method of index notation being fully explained. Owing to the small size of the page, some of the figures are printed across the binding, but in other respects they are very clear. There are no exercises.

(10) We cannot praise too highly this small volume; it is both simple and comprehensive. The subject of graphical statics is of real educational value. To regard it as suitable only for engineering students is an error which is now generally recognised. The mathematical specialist and the boy who is devoting time to the subject for the sake of a general education will alike profit by a course of this character. But neither of them needs that developed technique which the engineer or architect must acquire. One hour a week for a single term for the specialist, and about twice as much for the amateur, is sufficient to cover the range of this book. The boy who needs it for professional purposes will, however, have to devote three or four terms to it. The text is clearly put and illustrated by a number of excellent diagrams. There is a first-rate collection of examples.

(11) Dr. Besant's treatise on Hydrostatics, which was published about forty years ago, is so well known that any comment upon it is superfluous. It has now reached its seventh edition; but the alterations and additions that have been made are comparatively few. In appearance it is now rather more attractive, owing to the use of a larger page and wider spacing. Among the additions may be noted a treatment of stability of equilibrium by the principle of energy, which occupies nine pages, the use of Weierstrass's notation in some of the capillarity results which involve elliptic integrals, and a more comprehensive account of the equilibrium of revolving liquids. The collection of examples has also been improved by the introduction of a large number of problems taken from recent university examination papers.

OUR BOOKSHELF.

Handbook and Guide to Dundee and District. Prepared for the Members of the "British Association for the Advancement of Science," on the occasion of their visit to Dundee, under the direction of the Local Publications Committee. Section i. Edited by A. W. Paton. Section ii. Edited by Dr. A. H. Millar. Pp. xiv + 683. (Dundee: Printed by David Winter and Son.)

AMONG the various publications obtained by members and associates at the meetings of the British Association one of the most valuable is always the handbook which serves as a history of the place in which the annual assembly is held and a guide to matters of interest in the district. The "Handbook and Guide to Dundee and District," which has been prepared for the meeting to be opened on September 4, is one of the best arranged and most comprehensive we have had in recent years. The first section, which has been edited by Mr. A. W. Paton, the convener of committee, includes a history of Dundee, a forecast of its future, an account of its social service and city problems, its public services, its industrial and commercial life, and its importance as an educational centre. The second section, edited by Dr. A. H. Millar, includes seven scientific contributions dealing with the geology, the flora, ornithology, and so on, of Dundee and district; biographies of some distinguished men of science born in Forfarshire, and interesting information as to local architecture, ancient trades and incorporations of the district; and Dundee art, music and drama.

The biographical articles are of particular interest. Sir Archibald Geikie writes on Lyell and Forfarshire geology, Sir David Prain on Robert Brown and other botanists, Dr. Millar on James Bowman Lindsay, whose experimental researches in electricity were a generation in advance of his time; and there are many other biographies of scientific celebrities in whom Dundee has pride.

The volume runs to 683 pages, and in addition to a large number of illustrations and diagrams in the text, it includes a coloured botanical survey map of Fife and Forfarshire, a coloured geological map of Dundee and district, and a general plan of the docks and river wharves of Dundee.

The Testing of Wood Pulp: a Practical Handbook for the Pulp and Paper Trades. By Sindall and Bacon. Pp. 148. (London: Marchant Singer and Co., 47 St. Mary Axe, 1912.)

THIS is a practical handbook dealing with secondary features of value of papermakers' staple raw materials. The home production of the wood pulps representing only a small fraction of the consumption, there is necessarily a large trade with foreign products, chiefly Scandinavian, German, and American, involving close control on both sides. The primary factor of value is "cellulose quality"—a somewhat elusive and complex term, and largely dependent upon empirical judgment; next in order, but of inverse importance, is the incidental moisture which for obvious reasons requires exact adjustment.

The authors devote the first and larger section of their handbook to practical methods of estimating moisture in commercial deliveries. The important element in this operation is the sampling. This requires the expert. The authors are particularly qualified by long experience, fortified by full inquiry into the scientific basis of the operation of reducing, say, 100 tons to a representative 100 grammes to be actually subjected to the quantitative drying in the laboratory, and the volume reflects both qualifications.

Details of manipulation are adequately set forth, and the mathematics of the several schemes of drawing average samples are analytically enunciated.

The second section deals with the laboratory control of the bleaching of pulps. This is a question of bleach consumption and standard of colour in relation to that of cost. Here, again, it is a question of a plus-minus margin of value, and those few shillings per ton which in this highly competitive industry can by no means be left to "chance."

This little work is a useful contribution to the education of technologists, and the information of all business men who handle wood pulp as merchants or as manufacturers.

The Grouse in Health and in Disease. Being the Popular Edition of the Report of the Committee of Inquiry on Grouse Disease. Edited by A. S. Leslie. Assisted by A. E. Shipley, F.R.S. Pp. xx + 472 + plates. (London: Smith, Elder and Co., 1912.) Price 12*s.* 6*d.* net.

THE limited number of copies in the original edition of this work rendered it practically certain that a new one would soon be called for; in issuing this in a condensed and more popular form, at a much lower price, the publisher and editor have been well advised, for it will now be within the reach of head-gamekeepers and other persons to whom it ought to be of special interest. The editor and his staff of experts are, moreover, to be congratulated on the fact that no material alteration has had to be made (so far as can be gathered from the preface) in respect to the cause and diagnosis of the disease, thereby demonstrating the admirable and thorough manner in which the original investigation was conducted.

In the present edition much of the purely technical part of the original report has been omitted, only such pathological conclusions as are essential to a right understanding of the subject being retained. Most of the original plates had been cleaned from the stones, but the loss of these is compensated by the reproduction from the Zoological Society's Proceedings of a series of coloured plates illustrating the seasonal and other variations in the grouse's plumage. The wide circulation which this edition can scarcely fail to attain may lead to additional information on the subject. R. L.

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.]*

Butterfly Migration in Relation to Mimicry.

THE last paragraph in Prof. Poulton's letter in NATURE of June 13, referring to Mr. Swynnerton's experience that adult birds possess "a very fair knowledge of the main types of pattern and relative edibility of the local butterflies," reminds me of the only occasion on which I have seen a butterfly attacked by a bird during five years' observation in this district.

While walking in the observatory compound my attention was attracted by a Lycænid butterfly of an unfamiliar species, probably a migrant from a much lower elevation (the observatory is situated in the Palni Hills at an altitude of 7700 ft. above sea-level). I was watching the mazy flight of the insect in the expectation that it would settle, when I noticed a shrike sitting on a post near by, also observing it attentively. He evidently had a fair knowledge of the local butterflies, and considered this to be something new and worth eating, for he suddenly jumped from his perch and very cleverly caught the butterfly on the wing, a surprising feat for a bird having a rather clumsy build and heavy flight. Apparently he swallowed the insect entire, for I could discover no wings at the spot afterwards.

The general immunity of butterflies and day-flying moths from attack by insectivorous birds is as strikingly evident here as it is in England or America, and seems a serious difficulty in the way of accepting the Batesian theory of mimicry. Not only do the birds of this district pay no attention to the common butterflies, but the latter seem to despise the former. I have even seen a small bird frequenting the bracken of the uplands chased for a considerable distance by the vigorous and somewhat aggressive *Argynnis castetsi*!

In contrast with this immunity I have found that nocturnal moths, if forced to take long flights during the daytime, are very liable to attack, and in these circumstances stand a very poor chance indeed of reaching a haven of refuge. The watchful birds seem ever on the alert to snap up strangers.

It would seem, then, that unfamiliar lepidoptera are much more liable to attack than the common everyday kinds. May it not be that the real danger to a species occurs during migrations, and that mimetic resemblances may afford a real protection during such flights? In entering a new district a mimetic species would be immune from attack if the birds were familiar with the model, even if the latter were not unpalatable, while, on the other hand, unpalatable species migrating would be liable to attack if unfamiliar to the local birds.

In this district annual migrations occur across the Palnis during October and November of a considerable number of species from the plains, including the following mimics and models:—*Hypolimnas bolina, H. misippus, Euploea core, Danais plexippus, D. septentrionis, D. limniace, Papilio polytes, P. hector.* In these migrations it is noticeable that the mimetic species, *H. bolina* and *H. misippus*, are very liable to have torn wings, suggesting attack by birds, and it appears that the models as well as mimics are also sometimes attacked. An instance has been recorded by H. Leslie Andrewes (Journal of the Bombay Natural History Society, xx., 850), who found evidence of systematic onslaught by King crows (Dicrurus) on Danaids and Euplœas, also *H. bolina* ♀ and *Catopsilia crocale*. This was near Ootacamund in the Nilgiris in October. All the species mentioned by him are migrants from the plains, and I believe do not normally inhabit the Nilgiri plateau, although commonly seen at that particular season. There is a significant absence in the list of the very abundant and indigenous *D. nilgiriensis*, which would be well known to the local birds.

P. hector (the model of one form of *P. polytes* ♀) appears to be specially liable to attack when migrating across the Palnis, if one may assume that wings on the ground are good evidence of attack by birds.

This liability to attack of migrants passing over the Palnis or Nilgiris appears, however, not of much significance when large areas are considered. A mimic such as *H. misippus* ♀ possesses, so to speak, a passport over the whole of the plains of India, Persia, Arabia, &c., owing to its close resemblance to the very abundant and widely distributed plains butterfly *D. chrysippus*. The facility thus afforded for dispersal would surely be an important factor in the life of the race.

J. EVERSHED.

Kodaikanal Observatory, South India, July 9.

Parallel Mutations in Oenothera biennis.

IN a culture of a particular strain of *O. biennis*, L., a series of forms has been observed which constitute a parallel series to the well-known mutants from *O. Lamarckiana*, Ser. *O. biennis*, unlike *O. Lamarckiana*, has small flowers and a short style, rendering the flowers rather strictly self-pollinating. The particular race in question I received from the Madrid Botanical Garden. It has typical *O. biennis* flowers, as mentioned above, but the foliage closely resembles that of *O. Lamarckiana*. These plants were grown, to the number of 131 this year, at the John Innes Horticultural Institution, Merton, in connection with my other Oenothera cultures, which number in all more than 10,000 individuals.

While in the majority of the plants in this culture the foliage resembles *O. Lamarckiana* or *O. rubrinervis*, several have leaves corresponding to the mutants, there being six *laevifolia*, one *lata*, and possibly one *gigas*. With larger cultures probably other mutant types will also be found. The peculiar characters of the *lata* foliage are even correlated with sterility of the anthers, as in the *lata* from *O. Lamarckiana*, though the flower otherwise is that of *O. biennis*.

Though the foliage characters of these *O. biennis* forms are not identical with those of the Lamarckiana mutants, yet they differ from each other in corresponding ways, and thus form a parallel series.

The interesting question as to the origin of this strain of *O. biennis* cannot be answered at the present time. Even if they originated through crossing (as seems probable), their flowers are now self-pollinating, so that each individual, with occasional exceptions, must represent a "pure line." The most probable assumption is that, as in the case of *O. Lamarckiana*, the aberrant forms all originated from one type having Lamarckiana-like foliage. Of the mutant types in this culture, the *O. biennis lata* at least has evidently taken its origin directly from one of the other types, since it produces no pollen. It has probably arisen through such irregularities in the distribution of chromosomes during the meiotic processes as I have described for the *O. Lamarckiana* series of forms, and the presumption is that some of the other mutant types have had a similar origin. This is in harmony with my hypothesis that the mutation phenomena in *O. Lamarckiana* are not due merely to hybrid splitting,

but are an indirect result of the germinal instability occasioned by crossing in the ancestry.

It is to be hoped that further study of this new series of forms, with particular regard to the manner of origin of the mutant types, together with crossing experiments with the *O. Lamarckiana* series, will throw further light upon the nature of the mutation processes in Oenothera. R. R. GATES.

14 Well Walk, Hampstead, N.W.

William Herschel and his "Desertion."

IN the valuable discourse on Sir William Herschel delivered at the Royal Institution on April 26 by Sir George Darwin, the well-known story of the desertion of the young bandsman from the Hanoverian Guards has been alluded to (NATURE, August 15, p. 620). A week or two after the delivery of this discourse the "Scientific Papers of Sir William Herschel" were published by the Royal Society and the Royal Astronomical Society, and in the introduction to that work there is given a detailed account of how Herschel left the army, written by himself and corroborated by the still existing official discharge, signed by the colonel of the Guards in 1762. As many readers of NATURE may not come across that work, it may be of use to give a summary of the facts here.

After the battle of Hastenbeck (July, 1757) young Herschel (eighteen years of age) left the army and went home to Hanover, on the suggestion of his father. But on his arrival there he found that as a non-combatant he was liable to be pressed into the army at any moment. He therefore at once (or very soon) returned to his regiment, putting on his uniform again (not taking it off, as stated) when he had passed the sentries at Herrenhausen. He remained with the army till the following September, when he finally left it, as his father pointed out to him that there could be no objection to his doing so, since he had not taken the oath when he joined the band as a boy of fourteen. He then went straight to Hamburg without going home first, and proceeded to England, where he had spent five or six months in the previous year and where he wished to settle. In March, 1762, he obtained a formal discharge, which is now printed in my above-mentioned introductory memoir. The story, originally published by Airy on the authority of the Duke of Sussex, that George III. in 1782 handed Herschel a formal "pardon," must therefore have been due to some misunderstanding or other.

J. L. E. DREYER.

Armagh Observatory, August 23.

The Disintegration of Metals at High Temperatures.

DURING experiments on the disintegration of metals, particularly those which are not supposed to combine directly with oxygen, such as certain metals of the platinum group, I have found the disintegration to be due to the direct formation of an oxide. The loss of weight of a hot platinum wire, for instance, is zero in nitrogen, in hydrogen, and in a vacuum. By means of an expansion apparatus, all metals tried are found to give nuclei when oxygen is present, but not when it is absent, either in other gases or in a vacuum. The occluded gases come off in a vacuum in molecular aggregations, but there is no evidence that they bring particles of the metal with them. The loss of weight cannot be due to volatilisation, as it diminishes with diminution of pressure of surrounding oxygen.

By weighing experiments, the weight of oxygen absorbed and of platinum lost correspond to the formation of a hitherto unknown oxide of platinum. This oxide is deposited upon the walls of the containing vessel as a black powder; on being heated it turns to the metal, producing a platinum mirror. Microscopic examination does not reveal any evidence of crystals, either in the black powder or in the mirror. If, however, a piece of glass having such a deposit, and having been heated in different places, is boiled in aqua regia, the parts where the metallic mirror has been formed by heating become clear very quickly, whilst the black powder, where it has not been heated, remains unaffected. J. H. T. ROBERTS.

University of Liverpool, August 20.

September Meteor-showers.

THE following meteor-showers become due during the month of September:—

Epoch September 4, 19h. 30m. (G.M.T.), nineteenth order of magnitude. Principal maximum, September 4, 6h. 10m.; secondary maxima, September 3, 7h. 40m., and September 4, 18h.

Epoch September 7, 3h. 30m., approximately first order of magnitude. Principal maxima, September 6, 2h. 15m., and September 7, 21h. 5m.; secondary maxima, September 7, 12h. 30m., and September 8, 20h. 40m.

Epoch September 7, 2h., approximately first order of magnitude. Principal maximum, September 6, 6h. 30m.; secondary maxima, September 5, 11h. 20m., and September 6, 23h. 55m.

Epoch September 9, 15h. 30m., approximately seventeenth order of magnitude. Principal maximum, September 7, 22h. 50m.; secondary maximum, September 9, 13h.

Epoch September 9, 14h., sixteenth order of magnitude. Principal maximum, September 8, 10h. 15m.; secondary maximum, September 8, 2h. 35m.

Epoch September 12, 20h., thirty-fifth order of magnitude. Principal maxima, September 9, 18h. 25m., and September 11, 14h. 30m.

Epoch September 8, 17h. 30m., approximately seventeenth order of magnitude. Principal maxima, September 9, 22h. 45m., and September 11, 18h. 45m.; secondary maximum, September 9, 8h. 34m.

Epoch September 16, 8h., sixteenth order of magnitude. Principal maxima, September 13, 10h. 30m., and September 15, 6h. 35m.; secondary maximum, September 15, 14h. 30m.

Epoch September 14, 22h. 30m., eleventh order of magnitude. Principal maximum, September 13, 22h. 25m.; secondary maxima, September 12, 12h. 50m., September 13, 18h. 30m., and September 14, 8h. 50m.

Epoch September 16, 9h. 30m., twelfth order of magnitude. Principal maximum, September 14, 16h. 50m.; secondary maximum, September 16, 4h. 55m.

Epoch September 15, 4h. 30m., tenth order of magnitude. Principal maximum, September 14, 20h. 45m.; secondary maximum, September 13, 0h. 40m.

Epoch September 14, 15h., eleventh order of magnitude. Principal maxima, September 15, 18h. 25m., and September 17, 14h. 25m.; secondary maximum, September 17, 2h. 35m.

Epoch September 19, 21h. 30m., approximately seventh order of magnitude. Principal maximum, September 21, 2h. 35m.; secondary maxima, September 20, 8h. 45m., and September 21, 6h. 30m.

Epoch September 21, 9h. 30m., third order of magnitude. Principal maximum, September 22, 22h. 35m.; secondary maxima, September 23, 2h. 30m., and September 24, 22h. 25m.

Epoch September 25, 15h. 30m., fourteenth order of magnitude. Principal maximum, September 23,

20h. 50m.; secondary maxima, September 24, 0h. 45m., and September 25, 9h. 50m.

Epoch September 27, 8h., seventeenth order of magnitude. Principal maximum, September 26, 7h. 30m.; secondary maxima, September 25, 20h. 40m., and September 26, 18h. 25m.

Epoch September 28, 15h. 20m., sixth order of magnitude. Principal maximum, September 27, 5h. 45m.; secondary maxima, September 28, 3h. 30m., and 10h. 30m.

There is a considerable amount of meteoric activity in September, the first maximum of importance occurring on September 4, 6h. 10m. The principal maxima that become due on September 6, especially the first of them, and the principal maximum that falls on September 7, 21h. 5m., are of very high intensity. The principal maxima also are interesting that occur on September 13, 10h. 30m., and on the three days September 21–23. JOHN R. HENRY.

August 26.

A Flower Sanctuary.

SOME of the correspondence in your columns on the subject of the flora of the Cheddar Cliffs seems to assume that the Somerset County Council has a power to "proclaim" the flowers in question, that is, to protect them from being gathered, and that it has not exercised this power. I should be much indebted to any of your correspondents who can show me what power the council possesses to protect particular flowers, or how a bye-law can be framed for this purpose with any chance of its being valid. I think it will be found that, without further legislation, County Councils are powerless to afford the protection desired. EDW. FRY.

Failand House, Failand, nr. Bristol.

A Point in Geological Nomenclature.

WITH reference to Mr. A. Irving's communication under this heading in NATURE of August 15 (p. 608), the term *Quartär*, as German equivalent of our "Quaternary" or "Post-tertiary," is by no means a speciality of Prof. Credner, but the designation generally accepted by all German geologists since Naumann.

F. von Hochstetter (Vienna) used *Quartär* long before Credner, and it appears in the "Flötzformationslehre," written in 1856 by B. von Cotta, who succeeded Naumann in 1842 at the Mining Academy of Freiberg. F. GILLMAN.

16 Glebe Road, West Bridgford,
Nottingham, August 17.

BOATS AND LIFE-SAVING APPLIANCES ON SHIPS.

AT the time when the *Titanic* was lost the standing Advisory Committee appointed by the Board of Trade under the provisions of Merchant Shipping Acts was engaged in the reconsideration of the regulations for boats and life-saving appliances. A report had been presented by the committee recommending an extension of the previously existing scale for boats, so as to include the largest passenger steamers; and in the course of the inquiry by Lord Mersey and his colleagues an investigation was made of the causes of an apparently long delay on the part of the Marine Department of the Board of Trade in dealing with that report. Satisfactory explanations were forthcoming; but, in view of the great calamity that had occurred, it was obvious that the committee must reconsider the whole subject. That action was ordered by Mr. Buxton, and the committee received special instructions, its opinion being requested in regard to existing statutory regulations for boats and life-saving appliances on ships generally, and suggestions being invited in regard to "means calculated to diminish the risk or to mitigate the effects of accidents to vessels at sea."

Obviously a wide field of inquiry was laid open by these instructions; and in order to deal with this task efficiently the committee decided to co-opt additional members. A number of eminent men—shipowners, shipbuilders and professional officers of the great registration societies—were invited to join. Captain Watt, formerly commodore of the Cunard Line, was also co-opted, as his experience in command of trans-Atlantic passenger steamers had been altogether exceptional and had only recently been terminated as captain of the great steamship *Lusitania*. The original committee had been both strong and representative, so that the final report—now published as a Blue-book (Cd. 6353, 1912)—represents the views of men of great experience in the construction, command, navigation and ownership of shipping.

Since the report appeared, criticisms have been bestowed upon the constitution of the committee, which has been thought to have been biassed in favour of the shipowners of the United Kingdom. A certain confusion of thought underlies such criticism. The committee was intended to be representative of all classes interested in, and having special experience of, shipping. Its functions are purely advisory; the Board of Trade reserves the right of dealing with all recommendations made by the committee, and the framing of all regulations; and in this manner, as experience has shown, the public interests have been well safeguarded. Moreover, a perusal of the report and of the Minority Reports and Reservations—of which there are five—furnishes no real ground for the criticisms to which allusion has been made.

Apart from its expressions of opinion and its recommendations for future practice, the report is of great value as a summary of facts. Five sub-committees were appointed, and their reports form parts of the main report. The first of these sub-committees dealt with types of boats; the second with wireless telegraphy; the third with steamship routes; the fourth with vessels employed to carry passengers in the home trade; the fifth with statistical information. This last sub-committee consisted solely of the chairman (Sir Norman Hill) and the secretary (Mr. Matthew); and the report really embodies returns (relating to the subjects treated) for which the Board of Trade is primarily responsible, although the comments thereon are probably the work of the chairman—a gentleman whose opinions on shipping questions are entitled to respect. It is impossible in this brief notice even to enumerate the contents of the fifth report; all that can be said here is that the extraordinary degree of safety for life and property

at sea which has been attained during the last ten years is demonstrated, and the altogether exceptional character of the circumstances which attended the loss of the *Titanic* is made clear.

The main recommendations of the report may be summarised. First, it is recognised that "the stability and seaworthy qualities of the vessel itself" must be regarded as of primary importance. This includes the question of watertight subdivision, now under investigation by a special committee. Second, as regards boats and life-saving appliances it is recommended that accommodation should be provided for the *total number* of persons which each *foreign-going* passenger steamship is licensed to carry. This has not been done hitherto in the largest passenger steamships, but the report shows that the rules hitherto in existence for such ships were sufficient to provide boats carried under davits for all persons in 343 out of 521 such ships which were examined, and that out of the 178 ships for which these rules did not require sufficient boats under davits for all persons carried no fewer than forty-nine ships actually carried sufficient boats, their equipment going beyond legal requirements.

For passenger steamers in the *home trade*—plying in estuaries and rivers, cross-channel and coasting services, etc.—the recommendation made is that the boats, life-rafts and buoyant apparatus taken together should aggregate accommodation for not less than 50 per cent. of the passengers and crew. The conditions under which these vessels work obviously render it probable that, in most cases, external help would soon be available in case of accident, and the sub-committee says that there is "a consensus of opinion that in these smaller vessels any considerable increase in the number of boats is not practicable and would be a source of danger rather than an element of safety." While the force of this argument is undoubted, it is proper to add that the considerations urged therein make it imperative that the officials of the Board of Trade in granting passenger certificates and fixing the maximum numbers to be carried should also have regard thereto.

One must be impressed afresh in reading this report with the fact that even when the provision of boats and life-saving appliances is ample, there are comparatively few cases in which these can be fully utilised in case of serious accident. In the case of the *Titanic* the boat accommodation which existed was not fully utilised, although the boats were safely lowered and a calm prevailed. Modern ocean-going steamers carry their boats at great heights above water, and with any rolling motion of the vessel it is dangerous, if not impossible, to lower the boats. In very moderate weather it may be done, but even then occupies much time. This matter has been referred to another departmental committee, the labours of which are just beginning.

When the reports have been presented from the Committee on Boat Lowering Appliances and from the Bulkhead Committee, the President of the Board of Trade and his staff in the Marine Department will have much further material for consideration, in addition to the great mass of facts and opinions contained in the report now before us. One is disposed to ask: What will he do with it? Captain Hampson, a member of the Advisory Committee, in a lengthy reservation, which is severely dealt with by the chairman in a separate note, strongly urges the appointment of "a commission or committee composed of members independent in every way of the shipping interest, but at which various representatives of the different sections of shipping should be invited to submit their views." Such a course appears to be most undesirable; it would amount to an abandonment of the investigations by competent committees already set on foot. The materials on which future regulations ought to be based will be ample when existing committees have finished their labours, and the responsibility for these regulations must be accepted by the President of the Board of Trade. This general statement of the case applies not only to the points mentioned above, but to other important matters, including manning of British ships, boat drills, wireless telegraphy, the use of searchlights, rules for navigation, and others which cannot be mentioned.

In one direction the Advisory Committee appears to have undertaken a gratuitous task, as it has investigated the advance made in the speed of ocean-going steamships in order to demonstrate that the general increase has been small and that even now ships exceeding twenty knots are few in number. The really important question is not what maximum sea speed a ship can maintain, but what is an "undue speed" likely to lead to accidents in special circumstances. The committee itself recognises this distinction and one of its most valuable recommendations is that proposing to extend the present regulations and to prescribe to those in charge of ships the necessity for proceeding at moderate speed "at night in the known vicinity of ice." Anything less than this, after the loss of the *Titanic*, would be contrary to public feeling and to common sense.

FORESTS AND RAINFALL.

SIR W. SCHLICH, F.R.S., Professor of Forestry at Oxford, writing in the new edition of the "Encyclopædia Britannica," defines a forest as "an area which is for the most part set aside for the production of timber and other forest produce, or which is expected to exercise certain climatic effects, or to protect the locality against injurious influences." One of the most important of the climatic effects ascribed by some to forests is the increased amount of precipitation, not only in the forest areas themselves, but also in the country surrounding them, produced by the influence of the forests upon the moisture-laden air which passes over them.

Owing to the relatively small area of our forests and the rarity of serious floods or prolonged

droughts, the question of the influence of forests upon rainfall has not received much attention in this country, but on the Continent,—in France, Germany, and Austria especially,—in America, and, more recently, in India, the arguments for and against the existence of any influence have been put forward at great length, and sometimes with much energy.

The literature on the subject is somewhat bewildering, not only on account of its extent, but also because of the surprising divergence of views entertained by different authorities. Most European and some American writers are in favour of the accuracy of the supposed forest influence, while other American authorities maintain that the effect is entirely fictitious; that the instrumental records which have been adduced in support of it are affected by errors brought about by differences of exposure in the forest and in the open, and that, if there is a connection between forests and climate, it is the latter which controls the growth of the former, the former having no appreciable effect on the climate.

On one side the problem has been attacked by the historical method; that is, the state of a forest and the amount of rainfall in its vicinity are compared together over as long a period as possible. On account of the lack of trustworthy records of rainfall for the long periods required, the fall is usually estimated from accounts of the condition of some stream or river in the neighbourhood. As an example of this method may be cited the case of the river Loire, which in former times afforded communication by water between Nantes and the central provinces of France. In 1551 the Marquis of Northampton went from Orleans to Nantes, with his suite, in "five large, many-cabined boats," whereas navigation is now impossible above Saumur, the distance of which from Nantes is less than half that of Orleans. This change is ascribed to the deforestation carried on extensively in the surrounding country in the seventeenth century, and the consequent diminution in the volume of water in the Loire due to diminished rainfall. It is here tacitly assumed that the general climate over Western Europe has remained unaltered throughout the period, and that any change in the climatic conditions is due to local forest influence, secular changes of climate being entirely overlooked.

The strongest arguments in favour of the supposed influence are based upon observations at so-called "parallel" stations; *i.e.* meteorological stations are established within a forest area and in the open country round the forest, respectively, and a long series of *simultaneous* observations are made at all the stations. In nearly all localities where such observations have been carried out, an appreciable difference exists between the rainfall measured inside the forest and that measured outside, the forest station having an excess of precipitation over the "parallel" station. A remarkable example is that of Lintzel, in Hanover. In 1882 the rainfall at this station was considerably less than at most neighbouring stations. Young trees were planted round the station in 1877, and as they grew up the rainfall at Lintzel gradually increased in comparison with its neighbours, until in 1890 it was generally in excess where in 1882 it had been in defect. The objection urged against the historical method does not apply to this kind of reasoning, which appears conclusive on the face of it. In a series of recent papers in the *Meteorologische Zeitschrift*, J. Schubert has shown that a forest station in West Prussia and Posen has from 2 to 10 per cent., and in Silesia from 2 to 6 per cent. more rainfall than a parallel station in the open country. From this it is argued that inasmuch as a forest increases the rainfall over its own area, it may be expected to produce some effect of the same kind in the surrounding districts, because the wind would carry forward the rain-bearing clouds formed by the forest influence.

The value of observations derived from parallel stations has, however, been strongly criticised by some American meteorologists. Prof. Cleveland Abbe has urged that the results are vitiated on account of the fact that a rain gauge exposed in a forest clearing is not subjected to winds as strong as those which pass over a gauge at a parallel station in the open country; and that, in consequence, the forest gauge may be expected to record more rain, although the real fall may be identical at the two places. As a result of his investigations, Abbe is of opinion that there is no appreciable difference in the rainfall outside and inside a forest. Schubert was aware of the force of this contention, and definite allowance was made for difference of exposure in the results quoted above. His margin is, however, so small, and the correction allowed on account of exposure differences is so uncertain, that his final result cannot be regarded as furnishing a conclusive solution of the problem.

In a report on the "Influence of Forests on Climate and on Floods," Prof. Willis L. Moore, Chief of the United States Weather Bureau, brings forward some considerations against the supposed effect of forests on rainfall. One piece of evidence shows how climate affects the extent of a forest area, and suggests that the influence, if any, is from climate to forest, and not conversely. Mr. E. Huntington, travelling in Chinese Turkestan, stated that "poplar forests, which once extended for scores of miles, now form wastes of branchless dead trunks, like gaunt grey skeletons, and beds of dead reeds cover hundreds of square miles. It has often been asserted that the destruction of forests has been the cause of the diminution of rainfall. In the Lop basin the opposite appears to be the case; the supply of water has diminished, and therefore the forests have died."

The physical explanation for the increased rainfall which is put forward is that the evidence is undisputed that air temperature is less and percentage humidity is greater over a forest than over the neighbourhood. In favourable circumstances, condensation of water vapour may therefore be set up over a forest, and once the condensation has started, it may continue automatically, owing to the large amount of latent heat

liberated in the process of condensation, which will tend to set up convection currents.

Prof. J. von Hann's opinion on the subject, in the latest edition of his "Handbuch der Klimatologie" is that the question cannot be definitely answered at present, but that the effect, if any, should be greater in the tropics than in higher latitudes. Dr. G. T. Walker, of the Meteorological Office, Simla, is of a similar opinion. He states that if forests have any influence at all on the rainfall, it is probably not greater in India than 5 per cent. R. C.

OERSTED AND THE ELECTRIC THEORY OF LIGHT.

IN Sir John W. F. Herschel's classical article on light (dated 1827) in the "Encyclopædia Metropolitana" of 1830, p. 439, there is a vague reference to a theory of light then recently propounded by Oersted, in which he sought to explain the nature of light-waves as a succession of minute electric sparks. Desiring to follow up this reference, the writer of this notice consulted, but fruitlessly, all the writings of Oersted within his reach. Thereupon he applied for information to Prof. Absalon Larsen, of Copenhagen, who, after consultation with Prof. Christiansen, kindly directed the writer to sources not available in London, and furnished the extracts now given from Oersted's writings.

The theory of light suggested by Oersted was first advanced in a remarkable book, written in the German language, and published in Berlin in 1812, under the title, "Ansicht der chemischen Naturgesetze," von H. C. Oersted. The theory of light occupies only a small part of this book (298 pages in all), which is of a much wider scope. Oersted proposes to refer all chemical phenomena to fundamental agents (forces), hoping thus to initiate a development of theoretical chemistry analogous to the development which the introduction of simple laws had brought about in mechanics. A quotation from his own introduction, pages 7–9, will state the position :—

It will not be without use here at the outset to review the whole road to be travelled. We intend to make the beginning of our investigation with a demonstration and arrangement of all bodies according to their chemical nature. Then we will set forth some considerations about the ordinary chemical actions known to us, and will show from them that all chemical changes hitherto investigated can be referred to two widely extended forces of Nature. We will at the same time demonstrate that these forces are able to act not only by direct, but also by indirect, contact; that consequently they can be conducted. This will lead us to those chemical circuit-actions which have already been known to us for a long time in Galvanism. And, lastly, this will bring us on to demonstrate chemical forces in their free activity, and so at the same time to make evident their identity with electrical forces. Here, then, we shall reverse the course of our investigation, and directing our attention to electrical forces, we shall seek to discover how these also can be related to the chemical form of action. And besides we then become aware that the electric forces, like the chemical ones, are two, and that they at the same time are opposed; that both are of general application, and that, from the state of relative rest in which they exist in bodies, they can pass over into activity when aroused by external forces. . . . After we have in this way set forth the broad connection of chemical and electrical actions, in these two opposite directions, we shall, relying on an investigation into the nature of conduction, try to show under what conditions the two forces produce Heat, and under what conditions they produce Light. We shall thereby regard these great phenomena in a far more intimate connection with the rest of nature than were possible according to the ordinary view.

Starting from the nature of electric conduction, Oersted then attempts to show the conditions under which the two opposing agencies produce heat and light respectively. His ideas about conduction he develops on pages 138, 139 :—

If, therefore, one of the electric forces is propagated through space, this occurs in the following way: that it attracts the opposing force in the nearest zone, binds it, and itself in turn suffers a diminution from it, in consequence of which the next zone receives actually the overplus of the same force as it spreads, but itself excites a new zone of the opposing force, so as again to react, and so forth. One may express all this by saying that Electricity is propagated by wave-motion (*die Electricität verbreitet sich undulatorisch*).

As to the conditions under which the conduction of electricity produces heat, Oersted writes on pp. 164–165 :—

We have seen that Conduction consists in a disturbance running through all points of the body and in a restitution of equilibrium. So long as the Conduction is complete, the restitution will always be brought about by the mutual attraction of the force evoked out of equilibrium. But when by reason of a forced conduction a greater quantity of force penetrates the body than the latter is able spontaneously to conduct away, then at once the interiorly-disturbed equilibrium cannot be restored again by the body's own forces. . . . *This condition, in which equilibrium is disturbed at every point of the body, but in such wise that no recognisable separation of the forces is attained, gives us the phenomenon of Heat.* . . .

To distinguish it from other theories of heat, the *mechanical*, which regards heat as a vibration of material particles, and the *chemical*, which assumes a particular substance (caloric), Oersted calls his own the *dynamical* theory.

As regards light, Oersted first shows that heat may be transformed into light, and *vice versâ*, and he therefore considers heat and light as produced by the same two agencies. The difference is that, as stated above, for the production of heat no real separation of the two agencies is needed, whereas for the production of light the tension of the opposite forces or agencies must reach its maximum value and produce a discharge. The following passages are from p. 222 :—

. . . so we must content ourselves with knowing that Light will be produced if the tension of opposition of the internal forces has attained its maximum and passes over into equalisation.

He then continues:—

The propagation of Light occurs, as we have already seen, by dynamical undulations, for so we call the uninterrupted alternation of the opposing forces. This view stands between the Undulatory theory which Huygens and Euler taught and the Emanation theory of the Newtonian school, almost in the same way as the dynamical theory of Heat between the mechanical and electrical theories. Schelling, in his *Weltseele*, has recognised the possibility of such a view.

Besides these extracts from the "Ansicht der chemischen Naturgesetze," Oersted expounded his theory of light in a particular communication which he made to the Royal Danish Society of Science, and of which an abstract is printed in its Proceedings for the year 1815–16, pp. 12–15. One sentence will suffice as a summary of this abstract:—

According to the theory which has been set forth here, one may fairly well consider a ray of Light as a succession of immensely small electric sparks which might be called the elements of Light.

It is evident that, with all his ingenious insight, Oersted was far from having formulated an electric theory of light in terms which would admit of verification. His perception that electric forces were called into play in the displacements of the luminiferous waves was obscured by the view which he held of conduction; for, surely, the condition of the quasi-elastic actions called forth in the propagation of light should have been that the forces or agencies at work must *not* attain so great a value as to produce a discharge, as we now understand it. Indeed, in the existing state of knowledge, when as yet the quasi-elasticity of dielectrics was unknown, the foundation facts for an electric theory were not available. The remarkable fact is that in the paucity of available facts his speculations took him so far as they did along the road of progress.

SILVANUS P. THOMPSON.

SCIENCE AND RESERVATIONS.[1]

WHEN a district interesting to geologist and naturalist alike is handed over to a body of scientific investigators, the result in these days of intensive research is likely to be important. Dr. Conwentz, the indefatigable pioneer of nature-protection, has edited a volume of 700 pages, which gives the results of such a study in the case of the *Plagefenn* at Chorin, in Prussia, a district of marshes, lakes, islands, and wooded country. Of course, there are gaps in the mass of knowledge accumulated during several years, in the fauna and lower flora, for instance. But the whole work is a remarkable study in classification and generalisation.

The relations of water and earth, for which the historical records of the district are very useful, have seldom been studied so minutely, especially in reference to the lower vegetation. Dr. H. Schroeder describes the diluvial, and Dr. J. Stoller the alluvial, structure. On their foundations, Dr. E. Ulrich bases his botanical study. This, and the monograph on the fauna, are fine studies. As contributions to ecology they are of great value. Many readers should be able to obtain a better idea of the intricacies of plant communities from such a monograph as Dr. Ulrich's than from a general work on the subject. The sociology of plants and animals, as conditioned and initiated by geological and meteorological forces, has still all the fascination of a young science. Excellent diagrams and maps illustrate the social processes, so well marked in this district, which Dr. Ulrich praises as a model of biological complexity and natural beauty. Professor Kolkwitz's essay on the plankton is placed at the end of the volume, but should be read with Dr. Ulrich's contribution.

The account of the fauna could not have been in better hands than in those of Prof. F. Dahl. His general introduction on methods of research and his conclusions on the relations between animal and plant communities are fresh and important.

The analytical lists are carefully executed; that of the fauna extends to more than 200 pages. The index is a good one.

The keynote of the whole study, and the point of departure and of arrival alike, is the coast-line of a fresh-water lake; and there are few more interesting sites for the study of organic life. Our own country, it may be observed, has an abundance of similar districts, more or less useless to the agriculturist, but of enormous value for scientific research.

A. E. CRAWLEY.

[1] "Beiträge zur Naturdenkmalpflege." Herausgegeben von H. Conwentz. Dritter Band—"Das Plagefenn bei Chorin." Ergebnisse der Durchforschung eines Naturschutzgebietes der preussischen Forstverwaltung, By H. Conwentz, F. Dahl, R. Kolkwitz, H. Schroeder, J. Stoller and E. Ulrich. Pp. xvi+688. (Berlin: Gebrüder Borntraeger, 1912). Price 18.75 marks

NOTES.

ARRANGEMENTS have been made for the inclusion of two organised discussions in the proceedings of Section H (Anthropology) during the forthcoming meeting of the British Association at Dundee. On Friday, September 6, a discussion on the ethnological aspects of Scottish folklore will be opened by Mr. W. Crooke, president of the Folklore Society, and papers will be contributed by Mr. E. S. Hartland, Mr. W. J. Brodie-Innes, and Canon J. A. McCulloch. On Monday, September 9, the president of the section, Prof. G. Elliot Smith, F.R.S., will read a paper on the distribution of megalithic monuments, in which he will develop the theories as to the racial affinities of their builders which he has recently put forward. In the discussion which will follow, Prof. Ridgeway, Prof. J. L. Myres, Prof. W. Boyd Dawkins, Dr. T. Ashby, and others have promised to speak.

THE summary of the weather issued by the Meteorological Office for the week ending August 24 shows that the general conditions were again extremely unsettled over the United Kingdom as a whole, but in some localities in Scotland, Ireland, and the north-east of England rain is said to have been less common than elsewhere. The deficiency of temperature exceeded 3° in most districts, and the south-west of England was the only district where the highest day

temperature touched 70°. The radiation temperature on the grass fell below the freezing point at several places in different parts of Great Britain. The rainfall was above the average in all districts except in the west of Scotland, and in the south-west of England the measurement was as much as three times the average. Bright sunshine was everywhere very deficient. In the south-west of England the mean daily duration was less than two hours, and in the south-east of England, where there was more sunshine, the duration was little more than three hours. The summary of the weather for the current week will show very similar conditions to prevail, with a greater excess of rainfall over nearly the entire kingdom. The rainfall of 6 inches in less than twelve hours at Norwich on August 26 is one of the heaviest falls which have occurred in so short a time in England.

In Australian papers which have just come to hand we regret to see the announcement of the death of Mr. Francis James Gillen. Anthropology has thus lost a conscientious and devoted worker, whose world-wide reputation has been well earned in a fast-vanishing field of investigation, which, unfortunately, attracts far too few men of Mr. Gillen's type. It is now forty-five years since he entered the public service of South Australia, and his official work caused him to become virtually exiled to the heart of the Australian continent; but he devoted his spare time to the study of the aboriginal people amongst whom he lived, and it is no exaggeration to say that he acquired a much more intimate knowledge of the customs and beliefs of the most backward race of mankind now in existence than all other investigators had been able to collect; and this wealth of accurate information was put to the best use when Mr. Gillen collaborated with Prof. Baldwin Spencer, F.R.S., of Melbourne, and produced a series of the most discussed volumes that have ever been contributed to ethnological literature. The opportunities for such investigations as Mr. Gillen carried on are abundant, but with the rapid intrusion of European customs into every corner of the world they will soon be gone for ever. It is thus with especial gratitude that all students of mankind will always regard the labours of such men as the late Mr. Gillen, who have seized the opportunities presented by their daily occupations and rescued for posterity an accurate knowledge of the fast vanishing customs and beliefs of primitive peoples.

Dr. Jean Mascart, of the Paris Observatory, has been appointed director of the Lyons Observatory in succession to M. André.

It is announced in the *Revue Scientifique* that M. E. Solvay has given 400*l.* to the Institute of Physical Chemistry of the Berlin University to assist the researches on which Prof. Nernst is engaged. The gift will be renewed for three years.

The collection of foreign Lepidoptera bequeathed by the late Mr. H. T. Adams, of Enfield, has been received at the Natural History Branch of the British Museum. It is contained in 68 cabinets, and is stated to comprise about 150,000 specimens. The estimated value of the collection is between 40,000*l.* and 45,000*l.*

The death is announced in *Science* of Prof. E. L. Richards, emeritus professor of mathematics of Yale University, aged seventy-four years; and of Dr. M. H. Richardson, Moseley professor of surgery at Harvard University, aged sixty-one years.

Mr. Charles Ede, who was surgeon and naturalist to H.M.S. *Assistance*, which took part in one of the expeditions in search of Sir John Franklin's party in the Arctic region, has just died in his ninetieth year.

The death is announced, in his eighty-first year, of Mr. Alexander Dean, senior lecturer on horticulture to the Surrey County Council, and a well-known authority on horticultural matters. Mr. Dean received the Victorian Medal for Horticulture. He was a frequent contributor to periodicals dealing with gardening subjects, and the author of a useful little book on vegetable culture.

The death is announced of Prof. John Craig, one of the leading American horticulturists. He was born in 1864 in the province of Quebec, but received his education at the Iowa State College. He returned to Canada in 1890 to become horticulturist at the Dominion experiment station at Ottawa. In 1899 he once more crossed the border to take up an appointment as professor of horticulture and forestry at the Iowa State College. Since 1903 he had held the chair of horticulture at Cornell University. He was the editor of *The National Nurseryman*, and the author of a text-book of practical agriculture.

We notice with regret the death, on August 25, in his sixtieth year, of Dr. Andrew Wilson, lecturer on physiology and health to the George Combe Trust and Gilchrist Trust lecturer. In 1876 Dr. Wilson was appointed lecturer on zoology and comparative anatomy at the Edinburgh Medical School; and he was at one time editor of *Health*. But Dr. Wilson was best known as a popular lecturer and writer on scientific subjects, in which capacity he did very useful work in making clear and interesting to general readers and the ordinary public the results of research in various departments of natural science specially. He was the author of a large number of popular books on scientific subjects.

We regret to see the announcement of the death on August 26, at sixty-one years of age, of Mr. Clinton Thomas Dent, vice-president of the Royal College of Surgeons, honorary member of the Philadelphia Pathological Society, and late Hunterian professor and member of the Court of Examiners of the Royal College of Surgeons. Mr. Dent was the author of a number of surgical works, and was famous as an Alpine climber, and also for a series of explorations in the Caucasus. He was secretary of the Alpine Club from 1878 to 1880, vice-president in 1884, and president from 1886 to 1889. He took a large part in editing the mountaineering volume of the Badminton Library, and was also the author of a volume entitled "Above the Snow Line," published in 1885.

We notice with regret the announcement of the death, at eighty-six years of age, of Mr. A. Brothers, of Manchester, one of the oldest photographers in England, and the author of several important

works upon photography. Mr. Brothers was the inventor of the use of magnesium ribbon for flash-light photography, and he obtained some of the earliest photographs of the solar corona. Several hundred photographs were taken during the American eclipse of August 7, 1869, and one of them was reproduced in the first number of NATURE, but it shows only the chromosphere and prominences. During the eclipse on December 12 of the following year excellent photographs of the solar corona were taken by Mr. Brothers at Syracuse, and also by American observers in Spain. A woodcut reproduction of one of Mr. Brothers's pictures appeared in NATURE of February 23, 1871, and some points of interest were indicated by him in an article in that number and in the issue of March 9, 1871. The photographs were of great scientific value in connection with the then much-discussed question as to the nature of the corona.

DR. T. B. MCCLINTIC, of the American Public Hospital and Marine Hospital service, has died at the early age of thirty-seven, the victim of his own devotion to the cause of public health. For the last two years he had been investigating "Rocky Mountain spotted fever" in Montana, a disease most prevalent in the Bitter Root Valley. Dr. McClintic's campaign against the epidemic had prevented the development of any case in the valley this year until he was himself stricken. He had done much notable work in his previous career. He served on the relief ship after the San Francisco earthquake, assisted in administering the plague quarantine in the Philippines, and, in conjunction with Dr. Anderson, of the hygienic laboratory, set the standard for antiseptics in the United States. The New York *Evening Post*, in a leading article, says that Dr. McClintic's name "will be added to the illustrious roll of men who have cheerfully faced dangers more appalling than those of battle, and have yielded up their lives in the effort to save the lives of others."

WE regret to have to record the death of the Rev. Robert Ashington Bullen, who passed away suddenly on August 16, aged sixty-two. He was an enthusiastic naturalist, a Fellow of the Linnean, Geological, and Zoological Societies, and an active member of council of the Palæontographical and Malacological Societies. He was a generous supporter of scientific research, especially in geology, and either inspired or himself made numerous contributions to knowledge. He was closely associated with the late Sir Joseph Prestwich at the time when he was preparing his classic paper on the supposed worked flints from the plateau gravels of Kent; and Mr. Bullen himself subsequently published many descriptions and illustrations of "eoliths" both from Kent and other districts. He explored a prehistoric cemetery at Harlyn Bay, Cornwall, and described his results in a small work, of which the first edition appeared in 1901, the third edition quite lately. He visited the Bermuda Islands, of which he contributed a useful geological description to *The Geological Magazine* in 1911; and at the time of his death he was occupied with the study of material which he had collected from superficial deposits in the Canary Islands.

WE also note with regret the death of Captain Arthur William Stiffe, who had been for many years a familiar figure at the meetings of the Geological and Royal Geographical Societies. Capt. Stiffe was born in 1831, and during service in the Indian navy from 1849 to 1862 was chiefly occupied with hydrographic surveys of the Persian Gulf and the Mekran coast. In 1873 he read to the Geological Society an account of the mud craters and geological structure of the Mekran coast, from which he was one of the first to collect the now well-known fossiliferous nodules of Upper Tertiary age.

AS already announced, the autumn meeting of the Iron and Steel Institute will be held at Leeds on September 30—October 4. The provisional list of papers expected to be submitted includes the following subjects:—The solubility of cementite in hardenite and the solubility or diffusion of hardenite in ferrite; gases evolved on heating steel to its melting point in a vacuum; allotropy in general and that of iron in particular; the thermal-magnetic transformation of 25 per cent. nickel steel; a new method of revealing segregation in steel ingots; magnetic properties of manganese and nickel steels; the manufacture of open-hearth steel; the growth of cast irons after repeated heatings; and the iron ores and mineral resources of Chile.

IN the August number of *Man*, Mr. D. Wright describes the ceremonies at the burial of a chief in Rhodesia. When he dies during the winter months, the body will not be buried until after the first rains fall, and meanwhile it remains in the hut in which the chief died, where it is laid on a platform in charge of the friends, who sweep the floor and keep the walls of the hut smeared with clay to prevent the escape of the spirit. A fire is kept burning in the hut, and when decomposition sets in there is a feast, and offerings are made to the spirit. When the first rains fall an ox is slain, and the skin is removed with the hoofs and head complete. The corpse is then sewed up in the hide, a grave is dug in an ant-hill, and the body is placed in it with the pots which were in the hut. The grave is covered and plastered over, a hole being left for the exit of the spirit. This spirit is then believed to take the form of a lion cub, which remains near the grave, and is fed by other lions which are the depositaries of the souls of former paramount chiefs.

THE Journal of the Royal Statistical Society for July contains an interesting paper by Mr. A. L. Bowley on the measurement of employment. Mr. Bowley points out the limitations of the present Board of Trade index-number for unemployment, and gives the result of an experiment in forming a fresh index-number which takes into account all the information of every kind bearing on the volume of employment published by the Board. In the same issue there is a note by Sir J. A. Baines summarising the census returns, either provisional or final, which have now been received from nearly all the units of the British Empire. The total population is rather more than 419,000,000.

THE Royal Statistical Society has just published a report of its special committee which was appointed to inquire into the system adopted in different countries for the registration of births (including stillbirths) and deaths with reference to infantile mortality. The information collected is both extensive and abundant, and the practices of various nations in reference to this question appear to be almost as numerous as the nations themselves. There is even difference of opinion with regard to the exact meaning of the word "stillbirth." It is not, however, possible for us to summarise all these details, and those of our readers interested in statistical methods in general, and the question of infantile mortality in particular, should procure the report. The main conclusion arrived at by the committee is that stillbirths should be tabulated separately. If this is done, the present basis of calculation for mortality in infants will be altered and the tables will be thus rendered much more satisfactory and trustworthy.

IN the *Victorian Naturalist*, vol. xxix., p. 43, Mr. J. Mahony records the occurrence of remains of the Tasmanian devil on the sandhills near Warrnambool, Victoria, in association with bones and teeth of man and other mammals. The occurrence of *Sarcophilus ursinus* on the Australian mainland at a very recent epoch is thus conclusively proved.

TO the August number of *The American Naturalist* Mr. H. W. Fowler contributes an illustrated article on some features of the ornamentation in freshwater fishes, as exemplified by the development of tubercles on the head, or head and back, of males of the families Cyprinidæ (minnows) and Catostomatidæ (suckers) during the breeding season. These tubercles may develop in young fishes, provided they are sexually mature, as well as in adults, but in other instances adult fishes may breed without the tubercles appearing.

ACCORDING to an illustrated guide-book by Mr. T. Sheppard, Hull has established in the Pickering Park an exhibition devoted to the whaling trade formerly carried on from that port, as well as to matters connected with sea-fisheries and shipping in general. It is stated that the first whaler from Hull appears to have left that port for Arctic whaling in 1598, or only four years later than the first English vessel which sailed to hunt the Greenland whale. About the middle of the nineteenth century the industry began to wane; and the famous Hull whaler *Truelove*, which in her time had taken about 500 whales, made her last whaling voyage in 1868. The building in which the exhibition is contained is the gift of Mr. C. Pickering.

THE current number of the *Archiv für Zellforschung* (Bd. 8, Heft 4) contains a very interesting memoir by Dr. Henri Hoven dealing with the structure and function of glandular cells. The paper treats especially of the "chondriosomes," filamentous bodies which occur in the cytoplasm and exhibit characteristic staining reactions. The author considers that these bodies are identical with the chondriosomes described by Meves in embryonic cells. The latter are believed to be essentially formative bodies, at the expense of which myofibrillæ, neurofibrillæ, and other cell structures are differentiated. In glandular cells they are the active agents in the formation of the secretion, being, in some cases at any rate, actually broken up into the secretion granules. It seems probable that they have the power of multiplying by division. The author concludes that the bodies described by various observers as existing in glandular cells, under the terms vegetative filaments, basal filaments, ergastoplasm, ergastidions, and chondriosomes, are all one and the same thing.

AMONG the publications we have recently received through the courtesy of the director of Kew Gardens, mention may be made of appendix ii. and appendix iii. to the Kew Bulletin for 1912; the former contains a list of additions to the library at Kew during the year 1911, and the latter a list of new garden plants introduced last year. Of greater general interest is the new edition, just published, of the popular sixpenny Official Guide to the Royal Botanic Gardens, containing above a hundred pages of descriptive matter, interesting and plainly worded so as to be of value to the general public as well as to botanical students, with a small but admirably clear key-plan of the gardens.

MR. A. G. TANSLEY, of Cambridge University, has contributed to *The Gardeners' Chronicle* (Nos. 1336–8) an account of the vegetation of the forests of Provence, with seven excellent photographic illustrations. In his series of three articles, forming one of the most interesting of the purely botanical papers which have appeared recently in this journal, the author points out that within a space of about thirty miles all transitions may be traced between the typical Mediterranean coast vegetation and that of the high Alps. Since the underlying rock is almost everywhere limestone, the main factors differentiating the vegetation are climatic, and correspond with a decrease of temperature and an increase of moisture in passing from the low hills of the coast to the high mountains of the Maritime and Provençal Alps. The influence of aspect upon the vegetation is very striking, the cooler and moister northern slopes frequently bearing quite a different flora from that of the sunny southern slopes. The author distinguishes and describes four main forest zones: (i) the Mediterranean types of *Pinus halepensis* and *P. maritima*, with *Quercus suber* locally; (ii) a belt in which *Quercus pubescens*, a deciduous oak closely allied to *Q. sessiliflora*, is dominant; (iii) a belt of Scots pine extending into the subalpine region; (iv) forest composed of *Picea excelsa* and larch which form the uppermost belt, at least on northern slopes. The zonation is exceedingly well marked on the whole, though the four zones are, of course, much influenced by aspect, and there is a good deal of mingling in the transitional zones.

WE have recently received the Meteorological Report of the Survey Department of Egypt for the year 1909. Although somewhat belated, owing presumably to the careful discussion of so large an amount of data, a few general remarks will probably be of interest. The report is divided into two parts, as before: (1)

observations made at Helwan, the first order station of Egypt. The size of this part has been considerably reduced by the omission of observations for every hour and the publication of the results in a more summarised form. This part also includes an important paper by Mr. H. E. Hurst on the reduction of the observations of terrestrial magnetism. (2) Climatological tables, including rainfall and river gauge observations. The chief features of the year were the heavy rainfall in April and October, and the high Nile flood, which began early and was about 15 per cent. above the normal; the rainfall was, however, deficient in Egypt generally. With regard to relative humidities, it is found that the values in the Sudan computed from Jelinek's tables (Leipzig, 1903) not uncommonly fall below 10 or even 5 per cent. As it seems improbable that the surface air is ever so dry as this, the validity of the tables in extreme conditions is under consideration. A first order station for the Sudan is in course of formation at the Gordon College, Khartoum.

IN a publication of the Egyptian Survey Department entitled "Magnetic Observations made during 1911 at the Khedivial Observatory, Helwan," particulars are given of the mean monthly and annual values of the magnetic elements at Helwan during 1911, and of the diurnal variations in declination and in horizontal and vertical intensity for each month and the year. Days of incomplete record and those of disturbance character "2," on the international scale, are omitted, the days actually utilised being 330 for declination, 317 for horizontal, and 291 for vertical intensity. Particulars are given of eight disturbances—occupying parts of thirteen days—in which the range of the horizontal intensity exceeded 0·001 C.G.S. The largest ranges observed were 0·00188 in horizontal intensity, 0·00044 in vertical intensity, and 11′ in declination.

WE have received from the publishers (Messrs. A. Hermann et Fils) an interesting tract by MM. C. Jordan and R. Fiedler on convex closed curves, and others connected with them. The topic was suggested by questions of probability, and we are occasionally reminded of the work of Crofton, one of the great authorities in this field. But probability is not actually treated here; the main part consists of tangential polar formulæ and discussion of derived curves such as pedals, parallel curves, &c. On p. 34 there is an interesting figure such as is often produced in a street by one wheel of a cart which has twice turned round. Each turn generally involves a slight backing, and then the trace of the inner wheel contains two adjacent cusps and an ordinary node. Various examples due to Euler, Kepler, Newton, &c., are given as illustrations.

A METHOD of detecting the presence of polarised light in the light from a sky obscured by thick clouds is described by Mr. A. E. Oxley in the July number of the Proceedings of the Cambridge Philosophical Society. It depends on the use of a Babinet compensator, with its principal direction set at 45° to that of the observing Nicol, and of a special rhomb in front of the compensator which allows part of the incident light to pass without change while it introduces a phase difference of $\pi/2$ into the remainder of the beam. When the edges of this rhomb are parallel to the principal direction of the Nicol, bands are seen in the field of view even when the amount of polarised light present is too small to produce colours in a selenite plate, and the apparatus also allows the mean plane of polarisation of the incident light to be ascertained.

IN the June number of the *Bulletin de la Société d'Encouragement pour l'Industrie nationale*, M. A. Verneuil describes a form of muffle or crucible furnace suitable for laboratory work up to a temperature of 1600° C. If a crucible is to be heated, it is surrounded by a cylindrical block of refractory material which rests on a brick pillar and is provided with a lid which leaves openings for the escape of the burnt gas. The gas is introduced into the space between the crucible and its surrounding cylinder by a passage which is tangential to the inner surface of the cylinder at the point of entry. By this means the jet of gas and compressed air is given a spiral form and a higher temperature is attained, while the durability of the furnace is increased. The idea of the spiral flame seems worthy of general adoption in furnace design.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR SEPTEMBER:

SEPTEMBER	3.	13h. 57m. Saturn in conjunction with the Moon (Saturn 6° 20′ S.).
	7.	1h. 22m. Neptune in conjunction with the Moon (Neptune 5° 43′ S.).
	,,	16h. 0m. Mercury at greatest elongation W. of the Sun (17° 58′).
	8.	20h. 59m. Venus in conjunction with Mars (Venus 0° 30′ N.).
	9.	1h. 0m. Mercury in conjunction with α Leonis (Mercury 0° 5′ N.).
	,,	7h. 15m. Mercury in conjunction with the Moon (Mercury 3° 18′ S.).
	11.	21h. 43m. Mars in conjunction with the Moon (Mars 0° 4′ N.).
	12.	1h. 1m. Venus in conjunction with the Moon (Venus 0° 41′ N.).
	16.	3h. 0m. Saturn stationary.
	,,	13h. 33m. Jupiter in conjunction with the Moon (Jupiter 4° 54′ N.).
	20.	15h. 13m. Uranus in conjunction with the Moon (Uranus 4° 34′ N.).
	22.	22h. 9m. Sun enters Sign of Libra. Equinox.
	25.	23h. 45m. Moon eclipsed, invisible at Greenwich.
	30.	19h. 22m. Saturn in conjunction with the Moon (Saturn 6° 29′ S.).

THE VARIABILITY OF POLARIS.—The confirmation of the variability of the pole star, by the selenium photometer method, is announced by Mr. Joel Stebbins in No. 4596 of the *Astronomische Nachrichten*. He observed the star for light-changes in 1904 with a polarising photometer, but difficulties prevented a definite conclusion being arrived at for so small a variation as 0·10 mag. Again in 1910 he attempted to find the variability with the selenium photometer, but meeting with difficulty in the selection of a suitable comparison star, postponed the research.

In the meantime, Dr. Hertzsprung announced a variation of about 0·15 mag., determined from photographs; so Mr. Stebbins again took up the observation of Polaris, using β Ursæ Minoris as the comparison star. This is some 17° away, and, as the correction for differential absorption becomes too great if the altitudes are not nearly the same, the time of observation was unusually restricted. However, Mr. Stebbins secured measures on seventeen nights between March 4, 1911, and April 8, 1912, and from these he finds a variation of 0·078 mag., thus fully confirming Hertzsprung's result, for the two light-curves are practically in the same phase. The difference in amplitude is probably explained by the fact that Hertzsprung employed the actinic rays, whereas the selenium photometer utilises those on the red side of the visual region, and variables of this type (Cepheid) usually show greater variations photographically than they do visually.

A photographic comparison made at Harvard last year by Mr. King showed a variation of about 0·10 mag.

The comparison star, β Ursæ Minoris, used by Mr. Stebbins, has been described as a variable, but the results give no indication of change while it was under observation during this research.

THE SOLAR ECLIPSE OF APRIL 17.—Two interesting papers dealing with the solar eclipse of April last are published as abstracts from the *Astronomische Nachrichten* by Prof. Schorr and Dr. Graff.

In the former, Prof. Schorr describes the observations made at the Hamburg Observatory, and reproduces a number of the excellent photographs taken by the various instruments. In the latter, Dr. Graff describes in detail the profile of the moon's limb at the time of mid-eclipse. He tabulates the elevations and depressions for every 2° of the limb, and then shows them, exaggerated ten times, on a drawing. They are also shown and named on a set of altitude curves covering the entire limb. The important part played by the lunar profile during this eclipse gives an added interest and importance to these deductions.

γ GEMINORUM A SPECTROSCOPIC BINARY OF EXCEPTIONALLY LONG PERIOD.—From observations made at the Ottawa Observatory, combined with earlier observations made at other observatories, Mr. Harper has deduced elements for the orbit of the spectroscopic binary γ Geminorum. The period comes out at about 2175 days (nearly six years), so that the star is unique among binaries discovered spectroscopically in having so long a period. Betelgeuse, a star of a very much later type, possibly has a similar period, but definitive elements have not yet been derived for its orbit. The spectrum of γ Geminorum is of the Sirian type, and the periods for other spectroscopic binaries of this type range from a fraction of a day up to 100 days, so that the star may be looked upon as bridging the gulf between the periods of the longest spectroscopic and the shortest visual binary. (The Journal of the R.A.S. Canada, vol. vi., No. 3.)

THE HAMBURG OBSERVATORY.—With the reports for 1910 and 1911 of the work done at the Hamburg Observatory, Prof. Schorr issues a most interesting brochure containing photographs of the new buildings and instruments at Bergedorf, where the work of the observatory is now carried on. Among the instruments now erected is a large refractor, a 7½-in. meridian circle, and a reflector of 40 in. aperture and 10 ft. focal length; but, according to the 1911 report, the objective of the refractor is still unmounted. The reports show that observations of comets and planets, the time-service for various ports, and a new reduction of the Hamburg star catalogue are occupying the attention of the staff.

REGIONAL GEOLOGY IN EUROPE.

J. J. SEDERHOLM'S summary of the prequaternary rocks of Fennoscandia, with its admirable coloured geological map of Norway, Sweden, and Finland, is now issued in French as Bulletin 24 of the Commission géologique de Finlande. Under the director's active guidance, six further bulletins were published in 1911. V. Tanner has drawn a number of interesting conclusions from his discovery of brachiopods, resembling Kutorgina or Acrotreta, in dyke-like masses of sandstone filling cracks in granite in the Åland Islands, at the entry to the Gulf of Finland (Bull. 25, p. 10). These fossils are probably of Lower Cambrian age, and the cracks were opened, perhaps through earthquake action, in a surface of pre-Cambrian rocks which had been already worn down to a peneplane. It is urged that the present Fennoscandian peneplane, which includes the surface of the islands, represents only a small further degradation of that which was formed towards the close of pre-Cambrian times.

Bulletins 27 to 30 are extracted from the Atlas of Finland, published in 1910, and form an illustrated summary of the surface-forms and geology of the country, drawn up by the director. No. 27, "Esquisse hypsométrique de la Finlande," includes a new contoured map in colours, which shows how large a part of the country lies below 300 metres. The contours, though the scale of the map is 1 : 2,000,000, even bring out some of the eskers, such as the fine ridge of Kangasala on the road from Tavastehus to Tammerfors. A geological map on the same scale accompanies No. 28, on "Les roches préquaternaires de la Finlande," and the extent to which the country is covered by glacial deposits is shown by that in No. 29, on "Les dépôts quaternaires." Here the eskers, and the huge terminal moraines from Hangö to Joensuu, some 600 kilometres in length, stand out prominently in red, and show the form of the great ice-lobe and the course of its subglacial waters at the epoch when stagnation set in. In common with many Scandinavian geologists, Sederholm pictures the eskers as formed in the late glacial sea as the ice shrank back, the south-eastern end of each being thus older than that towards the Gulf of Bothnia. The sandy marginal moraines, running across the course of the ice-movement, are described as "oses marginales." The words "ose" and "oses" have been adopted for the more difficult *ås* and *åsar* in Fennoscandian literature, whether written in French or English (p. 6).

Bulletin 30 takes a still wider field, and deals with "La géologie quaternaire et la géomorphologie de la Fennoscandia." The coloured maps show the extension of the Scandinavian ice-sheets, the isobases indicated by the present positions of raised beaches, and the lines of fracture traceable in the prequaternary relief. The block-structure of so much of the Fennoscandian surface, and notably of the Finnish lowland, is referred to fracturing and faulting during the Alpine epoch of unrest. The scarps along the sides of fjords or rivers are held to be more often due to earth-movement than to ordinary erosion, though eroding agents have, of course, acted along the lines of weakness thus produced. As we write, we recall a granite cliff on the farm of Eskola by the Kyminjoki, and Wilhelm Ramsay's exposition of it as we sat upon the grass above the river. The gift of these excellent summaries to geologists is a further reminder of the hospitality of Fennoscandian lands.

Visitors to Norway will profit by the description of the Bergen district by C. F. Kolderup and H. W. Monckton, written in connection with the excursion of the Geologists' Association in 1911 (Proc. Geol.

Assoc., vol. xxii., 1912, p. 1). Some of the glaciers illustrated recently in NATURE (vol. lxxxviii., p. 460) are excellently figured here. Dr. Kolderup (p. 22), in dealing with the crystalline rocks, is faced with the same difficulty that arises in Scotland and in Ireland, where certain granites may be of post-Silurian age, or may be Archæan masses pressed up and rearranged during the Caledonian movements. The part containing these reports may be bought for 3*s.*, and includes a full bibliography. At the same date, Dr. Hans Reusch has contributed to *Naturen* an account of the Devonian beds of the Bergen coast (1912, p. 103).

N. O. Holst (*Sveriges geol. Undersökning, Årsbok*, 1910, No. 9, price 1 kr.) states the evidence for a pre-glacial flood, "Alnarps-floden," along south-west Sweden, which he compares with that which produced, as he believes, the Cromer Forest-bed in the delta of the Rhine.

The publications of the Geologische Reichsanstalt of Vienna continue to throw light on an empire of infinite variety. Short notes and criticisms often appear in the *Verhandlungen*, dealing with other publications on Austria-Hungary, while original contributions, like those of G. B. Trener on Adamello (1910, p. 91), add to our knowledge of regions that seemed at one time beyond reach of controversy. Especial interest attaches to the spread of geological surveying, under von Kerner and others, in the coast-lands of Istria and Dalmatia (see 1911, p. 111), while the attack upon areas once held to be Archæan, and the acceptance of contact-metamorphism upon a regional scale, give a new attraction to the rolling uplands of Bohemia. K. Hinterlechner (1910, p. 337) thus assigns a Lower Silurian age to a group of crystalline schists with graphite between Caslav and the Moravian border. The Lakes of Lunz, in a familiar region of Upper Austria, have furnished a detailed study in lacustrine sedimentation (G. Götzinger, 1911, p. 173).

The work published in the *Jahrbuch* of the same institute occasionally extends far afield, as when Franz Toula describes (1909, pp. 673–760) a late Tertiary molluscan fauna from Gatun on the Panama Canal. W. von Lozinski continues his studies of the Quaternary glacial deposits of Galicia with a description of the löss north of the Carpathians (1910, p. 133). The great plateau of detrital material cut into by the Vistula is well illustrated in plate vii. F. F. Hahn of Munich has undertaken a detailed examination of the mountainous region round the Sonntagshorn on the frontier south of Traunstein (1910, pp. 311 and 637). Radiolarian beds occur in the Middle Lias and in the Upper Jurassic of this area. Franz Kretschmer (1911, p. 172) concludes, from an elaborate study, that the "metamorphe Diorit- und Gabbromassiv" of the Zöptau area in Moravia is connected with the Hercynian movements. The schists surrounding the great laccolite are believed to be Algonkian, Silurian, and Devonian, and these new conclusions bring the basic intrusive mass of Zöptau, with its contact-aureole, into line with what is now known of the Erzgebirge gneiss and the granulites of Saxony. The Hercynian folding in Central Europe seems to have been accompanied by features of intrusion and metamorphism that recall those of the Caledonian folding in the British Isles. The intrusive gneisses of the Ötztal, described by Guido Hradil (1911, p. 181), have presumably a still later origin.

P. S. Richarz, writing of the "Umgebung von Aspang (Niederösterreich)" (1911, p. 285), enters the field as an opponent of the view that dynamic metamorphism has much to do with the origin of crystalline schists. He shows how composite gneisses were formed in his area on the margin of the granite of the Little Carpathians, where it works its way along the planes of foliation in the schist-mantle. He regards such conclusions as somewhat new (p. 331), though they have been held in France for thirty years. References are rare, however, throughout the *Jahrbuch* of the Reichsanstalt to papers published outside German-speaking lands.

We welcome (1911, p. 229) a further paper by Baron Nopcsa on Albania, although he scarcely considers the foreigner when he writes so many sentences more than a hundred words in length. He brings together the results of his work on the vilayet of Skutari between 1905 and 1909, and he regards the state of the country as now unsuited to scientific work. His warm words of gratitude to the mountaineers who were ready to lay down their lives for him (p. 280) show that his dangers did not originate with the regular—or irregular—inhabitants. The thrust of the Alpine movements here came from the north-north-east. Radiolarian deposits occur on a Jurassic horizon, but they do not seem to be associated with the "green rocks," serpentine, gabbro, and diorite, which appear about the same level in another part of the area. The photographs of the bare rocky highlands have a geographical interest of their own. F. Kossmat (1911, p. 339) reports on the geology of the mercury mining region of Idria, and suggests (p. 383) that the ores were originally imported during Triassic eruptions, and were brought into their present position by thermal waters under the influence of the Alpine movements.

Wiktor Kuźniar writes in German on the folding of the Flysch on the north side of the Tatra (*Bull. Internat. Acad. Sci. de Cracovie*, 1910, ser. A, p. 38). The Eocene Magura Sandstone in the upper part of the Flysch is regarded as part of a sheet thrust over the Tatra and over the earlier Flysch from the south, probably by post-Miocene movements. The base of the Eocene is now shown to have been laid down on an eroded surface of Triassic rocks (p. 40), and the Mesozoic and older strata of the Tatra at that time had much the same structure as they have now.

The details of Mrs. M. M. Ogilvie-Gordon's paper on the thrust-masses in the western district of the Dolomites (Trans. Edin. Geol. Soc., vol. ix., 1910, special part, price 7*s.*) cannot be fully discussed here. The work has involved the observation of very many miles of boundary, and the author concludes, as is well known from her other work, in favour of the isolation of the dolomite masses from their original surroundings by faults and thrust-planes. The contrast between their wall-like fronts and the bedded strata on their flanks is thus explained, without a resort to the theory of coral-reefs rising contemporaneously amid normal marine deposits. The thrust-plane over which the Schlern Dolomite is held to have moved is well photographed in plates ii., viii., and ix. The illustrations throughout are of a high order, and the boldly coloured sections recall those of the quarto publications of the early days of geological controversy. A comparison of the map of the Langkofl area (pl. xiii.) with that by Mojsisovics will show the extent to which slicing of the country has been invoked to account for the startling pre-eminence of the dolomite-masses in the scenery. Additional results published by the author in the *Verhandlungen der k.k. geol. Reichsanstalt* for 1910 were referred to in NATURE, vol. lxxxv., p. 280.

G. Steinmann (*Mitteil. der geol. Gesell.*, Vienna, 1910, p. 285) urges that the central gneiss of the Tauern area is pre-Permian, and that the "Hochstegenkalk" and other sediments associated with the gneiss are of later date, their metamorphism being due to the overfolding on them of the recumbent sheets of later

times. He suggests (p. 297) that an aplite "dyke" recorded by Becke in the Hochstegenkalk in reality results from a mechanical rearrangement of the older gneiss among the limestones.

Jan Nowak, of Lemberg, in a German paper, describes the structure of the limestone Alps of Salzburg and the Salzkammergut (*Bull. Internat. Acad. Sci. de Cracovie*, 1911, ser. A, p. 57), tracing the recumbent overfolds, and pointing out that in the eastern Alps faulting has played a greater part in cutting these asunder than it has in the more plastic masses of the west.

Fascicule iv. of vol. xxxvi. of the *Mémoires de la Société de Physique de Genève* (December, 1910, price 15 francs) is occupied with L. W. Collet's paper on "Les hautes Alpes calcaires entre Arve et Rhône." The author's personal observations extend over eight years. Numerous sections of folded strata are given, among which that of the Dents du Midi (p. 451) is conspicuous. The author believes (p. 577) that vegetation covered the karst-like surface of the Désert de Platé after glacial times, and that the organic acids originated the etching of the surface. The phototypes by Sadag, of Geneva, surpass almost anything that we have seen in the way of geological illustration. The panorama of the district on pl. 17, with its geological clue below, offers a superb study for the class-room.

The lands near the Rhine are not so largely visited by British geologists as they deserve. The neighbourhood of Trier (Trèves) is fully described in the *Sitzungsberichte vom naturhistorischen Verein der preussischen Rheinlande*, 1910, section D, pp. 1–108. L. van Werveke makes several contributions; that on the oolitic iron-ores of Middle Jurassic age (p. 50), which have so wide a distribution, has considerable petrographic importance. A bibliography of similar rocks is given, but no mention is made of the Cleveland ores of England, where the substitution of iron for calcium is obvious, or of the pisolitic ores with "greenalite" in North America. Van Werveke believes that the "Minette" ores of north-eastern France and western Germany were laid down in the sea, and result from the oxidation of iron salts washed from the pyritous Posidonia-beds, over which the Jurassic strata were unconformably deposited. The conditions also favoured the formation of glauconite.

In the *Verhandlungen* of the same society for 1909 (1910, p. 165), C. Mordziol places the Brown Coal Series of the Lower Rhine area on the horizon of the Lower Miocene strata of Mainz. In the next volume (1911, p. 237) he discusses the limits of the Upper Oligocene and Lower Miocene in the Mainz basin, with which his work is so closely identified. G. Fliegel (*ibid.*, p. 327) considers the effect of ice-lobes from the northern continental glacier in producing modifications, both in materials and in ultimate form, of the terraced drift of the Rhine valley.

The Cotteswold Naturalists' Field Club remains true to geological research. In the Proceedings, vol. xvii., 1911, p. 195, L. Richardson describes the Chipping Norton district, where the Inferior Oolite covers much of a very hilly country. J. W. Gray (p. 257) considers the glacial epoch in the north and mid Cotteswolds, and regards much of the "drift" as imported before that epoch by Cainozoic streams that have been beheaded by the development of the Severn tributaries. Like many workers in central and southern England, he remains sceptical as to the invasion of that part of the country by glacier-ice.

W. Hewitt, in his address to the Liverpool Geological Society (Proc., vol. xi., 1911, p. 88), reviews the theories of the origin of the Triassic beds in England, and C. B. Travis and H. W. Greenwood indicate (p. 138), after an elaborate mineralogical research, a source for the north-western beds different from that which supplied the Trias of the south-west and the Midlands.

E. E. L. Dixon and A. Vaughan apply zonal principles to the Avonian (Lower Carboniferous) succession in Gower, Glamorganshire (Quart. Journ. Geol. Soc., Lond., vol. lxvii., 1911, p. 477). Interesting arguments are adduced (pp. 522 and 525) for regarding the "Lower Culm" radiolarian beds as formed in a lagoon phase, near the mouths of rivers, and not in a deep sea. The absence of lime salts and the presence of silica seem to have been more potent influences than depth.

Turning to the south of Europe, part iii. of the *Jahrbuch der k.k. Reichsanstalt* for 1910 is occupied by a paper by C. Renz on the stratigraphy of the Mesozoic and Palæozoic rocks of Greece, on which the author has worked since 1903. This memoir of 215 pages and its successors promise to be a text-book of the geology of the country from the Ionian to the Ægean isles, a region at one time supposed to be covered only by Cretaceous and Cainozoic strata. We now become acquainted with deposits as old as the Devonian.

Rudolf Hoernes has published a paper on the "Bildung des Bosporus und der Dardanellen" (*Sitzungsber. k. Akad. Wissen.*, Vienna, Bd. cxviii., p. 693), in which full credit is given to T. English's paper in the Quarterly Journal of the Geological Society of London for 1904. The author places the break-up of the Ægean plateau in the Upper Pliocene, when a river from the north-east was cutting a cañon along the line of the present Bosporus and Dardanelles. The further depression of the region, and the entry of the sea into the channel, occurred in early Pleistocene times (p. 756). Hoernes opposes the view of English that the Bosporus was originally cut by a river running eastward (see English's paper, p. 261).

Federico Sacco has written a useful account of "L'Appennino settentrionale e centrale" (*Cosmos*, ser. 2, vol. xiii., 1911, p. 145), in which he summarises the geological features and connects them with the settlements and occupations of the people, especially in regard to agriculture.

D. P. W. Stuart-Menteath, in "El Darwinismo en los Pirineos" (*Boletin Soc. Aragonesa de Ciencias naturales*, vol. ix., p. 197), continues to attribute the spread of new views on Spanish stratigraphy to the pernicious influence of evolutionary doctrines.

G. A. J. C.

THE LIFE-HISTORY OF THE HOOK-WORM.[1]

THIS somewhat ponderous volume is the continuation of a monograph of which the first volume was published in Cairo in 1905. Like its predecessor, it will be found of great value for the reference library of all helminthologists.

Agchylostoma duodenale and *Necator americanus*, the latter originally thought to be an indigenous American species of hook-worm, but now believed to have been imported into the United States from Africa by negro slaves, are both parasites peculiar to man, with the exception of anthropoid apes; the near zoological relationship between the hosts is of great interest. The horse, though often accused, is now known not to be a host, and this is also true of dogs, in spite of the fact that the author has succeeded in

1 Ministry of Education, Egypt. Records of the School of Medicine. Edited by the Director. Vol. iv., "The Anatomy and Life-history of *Agchylostoma duodenale*, Dub." A Monograph, by Dr. A. Looss. Part ii., "The Development in the Free State." Pp. viii+163–613+plates xi–xix. (Cairo: National Printing Department, 1911.)

causing larvæ of the human Agchylostoma to live for a time in puppies.

He has set himself the task of writing a life-history of *Agchylostoma duodenale* from a scientific point of view, and traces the development of the parasite outside the body, while he also conceives it to be his duty to censure many previous authors for their errors. He finds that nematodes may be kept unchanged for years in undiluted glycerine, and that their eggs and larvæ can be best preserved by using hot alcohol. In order to prevent the decomposition of fæces used as a culture medium, he recommends the addition of an equal part of powdered animal charcoal, for this mixture prevents harmful effects to the eggs and larvæ.

He disagrees with other observers who state that the mature embryo breaks the eggshell by knocking against it with its head and tail, for he finds that the shell bursts of itself, and in so doing throws out the embryo passively. The fæces of natives of warm climates present a more favourable medium for the development of larvæ than the excreta of those who live entirely on meat or on vegetables. Oxygen, a constant temperature which may, however, be as low as 50° F., or as high as 105° F., and moderate moisture are the factors necessary for the development of young larvæ, while the proper element for mature larvæ is water, which they eagerly enter as soon as they can, and in water they can live for months because they no longer require any food. Prof. Looss finds that sunlight alone does not act injuriously upon the eggs, provided the temperature is not also raised.

While studying the migratory instincts of larvæ in his laboratory in Cairo, the author, by a not unhappy accident, found himself infected by a drop of culture fluid containing some hundreds of lively larvæ, which fell upon his hand. Experiments patiently conducted on himself, on volunteers, and on young puppies eventually solved the mystery of how mature larvæ enter the skin, either by the hair follicles or by the horizontal fissures between the scales of the epidermis, and how they then migrate to the duodenum of the host. The time which elapses between infection by the mouth and the earliest date when eggs are found in the victim's fæces is thirty days, whereas in infection by the skin it varies from forty-five to seventy-four days. His great discovery of infection by the skin has of late years been amply confirmed by many observers. Among the most important we may mention Schaudinn, Lambinet of Belgium, and in America, Claude Smith, Stiles and Ashford and King.

Passages on which the author desires to lay emphasis appear, as in German literature, in large spaced print.

The plates from Prof Looss's masterly drawings have been faithfully reproduced in Frankfurt, and add considerably to the value of the book

THE MICROSCOPIC DETERMINATION OF MINERALS.[1]

THE identification of a mineral fragment by means of the microscope, to be beyond doubt, must be based upon some quantitative test, such as a measurement of the refractive indices, or, in the case of doubly refractive substances, the amount of double refraction and the relation of the extinction directions to the crystalline form, or, in that of biaxial substances, a measurement of the angle between the optic axes. Recent years have witnessed great progress in the discovery of more convenient or more accurate methods of effecting such measurements, and almost equal progress in the design of the instruments and accessory apparatus. So rapid has been the advance that it has outpaced the text-books. Petrologists and all who may have occasion to identify minerals from chance fragments will therefore feel grateful to Dr. F. E. Wright for the admirable treatise in which he describes in detail and discusses with critical acumen the various methods and devices available. Dr. Wright is himself responsible for no mean share in the progress that has been made, and it is an excellent feature of the volume that he is in a position to write of almost every method or piece of apparatus from first-hand experience in the Geophysical Laboratory; the pages, in fact, teem with those practical hints and suggestions which prove so useful to the worker.

The scope of the work is satisfactorily complete. A lengthy introduction includes an adequate discussion of the principles of microscopic vision so far as they apply to the particular case of the petrological instrument; the various aberrations and their corrections are explained, and descriptions are given of some recent instruments. It is pleasant to find that full credit is given to Mr. A. B. Dick for his invention of the system of simultaneous rotation of the polarising and analysing Nicols which has been adopted in all the best forms of petrological microscope; Continental writers have overlooked his incontestable claims to priority. Dr. Wright prefers an adaptation of Mr. Dick's first suggestion, viz. a vertical bar rigidly attached to the circles carrying the Nicols, instead of the system of gear-wheels in general use, fearing that the backlash in the latter might introduce appreciable error in delicate work.

The first chapter deals with the physical characters which do not entail measurement, such as colour, crystal habit, dispersion of the optic axes, &c. The fact that there is still no recognised standard for gauging colour is dwelt upon, and a description is given of the Ives calorimeter, which consists of three filters rotated by means of an electromotor, the depth of each tint being varied at will by means of movable shutters. Mention might have been made of the Lovibond tintometer, which is based on the same fundamental principle, and, though not so accurate, is a much simpler piece of apparatus. The difficulty of describing a tint is one that affects us all in our everyday affairs, and it would be an inestimable boon if precision could be given to the colour terms in popular use. In the second chapter we pass to the measurement of refractive indices. Thanks to Prof. Becke's discovery of the phenomenon known as the bright-line effect, it is possible to obtain a value which with care may be as accurate as two units in the third place of decimals; Dr. Wright adds the useful warning that the phenomenon may be masked if the dispersion of the mineral and the liquid differ considerably, as not infrequently happens. The announcement of the discovery of a new, highly refractive liquid, ranging from 1·790 to 1·960, will arouse great interest; it is a mixture of methylene iodide, antimony iodide, arsenic sulphide, antimony sulphide, and sulphur, but complete details are promised in a paper yet to be published.

In the third chapter the determination of double refraction by means of wedges, various forms of which are described, is discussed, and it is pointed out that the most serious source of error lies in the measurement of the thickness of the fragment under observation. In the fourth chapter the methods of determining extinction angles are discussed with a wealth of mathematical detail, which is of great help in understanding the phenomena presented. Atten-

[1] "The Methods of Petrographic-microscopic Research, their Relative Accuracy and Range of Application." By Fred. Eugene Wright. Pp. 204+11 plates+118 figs. (Washington, D.C.: Carnegie Institution of Washington, 1911.)

tion is directed to the simple, but not generally known, method of slightly revolving the upper Nicol when in or near the position of extinction.

The last chapter, on the optic axial angle, is in many ways the most interesting. It is now possible to obtain determinations in cases that would have been abandoned as hopeless a few years ago. When both axes emerge in the field of view the angle is usually measured by means of a linear scale in the eyepiece; Dr. Wright points out that, owing to the distortion introduced in the interference figure by the lens system the Mallard constant does not usually hold, and it is safer to calibrate the scale. Prof. Becke, with characteristic ingenuity, has recently shown that by mapping the brush in various positions a remarkably accurate value of the optic axial angle is possible, even when only one "eye" is visible; the method is fully explained and illustrated. For such work Dr. Wright uses a double micrometer eyepiece, but admits that a cross-ruled scale in the eyepiece is equally effective, a device that has been in use some years. Dr. Wright recommends for graphical work the little known Postel projection, in which the eye is situated at such a distance from the sphere that the distortion in polar directions is reduced to a minimum, and in tangential directions does not exceed the ratio of $\pi/2$; the awkwardness of the shapes of the great and small circles, however, militates against its use.

Prof. Fedorow's universal stage, the invention of which placed an invaluable weapon in the hands of petrologists, and enables them to measure the angle between the optic axes and determine their positions with respect to the section, even when no "eye" is visible, is also fully discussed. At the close of the chapter Dr. Wright very carefully considers the accuracy of which the several methods are capable. Some novel diagrams will be found on the plates at the end of the book; neither of the diagrams representing the equation $\sin i = n \sin r$ is, however, as simple as the graph devised by Mr. Hutchinson, in which the sines of the angles are taken as co-ordinates. An excellent index greatly adds to the value of the volume.

SMITHSONIAN EXPEDITIONS.

THE Smithsonian Institution has just issued a pamphlet describing, in part, the expeditions which it has organised or participated in during the field seasons of 1910–11, covering a wide variety of investigations conducted both in the United States and abroad. During the past two years the institution has been represented in eighteen different exploration and field parties. The scope of these activities has been world-wide, but more recently especial attention has been directed to Africa and the Panama Canal Zone.

Unfortunately, as the regular resources of the institution are not sufficient to carry on extensive field explorations, it is often compelled to confine its efforts to investigations of limited scope, but of such a nature as to bear directly on the progress of science. In this connection it has been fortunate in securing the cooperation of a number of public-spirited citizens and scientific institutions, as well as several branches of the United States Government.

The Smithsonian African Expedition had scarcely returned from the field when the institution received invitations to participate in two others, organised to explore the same general region. The first was Mr. Paul J. Rainey's hunting trip to British East Africa and southern Abyssinia, where Mr. Rainey especially arranged to hunt lions with a pack of American fox-hounds. The natural history collections that might be secured were offered to the Smithsonian Institution, provided an expert field naturalist be sent to accompany him and prepare such of the game collected as was desired for exhibition or scientific study. Mr. Edmund Heller, who had accompanied the Smithsonian African Expedition in such a capacity, was selected, and departed with Mr. Rainey in February, 1911. The collection made has been estimated to contain some 4700 skins of mammals, together with many birds, reptiles, &c., and supplements the present African collection to a great extent. Nearly all of the material is from localities not covered by the earlier expeditions, and some of it comes from points never before visited by naturalists.

The other natural history expedition was that of Mr. Childs Frick, of New York, whose object was to secure a collection of animals from the territory lying to the north of the regions visited by the earlier Smithsonian expedition and that of Mr. Rainey, covering at the same time certain parts of Abyssinia, northern British East Africa, and the country lying about Lake Rudolf. As naturalist of this party, Dr. Edgar A. Mearns, of the Smithsonian African Expedition, was chosen. A portion of the collection of birds is to be donated to the Smithsonian Institution by Mr. Frick, and already several hundred specimens have been received.

During the summer of 1911, Mr. Charles G. Abbot, director of the Smithsonian Astrophysical Observatory, and Prof. F. P. Brackett, of Pomona College, California, made a series of observations on the radiation of the sun at Bassour, a small town about sixty miles south-west of Algiers, and secured a large amount of data for comparison with simultaneous observations taken by Mr. L. B. Aldrich at the Smithsonian observatory station on Mt. Wilson, California.

An expedition to South America, for the purpose of studying the material relating to the antiquity of man in that region, was conducted by Dr. Ales Hrdlicka, curator of physical anthropology, United States National Museum, and Mr. Bailey Willis, of the U.S. Geological Survey. The expedition collected many interesting geological, palæontological, and anthropological specimens, which have been turned over to the National Museum for identification and description, but the evidence gathered does not seem to sustain a large part of the claims regarding the antiquity of man in that region, which had been previously asserted by various authors.

While in this part of the continent, Dr. Hrdlicka also visited the ruins of the city and temples of Pachacamac, Peru, where he made personal researches and studies in archæology and ethnology. His complete report on the antiquity of man in South America is made in Bulletin 52 of the Bureau of American Ethnology, now in press.

In 1910 the institution organised a biological survey of the Panama Canal Zone, with the cooperation of the Departments of State, Agriculture, Commerce and Labour, and War. At first it was intended to confine the collections to the Canal Zone proper, but as the natural and floral areas extended to the north and south of this region, it was decided to carry the work into the Republic of Panama, a step which met with the hearty approval of that Republic. The work accomplished during the season of 1910 and 1911 related to vertebrate animals, land and fresh-water molluscs, and plants, including flowering plants, grasses, and ferns.

Another expedition in which the institution co-operated was that organised by the United States Bureau of Fisheries and the American Museum of

Natural History, and consisted of an exploration of the west coast of Mexico. In this connection, the fisheries steamer *Albatross* was used. Dr. J. N. Rose and Dr. Paul Bartsch represented the National Museum, collecting, respectively, the plants and molluscs from the portions of the coast visited. It was through this expedition that the National Zoological Park secured two yearlings of the elephant seal, a very remarkable and interesting animal, which for many years had been supposed to be extinct.

Mr. A. C. Bent, with a small party of ornithologists, made an excursion to the Aleutian Islands in search of further information for incorporation in a work on the life-histories of North American birds, which he is compiling for the institution. The members of this party were accorded many facilities by the Revenue Cutter Service of the Treasury Department, and particularly by the officers of the cutter *Tahoma*. Good series of land birds were obtained from nearly all the islands of the Aleutian chain, and many valuable facts concerning the distribution and habits of the land and water birds were recorded.

Mention is made of the field work in Cambrian geology and palæontology in British Columbia, continued by Dr. Charles D. Walcott, secretary of the institution, and his assistant, Mr. L. D. Burling. A remarkable collection of fossils was taken, and will be described in a future publication of the institution.

This publication on explorations consists of fifty-one pages of text, together with many illustrations from original photographs taken at the scenes of the investigations, and forms publication No. 2087 of the Smithsonian Miscellaneous Collections.

SECONDARY AND TECHNICAL EDUCATION IN ENGLAND.

THE annual volume of Statistics of Public Education in England and Wales, prepared by the Board of Education, is a valuable record of the position and progress of the various branches of elementary, secondary and technical education receiving State aid or recognition, so far as these may be judged by numerical values. Part i. of the volume of Educational Statistics for 1910–1911, which has just been published as a Blue-book (Cd. 6338, price 2*s.* 6*d.*), contains more than five hundred pages of tables and other statistical information relating to education in England and Wales. From this mass of material we have abstracted a few facts as to the position of English secondary schools, technical institutions, evening classes, and so on, in receipt of State grants.

Secondary Schools.

A secondary school, in the sense in which the term is used in the Board's regulations, must offer to each of its pupils a progressive course of instruction (with the requisite organisation, curriculum, teaching staff, and equipment) in the subjects necessary to a good general education, upon lines suitable for pupils of an age-range at least as wide as from twelve to sixteen or seventeen. The provision, if any, made for pupils below the age of twelve must be similarly suitable, and in proper relation to the work done in the main portion of the school. The regulations also require that an adequate proportion of the pupils must remain at least four years in the school, and that an adequate proportion must also remain up to and beyond the age of sixteen; but these requirements may be reduced to three years and the age of fifteen respectively in the case of rural areas and small towns, where such a course appears to the Board to be advantageous in view of local circumstances. The great public schools are not connected with the Board under these regulations, but with this exception most of the secondary schools in England are included in the subjoined table :—

Numbers of Schools and Pupils.

Number of schools		862
Number of full time pupils under 12 years of age	36,989	
12 and under 16 years of age	96,058	
16 ,, 18 ,, ...	11,555	
18 years of age and above	1,007	
		145,609

It will be seen from this table that more than 90 per cent. of the pupils in our State-aided secondary schools are under sixteen years of age, and one-quarter of the pupils are under twelve years of age In other words, a large part of the work of these secondary schools is of an elementary grade educationally, and not secondary in the sense of being a continuation of primary education. Of the total number of pupils in the secondary schools, 60 per cent. are from public elementary schools, and 35 per cent. receive free education. When only Council schools are considered, it appears that nearly three-quarters of the pupils are from public elementary schools and 40 per cent. pay no fees.

Any bright boy or girl can proceed from the elementary school to the secondary school by the liberal provision of "free places," and they can often obtain maintenance grants in addition. There are now very few really promising children of working-class parents who fail to secure places in our secondary schools if they wish to do so. In many districts it is difficult to find among the pupils presented from elementary schools a sufficient number to justify their admission to secondary schools under the clause which provides for 25 per cent. free places for pupils from elementary schools, without having a low educational standard. In fact, free secondary education practically exists at present for every capable child of the elementary school class who desires to take advantage of it. The children enter as free-placers or by payment of low fees; but as most of them leave before they are fifteen years of age, they had better have remained in the elementary schools. Free secondary education may be accepted as a general principle, but the privilege should be accompanied by the responsibility of remaining at school until a full course has been completed, whether maintenance grants are provided from public funds or not.

A rough indication of the attainments of pupils as measured by success in certain examinations is given in a table which appears for the first time in the present volume of statistics. The examinations selected are the preliminary examination for the teacher's certificate, university senior locals, university matriculation, university senior school examination, university higher locals, and other examinations of like standard. The results of the inquiry are here summarised :—

Attainments of Pupils leaving Secondary Schools.

Number of pupils of 14 years of age and above who left during the year 38,672

	Boys %	Girls %	Combined %
Passed one of the above examinations	14·06	21·16	17·16
Did not pass ,, ,, ,,	85·94	78·84	82·84

In the table from which these numbers have been extracted we have for the first time a means of estimating the standard reached by pupils leaving our State secondary schools. It appears that more than four-fifths of the pupils had not passed an examination of senior local or matriculation standard when they left school. This is probably explained by the fact

that about 50 per cent. of the pupils were under sixteen years of age at leaving, and therefore not qualified to enter for a matriculation examination even if capable of passing it. But whatever the explanation, it must be confessed that, both as regards leaving age and attainment, our State secondary schools do not as a whole represent educational work of an advanced type. The normal end of a secondary school course ought to be a leaving certificate which would be a passport into any profession or university, whereas at present relatively few reach that standard.

In connection with the table of examinations passed by pupils, it is of interest to give an extract from another table, in which an endeavour is made to show what happened to pupils after leaving secondary schools in recept of State grants :—

Further Education or Occupation of Full-time Pupils who left during the School Year.

	%
Proceeded to universities	2·0
,, other schools or institutions ...	15·3
Teaching	13·2
Professional, commercial, or clerical	31·6
Industrial or manual	8·7
Agricultural or rural	2·8
Home or unclassified occupation	20·4

The table shows only what was the destination or occupation of the pupil when leaving school, and it thus may bear little or no relation to the career ultimately selected. But even when this is borne in mind, it is evident from the table that most of the pupils who leave secondary schools prefer to enter clerical rather than industrial occupations. Two per cent. proceeded to universities, and 7 per cent. to technical schools and institutions, medical schools, training colleges for secondary school teachers, and like places providing special training for professions, trades, or commercial occupations.

Technical Institutions.

A technical institution, within the meaning of the regulations of the Board, is an institution giving an organised course of instruction in day classes, including advanced instruction in science, or in science and in art, and provided with a staff and equipment adequate for the purpose. Provision must be made in such institutions for at least a two years' systematic course in science, or in science and in art, either alone, or in conjunction with subjects of general commercial, manual, or technological instruction. Except that for the present students may be admitted between the ages of fifteen and sixteen, no student may be admitted to the course unless he has passed through at least a three years' course of instruction in a school recognised under the regulations of the Board for secondary schools, or is over sixteen years of age and is qualified from his general education to profit by a course of advanced instruction. About 10 per cent. of the students are admitted without fees.

Students in Technical Institutions.

Institutions recognised	36
Students who attended full-time courses ...	2478
Students who attended at any time during the year :—	
(i) Age at date of first registration for the session :—	
15 and under 16 years of age	147
16 ,, 18 ,, ...	725
18 ,, 21 ,, ...	1314
21 years of age and over	838
(ii) Sex :—	
Boys and men	2916
Girls and women	108
Students returned as admitted :—	
(i) On account of passing a university matriculation (or equivalent) examination ...	812
(ii) On account of passing an examination recognised by the institution as a test of ability to profit by the courses	1081
(iii) Without passing any such examination test	652

The institutions represented in the above table include almost all those in which day students are taking connected courses of science and technology in England. There are thus about 2500 such students, one-third of whom had passed on entrance an examination of university matriculation standard.

Day Technical Classes.

Grants are payable under the Board's regulations to schools and classes which are, as a rule, for students younger than those in the technical institutions. Under this category there are included, however, some classes of a standard equal to that required in a technical institution, but with courses not of sufficient duration to be eligible for grants as technical institutions. Day technical classes vary in their aims, some being preparatory to trades, such as enginering, others providing instruction of a domestic type, others again being for blind or deaf students. The classes are held in technical schools and colleges, and may be classified as (1) commercial day schools; (2) trade preparatory schools; (3) special trade schools; (4) domestic economy schools for girls; (5) training schools for domestic economy teachers; (6) detailed classes. About 40 per cent. of the pupils are admitted without payment of fees.

Students in Day Technical Classes.

Institutions in which day technical classes were recognised	110
Students who attended at any time during the year :—	
(i) Age at date of first registration for the session :—	
12 and under 15 years of age	4433
15 ,, 18 ,, ...	3151
18 ,, 21 ,, ...	1117
21 years of age and over	2628
(ii) Sex :—	
Boys and men	6162
Girls and women	5167

The work of day technical classes consists in the main of preliminary training for apprentices or other specialised preparation for industrial, commercial, agricultural, or domestic life, and is equally suitable for students who have received their previous education either at public elementary or at secondary schools. It is distinct from the higher training given in the day classes of technical institutions.

Evening and Similar Schools and Classes.

The defining feature of these schools and classes is that they are intended to maintain educational facilities for those already engaged in some occupation which takes up the greater part of their time. The usual time of meeting is therefore in the evening, or on Saturday afternoons; but where the conditions of employment, or other circumstances, render a different time more convenient, classes meeting in the daytime may be recognised under the same category, and may receive the same grants as classes meeting in the evening. The classes vary very widely in character and scope, for they range from the small and unambitious continuation classes of a rural school to the highly specialised work done in the best equipped of the technical colleges. About 30 per cent. of the pupils receive free instruction.

Students in Evening Schools.

Recognised schools or centres	7,422
Students who attended any time during the year :—	
(i) Age at date of first registration for the session :—	
Under 12 years of age	735
12 and under 15 years of age ...	151,330
15 ,, 18 ,, ...	214,569
18 ,, 21 ,, ...	118,082
21 years of age and over	222,943
(ii) Sex :—	
Boys and men	414,417
Girls and women	293,842
Total	708,259

In this large number of evening students, nearly one-third of whom are twenty-one years of age or above, and most of whom attend the classes after a day's labour in workshop or office, we have a volunteer army from which many captains of industry and leaders of thought have been selected. It is true that some of the instruction given in these evening schools and classes is not far removed from that of continuation schools, but there is much of a higher standard, and in the combination of practical experience in the works during the day with theoretical knowledge gained at night we have a means of technical education which has proved successful in the past, and from which more may be expected in the future. R. A. G.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. ARTHUR I. KENDALL, instructor in preventive medicine and hygiene at the Harvard Medical School, has been appointed to the chair of bacteriology at Northwestern University, Evanston, Ill. This appointment will give him the oversight of the researches in the problem of tuberculosis which have recently been endowed by Mr. James A. Patten at a cost of 50,000*l*.

THE Calendar of the Royal Technical College, Glasgow, for the one hundred and seventeenth session, 1912–1913, has just been received. It contains much information as to the courses of work prescribed for candidates for the college diploma, as well as other details. We notice that the governors contemplate the extension and modification of the diploma courses in mechanical, electrical, and civil engineering, mining, and naval architecture. The whole building of the college extends over seven acres of floor space, and forms the largest structure in Great Britain devoted to education. With its equipment it has cost about 400,000*l*.

IN the Calendar of the Edinburgh and East of Scotland College of Agriculture for 1912–1913, which has just been issued, full particulars are given of the various courses that may be taken at the Central Institution in the departments of agriculture, horticulture, and forestry. The new arrangements in forestry will come into operation next session, and in this subject a new class will be commenced, the syllabus of which has been laid down with a view to meet the needs of those who desire a general knowledge of forestry from the practical point of view. It is intended that this side will be specially emphasised by work in the forest garden. The calendar contains full details of the large amount of extension work carried on in the counties of the college area. The numerous lecturers and instructresses engaged in this department take to the doors of the rural population teaching in many subjects bearing on country life.

THE Board of Agriculture and Fisheries has awarded the following research scholarships in agricultural science :—A. W. Ashby, Oxford (economics of agriculture); W. Buddin, Cambridge (plant nutrition and soil problems); A. E. Cameron, Aberdeen (agricultural zoology); F. Cook, London (animal nutrition); A. Cunningham, Edinburgh (bacteriology); J. Davidson, Liverpool (agricultural zoology); F. C. Minett, London (animal pathology); P. A. Murphy, Dublin (plant pathology); M. S. Pease, Cambridge (genetics); W. W. P. Pittom, Cambridge (animal nutrition); J. A. Prescott, Manchester (plant nutrition and soil problems); F. Summers, London and Liverpool (plant physiology). The scholarships, which are of the annual value of 150*l*., and are tenable for three years, have been established in connection with the scheme for the promotion of scientific research in agriculture, for the purposes of which the Treasury has sanctioned a grant to the Board from the Development Fund, and they are designed to provide for the training of promising students under suitable supervision with a view to enable them to contribute to the development of agricultural science.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 19.—M. Bassot in the chair.—A. **Lacroix** : The gem-bearing pegmatites of Madagascar. These pegmatites fall into two groups : potassium pegmatites and sodium and lithium pegmatites. The first contains beryls, and also rare minerals containing titanium, niobium, tantalum, uranium (radio-active), cerium, and yttrium ; the latter is characterised by numerous lithium minerals, tourmalines of various colours, beryls, red triphane (lunzite), and also minerals containing boron and fluorine.—Richard **Birkeland** : The trajectory of an electrified particle in a magnetic field.—L. **Wertenstein** : The absorption of radio-active projections and the ionisation which they produce.—S. **Ratner** : The mobilities of the radio-active atom-ions in gases. A study of the mobilities of the atoms of radium B, projected by radium A, Rutherford's method of the alternating field being employed in the measurements.—Jean **Bielecki** and Victor **Henri** : The quantitative study of the absorption of the ultra-violet rays by alcohols, acids, esters, aldehydes, and ketones of the fatty series. The photometry of the spectrograms has been utilised as the basis of a quantitative study of the absorption in the ultra-violet. The absorption increases as the molecule becomes more complex. The acid group (CO·OH) possesses a very great absorptive capacity. Other groups possess specific absorption characteristics.—M. **Portevin** : The effect of tempering upon the electrical resistance of bronzes and brasses.—Georges **Baume** and F. Louis **Perrot** : The atomic weight of chlorine. Gaseous hydrochloric acid was allowed to come in contact with liquid ammonia, and the weight of gas necessary to form neutral ammonium chloride determined. Taking N = 14·009, the results lead to Cl = 35·465, practically identical with the international value 35·460.—E. C. **Teodoresco** : The presence of a nuclease in Algæ.

CAPE TOWN.

Royal Society of South Africa, July 17.—J. Medley **Wood** : Addendum to revised list of the flora of Natal.—J. **Hewitt** and Hon. P. A. **Methuen** : Descriptions of some new Batrachia and Lacertilia from South Africa.—Miss L. **Currlé** : Notes on Namaqualand Bushmen. The account is taken from a gentleman whose early life afforded him ample facilities for obtaining a clear insight into the characteristics of Cape Colony Bushmen. Their wandering life is noted, also their mode

of existence; the K'mè, by means of which they procure white ants; their dress and adornments. Nothing comes amiss to them, eating hyæna, jackal, reptiles, and worms. Huts they never build, making only a frail shelter of grass and twigs. The poison they use for their arrows consists of snake poison, and also of that of the large spiders reputed to be very venomous, mixed with the milky juice of a Euphorbia growing in the Langebergen. They practise witchcraft to remove illness, this being done in a very simple manner by the old women. They acknowledge no chief or leader, and are not polygamous, but they have no marriage ceremonies. They are extremely revengeful, killing even their own relations if necessary. They believe in resurrection, and bury the dead in a sitting position, so as to enable them to get up easily and walk to a certain place where there is plenty of wild honey and locusts. Those who have been quarrelsome and have behaved badly towards their friends during their lifetime would get common flies to eat as a punishment. The Bushmen believe that jackals, wild cats, &c., were formerly human beings transformed by witchcraft as punishment for evil doing.—Dr. J. R. **Sutton**: The physical significance of the mean diurnal curve of temperature. This paper discusses briefly the question whether hourly average temperatures have any great scientific value. The author comes to the conclusion that it is not unlikely that the mean diurnal curve of temperature is, for Kimberley, made up of at least three superimposed curves of the same period, which curves are proper, perhaps, to various outstanding types of weather.—Dr. J. R. **Sutton**: A note on the earthquakes of the South-African Table-land. Occasional shocks of earthquake are felt in South Africa. Four have occurred of sufficient intensity to be plainly felt since the observatory at Kenilworth (Kimberley) was established. The author directs attention to the fluctuations of barometric pressure which were in progress at the time of these shocks.

BOOKS RECEIVED.

Kausale und konditionale Weltanschauung. By Max Verworn. Pp. ii+46. (Jena: Gustav Fischer.) 1 mark.

Das Tierreich. Edited by F. E. Schulze. 31 Lieferung, Crustacea, Ostracoda. By G. W. Muller. Pp. xxxiii+434. (Berlin: R. Friedländer & Sohn.) 32 marks.

Notes on Foundry Practice. By J. J. Morgan. Pp. viii+108. (London: C. Griffin and Co., Ltd.) 2*s*. 6*d*. net.

A Text-book of Rand Metallurgical Practice. By R. Stokes, J. E. Thomas, and others. Vol. ii. Pp. xxii+438. (London: C. Griffin and Co., Ltd.) 21*s*. net.

Campagne Arctique de 1907. By le Duc d'Orléans. Crustacés Malacostracés. By Dr. L. Stappers. Pp. vi+152+xii+xii+vii plates+ii maps. Bryozoaires. By O. Nordgaard. Pp. iii+43+map. Coelentérés du Fond. By Dr. H. Broch. Pp. ii+29+map. Annélides Polychètes. By Prof. F. Fauvel. Pp. iii+45+iv+i plate+i map. (Brussels: C. Bulens.)

Black's Sentinel Reader. Book iv. By Prof. E. E. Speight. Pp. x+210. Book v. By Prof. E. E. Speight. Pp. xii+239. (London: A. and C. Black.) 1*s*. 6*d*. each.

The Treatment of Tuberculosis by means of the Immune Substances (I.K.) Therapy. By W. H. Fearis. Pp. xx+206. (London: John Murray.) 6*s*. net.

Naturwissenschaftliche Studien am Toten Meer und im Jordantal. By Prof. M. Blanckenhorn. Pp. vii+478. Berlin: R. Friedländer & Sohn.) 25 marks.

A Manual Flora of Egypt. By Dr. R. Muschler. Vol i. Pp. xii+672. Vol. ii. Pp. 673–1312. (Berlin: R. Friedländer & Sohn.)

Axiom and Principles of the Science of Organisation. By M. Bruce-Williams. Second edition. Pp. 21+plates. (London: Association of Standardised Knowledge, Ltd.) 7*s*. 6*d*.

The Strategy of Nature. By M. Bruce-Williams. Pp. 60. (London: Association of Standardised Knowledge, Ltd.) 2*s*. 6*d*.

Die Feigenbäume Italiens und ihre Beziehungen zu einander. By Dr. R. Ravasini. Pp. 174+6. (Bern: M. Drechsel.) 11 marks.

Solar Physics Committee. Report of the Solar Eclipse Expedition to Vavau, Tonga Island, April 29, 1911. (Eastern date.) By Dr. W. J. S. Lockyer. Under the direction of Sir Norman Lockyer. Pp. iv+82+10 plates. (London: H.M. Stationery Office.) 6*s*.

The Evolution of Ethers and Ether Phenomena. By A. Dilks. Pp. 50. (Bridgwater: Coombs and Dilks.) 2*s*. 6*d*. net.

Fifth Scientific Report on the Investigations of the Imperial Cancer Research Fund. By Dr. E. F. Bashford. Pp. vi+94. (London: Taylor and Francis.) 5*s*.

Jahrbuch der Naturwissenschaften, 1911–1912. Edited by Dr. J. Plaszmann. Pp. xvi+452. (Freiburg and London: B. Herder.) 7*s*. 6*d*.

Dactylography, or the Study of Finger-prints. By H. Faulds. Pp. 127. (Halifax: Milner and Co.) 1*s*. net.

Reports of the Cambridge Anthropological Expedition to Torres Straits. Vol. iv. Arts and Crafts. Pp. xxiv+393+40 plates. (Cambridge: University Press.) 25*s*. net.

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