THURSDAY, JULY 3, 1919.

SIR WILLIAM TURNER.

Sir William Turner, K.C.B., F.R.S., Professor of Anatomy and Principal and Vice-Chancellor of the University of Edinburgh. A Chapter in Medical History. By Dr. A. Logan Turner. Pp. xv+514. (Edinburgh and London: William Blackwood and Sons, 1919.) Price 18*s.* net.

OF all the distinguished men who have passed away during the years of the war, few or none have shown more devotion to, and done greater service for, the institution and the profession to which they belonged than the late Sir William Turner.

The life-history of a man who, without money or influence to facilitate his progress, became demonstrator, professor, principal, and vice-chancellor in a great university, and president of the General Medical Council, is naturally an attractive subject for a biographer, and, provided that the writer of the history has had an intimate acquaintance with his subject and has a thorough appreciation of the circumstances of the period in which the events dealt with took place, the biography is likely to be both interesting and instructive.

Fortunately the conditions have been adequately fulfilled, and Dr. Logan Turner's history of his father's life and of the circumstances of the time in which it was lived shows that he has inherited two at least of his father's characteristics—full grasp of the subject to be dealt with, and the faculty of clear exposition which renders prominent and comprehensive all its chief features.

Sir William Turner was a many-sided man; he was interested in teaching, government, administration, and research; he dealt, therefore, with many problems, and left them all in a clearer position than that in which he found them; but, since his researches commenced in his early days as a teacher and ended only with his life, and as his work as a developer, organiser, and governor extended over the greater part of the time that he was connected with the University of Edinburgh, his many activities in the various spheres overlapped one another to a very large extent. This has been recognised by his biographer, who has dealt with the events of the history, not in strict chronological order, but, to quote his own words, "rather in the form of a series of sections, each more or less complete in itself."

The book commences with an account of the boy, William Turner, following him from Lancaster to London, and from London to Edinburgh; then it touches upon his early difficulties, anxieties, and successes as a demonstrator under Goodsir; afterwards comes the period of work as professor of anatomy, and in that section the author discusses the reasons for the rise and fall of the number of the students in the anatomy class in three decennial periods. The succeeding section deals with Sir William's scientific work, which covered very wide and varied ground, though the greater part of it was in connection with marine mammals and anthropology.

The remaining half of the book is devoted to Sir William's work in the Senatus Academicus; his association with the Medical Act of 1886 and the Universities (Scotland) Act of 1889; the progress and extension of the Medical School of Edinburgh during his periods of office as professor and principal; and it concludes with a summary of his character in relation to his administrative work.

Such a bald outline of the plan on which the biography is written gives no idea of the entrancing history of the times during which the work was done, which the author has made the setting for the life-history of his subject, and into which he has introduced a series of letters which passed between Sir William and the numerous distinguished men with whom he was associated in connection with all the various branches and phases of his work. The letters carry the reader back to 1854, when John Goodsir first wrote to Mr. William Turner, and thence onwards to 1908, and they include several from Charles Darwin which are now published for the first time.

It is possible that the reader will not agree with all the author's opinions and conclusions, but he will be bound to admit that they are fair and tenable, and he will find the book interesting, illuminating, and eminently readable from the beginning to the end.

APPLIED PHYSIOLOGY.

The Physiology of Industrial Organisation and the Re-employment of the Disabled. By Prof. Jules Amar. Translated by Bernard Miall. Edited, with Notes and an Introduction, by Prof. A. F. Stanley Kent. Pp. xxv+371. (London: The Library Press, Ltd. 1918.) Price 30*s.* net.

PROF. AMAR displayed, in the research which formed the subject of his doctoral thesis of 1909, much ingenuity in applying the somewhat difficult technique of indirect calorimetry to the study of human energetics under unfavourable conditions. Later, in various researches which are described in his treatise "Le Moteur humain," the same resourcefulness was manifested; in particular, his measurements of the respiratory metabolism of metal workers deservedly attracted attention to a line of inquiry which was, and is, of considerable practical importance. Since then the French Government has utilised Prof. Amar's talents in a wider field, and the present volume contains a general account of his recent work.

No reader of this book can fail to be impressed by the mental acuteness, mechanical ingenuity, and enthusiasm displayed by its author, particularly, perhaps, in the concluding section, which treats of the re-education of war cripples, expounds the principles of prosthesis, and describes, with numerous diagrams and photographs, a large number of valuable devices.

Had Prof. Amar restricted the scope of his

undertaking to matters with which he is thoroughly familiar, the most censorious critic would have found little to blame; but he has attempted to cover so large a field that the most friendly reader is often reminded of Dr. Johnson's ungallant dictum that a "woman's preaching is like a dog's walking on his hind-legs. It is not done well; but you are surprised to find it done at all." The psychologist will perhaps feel this when confronted with such questions as: "Can it be that thought also constitutes a radio-active phenomenon? Is it evolved from the disappearing cerebral substance by a process as yet inexplicable?" while the physiologist must object to difficult problems of nutrition being summarily and dogmatically decided, the decision being emphasised by such aphorisms as: "The chains of the laboratory must not too closely shackle the limbs of education, for education is a thing which lives and moves."

The general physiological introduction is, in fact, the weakest part of the book, and the method of its presentation in an English edition is, we think, open to criticism. The work is announced as edited, with notes and an introduction, by Prof. Stanley Kent, and on pp. 28–29 a note, containing a mild witticism as to the work of the heart, duly appears. But the editor has not thought it his duty to amplify the citations of literature. Ferrier is cited in a French translation, Hill and Flack in a short French abstract, while a misleading account of the chemical physiology of respiration is allowed to stand without any marginal references to the papers of Haldane, Pembrey, or their pupils. Similarly, the English reader of the section upon the physiological action of alcohol should have been directed to the recent report of the scientific committee appointed by the Central Control Board, a report which modifies some of the inferences likely to be drawn by the general reader from Prof. Amar's statements. The description on pp. 73–75 of indirect calorimetry should have been supplemented by references to some of the recent papers accessible to the English reader; as it stands, it conveys a very inadequate impression of the difficulties of such work.

We have directed attention to these defects because, in the introduction, an appeal is made to a wide circle of readers, and we fear that an erroneous impression of simplicity and finality may be conveyed. In our opinion, the book should have received much closer editorial supervision before being placed in the hands of the general public.

M. G.

THE PROBLEM OF INDIVIDUALITY.

(1) *Conscience and Fanaticism: An Essay in Moral Values.* By George Pitt-Rivers. Pp. xvi+112. (London: Wm. Heinemann, 1919.) Price 6*s.* net.

(2) *The Nature of Being: An Essay in Ontology.* By Henry H. Slesser. Pp. 224. (London: George Allen and Unwin, Ltd., 1919.) Price 10*s.* 6*d.* net.

(3) *Life and Finite Individuality: Two Symposia.* 1. By J. S. Haldane, D'Arcy W. Thompson, P. Chalmers Mitchell, and L. T. Hobhouse. 2. By Bernard Bosanquet, A. S. Pringle-Pattison, G. F. Stout, and Viscount Haldane. Edited for the Aristotelian Society by Prof. H. Wildon Carr. Pp. 194. (London: Williams and Norgate, 1918.) Price 6*s.* net.

WE have been forced by great world events to revise many accepted formulæ and analyse anew many familiar concepts. The period of reconstruction on which the human race seems to have entered is not confined to economic and social relations, and "unrest" is not merely descriptive of the labour world; it extends to the sphere of speculation. In the new order which we feel arising it is easy to see that the predominant interest is the problem of the limits of individuality.

(1) Mr. Pitt-Rivers has given us a study of very great interest and value if we consider, not the erudition or lack of erudition it displays, for it makes no pretence to any, but the special circumstances which have led to its conception and production. A young officer in such leisure as is afforded to him in the intervals between the active operations of campaigning relieves the *ennui* by setting himself the task of studying the curious, and to him irritating, phenomenon, the conscientious objector. He has done it very well. There is a certain lack of co-ordination between the parts of his book, but what we are struck with is the freshness with which one who has responded cheerfully and whole-heartedly to the call of the community views as an intellectual puzzle the case of the man who fanatically rejects that call, even to the extent of incurring ignominy and extreme personal suffering.

(2) Mr. Slesser's "Essay in Ontology" is a much more ambitious effort. It proposes in a very short treatise, divided into easy sections with bold headlines, to settle finally the vexed problem of metaphysics. It regards the enterprise as both simple and easy. To enter the kingdom of philosophy we have only to become as little children. It brings to mind the famous adventure of a professor in the Academy of Laputa, who simplified the task still further by inventing a machine by means of which works of philosophy could be produced without any aid from learning and study.

(3) If anyone wants a corrective to the notion, by no means uncommon, that the problems of philosophy are simple and only require that we shall consent to be disingenuous, he will find it if he will study the second symposium in the Aristotelian Society's supplementary volume. The question discussed from various points of view by Prof. Bosanquet, Prof. Pringle-Pattison, Prof. Stout, and Lord Haldane, "Do finite individuals possess a substantive or an adjectival mode of being?" deals with the problem which presents probably the deepest cleavage in philosophical opinion, not only to-day, but also throughout the modern period. It is a metaphysical and a logical problem. Is reality ultimately monistic, or is it

monadistic? If monadistic, how are the monads related to one another and to God? And, is the unity of knowing and being such that there can be only one ultimate subject of every judgment to which all predication refers?

The first symposium in the volume, "Are physical, biological, and psychological categories irreducible?" is of much narrower range, but of very wide and practical interest from the point of view of scientific method. Dr. J. S. Haldane, in the opening paper, makes a powerful appeal to his special experimental work on the physiology of breathing, and also to his experiments on bleeding and on the action of the kidneys, as conclusively proving the inadequacy of the ordinary mechanistic explanation. His contention is that in vital phenomena the investigation must proceed from function to structure, and never *vice versa*. He rejects the neo-vitalist hypothesis equally with the mechanistic, and proposes a principle which he suggests may be named "organicism," but is really the philosophical principle of personality. The activity of life consists in the maintenance of a normal or constant equilibrium in a continuously disturbing environment, and an organism is a system of interconnected normals. The thesis is criticised from somewhat different points of view in the papers of Prof. D'Arcy Thompson, Dr. Chalmers-Mitchell, and Prof. Hobhouse, but Dr. Haldane is able to claim in his reply that on essential points there is general agreement.

The two symposia have been reprinted from the Aristotelian Society's Proceedings. They cannot fail to be welcome to a great number of students in the convenient form of this independent volume.

OUR BOOKSHELF.

The Science of Labour and its Organisation. By Dr. Josefa Ioteyko. (Efficiency Books.) Pp. viii + 199. (London: George Routledge and Sons, Ltd., 1919.) Price 3*s.* 6*d.* net.

IN this little book Dr. Ioteyko treats of the human motor and the measurement of industrial fatigue, scientific management, measurement of aptitudes, anthropological comparison of the sexes from the point of view of strength and endurance, alimentation and work, re-education of the left hand for the mutilated, and Belgian methods of technical education and the University of Labour.

The earlier part of the book consists largely of material gleaned from different authors, and not always very skilfully strung together. Much important work remains unnoticed, and the treatment, as a whole, is inadequate. If the intention was to write an elementary book for the use of beginners, a different style and simpler language might well have been employed. If it was to produce a volume useful to those already acquainted with the subject, a more exhaustive treatment would have been suitable.

The need has passed for small books written merely to attract attention to the importance of the matter. The study of the organisation of labour is entering on a new phase, and requires a new treatment. There are persons sufficiently learned in the subject to assume the *rôle* of teachers, and it is to be hoped they will soon find time to make the learning they possess available for all those who desire to pursue the matter in the light of modern knowledge.

This book is one of Messrs. Routledge's "Efficiency" series, and we naturally looked for internal evidence of efficiency in it, but we must confess to some disappointment at the occasional use of words to express an English idea whereby the meaning is obscured. For instance, on p. 55, where it is stated that "a man should be required *to load* during a strictly defined time," a completely wrong idea is given of Taylor's meaning.

Typographical errors are met with frequently, and, though these may perhaps be viewed leniently in existing circumstances, one cannot help feeling that the exercise of a little care would have led to their elimination.

For the rest, the book is evidence of the interest that is taken in an important subject, and we welcome it accordingly.

Army Gardens in France, Belgium, and Occupied German Territory. Their Making and Management, with Plans and Directions suited to the Garden Service of the British and American Expeditionary Forces. By Georges Truffaut, with the collaboration of Helen Colt. Pp. 65. (Versailles: Œuvre des Pépinières Nationales du Touring-Club de France, 1919.)

THIS booklet, which has been drawn up by M. Georges Truffaut, Director-General of Army Gardens on the French Front, is a very interesting record of a remarkable piece of work, which has been of immense service to the armies in France. During the past two years 7000 vegetable gardens have been established in the actual war zone behind the French front, and, in addition, large national nurseries for vegetable plants have been formed at Versailles. Fifty-six other nurseries for raising seedling vegetables for gardens near the front have also been established, and during 1918 some 200,000,000 seedling vegetables were distributed. Tables of vegetable rationing and full details of the cultivation and cropping of the gardens are given, also particulars as to the arrangement of the gardens, manuring, and other cultural matters.

The value of the publication is heightened by the illustrations of the huge nursery of about 70 acres at Versailles, of some of the smaller nurseries at Champigneulles and Baccarat, and of some of the Army gardens. A list of the vegetables suitable for cultivation, with their seasons and other particulars, is given, and also plans for the planting of a given area of ground.

Though, happily, the immediate military need of the gardens and nurseries has come to an end, the results achieved are by no means lost, as the work done by M. Truffaut and his staff should have far-reaching effects not only in France, but also in this country.

The Peace Conference Atlas. A Series of Maps to Illustrate Boundary and Other Questions under Consideration at the Peace Conference, 1919. Maps 24. (London: Edward Stanford, Ltd., n.d.) Price 5*s*.

THIS small atlas is not designed specially to illustrate the Peace Treaties, but rather the problems which faced the Peace Conference. It should prove useful in studying the vexed problems of European racial and national boundaries. The maps are black and white, with the boundaries, as in 1914, in red, and a red wash used in many cases to indicate areas of speech. Presumably the dividing line is taken at a bare majority, but this is not stated, and in any case we fear that such simplification of Eastern European problems as these clear-cut maps suggest is outside the scope of practical statesmanship. In comparing the maps showing Italian speech and the boundaries of Yugo-Slavia we note some discrepancies, but on the whole the maps are carefully prepared and well printed. The larger scale maps deal chiefly with Eastern Europe, but the late African and Pacific possessions of Germany are not omitted.

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.*]

Dr. Kammerer's Testimony to the Inheritance of Acquired Characters.

PROF. MACBRIDE'S letter in NATURE for May 22 last calls for some statement from me. When, in 1910, I was engaged in writing those chapters of my book, "Problems of Genetics" (1913), which deal with the effects of changed conditions in producing genetic variation, I endeavoured to form an opinion as to the validity of the cases usually claimed in recent years as having given positive results. I had no difficulty in showing that nearly all this evidence is unsubstantial. The copious and astonishing observations said to have been witnessed by Prof. Tower, of Chicago University, and by Dr. Kammerer, of the Vienna Versuchsanstalt, naturally called for exceptionally careful examination. The results of both these authors had been very widely accepted, and had begun to pass current in the text-books. In the case of Prof. Tower's paper, as I demonstrated in my book, close textual criticism revealed features which suggested that implicit confidence should be postponed pending confirmation—a conclusion to which I had already come when, on a visit to Chicago in 1907, I had seen illustrative specimens which Prof. Tower was good enough to show me. Prof. Tower's results are still quoted (*e.g.* by Babcock and Clausen in their recent text-book, 1918), but we have for some years awaited fresh light on the facts or any explanation of the difficulties to which I directed attention.

In the case of Dr. Kammerer's statements, most were plainly incapable of ready verification. The instance of Alytes was the most favourable for this purpose, inasmuch as the males with the horny pads, said to have been produced in response to changed conditions, could be easily preserved. So, no doubt, might the Salamanders, of which the "*sattsam bekannte*" history, as Prof. Baur calls it, has been published in numerous German periodicals; but there was this difference: that whereas Salamanders corresponding with Dr. Kammerer's several patterns can be had from the dealers, students of the Batrachia are, I understand, agreed that Alytes with Brunftschwielen does not exist in Nature. I therefore wrote from Cambridge (July 17, 1910) to Dr. Kammerer asking for the loan of a demonstrative specimen, promising to examine it with every care and to return it in due course. He replied in English (July 22) that he was on a holiday, continuing: "As soon as I shall be returned to my usual work—two congresses and a journey to Munich are still between—I will send to you any objects you may need for your book and have interest for, with the greatest pleasure! I hope that it will not be too late then for using them in the chapter, 'Effects of External Conditions,' of your future book.

"I am not quite sure whether I killed already specimens of Alytes with 'Brunftschwielen' or am possessing only living males of this (F_4) generation.

"But I do not doubt that also other objects are well fitted to show easily the effect of conditions and their inheritance. Especially my new experiments on influence of soil, etc., upon colours (not yet published, except some preliminary notes; for instance, in the *Verh. Deut. Naturforscher u. Aerzte*, Salzburg, 1909) are much more favourable for that purpose than the instinct variations, in spite of their morphological consequences.

"I have also promised (*i.e.* Dr. Przibram has in my name) to Mr. Doncaster to spare him a series of tadpoles with alterations, etc., for your museum; and it is my intention to fulfil this promise, together with that given to you in my present letter during the beginning of this autumn." Nevertheless, neither I nor the Cambridge Museum (as Dr. Doncaster tells me) ever received any of the promised material.

Later in the summer of 1910 I unexpectedly was able to attend the *Mendelfeier* at Brünn, and was for some time in Vienna, having the privilege of being the guest of my old friend Dr. Przibram. I was many times at the Versuchsanstalt, and inquired in vain for the Alytes. On one occasion especially, about October 3 or 4, I was there in company with Profs. E. Baur, Lotsy, Nilsson-Ehle, Dr. Hagedoorn, and the late M. Ph. de Vilmorin. Those who survive of that party will remember that, on conferring together, we all shared the same feeling of doubt. After seeing what Dr. Kammerer showed us we were entirely unconvinced, and in particular it seemed to us inexplicable that, if Alytes had existed with Brunftschwielen in July, one specimen of so great a curiosity should not have been preserved, if only for exhibition with the Salamanders at Dr. Kammerer's numerous lectures. I may add that I expressed my doubts categorically to Dr. Przibram, the head of the Anstalt, but I am glad to think that, though he defended Dr. Kammerer, our cordial intercourse continued unbroken up to the time of the war. Few, I imagine, will now consider that, on the evidence available, my scepticism was not justified. (For an elaborate and destructive criticism of Dr. Kammerer's statements, see Boulenger, G. A., *Ann. and Mag.*, August, 1917, p. 173).

After reading Dr. Kammerer's new paper I agree with Prof. MacBride that a fresh inquiry is desirable. The two photographs, Taf. x., Figs. 1 and 2, which he accepts as proof of Dr. Kammerer's observation, present some very curious features, and I feel much curiosity concerning them. It is, of course, on Fig. 2

that the case rests. This photograph, said to be the work of Prof. E. D. Congdon, of Harvard, is extraordinarily bad. It represents a Batrachian lying on its back, seen from in front. Were we not told that it is Alytes, the fact could not have been ascertained, for all but the hands is a blur. The hands are seen from their dorsal surfaces. On the radial side of the *wrist* of the right hand is a lump which Dr. Kammerer claims as a Brunftschwiele. The phalanges of the thumb, as Dr. Kammerer expressly declares, are unmodified in this specimen, and no *Schwielen* are visible on the left arm or hand at all. Though on analogy with other genera *Schwielen* might well occur on the wrist or forearm, the proposition which Fig. 2 is intended to support is not that set forth in the original paper which I criticised (*cf.* especially *Arch. Entwm.* 1909, xxviii. Taf. xvi., where a modified *thumb* is vaguely represented). In the text of the present paper we are told that the *Schwielen* are very variable in position and extent. *I do not, however, find any mention of modification in digit iv.* This finger is, of course, external, and could scarcely function in the embrace; nevertheless, the *outer* side of digit iv. is most conspicuously thickened in the right hand of the animal shown in Fig. 2. So striking is this appearance that everyone to whom I have shown the figure at first sight supposes this thickening to be the *Schwiele* illustrated. I myself, on looking at the picture before reading the details, had no doubt that this was the *Daumen* with its excrescence, the hand being thus supposed to present a palmar view. Dr. Boulenger at once pointed out to me that this interpretation was impossible, for the reason, among others, that the comparative lengths of the digits proved the hand to be shown in dorsal view, and that the modified digit is iv. It must be remembered that the photograph is so indistinct that much is left to the imagination.

The peculiarity of the right digit iv. would be still more manifest if Fig. 1, which gives a normal Alytes, were a genuine photograph. It has, however, been so clumsily painted up that the extremities are not like those of any animal. Each finger and toe has a painted outline, not always in the right place, and only on comparison with actual specimens can the full extent of the modification in digit iv. of Fig. 2 be appreciated. As it stands, this digit is very like the *Daumen* of the original figure. I will not yet venture on a positive interpretation, but I may remark that what the new evidence suggests is that these modifications, whatever they may be, and to whatever cause they may be due, can also appear on the outside of digit iv.

I find it difficult to understand why, if these structures are as Dr. Kammerer declares, he did not make a proper series of photomicrographs of them *in situ*, showing their several positions and forms—no very hard task for such an institution as the Versuchsanstalt. Entomologists and students of fungi make such photographs constantly. Even one good ordinary photograph or drawing would have shown more than the ambiguous pictures now offered us. If anyone wishes to see how Alytes looks in a good photograph, he should turn to Boulenger (*Bull. Ac. Roy. Belg.*, 1912, p. 573). The latest of Dr. Kammerer's figures dates from July, 1913. A long series of *Arch. Entwm.* has been published during the years of the war, often with magnificent plates. Dr. Kammerer does not state how many modified Alytes he has had, but by implication they have been numerous. If, on second thoughts, he was unwilling to send one to England, could he have resisted the temptation to send one to the Berlin Museum to be shown to Prof. Baur, and so confound him and other sceptics? Three years had elapsed since we openly expressed our disbelief, but I know that up to January, 1914, no such specimen had been sent.

Prof. MacBride urges that sceptics should repeat experiments on the inheritance of acquired characters. We, however, are likely to leave that task to those who regard it as a promising line of inquiry. Why do workers in that field so rarely follow up the claims of their predecessors? Each starts a new hare. Scarcely has one of their observations been repeated and confirmed in such a way that we could be sure of witnessing the alleged transmission if we were to try for ourselves. Brown-Séquard's observation on guinea-pigs is an exception. That has been repeated by various observers, until at length, by the work of Graham Brown, the mystery may be regarded as explained. The observation was true, but the interpretation was faulty. As I have often remarked, acquaintance with the normal course of heredity is an indispensable preliminary, without which no one can interpret the supposed effects of disturbance. This knowledge of normal genetic physiology is being slowly acquired, and already we have enough to show that several variations formerly attributed to changed conditions should not be so interpreted. Even in this case of Alytes, were a male with incontrovertible Brunftschwielen before our eyes, though confidence in Dr. Kammerer's statements would be greatly strengthened, the question of interpretation would remain, pending the acquisition of a knowledge of Batrachian genetics.

W. BATESON.

June 22.

The Food of Rats.

IN NATURE of September 19, 1918 (vol. cii., p. 53) a summary is given of an article by Prof. P. Chavigny on the food of rats. Some of the statements in this article appear to me to be extraordinary, particularly the alleged necessity for rats to get cooked human food. The hordes of rats which swarm along our foreshores, and in granaries and like places, could not possibly get sufficient cooked human food to keep them alive, yet they are plump and well-fed. Anyone who has kept fowls or ducks in a rat-infested place knows that rats will carry off and devour chicks and ducklings, even dragging them from under the brooding mother, eating them raw. Attacks on living and dead human beings and smaller animals are by no means rare. Along the water-front rats freely catch and eat crabs, and they will devour raw fish with avidity.

Certainly rats will eat cooked food when they can get it, but they are omnivorous feeders, and I have personally known them not merely to gnaw, but to devour pumpkin, melon, apple, and other fruits. Of pumpkin-seeds they are very fond, and an apple-core makes a good bait for a trap. They do not seem to care much for raw beef; I have noticed them attack raw potatoes and pumpkin-seeds, neglecting raw steak which was lying alongside. Under a creeper in my garden near Sydney the common snail (*H. aspera*) was very abundant, and *M. decumanus* used to devour large quantities; the apex of the shell was always bitten off so that the mollusc could be readily extracted. On the Upper Waikato River, New Zealand, the same rat dives into the water and gathers the fresh-water Unio. On the river-banks the shells are gnawed open and the animal eaten. The shells are always bitten through at the same spot of one valve, but I forget now whether that was the right or left one.

In Australia at certain seasons a "cutworm" moth, known as the "bogong" or "bugong" (*Agrotis infusa*), swarms in myriads in many places, and is,

after the wings have been singed in a charcoal fire, used as an article of food by the aboriginals. These moths sometimes invade the cities and crowd into houses and stores for the sake of darkness. At Melbourne, in a large sugar store, I have noticed *M. decumanus* collect the moths and eat the bodies, rejecting the wings.

There came under my notice lately at Pennant Hills, near Sydney, a case of a curious article of food for a rat. A rat gained access to the laundry attached to my house, and for some weeks it used to drag pieces of common soap behind any shelter and devour them. That the soap was really eaten was evident, because no particles were left lying about. Ultimately I succeeded in trapping the rat, which was a half-grown male, *M. decumanus*. An empty spring trap was placed open in a box having an opening just over the jaws. A piece of tissue-paper was arranged over the jaws and the whole covered with a thin layer of bran, a bait being laid at the far end of the box. On examination I found the intestines empty and the stomach gorged with fresh bran, which the rat had scooped up before entering the trap. Although I searched carefully I could never find any means of exit from the laundry or see the rat, but I presume it must have got other food somewhere, for absolutely nothing edible was ever placed in the laundry. The rats' excreta were always quite normal.

THOS. STEEL.

Sydney, April 28.

SOME RECENT ATOMIC WEIGHT DETERMINATIONS.

THE story, adequately told, of the evolution of ideas and the development of knowledge concerning the stoichiometrical constants we term atomic weights forms a most interesting chapter in the history of the philosophy of chemistry. In point of time it would extend over no very long span. There are men living who are personally cognisant of its most important phases, and some of them in early life were acquainted with others who may be said to have connected their own epoch with that of those who witnessed the beginning of experimental efforts to obtain quantitative estimations of their values.

The formulation of the laws of chemical combination involved the necessity for exact knowledge of the relative weights with which substances enter into such combination, and, as is well known, Dalton himself made tentative trials to obtain some definite conception of their measure. But Dalton was not a particularly skilful or accurate experimenter; his apparatus and methods of quantitative work were very crude and even below the standard of his time. This was fully recognised by his contemporaries, particularly by Berzelius, who may be said to have been the first to attempt precise determinations of atomic weights. The work of Berzelius and his coadjutors marks, in fact, an epoch in the history of the subject.

Of course, as is now well understood, the germ of Dalton's ideas, although he probably was unconscious of it, is to be found in the work of his predecessors, but it does not seem to be generally known that Cavendish, in effect, postulated and put into practice the fundamental conceptions expressed in the laws of constant, multiple, and reciprocal proportions. He appears to have convinced himself years before the time of Proust and Berthollet that the same substance is invariably composed of the same elements united in the same proportion, and, as can be shown from his published writings, he made quantitative analyses on the implicit assumption of the other laws. This was first pointed out by George Wilson, and has been more fully developed in the course of a critical examination of Cavendish's memoirs in the Phil. Trans. for 1786 and 1788 on "Freezing Mixtures," contained in an annotated edition of his complete papers, published and unpublished, which it is to be hoped the Cambridge University Press may soon be in a position to issue.

It would occupy more space than is available to attempt to trace the several phases, which, like milestones, mark successive stages in the progress and development of knowledge concerning atomic weights, nor is it necessary to set out in detail the various reasons which have led chemists to recognise the imperative necessity of knowing these constants with the highest attainable precision. Philosophers like Berzelius always desired the utmost accuracy in the abstract interests of truth. But, to begin with, the only practical use of atomic weights, or combining proportions as they were called by Davy, was in quantitative efforts to elucidate the chemical composition of substances, and, considering the imperfections of quantitative methods, an approximation to exactitude sufficed. When substances began to be bought and sold on the results of analysis, atomic weights became of importance in commercial transactions, but even then, for the purpose of trade, no very high degree of accuracy was required. Even the numbers of Berzelius's time sufficed for the determination of exact formulæ, and enabled the nature and progress of a chemical change to be traced with precision.

But in recent time, and with the development of chemical theory, atomic weights have acquired a wider importance and a new significance, and a much higher degree of accuracy is demanded. It is, in fact, almost useless to discuss certain questions unless these constants have been rigorously determined. Very much now depends upon little differences—the little difference, indeed, frequently makes all the difference. But, unless this is established with reasonable certainty, it is a waste of time to base an argument upon it. We thus enter upon another and the latest phase in the development of the subject.

For this new departure, which may be said to start with Stas, the chemical world is greatly indebted to American chemists, such as J. P. Cooke and his colleagues, Oliver Huntington and Theodore Williams; and to J. W. Mallet, Morley, and Noyes. Prof. Theodore Williams has worthily maintained the traditions of the Harvard school, and it is largely to his work and example that the present high standard has been reached. We

owe to him in great measure the enormous improvement in technique which distinguishes modern determinative work of this kind. Such work will not pass muster to-day unless it is performed with the scrupulous regard to detail and conscientious search for causes of error and for means to avoid them which characterise the determinations he has directed.

America, moreover, is to be congratulated in possessing a publishing agency like the Carnegie Institution of Washington, which undertakes the printing and distribution of important scientific memoirs which might seriously tax the means of most scientific societies, and which, on account of their specialised character, no ordinary publisher would be likely to accept as a business proposition.

A recent publication by the Carnegie Institution is concerned with the results of a determination of the atomic weights of boron and fluorine by Messrs. Edgar F. Smith and Walter K. van Haagen.[1] As it presents some features of general interest, an account of the work may not be unacceptable.

The redetermination of the atomic weight of boron has revealed the unexpected fact that the value for this constant hitherto accepted is at least 1 per cent. too high—a remarkable circumstance, all things considered. Boron, of course, is a common and widely distributed element, and the estimation of its atomic weight has been made by at least half-a-dozen experimenters since the time of Berzelius with such concordant results that it might be assumed that it was fairly well known. But there are certain considerations connected with these determinations which might occasion doubt. To begin with, there is no great choice of methods in this particular case of a sufficiently valid character upon which to base determinations. Practically all the numbers depend upon the analysis of borax, either hydrated or anhydrous. We have here an instance of what has been frequently deprecated in atomic weight work. A determination based upon the amount of water in a hydrated salt rests upon a faulty principle. It presupposes that the amount of water in a hydrated salt is absolutely definite and constant, and that adventitious water can be separated from that which is supposed to be normal to the constitution of the salt, of which there is no absolute proof. It further assumes that the salt can be completely dehydrated under the particular conditions of the experiment, which may or may not be the case. Now, as all the previous determinations of the atomic weight of boron rest upon practically the same basis, they may involve the same fortuitous errors, and Messrs. Smith and van Haagen's investigation shows that, as a matter of fact, they do. The substantial uniformity of the previous results is therefore misleading. It is a recognised canon in atomic weight work that a value can be accepted with confidence only if it is based upon methods involving different principles and modes of manipulation free from known sources of error. In these analyses of borax the manipulative processes were of the simplest possible character, and of themselves not liable to introduce error if properly conducted. The main error is traceable to the water and to an imperfect knowledge of the conditions under which the borax could be completely dehydrated.

The persistent retention of water by substances, even when exposed to high temperatures, is, of course, no new fact, and many instances might be given of it. No rational explanation of the phenomenon is known. In the case of borax Messrs. Smith and van Haagen offer an explanation which has at least the merit of ingenuity, if not of generality. In effect it is as follows: When the hydrated salt is heated the water of crystallisation is evolved, and at first passes through the liquid state before escaping as steam, forming droplets of an aqueous solution of borax, which is then hydrolysed as follows:—

$$Na_2B_4O_7+H_2O\rightleftarrows 2NaBO_2+2HBO_2$$
$$Na_2B_4O_7+3H_2O\rightleftarrows 2NaOH+4HBO_2.$$

This process is known to occur in weak aqueous solutions of borax. The sodium metaborate and hydroxide on concentration slowly recombine with the boric acid, reforming borax. It may be that on heating the borax the expulsion of water takes place more rapidly than the recombination of base and acid, and therefore heated borax may contain more or less sodium metaborate or hydroxide and free boric acid, and that the recombination is only complete after prolonged fusion.

"According to this view," say the authors, "the last traces of water expelled from fused borax are not merely the last portions of the water of crystallisation proper, but are to be looked upon as water of neutralisation, resulting from the recombination of sodium metaborate (or hydroxide) with boric acid, both of which were produced by a transient hydrolysis during the earlier stages in the dehydration; and this view explains why the last traces of water should be removed with greater difficulty than the bulk. Hence the final loss of water in the dehydration of borax may in all probability be due to the completion of such reactions as the following:—

$$2NaBO_2+2HBO_2=Na_2B_4O_7+H_2O$$
$$2NaOH+4HBO_2=Na_2B_4O_7+3H_2O."$$

In support of this hypothesis the authors point to other instances in which salts which are extensively hydrolysed in solution retain the last traces of water with great tenacity. There are, however, cases to which this reasoning scarcely applies. Indeed, even in the particular instance of borax the authors point out that it is not necessary to assume this hydrolytic action. Borax in a state of fusion may dissociate into sodium metaborate and boric anhydride:—

$$Na_2B_4O_7\rightleftarrows 2NaBO_2+B_2O_3.$$

This dissociation may begin before the water is completely expelled, and the hygroscopic boric

[1] "The Atomic Weights of Boron and Fluorine." By Edgar F. Smith and Walter K. van Haagen. (Washington: The Carnegie Institution of Washington, 1918.)

anhydride may combine with this water and so retard the final dehydration.

But, whatever may be the true explanation, it cannot be doubted that this obstinate retention by heated, and even fused, borax of about 0·2 per cent. of water is the main cause of error in all previous attempts to determine the atomic weight of boron by means of this salt. That the complete dehydration of borax is difficult was recognised by Dobrovolsky so far back as 1869, and was known to Hoskyns Abrahall, who concluded that the dehydration of borax was untrustworthy for ascertaining an atomic weight ratio.

In 1893 the late Sir William Ramsay and Miss Emily Aston published the results of a redetermination of the atomic weight of boron which appeared to them to confirm the commonly accepted value of 11·0. Their methods consisted (1) in ascertaining the water of crystallisation in borax, and (2) in converting dehydrated borax into sodium chloride by repeated distillation with hydrochloric acid and methyl alcohol, according to the process of Gooch and Rosenbladt. All the weighings are given in their paper to seven places of decimals—an assumption of precision scarcely warranted by the circumstances, and an instance of what Kopp was wont to call *Decimalspielerei*. The results of the first method varied from 11·04 to 10·85; the mean value adopted was 10·921. Two series were made by the distillation method; the first gave values varying between 11·015 and 10·879: adopted mean = 10·952; in the second the extreme values were 10·992 and 10·936: adopted mean 10·966. In the last series the amount of chlorine in the common salt was determined by gravimetric analysis in the usual way, which afforded a new ratio. The numbers thus obtained were uniformly above 11 (11·003–11·091: adopted mean 11·052).

The details given by Ramsay and Aston permit of a discussion of their observations in the light of the facts obtained by Messrs. Smith and van Haagen, and it is satisfactory to find that the two sets of observations can be brought into complete harmony. Indeed, certain inconsistencies among the results of the English observers, on which they themselves commented, but were unable to explain, are now cleared up, and serve to corroborate the results of the American chemists.

The recalculation of Ramsay and Aston's experimental numbers by means of the best-determined ratio of AgCl : NaCl shows that the inconsistency referred to becomes slightly greater. From the weight of NaCl, B = 10·951; from that of AgCl, B = 11·061, or a difference of fully 1 per cent. Now the method which they adopted to dehydrate borax combined with their low value for the density of vitreous borax—2·29, as against the proper value, 2·357—makes it practically certain that the fused borax still contained approximately 0·3 per cent. of water, and that the sodium chloride, although heated to 350°, still retained water the amount of which may be computed from the ratios. It was 0·214 per cent. By introducing these corrections, which are not arbitrary, but fully warranted by the facts, Ramsay and Aston's first series leads to the value B = 10·901, and their second series to B = 10·909. They agree, therefore, among themselves, and are in conformity with the result of 10·900 obtained by Messrs. Smith and van Haagen.

As regards the new determination of the atomic weight of fluorine, it must suffice to say that it depends on the ratios of sodium fluoride to sodium borate and sulphate, and on a cross-ratio between sodium chloride and sodium fluoride. Eight determinations varying between 19·002 and 19·008 gave F = 19·005, which completely confirms the present international value. T. E. THORPE.

THE PEACE TREATY AND MINERAL FIELDS.

THE Treaty of Peace has taken into account the economic relations of the contracting parties and the effect upon these of the peace conditions to a degree that has never been approached in any previous document of the kind. It is not too much to say that, whereas all previous peace treaties have been essentially diplomatic, the present one is essentially industrial in its outlook. The only mineral rights specifically referred to are those involved in the cession of the coal basin of the Sarre to France; it is difficult to understand, by the way, why, in the published English version of the treaty, the German spelling of the name has been used instead of the French. This cession bulks very large in the Treaty, but is of far less importance than would appear at first sight. It is estimated that the total quantity of coal contained in the Sarre basin is only 5·7 per cent. of the total quantity owned by Germany, so that the loss to Germany in respect of coal reserves is insignificant. From the point of view of annual output, it is somewhat more important; Germany produced in 1913 about 191½ million tons of bituminous coal, out of which the Sarre district produced about 14 millions, or rather more than 7 per cent. On the other hand, the possession of this coal-field means a great deal to France.

Before the war the total coal output of France was about 42½ million tons, so that the Sarre coal-field will increase the ultimate producing capacity by about 33 per cent. Of the total production nearly 22 million tons came from the Pas-de-Calais district, whilst the Nord district produced nearly 8 millions—about 70 per cent. of the entire production. These two districts have been almost wholly wrecked by the Germans; owing to the configuration of this coal-field, in which the coal-measures are overlain by Secondary, highly water-bearing strata, it was easy to do very serious damage by merely blowing in the watertight shaft linings and thus drowning out the pits; owing, further, to the fact that many of the more important collieries are connected by drifts with each other, recovering merely a few of the shafts or even sinking new ones will not suffice, and practically all the old

shafts will have to be re-lined before production on any reasonable scale of output can be commenced. It cannot be hoped to do this in less than five years.

The Peace Treaty provides that due diligence shall be exercised in the restoration of these mines, but that Germany shall make up any deficiency in French coal output from these areas for ten years, the quantity to be thus delivered not to exceed 20 million tons annually for the first five years, and 8 million tons annually for the next five years. Furthermore, Germany is to supply France with 7 million tons a year for ten years, $4\frac{1}{2}$ to $8\frac{1}{2}$ million tons yearly to Italy, and a certain quantity also to Luxembourg. At the most, however, Germany will not have to provide more than about 32 to 35 million tons a year, or about one-fifth of the output left after the Sarre basin has been handed over. The price to be paid for this coal is to be the German pithead price, provided that such price does not exceed the British pithead price for export coal. Thus, incidentally, the Sankey award has had the result of enabling the Germans to charge our Allies 4*s*. 6*d*. per ton more for coal than they would otherwise have been able to do.

It is possible that Germany may lose a certain amount of her Silesian coal to Poland, but it seems clear that at the worst Germany will retain more than two-thirds of her coal reserves, and, as these were originally about two and a half times our own reserves, and more than half the total coal of all Europe, she is not seriously weakened in this respect, although France is undoubtedly strengthened.

No other minerals are specified in the Peace Treaty, but it is well known that the restoration to France of Alsace and Lorraine will have a profound effect in many respects. First of all France re-enters into possession of the whole of the Lorraine iron-ore fields; the vast deposit of "minette" thus becomes wholly French, with the exception of a small amount within the frontiers of Luxembourg, and, now that the latter country ceases to form part of the German Zollverein, it may be hoped that this ore will be diverted to Belgium, where it ought to go. Before the war Germany produced from the conquered province of Lorraine about 21 million tons of iron ore, or about three-fourths of its total output, so that the loss of Lorraine is for Germany an extremely serious matter. On the other hand, France is tolerably rich in iron ores, and the additional quantity of which she resumes possession will not matter to her very much, except for the fact that she can dispose of her surplus to other nations. Above all, the cardinal fact, which makes for world-peace more than would a dozen Leagues of Nations, is that Germany has no longer the iron-ore supplies with which to manufacture the immense stores of munitions which she would need if she were to commence the next war of which a certain section of Germans is already talking.

Another important point, equally well known, is that, with the rich potash deposits of Alsace in French hands, the German potash monopoly is broken, and the rest of the world is no longer bound to come to her for that important product. Thus it may be said that Germany has lost a large slice of her mineral assets; to maintain her position will need all the industry of her hard-working population, and it is more than ever clear to-day, with the Peace Treaty before us, that the future belongs to that nation which chooses to put in most real, steady, hard work for the next ten years. H. L.

NOTES.

WE announce with profound regret that Lord Rayleigh, whose achievements in many fields of scientific research are familiar to all men of science, and esteemed throughout the world, died on June 30 at seventy-six years of age.

WE record with devout gratitude that the Treaty of Peace between the Allied and Associated Powers and Germany was signed at Versailles on Saturday last, June 28, thus bringing to a close a struggle in which the leading nations of the civilised world have been engaged for a period of nearly five years. The German delegates, in a statement to the Press, declare that they have signed the Treaty without any reservations whatsoever and in the honest intention of carrying out its provisions. They hope, however, that the Entente may in time modify some of the conditions. The return of peace has given rise to great rejoicing throughout the United Kingdom, and in the following message the King expresses the feeling of the people:—"The signing of the Treaty of Peace will be received with deep thankfulness throughout the British Empire. This formal act brings to its concluding stages the terrible war which has devastated Europe and distracted the world. It manifests the victory of the ideals of freedom and liberty, for which we have made untold sacrifices. I share my people's joy and thanksgiving, and earnestly pray that the coming years of peace may bring to them ever-increasing happiness and prosperity." Sunday next has been appointed by Royal proclamation as the day of general thanksgiving, and Saturday, July 19, will be devoted to national rejoicings.

FOLLOWING quickly on the Atlantic flight by heavier-than-air machines, a Service venture, under the control of the Air Ministry, is being made by R34, a machine lighter than air. This airship left East Fortune, Scotland, for Long Island, New York, in the early hours of Wednesday morning, with six officers and 20 N.C.O.'s and airmen, under the command of Major G. H. Scott, and also three officers travelling as passengers. The return journey was to be commenced in a few hours, after replenishing supplies. The distance to a destination near New York is approximately 3000 nautical miles. There will be no attempt to follow a direct route, but the airship will be navigated to secure the best weather conditions and to avoid unfavourable conditions. If the weather proves unfavourable to a westerly crossing, the ship will return to her base in the British Isles. There is a meteorological officer on board who will chart information received by wireless through the Air Ministry. An interesting discussion of the geostrophic winds or gradient winds for June, which give the air-flow practically at about 1000 ft. elevation over parts of the North Atlantic, has been made by

the Meteorological Office. At 50° N. and 25° W. daily observations for twenty-eight years in June show that westerly and south-westerly winds greatly predominate, whilst easterly winds are rare. Similar conditions are shown in 50° N. and 40° W., but north-westerly winds are more frequent than further to the eastward. Wireless reports for several days past published by the Meteorological Office show a great amount of northerly wind, moderate to strong in force, ranging from 10 to 30 nautical miles an hour, and fair weather with a good deal of cloud over the eastern portion of the North Atlantic. Probably better progress would be made in proximity to the 40th parallel than by following the Great Circle track, as lighter head-winds would be experienced on the outward passage.

ON the motion for the third reading of the Dogs Protection Bill in the House of Commons on June 27, its rejection was moved by Sir Watson Cheyne and seconded by Sir Philip Magnus. The ground on which this amendment was based was the "unnecessary and vexatious obstacle to medical research" that would be imposed by it, the delay involved in additional certificates being frequently a matter of great importance. The Minister of Health (Dr. Addison) concurred in this view, and pointed out that there was no breach of faith on the part of the Government in reconsidering its amendment passed at the Report stage. He held that Parliament had no right to stop or needlessly to embarrass such research work as that on rickets. The Bill was rejected, the voting being 62 for the third reading, 101 against.

SIR NORMAN LOCKYER has been elected an associate of the Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique in the section of mathematical and physical sciences.

THE death is announced, on June 27, of Dr. R. Dancer Purefoy, past president of the Royal College of Surgeons, Ireland, and a member of the Royal Irish Academy and the Royal Dublin Society.

SIR JOHN TWEEDY has been asked to deliver the first Thomas Vicary lecture (on anatomy and surgery, instituted by the Barbers' Company) to the Royal College of Surgeons of England. Prof. Elliot Smith and Dr. F. Wood Jones have been appointed by the college Arris and Gale lecturers.

THE death is announced, on July 1, in his seventy-eighth year, of Sir John T. Brunner, Bart., the well-known chemical manufacturer, who was associated with the late Dr. Ludwig Mond in the foundation of the alkali works of Brunner, Mond, and Co. around Northwich, which are now among the largest of their kind in the world.

A SERIES of earthquake shocks caused much injury and loss of life in the districts of Florence and Bologna on June 29. The Exchange Telegraph Co. reports that the Ximenian Observatory at Florence has been greatly damaged; and Father G. Alfani, director of the observatory, states that the shocks are the worst which have been experienced in Italy since 1895.

IT is announced in *Science* that the seismological library of Count F. de Montessus de Ballore, director of the Seismological Service of Chile, has recently been purchased by Dr. J. C. Branner and presented to Stanford University. This is probably one of the most complete collections of seismological literature in existence, and it is accompanied by a manuscript catalogue containing nearly 5000 titles.

THE council of the Royal Society of Arts has awarded the society's silver medal for the following papers read before the society during the past session:—E. C. de Segundo, The Removal of the Residual Fibres from Cotton-seed, and their Value for Non-textile Purposes; Sir Frank Heath, The Government and the Organisation of Scientific Research; W. L. Lorkin, Electric Welding and its Applications; W. N. Boase, Flax: Cultivation, Preparation, Spinning, and Weaving; Lord Montagu of Beaulieu, Aviation as affecting India; and Prof. J. C. McLennan, Science and Industry in Canada.

THE Imperial War Conference, after considering the report of a committee of which Sir James Stevenson, Bart., was chairman, made a recommendation in favour of the constitution of an Imperial Mineral Resources Bureau. This body has now been set up and charged with the duties of collecting information regarding the mineral resources and metal requirements of the Empire, and of advising the various Governments and others concerned from time to time what action might appear to be desirable to enable those resources to be developed and made available to meet the requirements of the Empire. The Governors of the Bureau have been appointed, one by the Home Government (the representative of which is the chairman of the Bureau), one by each of the five self-governing Dominions, one each by the Government of India and the Secretary of State for the Colonies, with six representatives of the mineral, mining, and metal industries appointed by the Minister of Reconstruction after consultation with the principal institutes and institutions representing those industries. The Governors have now received their charter of incorporation, and are engaged in putting into effect their scheme of organisation In order that the Bureau may be able successfully to discharge its functions and issue information of an up-to-date character, the Governors are seeking the closest co-operation and assistance of the various Government Departments, scientific institutions, societies, and other bodies with which the Bureau hopes to be associated. The offices of the Bureau are at 14 Great Smith Street, Westminster, S.W.1, and all communications should be addressed to the secretary.

A REPRINT has recently been issued in booklet form of the article entitled "Patent Law and the Legal Standard of Novelty," first published in the *Engineer* for April 11 last. "Historicus," the author of the article, directs attention to the fact that it was owing to a blunder committed by the Courts in the eighteenth century that the legal standard of novelty was raised from that of the practice of the art to that of absolute novelty within the realm. To this blunder has it been due that upon the shoulders of the inventor has been placed an onus of proof which he is to-day unable to bear. The subject is considered under the following headings:—(1) Is the legal standard of novelty a practicable one from an administrative point of view, or reasonable from the economic one? (2) To what extent can relief be granted from the legal requirement? (3) What modifications would it necessitate in the law and practice of letters patent? The opinion is expressed by "Historicus" that an official examination which would satisfy legal requirements is an administrative impossibility, and, further, that relief from the unduly high standard of novelty prevailing to-day is the primary need of the inventor. Such relief could, it is pointed out, be readily afforded him if the law and practice of letters patent were founded on the assumption that the applicant for protection intended "to make good" at the earliest op-

portunity. If this view found acceptance, the situation could be met by the institution of a preliminary examination limited in nature and extent, but sufficient in character to enable the inventor to approach the capitalist in the first instance with a broad claim for his invention, the title to which could be assured later by carrying out the manufacture of the invention within the realm.

THE controversy on the subject of mother-right which has arisen between Dr. E. Sidney Hartland and some American anthropologists is continued by Mr. R. H. Lowe in the University of California Publications on American Archæology and Ethnology (vol. xvi., No. 2). Dr. Hartland advanced two propositions: first, that normally, and apart from a few exceptions that seem well established, kinship was originally reckoned on one side only; secondly, that descent through the mother regularly preceded descent through the father. The objection raised to the first dogma is that almost uniformly the lowest tribes lack the unilateral mode of reckoning kinship. The second proposition is vigorously contested: the development of patrilinear out of matrilinear descent is denied as ignoring two vital groups of empirical phenomena—the frequent absence of the supposed symptoms among undoubtedly matrilinear peoples, and the enormous extent of borrowing. The matter is still *sub judice*, but the discussion, which is full of interest, may be commended to the notice of all students of sociology.

IN the University of California Publications in American Archæology and Ethnology (vol. xiv., No. 4) Mr. S. A. Barrett gives an elaborate account of a series of rites performed by the Wintun Indians, who formerly occupied a territory lying between the Sacramento River and the crest of the coast range of California. Their culture seems more closely related to that of the Pomo, adjacent on the west, than to that of the Maidu, who are separated from them by their own south-eastern kinsmen. The object of all their ceremonies, but especially that of the Toto and the Hesi, is, primarily, by a series of dances and dramatic performances, to ensure plentiful wild harvests, and, secondarily, to secure the health and general prosperity of the people. The performance of the Toto is believed to assure an abundance of green foods, such as Indian potatoes, by which is meant Brodiœa, Calochortus, and their bulbs, as well as the plants the foliage of which is eaten. The Hesi is thought to produce ripe foods in plenty: grass seeds, manzanita berries, and especially acorns.

IN *Mind* (N.S. 110, April) Mr. H. S. Shelton discusses the syllogism and other logical forms. His aim is to define more clearly than is usually done in textbooks the exact sphere of logic, and to distinguish elements in it which, being of a metaphysical type, are misleading in logical argument. He maintains that in making any deduction three processes are involved:—(*a*) The abstracting from reality the concepts of the aspect with which we are dealing, (*b*) reasoning with regard to these concepts by means of some universal rule, and (*c*) the reference back again to reality of our conclusion. It is only when this last has been completed that we can be sure that our conclusion is materially true. He emphasises strongly that the sphere of deductive reasoning is not the sphere of empirical reality, and so logical conclusions require empirical verification. This view must not, however, be taken to imply that there is no sphere for formal logic; on the contrary, by defining more clearly what it cannot do, we are able to recognise what it can do. It is argued that the fundamental form of deductive reasoning is the syllogism, and that there is a sense in which all deductive reasoning, whether the rough and ready product of ordinary life or the more exact deductions of mathematical science, is and must be formal. In everyday life and ordinary arguments the various elements are so entangled as to obscure the essential characteristics of reasoning, and it is the function of logic to emphasise those aspects likely to be overlooked. The article should prove interesting both to men of science and to logicians.

AN artificial lava-flow, in places 6 ft. thick, was recently formed at a bottle factory in Kinghorn, Fife, by the corrosion of the floor of a tank through the solvent action of the glass. Seventy tons of "metal" were thus liberated, taking five days to cool, and developing, either directly or by contact-action with bricks, an interesting series of rock-forming minerals. The products have been carefully studied by Mr. G. V. Wilson from a petrographic point of view (Journ. Soc. Glass Technology, vol. ii., p. 177, 1918; see also NATURE, May 16, 1918, vol. ci., p. 217). Corundum occurs as a contact-product with bricks rich in alumina, and sillimanite, similarly developed, proves valuable as a protective lining on the bricks, as was pointed out in the discussion following the paper. Oligoclase arose in the absorption-zone between the bricks and the attacking glass, and small bipyramidal crystals of quartz, like those of many rhyolites, separated out in a portion of the glass that was stained violet by manganese and injected into the bricks after the main greenish glass. It is hence inferred that these later injections consolidated below 870°, and questions of temperature are critically considered throughout the paper. Tridymite and wollastonite were the only minerals developed in the general body of the glass, which is held, on account of the absence of pseudo-wollastonite, to have been at no time at a higher temperature than 1200°.

IN Professional Paper No. 17 of the Survey of India, Col. Sir S. G. Burrard makes an important contribution to the theory of isostatic compensation of inequalities in the earth's crust. Hayford in 1909 showed that in the United States this compensation is generally complete, and uniformly distributed in depth down to a uniform depth of about 110 km. But measurements of gravity in the outer Himalayas and in the adjacent alluvial plains of the Gangetic trough have hitherto been regarded as incompatible with the theory of isostasy. One suggestion which has been made to account for this is that in India the geological upheavals have taken place too recently to allow the compensation to be perfected as yet, but the anomalies in gravity seemed to correspond with over-compensation. Sir S. G. Burrard discusses this and other recent views on the subject preparatory to describing his own investigation, in which the novel point is that the excesses and deficiencies of density occurring in the different geological formations of the region are taken into account. In the past the theory of isostasy has been applied only topographically to the excesses and deficiencies of mass visible as mountains and oceans at the earth's surface; the density of the geological formation has not been considered hitherto because the depth to which any particular rock extends is frequently undetermined, so that its total volume and mass are unknown. Sir S. G. Burrard estimates the average depth and width of the Gangetic trough across six different sections, and adopts mean values of the density of the light rock deposits in the trough, including those into which, at no considerable depth, the alluvium is compacted by pressure. The crustal attenuation in the trough, assumed compensated for by denser rocks beneath, according to the isostatic theory, is shown to produce

negative anomalies of gravity over the trough, and positive anomalies on either side of it; these are, in fact, the discrepancies which required explanation. After showing the agreement of the theory with the Himalayan and Gangetic observations, Sir S. G. Burrard similarly discusses the data for other great Indian troughs, and finds further confirmation of the existence of isostasy.

THE Geophysical Journal of the Meteorological Office, or the British meteorological and magnetic year-book, for 1917, recently received, gives daily values of the several elements observed in the British Isles. Data are dealt with for solar radiation, meteorology, atmospheric electricity, terrestrial magnetism, and seismology. Results for the upper air are given for certain stations situated in different parts of the United Kingdom, and nephoscope observations are made at Aberdeen, together with tables showing the occurrences of aurora. The hours of bright sunshine are given for several stations and the percentage of the possible duration; the normal values for some stations are for thirty-five years. Meteorological results comprise pressure, temperature, wind direction and velocity, and precipitation; the values are taken from self-recording instruments. Estimation is made of the cloud amount and the weather. Magnetic data are given for the observatories at Kew and Eskdalemuir (Dumfriesshire). Earth temperatures and the mean level of underground water are given for each day at Kew Observatory. Referring to the anemographs and to the wind factor derived from the revolution of the cups of the anemometers, it is noted that "recent investigations have shown that the correct factor depends on the speed."

A NOTE from the Nela Research Laboratory which appears in the February issue of the Journal of the Franklin Institute deals with the observations of Mr. M. Luckiesh on the influence of temperature on the transmission of a number of commercial coloured glasses. In general, the transmission decreases as the temperature of the glass is raised from 30° C. to 350° C., and in some cases there is a slight change of colour of the light transmitted, which, from the table of results given by the author, appears to be towards the red end of the spectrum. For medium red glass coloured by copper the transmission at 350° C. is 84 per cent. of that at 30° C., for deep red copper glass 42 per cent., and for blue-green copper glass 82 per cent. For pink gold glass, purple manganese, and dull yellow glass it is 90 per cent. or more, while for lemon-yellow glass it is 71 per cent. The cobalt glasses transmit well, deep violet showing no diminution at 350° C., while light blue transmits at 350° C., 8 per cent. more than at 30° C. For a yellowish-green chromium glass the transmission is 67 per cent. only.

MR. HARRY J. POWELL'S paper on glass-making before and during the war, recently read before the Royal Society of Arts, is a valuable summary of the achievements of the British glass trade in the very trying conditions of war. Many new types of manufacture were undertaken by individual firms, and especially in the field opened up by the war, which deprived this country of the different classes of scientific glassware obtained prior to 1914 from Germany. Thanks to assistance from Sir Herbert Jackson and the Institute of Chemistry (who supplied recipes of certain German glasses), this particular branch of the industry has obtained a good start in the direction of rendering our country independent of German supplies in future. The author, however, warned his listeners that Germany (and especially Jena) have probably made progress as well during the war. It therefore behoves British science and the glass industry to cooperate more clearly than in the past; and no doubt the new Institute of Glass Technology at Sheffield University will contribute in no small measure to the attainment of this object.

LICHTENBERG'S dust figures caused by an electric spark were observed for the first time in 1777. Since then they have formed the subject of a long series of investigations. P. O. Pedersen has recently published in English the first part of a detailed examination of the subject (*Det Kgl. Danske Videnskabernes Selskab, Mathematisk-fysiske Meddelelser*, i., 11). In order to obtain pure and simple figures the Lichtenberg gap must be subjected to a very high impulsive voltage of very short duration. The size, shape, and character of the figures are independent of the nature of the plate and the mechanical and physical condition of its surface. They are controlled almost exclusively by the nature and pressure of the surrounding gas. The difference between the positive and negative figures is very striking. The pure negative figure appears as a white disc broken up into separate parts by a number of fine dark radial lines. It is attributed to ionisation by collision produced by electrons moving outwards from the electrode. The positive figures consist of sharply defined stems or trunks with short, well-defined branches or offshoots. It is suggested tentatively that they are due to positive particles moving outwards from the electrode. One difficulty in the way of this view is the fact that the velocity with which the positive figure spreads out from the electrode is two or three times greater than the corresponding velocity for the negative figure. The results already obtained seem to indicate that the elucidation of the formation of the figures will prove of considerable theoretical importance.

ALTHOUGH surveying by means of photography is a comparatively old art, and was actually employed more than twenty-five years ago for mapping some 25,000 square miles in America under conditions that rendered surveying by the usual method quite impossible, it is the recent war that has brought it into prominence, and done more than any other circumstance to demonstrate its advantages. Moreover, the recent methods are new so far as they allow the use of a very high viewpoint, and also the vertical position of the camera, which brings the sensitive plate parallel to the ground, instead of, as is usual, perpendicular to it. New conditions and new desiderata have led to the designing of new forms of cameras, and these we referred to a few weeks ago. But these new conditions have given rise to new problems, many of which were solved during the war, but for obvious reasons are only now getting published. In the *British Journal of Photography* for May 30 there appears a small series of articles on "Calculations in Aerial Photography," by M. L. P. Clerc, the results of which were empoyed by the French Aerial Photographic Service. In these M. Clerc considers "the lowering of the horizon line in photographs taken from high view-points," and gives a diagram which shows the extent of the lowering in mm. for various heights and various focal lengths of the objective. "The estimation of the height of objects by the measurement of their cast shadows in aerial photography" is also accompanied by a chart, in which a series of curves gives the height sought under the various conditions that affect the shadow. "The limit of admissible angling in vertical or horizontal photography" is, as in the other cases, worked out mathematically, and the results expressed in curves on charts for convenience in practice.

THE governing body of the College of Science, University of Calcutta, has expressed a desire that the researches undertaken in the various departments of the college should be published from time to time in the form of memoirs or bulletins. Through the courtesy of Sir Prafulla Chandra Rây, we have received a copy of the first of these memoirs issued by the department of chemistry; it is a volume devoted to the organic thio-compounds. Some of the papers have already appeared in a condensed form in the Journal of the Chemical Society; these have been incorporated with additional matter so as to present a connected account of the thio-compounds which give rise to tautomeric changes and to the formation of polysulphonium derivatives. The author remarks that time alone can show whether there will be a continuity in the regular issue of such memoirs, and warns those who intend to pursue chemistry in India that they must not expect to reap a rich harvest in the near future. For a thousand years or more India has been a *tabula rasa* so far as the cultivation of the physical sciences is concerned. "We in the East have been living in silent and ecstatic meditation." Pioneers in the introduction of Western science have no native tradition to follow up: they must formulate their own schemes and carry them out as best they may. At the same time, the work already turned out by some of the pupils is full of hopeful augury for the future.

MESSRS. DULAU AND CO., LTD. (34 Margaret Street, W.1), are offering for sale (in Catalogue No. 76) some nine hundred works in geology and palæontology, entomology, botany and agriculture, geography and travel. The list contains several scarce items, and long runs of scientific serials, but for the most part it deals with volumes of current interest and value, and the prices asked are most moderate. The catalogue should be seen by anyone wishing to form or add to a science library.

A NOTEWORTHY feature of the latest catalogue (No. 180) of Messrs. W. Heffer and Sons, Ltd., Cambridge, is the Oriental library of the late Dr. A. F. R. Hoernle, of Oxford, comprising more than four hundred items (the Sanskrit portion of the library is not included, being promised for a later catalogue). Other works offered for sale by Messrs. Heffer deal with folk-lore, mythology, and allied subjects; there is also a list of recent purchases in science books, many of which are publications issued abroad. The catalogue is sent free by the publishers upon application.

MR. J. Y. BUCHANAN, F.R.S., is publishing through the *Cambridge University Press* a volume entitled "Accounts Rendered of Work Done and Things Seen." It will comprise some thirty-three papers, mostly dealing with scientific subjects. Among them are several from our columns. Others are "Geography, in its Physical and Economical Relations"; "A Retrospect of Oceanography in the Twenty Years before 1895"; "On a Method of Determining the Specific Gravity of Soluble Salts by Displacement in their own Mother-liquor, and its Application in the Case of Alkaline Halides"; "On the Oxidation of Ferrous Salts"; "Lakes," and "On the Compressibility of Solids." The essays will be printed in their original form. *Messrs. H. K. Lewis and Co., Ltd.*, will shortly issue to subscribers "Sir William Osler's Anniversary Book," which is now in course of preparation by Sir W. Osler's pupils and colleagues numbering about a hundred.

OUR ASTRONOMICAL COLUMN.

NOVA AQUILÆ.—This temporary star, which appeared last year, is slowly pursuing its course of decreasing brightness, and is now about magnitude 6½ or fainter. Observations by Mr. Harold Thomson, in the Journal of the British Astronomical Association for May, give 6·14 as the magnitude on March 28, 6·14 on April 26, 6·37 (the mean of observations with two instruments) on May 22, and 6·64 on May 26. These magnitudes are determined by comparison with the neighbouring star B.D.+0° 4027, the magnitude of which is taken as 6·04. Mr. Thomson adds that the visual spectrum strongly resembles that of Nova Geminorum II. at a similar stage of its career. The continuous spectrum is still visible from about the position of the D line to near Hγ. The brilliance of the nebula line at 5007 is intense. There is at least one bright line remaining of the group near D, which was so conspicuous in the early stages, and bright lines or bands are still visible near 464 and Hγ.

THE PARALLAX OF THE ORION NEBULA.—The distance of this well-known nebula, or rather of the stars associated with it, has been determined both by Prof. Kapteyn and Prof. W. H. Pickering with considerable divergence in its amount. In both cases the results were deduced by a method which is practically comparing the brightness of the stars in question with the brightness of stars of the same types the distances of which are assumed to be known. Prof. Pickering obtained the value 0·0005″, whilst Prof. Kapteyn found 0·0054″. In the April issue of Publications Ast. Soc. Pac. Prof. Pickering attempts to explain this wide discordance by the fact that the same stars of the nebula formation were not used in the two investigations, and that the type of spectrum assigned, and therefore luminosity, were different. He now accepts 0·0020″ as the value of the parallax, and considers this to be a maximum value.

PLANETARY NEBULÆ.—The 60-in. reflector of the Mount Wilson Observatory is being used by Mr. van Maanen for the determination of stellar parallaxes photographically by the usual method relative to comparison stars. Mr. van Maanen is specially finding the parallaxes of nebulæ, and the distances of six of the planetary class have lately been published (communication to the National Academy of Science, No. 56, reprint). The absolute parallaxes of the central stars range from 0·008″ to 0·023″, and, the photographic magnitudes having been derived, it is possible to determine the absolute magnitudes, the mean of which for the six nebulæ is +9·1. This faint absolute magnitude is noteworthy because the spectra of these objects consist in many cases of bright lines, whereas with the stars in general bright-line spectra are usually associated with high luminosities, some Wolf-Rayet stars, for instance, the spectra of which resemble those of planetary nebulæ in some respects, having been found to have a mean absolute magnitude not far from 0. The linear dimensions of these objects can obviously be found from their measured angular diameters, and the major axis of the largest of the six, N.G.C. 6720, is given by Mr. van Maanen as 10,000 astronomical units, and the smallest, N.G.C. 7662, as 1350 units, which may be compared with the orbit of Neptune, the diameter of which is 60 astronomical units. It is to be noted that in the new General Catalogue these six objects are not described as planetary in every case, the two above-mentioned being in the annular class.

MEDICAL SCIENCE IN THE WAR.

SIR ANTHONY BOWLBY, at the annual general meeting of the Research Defence Society on June 26, gave an admirable little address on "Experimental Medicine and the Sick and Wounded in the War." He spoke with authority; there is no surgeon with more right to do that. But, of course, he could not do more than touch points here and there of the great subject. He took for these points typhoid, tetanus, gas-gangrene, dysentery, and trench-fever, and he began with this praise of our Army: that it had been the healthiest Army in the war, partly because "the average Briton is naturally a cleanly animal," partly because the British soldier understands a reasonable explanation, and is guided by it in daily life, and partly because our Army Medical Service, "a body of men unequalled in any other country on the face of the globe," was constantly lecturing to the combatant officers, who in their turn instructed their men in the ways of health. So it came to pass that the amount of "sick wastage" in our Army was kept low; and that is how the war was won.

If that were all, or anything like all, there would be some excuse for the foolish people who say that the health of our Army was safeguarded, not by experimental medicine, but by "ordinary sanitation." But, as Sir Anthony said, "the hygiene of to-day is based upon the experimental medicine of yesterday." It was hygiene to protect our men against typhoid and our wounded men against tetanus; but it came out of the experimental work of Nicolaier, Wright, and others; there was no possible way but that, if it was ever to come. He reminded his hearers of the vivid contrast early in the war between the British Expeditionary Force and the French Army; how France, to save herself, had to send out her Army unprotected against typhoid; there was no time to protect them; "the result was that between August 1 and April they had as many as 60,000 cases of enteric." He might have added the not less remarkable results of the protective treatment later in the war against paratyphoid.

Next, Sir Anthony spoke of tetanus. We all remember how, in the first months of the war, our national anxiety for our men was heightened by the dreadful news that there was a great deal of tetanus among the wounded:—"At the beginning of the war in France we had a truly terrible attack of tetanus among our wounded. Everybody was surprised and alarmed. The prevalence of the disease had not been anticipated, and consequently there was no prophylactic serum in proportion to the number of troops. We could not suddenly supply them with preventive doses of serum. It had to be made. We obtained all the supplies we could get from America, but it took time. In August, September, and October, 1914, our troops were to a great extent uninoculated, and the result was an appalling amount of tetanus. Shortly afterwards almost every man was able to be inoculated. The ratio of the number of cases of tetanus to the number of wounded was about six times as high in September, 1914, as it was in November, and nine times as high as it was in December of the same year."

Sir Anthony spoke also of experimental medicine in relation to the study and treatment of gas-gangrene and of dysentery, and he and Capt. Walter Elliot (who seconded a vote of thanks to him) spoke of trench-fever and of those memorable experiments on self, by British and American volunteers, which proved the transmission of trench-fever by lice, and made it possible to bring down "by leaps and bounds" the evil done by the disease. Strange to think, with these facts before us, that there are so many people who still belong to "anti-vivisection" societies.

EXPERIMENTAL STUDIES OF SELECTION.

MR. A. STURTEVANT has experimented (Publication 264, Carnegie Institution of Washington, 1918, pp. 1–68, 1 plate) with a mutant race of the fruit-fly, *Drosophila melanogaster* (*ampelophila*), with the particular object of determining the effects of selection. The mutant character in question is known as Dichæt; it appeared in 1915 in a single female which had wings extended and bent backwards near the base, and with only two dorso-central bristles instead of the usual four. This "Dichæt" character behaves as a dominant, and it appears that the factor or gene corresponding with it is located "in the third chromosome, approximately five units to the left of pink." Dichæt-flies are more variable in bristle-number than are non-Dichæts. The variability is partly environmental, partly genetic.

Selection is generally admitted to be capable of effecting change, either gradually or suddenly, in the mean character of a mixed race, but if this be granted a number of questions arise. *Does selection use germinal differences that are already present, or differences that arise during the experiment?* To this the author answers that selection produces its effects chiefly through isolation of factors already present, though occasionally available mutations do arise in the course of the experiment. *But if selection uses new differences, does it cause them to occur more frequently, and does it influence their direction?* To this the author answers that there are no available data warranting an affirmative answer.

What selection does is to isolate genetic differences already present. The experiments made on the Dichæt-fly go to show that genes are relatively stable, not being contaminated in heterozygotes, and mutating only very rarely. There is strong confirmation of the multiple-factor view that characters may be influenced by more than one pair of genes. There are genes that modify other genes, but there is no experimental evidence that allelomorphs present in the heterozygote may influence or "contaminate" each other, so that they do not come out unchanged. The general outcome of Mr. Sturtevant's elaborate investigation is to lead us to believe that the chief *rôle* of selection is in isolating favourable combinations of genes.

FUNGUS DISEASES OF ECONOMIC PLANTS.

OTTO A. REINKING (*Philippine Journal of Science*, vol. xiii., section A, July, 1918) supplies a list of fungus diseases of Philippine economic plants which will be of value to plant-growers in other tropical areas. The warmth and moisture of the climate account for the great number and destructiveness of these diseases during the wetter months of the year, and Mr. Reinking estimates that in the province in which he is specially interested at least 10 per cent. of agricultural crops are destroyed by fungi. The great factors in the spread and destructiveness of fungi are the lack of proper culture, of sanitation, of pruning, and of spraying. Many of the plants concerned are widely cultivated in the tropics, and the paper has been written in order to give some idea of the prevalence of plant diseases, their causes, mode of attack, plant hosts, the amount of damage, and also the methods of control. Many of the diseases are due to fungus species new to science. The account is illustrated by twenty-two plates and forty-three text-figures.

Under the title "Seedling Diseases of Conifers" (*Journal of Agricultural Research*, Washington, D.C.,

vol. xv., December, 1918), Carl Hartley, T. C. Merrill, and Arthur S. Rhoads have made a valuable contribution to the study of forest pathology. Damping-off is the most serious disease of very young seedling conifers, and several types of the disease are described. In addition to the well-known *Pythium debaryanum* and *Corticium vagum*, species of Fusarium and *Botrytis cinerea* have been isolated from affected seedlings, and are believed to be able to cause the disease. Artificial cultures of the fungus indicated a marked difference in virulence between different strains, which bears little or no relation to the host from which the strain was isolated. Thus strains from spruce and sugar-beet respectively proved more virulent in inoculations on pine seedlings than did any of the strains originally isolated from pine. Losses often wrongly attributed to poor seed are caused by the fungus killing the seed or the seedling before it appears above soil; and some of the damping-off fungi may continue to kill the roots of seedlings after they develop rigid stems, so that the plant does not fall over. The latter type of trouble is sometimes confused with damage caused by excessive heat or dryness of soil.

In the Memoirs of the Department of Agriculture in India (Botanical Series, vol. ix., November, 1918) W. McRae gives a detailed account of a new fungus disease (*Phytophthora meadii*) of a rubber plant, *Hevea brasiliensis*. This species of Hevea is now being extensively grown in the south-western region of the Indian peninsula. The most striking symptoms of the disease are the rotting of the fruit and the wilting and abnormal shedding of the leaves. Mr. McRae describes the external symptoms and the microscopic characters of the affected tissues, and also his experiments on inoculation; the structure and the life-history of the fungus are also fully described. The resting spores of the fungus are found in the fruits of the plant, and as the fruits are therefore the chief means of propagating the disease, the possibility is suggested of the destruction of the flowers in order to prevent the formation of fruit. This might be done by mechanically removing the flowers or by spraying them with a chemical that would kill them, but up to the present neither of these means has been found practicable.

THE FISHERIES AND THE INTERNATIONAL COUNCIL.[1]

I.

IN former communications[2] it was shown how insignificant is the influence of man in affecting the plants, such as seaweeds and diatoms, abounding in the sea, and how little he can influence the lower marine animals, from microscopic elementary forms, through sponges, zoophytes, starfishes, annelids, shellfishes, and cuttlefishes, up to fishes. It was further demonstrated in 1898 that the closure of the experimental areas (Forth, St. Andrews Bay, and Aberdeen Bay) had not affected the food-fishes, either as regards increase or diminution in numbers or size. Now it may be asked: Where have the melancholy anticipations of the pessimists been demonstrated; where has the serious diminution of any food-fish occurred; and where have the principles enunciated in "The Resources of the Sea" been traversed by the International Fisheries Council, the most extensive, and certainly the most expensive, combination of fisheries authorities the world has seen, which owed its existence to opinions (viz. those of the impoverishment theory) diametrically opposed to those of "The Resources of the Sea"?

In the lectures at the Royal Institution in 1907 the uncertainty of the Fishery Board for Scotland in connection with the further closures than those remitted to it was pointed out, for it had oscillated between an increase and a diminution of fishes in the experimental areas, and its own statistics in subsequent years proved the safety of the Scottish fisheries, which have been dealt with elsewhere up to 1912, when they were reviewed at the Dundee meeting of the British Association. No voice at that meeting was raised in support of the impoverishment of the sea, though Dr. Petersen, Dr. Mortensen, and Prof. Jungarsen from Copenhagen, and others specially interested were present. Indeed, Prof. Hulrecht, of Utrecht, also present, strongly supported "The Resources of the Sea," and stated that Prof. Huxley held the same views. Since 1912 similar prosperous records have been annually published by the Scottish Board up to 1913, the last year unaffected by the war, when the climax was reached, the value of the catch of fishes being no less than 3,997,717*l.* (or only 2283*l.* less than four millions), the highest value yet attained in the fisheries of Scotland, though the catch of herrings that year had been 758,756 cwt. below that of the previous one.

The same cause for satisfaction exists after a perusal of the captures, year by year, in such a bay as St. Andrews, where they have been under observation for at least half a century, and in which the pulse of the North Sea is felt day by day and month by month each season, with perhaps varying regularity, producing its fishes in greater or less abundance.

Before going into the results of the costly international scheme, it may be well to recall the remit made to the Council of that body. It was, in the first place, to benefit the British fisheries, to clear up the discrepancies between "The Resources of the Sea" and "The Impoverishment of the Sea"—in the words of Prof. Garstang: "It was the problem of all problems whether the conclusions in this book ['The Resources of the Sea'] were well or inadequately founded." The Council had also to ascertain "whether the quantity and consumption of fish taken from the North Sea and neighbourhood are in proper proportion to the production occurring under the prevailing natural conditions, and whether any disproportion between production and consumption arises from a local over-fishing or from an injudicious employment of the fishing apparatus at present in use." The flat-fish grounds were also to be investigated; annual results published; discoveries of practical importance to the fisheries made, such as "discovering the limit to which fishing grounds can be depleted without undergoing serious injury"; and, finally, recommendations for international action proposed. This formidable remit was, moreover, burdened by a heavy load of hydrographical, physical, chemical, and meteorological observations. Yet some members of the Council guaranteed results for international action within two years—a fact which demonstrates how little the situation was understood.

The earlier work of the International Council was dealt with on a former occasion, and since then the following gives a brief note of its labours:—

Reports on the quantitative distribution of the eggs and larvæ of the cod tribe and of the sardine and anchovy in the North Sea have been given by Hoek; on young salmon by Arwidsson; on the cod by Hoek; on the herring by Hjort and Lea; on the eel by Schneider; and on the mackerel by Nilsson, all containing additions to our knowledge, though they do not bear on the main question submitted to the International Council for solution. The Council was likewise

[1] From a lecture given in Aberdeen on March 4 by Prof. McIntosh, F.R.S.

[2] NATURE, vol. lxxvi., p. 301, 1907.

concerned about the capture of full-sized herrings by the ordinary trawl in daylight. A useful summary of the present knowledge of the mackerel fishery in Denmark, Sweden, Norway, Holland, Germany, Scotland, England, Ireland, France, Southern Europe, and the North-West Atlantic came from Ehrenbaum, the usual variations occurring throughout. This variability was further emphasised by Dr. Hugh Smith, of the United States, in the decline of the fishery there from 500,000 barrels in 1885 to 3000 in 1910; yet it had not been proved that the fishes had migrated to other grounds, such as western Europe, or had been decimated by the purse-seines.[3] Moreover, a similar experience had been met with in Norway.

As the oft-repeated statements concerning the diminution of the flat-fishes (Pleuronectids) had attracted public notice, the Council devoted a large amount of attention to this group. Thus Ehrenbaum, in two papers, took in hand the early stages from the eggs onwards, and their occurrence according to the months of the year; whilst Johansen discussed them in relation to the North Sea generally, a certain amount of duplication taking place. Ehrenbaum's first paper, perhaps, was the less important, for the subject had in many respects been dealt with previously. In his second paper he groups the pelagic eggs according to the presence or absence of an oil-globule, and appends two plates, the figures on which had, for the most part, been published by other authors. Hefford describes the proportional distribution of plaice in the North Sea, males slightly preponderating in small plaice, whereas in the larger forms females are in the majority, yet in the breeding season in the south (December to February) the catch of males by trawlers greatly exceeds that of females. Masterman's three reports on the late stages of the flat-fishes give much important information and noteworthy recommendations, but there is no indication of a serious diminution of any form. On the other hand, Johansen considers that the average weight of plaice in the Danish region of the North Sea has distinctly decreased since 1888—a different finding from a much longer experience in St. Andrews Bay. Heincke (1913) is of opinion that the Danish and German investigations show a deterioration of the stock of plaice, and that, apart from over-fishing, the destruction of small plaice is in itself sufficient to render protective measures desirable. He has not, however, proved that the small plaice are reduced in number—a vital point—and this though he states that 300,000,000 are annually destroyed, irrespective of the capture of plaice from two to thirty years old for sale, only 10 per cent. of which have produced eggs. He therefore proposes the sole legislative measures which the sixteen years' costly labours of the Council have produced, viz.: (1) Protection of the young plaice; (2) closed areas and seasons; and (3) a size-limit. The revival of the old size-limit is interesting, but its application is more than doubtful, especially when Heincke cannot prove definitely that plaice have diminished. Redeke concludes with an account of the local forms of plaice in Danish waters.

The Council has, indeed, expended a great amount of labour on the plaice, and it is no lack of sympathy with the various authors of the memoirs which prompts the statement that no trustworthy conclusion as to its serious diminution can be drawn from them, and they are in some respects duplicated. No author can definitely assert that the plaice is on the road to extinction. It is said that evidence to the effect that the diminution of the plaice "was already made clear to the House of Commons in 1803, and that all authorities are agreed that this fish shows serious diminution." But the statistics of the Fishery Board on which I and others relied in 1893 were found by a more stringent examination to be in need of modification, and in the history of the fisheries the plaice, as already mentioned, has of old been the subject of pessimistic views, just as those accounting for the absence of large plaice in inshore shallow waters—by over-fishing—rest on a misapprehension of the life-history of the species. The conjectures that only 10 per cent. of the captured adults have produced eggs, and that the removal of 20 to 40 per cent. from the North Sea annually is too great a loss to be compensated by natural means, are not the clear facts demanded by science and the State. Plaice have been taken from the North Sea from time immemorial, and yet are distributed to-day over its entire area, whilst their tiny young swarm on every suitable sandy or muddy beach. Though it is to be regretted that the destruction of the small plaice crowding on the sandy flats of the Continental shores still goes on, yet there is no marked diminution in their numbers. Heincke's suggestions for the protection of the young are of doubtful practical utility; besides, as Masterman says, why confine legislation to the plaice when the other flat-fishes are likewise supposed to be in need, and the round-fishes have an equal claim? Perhaps the pressure brought to bear on the Council to produce, after its lengthened labours, something tangible in the way of legislative recommendations may have had some connection with this step.

In "The Analysis and Review of the English Plaice-marking Experiments," published in 1916 by the Board of Agriculture and Fisheries, less ambitious views were promulgated, though it was thought that the transplantation of plaice on a commercial scale might yield a profit. Many important papers have been issued by the English Board, such as Masterman's report on the plaice fisheries of the North Sea, and the age, growth, and sexual maturity of this fish; Todd on the food of the plaice; Buchanan Wollaston on the spawning grounds of the plaice; Wallace on the age and growth-rate of the plaice, on the ear-bones, and on the size and age of the plaice at maturity; whilst others by Booley, Lee and Atkinson, Garstang, Bygrave, and Matthews show the scientific zeal of the Board's staff. The excellent work in marine zoology and in the fisheries which for more than thirty years has been carried on by the Marine Biological Association at Plymouth likewise speaks for itself.

The work of the northern section, as undertaken by the Fishery Board for Scotland, has also been reviewed up to 1907 in the second lecture at the Royal Institution. It was shown that, as a result of Hjort's discovery of vast swarms of young Gadoids from Jan Meyen southwards, there was little need for surprise at the immense hordes of young haddocks which, as last year, swarmed all along the east coast of Scotland, and as little need for doubting the resources of Nature in the sea.

Johs. Schmidt gives valuable information on the young stages of the cod tribe, of the lings, halibut, long rough dab, and the torsk, and, along with Petersen, describes the spawning ground of the eel in mid-Atlantic. H. M. Kyle produces two papers on the literature of the ten principal food-fishes of the North Sea and a catalogue of the fishes of northern Europe. Jensen (Norway) writes on the ear-bones of fishes from the bottom of the deep polar sea, and shows that cod may frequent the upper regions of the water and thus be overlooked. Johansen describes the history of the post-larval eel, and Petersen writes on the larval and post-larval stages of the ling, flat-fishes, eel, and on the fisheries of the Cattegat and Sweden. On the whole, the papers on the young stages of the

[3] This fishery has now largely improved.

food-fishes (with the exception of Schmidt and Petersen on the eel) do not show much that is novel, for most of these had long before been worked out from the egg to a recognisable stage in Scotland.

The third report of the northern section consists of a series of statistical tables of the round fishes from the Aberdeen trawl fishery, 1901–6, and a report of the fluctuations in the market price of fishes (Prof. D'Arcy Thompson). No conclusion is arrived at in regard to abundance or scarcity. The fourth report (1906–8) states that recent work has greatly added to our knowledge, "though without bringing us within reach of a clear statement and comprehension of the whole case," and this though results were guaranteed within two years. The report includes hydrographical investigations in the North Sea and Faröe-Shetland Channel, temperatures of the surface waters of the North Sea, salinity of the North Sea, and experiments with drift-bottles. The fifth report contains observations on the plaice caught by the *Goldseeker*, supplemented by statistics from the Aberdeen market, by the same author. It is stated that large plaice have diminished by two-thirds between 1905 and 1911, whilst the landings of extra small plaice (8 in.) have increased threefold. No explanation is given as to whether the ship worked on adult plaice grounds, or whether those in the fish market represented with any degree of trustworthiness the corresponding work of the earlier period; nor is it explained that the smaller forms are now saleable, whereas formerly they were not. In any case, the removal of the larger plaice by intensive fishing is the rule, but the gaps thus made are filled later by the swarms of the smaller. Besides, it is not stated that the search for the large plaice was in the same or similar areas and on the corresponding dates in each period. As already indicated, the wide distribution of the plaice over the North Sea is a safeguard. An able report by Dr. Fulton on the seasonal abundance of the flat-fishes in the North Sea follows. He concludes that turbot and brill are scarcer, halibut more numerous, large witches fewer, small witches less diminished, megrims less numerous, lemon-dabs (the decrease of which twenty years ago was a mainstay of impoverishment) have increased, plaice have decreased, yet off Kinnaird Head, a chief trawling area, small plaice have rather increased, though less so than small lemon-dabs and witches. An interesting and laborious report is given by the same author on the marking of plaice in connection with their migration, growth, and other features. The adult plaice seemed to travel further than the immature, and often against the current from the north, so that he was inclined to connect this with their reproduction, the eggs and larvæ being thus carried southwards; but such may be capable of other interpretations. At any rate, large plaice occur all along the eastern deep waters, and produce eggs and larvæ which pass shorewards there. Other papers are on egg-production of numerous fishes by Miss A. Mitchell, statistics of trawled fishes landed at Aberdeen, and a report on hydrographical investigations (1913). The fishery statistics of the world for 1911 and 1912 were given by Prof. D'Arcy Thompson in 1917. though the relation of this compilation to the task set before the International Council is not evident. The main fact is the prominence of Great Britain amongst the twelve countries selected. The preponderance of the total catch of fishes, moreover, in the North Sea is noteworthy, and bears out H. M. Kyle's view that there has been no diminution in the yield of the North Sea between 1907 and 1912. It would have been interesting to compare these with the fisheries of the United States and of the great British Colonies of Canada, Australia, and New Zealand. Other statistical papers, such as those on the Aberdeen trawl industry, by the same author, and by Helland-Hansen on the cod and haddock, need only be mentioned. They do not affect the general question.

The work of the trained scientific staff of the Fishery Board for Scotland, again, and independently of the International Council, has for many years been worthy of all praise. The researches of Dr. Fulton on the plaice and other flat-fishes, on the rate of growth and the food of fishes, their migrations, distribution, fecundity, ovarian eggs, and spawning, are both numerous and important. His reports on trawling, line fishing, herring fishing, and on the hatchery at Nigg still further add to our knowledge. The able work of Dr. H. C. Williamson is also equally creditable to the Board, and ranges over the various food-fishes, adult and young, edible crabs and shell-fishes, as well as includes interesting experiments on the effect of cold in connection with the transportation of fishes' eggs to distant regions, such as Australia. Dr. Thomas Scott ably took in hand the floating fauna, crustacean and annelidan parasites of fishes, the food of marine fishes, and the fauna of fresh-water lochs. Mr. Harold Dannerig managed the hatchery at Dunbar, and for a few years that at Nigg, until he left for an important fishery post in New South Wales; but, unfortunately, this trained fisheries worker perished with the fishery research ship of the Commonwealth. Besides these, the talented George Brook, Prof. Milroy, of Belfast, Dr. H. M. Kyle, J. T. Cunningham, Dr. A. G. Anderson, Mr. E. W. Shann, and Dr. Bowman have all contributed to our knowledge of the fisheries.

In addition to the international work, the Danish Government carried out, by means of its vessel *Thor*, various independent observations. Thus Johansen (1907) marked numerous plaice, and found that growth was most rapid up to the third year, but on approaching maturity it was slower. He thought adult plaice sought the shallow water in spring and autumn (which has not been verified as yet in Britain), and that their rate of progress was from two to six miles a day. Johannes Schmidt, again, marked many cod in Icelandic waters, where they spawn chiefly off the south and south-west coasts in warmer water, for a polar current keeps the north and north-east shores cold through the year. In summer a branch of the warm current moves eastwards along the north coast, and he thinks it is important for young fish-life, since the young swarm in the fjords of the north and north-east, yet they pass the winter there, notwithstanding the temperature. He was of opinion that the mature plaice, which he also marked, migrated to reach warmer water for spawning, but he was uncertain of this in regard to the cod. He concluded by supposing that at the spawning period fishes generally require definite conditions of temperature and depth, whilst at other times they are indifferent to these. The same author describes the larval stages of various fishes, as also did C. J. Petersen. Semundsen (1913), from marking experiments, thought that both plaice and cod kept to Icelandic waters. Changes in the specific gravity of the floating eggs are noted by Jacobson and Johansen (1909); the latter also contributed several papers on the plaice, such as variations in the frequency of young plaice in Danish waters (1908). He could not say definitely that a low salinity of surface water caused a deficiency of young plaice in 1904, and is not sure but that a low temperature might be prejudicial to eggs and young. Papers of outstanding merit are contributed by Johs. Schmidt on the metamorphosis and distribution of the larvæ of the eel, on the occurrence of young eels (Leptocephali) in the Atlantic west of Europe, and on the distribution and classification of fresh-water eels

in the Atlantic; and this able author's experiences range to the marking of turtles in the West Indies. He also furnished an account of the European, American, and Japanese eels. Finding no racial differences in the common eel, he selected the viviparous blenny to illustrate this feature, those in the inner waters of a fjord having a reduced number of vertebræ, and the number of the rays in the breast-fin being increased from the mouth to the inner waters of the fjord. Kramp, again, reported on the eggs and larvæ of common fishes collected by the *Thor* in the Belt Sea. Wingo (1915) regards locality as a factor in determining the value of the rings on the scales of the cod, and is of opinion that there is no great distinction between summer and winter rings, whether the examples come from Danish or Icelandic seas. Struberg (1916), by marking experiments at the Faröes, found that the cod at the end of the first year were 16 cm. (about 6½ in.) long, at the end of the second year 30–35 cm. (about 12–14 in.), at the end of the third year 15 cm. (6 in.) longer, and the weight doubled and quadrupled; at the end of the fifth year an increment of only 5–6 cm. took place. The growth in all was distinctly retarded between October and January, but this varied according to locality. The cod remain in the neighbourhood, undergo no great migration, and reach maturity at the fourth year.

This work of the Danes is an example to the theoretical workers in other countries, since the zoologists were personally in touch with the sea and searched Nature for themselves; and it would appear that, by the skilful adjustment of the resources of a single nation, more satisfactory advances might be made than by any other means. Even international co-operation has its limits.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BRISTOL.—With the concurrence of the Society of Merchant Venturers, the council has appointed Major Andrew Robertson to the vacant chair of mechanical engineering. Prof. Robertson was demonstrator in engineering in the University of Manchester from 1908 to 1912; Vulcan research fellow, 1912–15; lieutenant in the R.N.V.R., 1915, and for some time has been head of the mechanical testing laboratory for the R.A.F. at Farnborough. The present occupant of the chair, Prof. J. Munro, has been granted the title of emeritus professor in mechanical engineering.

GLASGOW.—The following were among the degrees conferred on June 25:—*Doctor of Laws (LL.D.)*: The Very Rev. Principal Sir John Herkless, St. Andrews; Prof. Magnus Maclean, the Royal Technical College, Glasgow; and H. F. Stockdale, director of the Royal Technical College, Glasgow. *Doctor of Philosophy (D.Phil.)*: J. W. Scott—thesis, "Recent Philosophy and Recent Social Movements." *Doctor of Science (D.Sc.)*: W. M. Alexander—thesis, "A Research in Egyptology: The Ancient Egyptian Canals between the Mediterranean and the Red Sea, their Problems for the Sciences of Geology, Geography, Engineering, and History"; J. M. Campbell—thesis, "Laterite: Its Origin, Structure, and Minerals"; W. J. Goudie—thesis, "Steam Turbines (Text-book for Engineering Students)," with other papers; I. M. Heilbron—thesis, "A Contribution to the Study of Semi-carbazones: Their Reactions and Spectrographic Examination," with other papers; R. G. A. Holmes—thesis, "Design and Construction of H.M.S. *Argus*"; and H. G. Wigg—thesis, "The Balancing of Rotating Bodies."

LONDON.—Mr. Thomas Baillie Johnston has been appointed the first incumbent of the University chair of anatomy tenable at Guy's Hospital Medical School. Mr. Johnston received his medical training at the University of Edinburgh, graduating M.B., Ch.B., with First Class honours. In 1907 he was appointed demonstrator, and in 1911 lecturer, in anatomy at Edinburgh University. Since 1914 he has been lecturer on anatomy at University College, London, and has also acted as superintendent of dissections to the Conjoint Board.

Dr. Alfred Joseph Clark has been appointed, as from September 1, 1919, to the University chair of pharmacology tenable at University College. Dr. Clark was educated at King's College, Cambridge, and at St. Bartholomew's Hospital; was demonstrator in pharmacology at King's College, 1911–12; assistant in pharmacology at University College, 1912–13; and lecturer in pharmacology at Guy's Hospital, 1913–14. Since December, 1918, he has been professor of pharmacology in the University of Cape Town.

The following doctorates have been conferred by the Senate:—*D.Sc. (Engineering)*: Mr. O. S. Sinnatt, an internal student of King's College, for a thesis entitled "Thermo-dynamics of Metal Bars." *D.Sc. in Physics*: Mr. F. L. Hopwood, an external student, for a thesis on acoustics.

The thanks of the Senate have been accorded to Mrs. Row for her donation of 1000*l.* for the department of zoology at King's College in memory of her son, Harold Row, who was lecturer in zoology at the College from 1911–19. The income from this donation is to be devoted to the purposes of a scholarship for the promotion of zoological research, to be called "The Harold Row Scholarship."

The syllabuses for the Intermediate Science Examination for external students were approved as alternative syllabuses for the Higher School Examination, and resolutions were passed regarding the award of the higher school certificates.

MR. W. ELLIOTT has been appointed principal of the Technical Institute, Rathmines, Dublin, in succession to the late Mr. A. Williamson.

THE U.S. General Education Board has, says *Science*, made a grant of 100,000*l.* towards a fund of 400,000*l.* to be raised to endow a graduate school of education for Harvard University. The new fund will be named in honour of Dr. Charles W. Eliot, president emeritus of Harvard University.

MR. J. B. ROBERTSON, assistant in the chemistry department, University of Edinburgh, has been appointed lecturer in chemistry in the South African School of Mines, Johannesburg. Mr. A. E. Walden, also an assistant in the same department, has been appointed professor of chemistry in the Wilson College, Bombay.

Two scholarships of the value of 150*l.* per annum each, and tenable for three years, will be offered by the Institution of Naval Architects this summer, viz. the Cammell Laird scholarship in naval architecture and the Parsons scholarship in marine engineering. Candidates must be British apprentices in shipyard or marine-engine works, between the ages of nineteen and twenty-five. Entries close on August 11. Full particulars can be obtained from the Secretary, Institution of Naval Architects, 5 Adelphi Terrace, London, W.C.2.

THE Gilchrist Trustees offer, through the council of the London (Royal Free Hospital) School of Medicine for Women, a special scholarship tenable at the Medical School by a woman who has served under an organisation directly connected with the war during not less than three years since August, 1914. The

scholarship is of the value of 50*l.* per annum for five years. Applications must reach the Warden and Secretary of the Medical School, 8 Hunter Street, Brunswick Square, W.C.1, not later than July 12.

WE learn from *Science* that the Washington School of Medicine, St. Louis, has been offered the sum of 30,000*l.* by the General Education Board on condition that an equal amount be raised by subscription. This fund of 60,000*l.* is to be used for the endowment of the department of pharmacology. From the same source we learn that the board of trustees of the University of Tennessee have voted 20,000*l.* to the medical school to be used for a new laboratory building to be erected in the rear of the Memphis City Hospital. The new building will have laboratories for pathology, bacteriology, chemistry, and physiology.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 19.—Sir J. J. Thomson, president, in the chair.—The Hon. R. J. **Strutt**: Bakerian lecture: A study of the line-spectrum of sodium as excited by fluorescence. An improved form of sodium vapour lamp, in quartz, was described, giving an intensely bright sodium spectrum, admirably adapted for exciting sodium vapour to resonance. It is found that excitation of sodium vapour by the second line of the principal series leads to the emission of both λ 3303 and the D line. On the other hand, as might be expected, excitation by the D line leads to the emission of the D line only, without 3303. If only one of the components of the doublet 3303 is stimulated, both the D lines are emitted. When D light falls on sodium vapour of appropriate density, it is known that an intense surface emission occurs from the front layer, and a weaker one from succeeding layers. Analysis by absorption in an independent layer of sodium vapour shows that the superficial emission is more absorbable, and therefore nearer the centre of the D lines. The breadth of the D lines in superficial resonance has been estimated by interferometer methods. It is found to correspond with the breadth conditioned by the Doppler effect, calculated on the assumption that the luminous centre is the sodium atom. Polarisation could not be detected in the ultra-violet resonance radiation, though, in accordance with previous observers, it was readily observed in D resonance.

Mineralogical Society, June 17.—Dr. A. E. H. Tutton, past-president, in the chair. A. E. **Kitson**: Diamonds from the Gold Coast. The crystals and their occurrence were described.—A. **Brammall**: Andalusite (chiastolite): its genesis, morphology, and inclusions. In a survey of thermometamorphic "spotted" rocks, evidence based on structural features, optical properties, and microchemical reactions is adduced to show that certain types of spots, convergent towards such minerals as chiastolite, andalusite, cordierite, mica, and chloritoid, record arrested development, and that they are probably ontogenetically related. The spot is a complex system containing a volatile phase, water, and its development involves metamorphic diffusion and differentiation, controlled by changing conditions of temperature and stress, the tendency being towards the attainment of an equilibrium end-point in a metastable mineral. Thermal and stress conditions adequate to initiate the tendency may be inadequate to sustain it, the time factor also being involved; development may be arrested and abortive effort recorded as a mineral "spot," the nature of which is determinable, but is often vague or wholly conjectural. The chemical and physical characters of argillaceous sediments are considered, with special reference to the genesis of chiastolite. Clays contain a high proportion of hydrated silicates of alumina, readily soluble and in part probably colloidal. On rise of temperature diffusion effects the segregation of the primary clot; diffusion inwards of allied molecules and diffusion outwards of alien substances tend to promote homogeneity and reconstitution within the spot, the peripheral zone being maintained for a time in a relatively high state of hydration. In this connection the peripheral zone of yellow-brown, non-pleochroic, and isotropic stain is significant; microchemical tests show that it is due to ferric hydrates, which are known to be liable to spontaneous dehydration, and it is suggested that the ferric hydrate in the peripheral stain acts as a catalyst, assisting dehydration within the spot and transmitting water to the base. For chiastolite (andalusite), a mechanism of formation is suggested to cover the observed facts, to explain the characteristic distribution of its opaque inclusions, and to account for crystals which have the superficial aspect of cruciform twins.—R. H. **Rastall**: The mineral composition of oolitic ironstones. In many oolitic ironstones the ooliths contain more iron or are more highly oxidised than the matrix. Assuming that the iron-content of such rocks is introduced by metasomatism of calcium carbonate, this may be explained in the following way: Many ooliths and organic fragments in limestones consist of aragonite, while the cement is calcite. Aragonite is less stable than calcite and more readily decomposed by iron-bearing solutions, which therefore attack the aragonite first, while the calcite is replaced later. Hence we have the following scheme in successive stages:—

Ooliths. aragonite → chalybite → limonite.
Matrix. calcite — calcite → chalybite.

The ooliths are always a stage ahead of the matrix in replacement and oxidation. The origin of the green silicate of iron, found in many ironstones, requires further investigation.—L. J. **Spencer**: Eighth list of mineral names.

Royal Anthropological Institute, June 17.—Prof. A. Keith, past president, in the chair.—J. Reid **Moir**: Flint implements from Glacial gravel north of Ipswich. This gravel is covered by a definite Glacial boulder clay, and is therefore of Glacial age. Mr. W. Whitaker states that the gravel is what is usually called "Middle Glacial," and this view is shared by the author. As, however, Lower Glacial deposits do not occur in the Ipswich district, the use of the term Middle Glacial is deprecated. The flint implements comprise small platessiform specimens, very similar in their outlines to some of the Early Chellian artefacts, points, *radoirs*, and well-made scrapers. These and the numerous flakes recovered exhibit all the usual characteristics of flints ascribed to human workmanship. Quartzite hammer-stones and burnt flints occur in the gravel, and the deposit probably represents, in part, a land surface broken up and redeposited by water resulting from melting ice. It is not at present possible to correlate the Ipswich gravel with others in different parts of the country containing similar implements, but further investigation may enable this to be done.

Zoological Society, June 17.—Prof. E. W. MacBride, vice-president, in the chair.—J. T. **Carter**: Occurrence of denticles on the snout of Xiphias.—Dr. C. W. **Andrews**: New species of Zeuglodons and a leathery turtle from the Eocene of Southern Nigeria.—E. **Heron-Allen** and A. **Earland**: Experiments on the cultivation of *Verneuilina polystropha* Reuss, in hypertonic sea-water and gem sand.—C. **Morley**: Equatorial

and other species and genera of African Ichneumonidæ.—G. A. **Boulenger**: (1) A list of the snakes of West Africa from Mauritania to the French Congo. (2) A list of the snakes of North Africa.—The Rev. T. R. R. **Stebbing**: Crustacea from the Falkland Islands collected by Mr. Rupert Vallentin. Part iii.

Linnean Society, June 19.—Dr. A. Smith Woodward, president, in the chair.—T. A. **Dymes**: Notes on the life-history of the yellow flag (*Iris pseudacorus*, Linn.), with special reference to the seeds and seedlings during their first year. *I. pseudacorus*, Linn., is a plant of shallow swamps and wet pastures, occurring in many different kinds of soil. Its xerophytic adaptations and its contractile roots are a protection from some of the dangers of the physical world. Its acridity and astringency protect it from being readily eaten, but the larvæ of some insects feed upon it, those of a sawfly doing considerable damage; a few molluscs resort to it for food. It appears that wild-fowl eat the seeds and the very young seedlings; it is also attacked by a parasitic fungus. This plant hibernates, and the normal minimum for the seeds is about seven months, the maximum being not less than twenty. Flowering in its fourth year, the capsules begin to dehisce in September. There are two kinds of seed, flat and round, and the difference between them has some significance both in dispersal and in germination. Uninjured seeds float for two years or more. The most important of the agents are diving wild-fowl, and the least is the wind; running water plays a very considerable part.—S. L. **Moore**: A contribution to the flora of Australia. This memoir contains notices of rare and descriptions of new Australian plants preserved in the British Museum.—A. W. **Waters**: Selenariadæ and other Bryozoa. The paper deals with some cup-shaped or flat forms of Bryozoa, and while the zoarial shape alone is sufficient for generic classification, an examination has been made to see how far other characters run through all or most species.—Dr. E. **Penard**: Studies on some Flagellata. The author gives the result of his observations on some Flagellata from the vicinity of Geneva.—Dr. W. M. **Tattersall**: Report on the Stomatopoda and Macrurous Decapoda collected by Mr. Cyril Crossland in the Sudanese Red Sea.

BOOKS RECEIVED.

Life and its Maintenance: A Symposium on Biological Problems of the Day. Pp. viii+297. (London: Blackie and Son, Ltd.) 5*s*. net.

George Westinghouse: His Life and Achievements. By F. E. Leupp. Pp. xi+304. (London: J. Murray.) 15*s*. net.

Resources and Industries of the United States. By Prof. E. F. Fisher. Pp. ix+246. (Boston and London: Ginn and Co.) 3*s*. 9*d*. net.

Heredity. By Prof. J. Arthur Thomson. Third edition. Pp. xvi+627. (London: J. Murray.) 15*s*. net.

Woman: The Inspirer. By E. Schuré. Translated by F. Rothwell. Pp. vii+166. (London: The Power-Book Co.) 4*s*. 6*d*. net.

A Practical Handbook of British Birds. Part iii. Pp. 129–208+2 plates. (London: Witherby and Co.) 4*s*. net.

The Chemistry and Manufacture of Hydrogen. By Major P. L. Teed. Pp. vii+152. (London: E. Arnold.) 10*s*. 6*d*. net.

On Longevity and Means for the Prolongation of Life. By Sir H. Weber. Edited by Dr. F. Parkes Weber. Fifth enlarged edition. Revised and partly rewritten. Pp. xxii+292. (London: Macmillan and Co., Ltd.) 12*s*. net.

The Metals of the Rare Earths. By Dr. J. F. Spencer. Pp. x+279. (London: Longmans, Green, and Co.) 12*s*. 6*d*. net.

La Tension de Vapeur des Mélanges de Liquides. L'Azéotropisme. By Dr. M. Lecat. Pp. xii+319. (Gand: Hoste, S.A.; Bruxelles: H. Lamertin.) 45 francs.

Practical Vaccine Treatment for the General Practitioner. By Dr. R. W. Allen. Pp. xii+308. (London: H. K. Lewis and Co., Ltd.) 7*s*. 6*d*. net.

Descriptive Geometry. By H. W. Miller. Pp. v+176. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 7*s*. net.

Introductory Mathematical Analysis. By Dr. W. P. Webber and Prof. L. C. Plant. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 9*s*. 6*d*. net.

Irrigation Engineering. By Dr. A. P. Davis and H. M. Wilson. Seventh edition. Pp. xxiii+640. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 21*s*. net.

Annals of the Philosophical Club of the Royal Society written from its Minute Books. By Prof. T. G. Bonney. Pp. x+286. (London: Macmillan and Co., Ltd.) 15*s*. net.

Practical Butter-making. By C. W. Walker-Tisdale and T. R. Robinson. Fourth revision. Pp. 143. (London: Headley Bros. Publishers, Ltd.) 5*s*. 6*d*. net.

The Doctrine of Degrees in Knowledge, Truth, and Reality. By Viscount Haldane. Pp. 32. (London: H. Milford.) 2*s*. net.

The Book of Cheese. By C. Thom and Prof. W. W. Fisk. Pp. xvi+392. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 8*s*. net.

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