THURSDAY, MARCH 23, 1916.

THE BUDGET OF PARADOXES.

A Budget of Paradoxes. By A. de Morgan. Second edition, edited by D. E. Smith. Two volumes. Vol. i., pp. viii+402; vol. ii., pp. 387. (Chicago and London: The Open Court Publishing Co., 1915.) Price 30*s.* net.

THIS is not the first time the Open Court Co. has deserved grateful thanks for undertaking a reprint of a rare work, although they will probably make no profit out of it. The editor, well known as a writer on the history and teaching of mathematics, has laid down for himself an excellent plan, namely, to preserve the text intact, except where mistakes could be corrected with certainty; to indicate clearly the authorship of every addition or alteration; to add catchlines to break up the text; and to give notes for the information, not only of mathematicians, but of those who treasure the "Budget" as a literary work of art, and who, even when well-read, may be puzzled by the numerous quotations and allusions in which De Morgan delights. To produce an annotated edition of this kind is a very difficult task; it would require another De Morgan to perform it to perfection, and we thank Prof. Smith for what he has done, without dwelling ungraciously upon what he has omitted, or blundered in trying to do.

First of all we may say that the biographical notes are abundant (too much so, some may think); so far as they refer to mathematical writers, they are generally appropriate, and so far as we have tested, are accurate. To end up a ten-line note on Rowan Hamilton with the sentence "He also wrote on dynamics" irresistibly reminds us of that other casual after-thought "and the stars also" in Gen. i. 16. Here, as elsewhere, the editor's humour is of the unconscious kind; and one instance is so funny that we really cannot pass it over. The Religious Tract Society (see i. 194) censored a perfectly harmless passage in one of Hannah More's tales which they were reprinting. On this De Morgan: "O fie! Miss Hannah More! and you a single lady too, and a contemporary of the virtuous Bowdler!" Editorial comment: a note on Henrietta Maria Bowdler, and not a word about the immortal Thomas! Again, by confusing "Tom" Sheridan with the elder Thomas S., the editor has found one of the most wonderful mare's-nests on record (i. 175).

In giving translations of quotations, etc., in the text Prof. Smith is sometimes painfully inaccurate, and in other cases he is unsympathetic. As an instance of what we mean, take i. 40, where we read: "the answer is—

"Rumpat et serpens iter institutum

—a line of Horace [Carm. iii. 27], which the demons interpret as a direction to come athwart the proceedings of the Institute by a sly trick." If we are to have a translation here, the best would be a mock-translation, such as "And let the Old Serpent interrupt the proceedings of the Institute," like De Morgan's "change dice into coin" for *mutat quadrata rotundis*, where the editor gives no reference to the original context (possibly to spare the feelings of a certain class of millionaires). To return to the present case, the editor's rendering is "Let the serpent also break from its appointed path," which is incorrect, and neither suits the original context nor the one to which De Morgan applies it. (And we might have had, instead of this blunder, a brief note on the *Institut national*.)

The list printed below[1] contains corrections of errors we have found, which are serious enough to be actually misleading; perhaps the Open Court Co. might be willing to have them tested, and then pasted as *corrigenda* in some at least of the copies of this edition.

Prof. Smith has adopted a system of what he calls "slightly modernised spelling." If, in his notes, he likes to print "equaled" (why not "equald," like "herald" and "ribald," while we are about it?) he has a perfect right to do so; but we respectfully protest against his taking this liberty with the text. And is *dilletante* a misprint, or an example of modernised spelling?

To us, the one great failing of Prof. Smith, as an editor, is that he has treated the "Budget" (naturally enough, from his point of view) too much as a chapter in the history of mathematics, or rather of pseudo-mathematics. Really, it is a study of a class of cranks (who are always with us), and, as such, it is a section of the great Book of Human Folly and Self-Conceit. Incidentally, of course, it gives a portrait of the author, who was a very remarkable man. No mean mathematician, he was an excellent teacher of his subject (we ourselves knew one of his pupils); he was an expert in formal logic; an antiquarian and humorist like Walter Scott, a scholar and a wit like Sydney Smith. (His digression, ii. 22, suggested by the paradox of the moon's rotation, is so like an essay by Sydney Smith that if candidates in an examination on English literature were given a selected passage from it, and asked to name its author, the intelligent ones would be very likely to ascribe it to S. S., that imperishable ornament of the English Church). Handicapped by that wretched name Augustus, he made it one of the few exceptions to a general rule. Like Augustus among the

[1] In i. 4 Kleckermanno should be Keckermanno; *Cl.* means *Claro*, and should have been translated (the reference appears to be to Bartholomew K.): next p., *veritate* should be *veritati*; *quamvis eo nomine non multum gratiae inierit* means "although he (K.) has not found much favour on that score"; i. 7 "unprovoked" *l.* "unproved"; (i.) 13 *l.* "Merchant Taylors'"; 73 (end) *l.* "the Moors that we see (among ourselves)"; 104 *l. prave* (the passage is from Phædrus); 127 "work" *l.* "word"; 175, "Tom Sheridan" means the only son of the playwright (R. B. S.), and there are no chronological difficulties about the story, whether it be true or not; 194 the reference is to Thomas Bowdler and his famous edition of Shakespeare; 204 the book referred to is the "Trigonometry and Double Algebra"; 241 Revilo means Oliver Byrne (*v.* i. 329); 209 Slow=Slough, and printing "Dr. Heirschel at Slow" would have made things clearer; 302 for "quib" *l.* "squib." In ii. 2, *l.* "I *had* no need for that hypothesis"—to render *avais* by "have" misrepresents Laplace; 4 (end) "sorest" is probably a misprint for "worst"; 15 (top) for "At least" *l.* "At last"; 31 'L' should be 'L (with 'for the *spiritus asper*); the new editor has spoiled the joke, such as it is; 73 *Pansées*, *l. Pensées*; 136 (*n.*) "condemned" should be "thought negligible"; 166 *a cru devoir*="fancied himself obliged," and *gratuitement*='gratuitously'; 225 (end) the second "goals" should be "gaols"; and "sums' (just above should be "sum."

Roman Emperors, he was distinguished by his all-round ability and common-sense; a lover of peace, he conquered whenever he fought, and was clement to the vanquished. In his quotations and references he is not always exact, but he is eminently trustworthy. If he cites a tag from Horace (often, undoubtedly, from memory) it generally agrees with some respectable text; if he says that such-and-such a book was published at such-and-such a place at such-and-such a date, his information is pretty sure to be substantially accurate (*e.g.*, take the case, i. 66), because he knew the trouble caused by "slipslop" references.

His weakest point was a passion for acrostics, anagrams, *et hoc genus omne;* he simply cannot resist the chance of airing it, as when he says about the theory of gravitation that for Newton it was *not new,* but he *went on.* One of the many puzzles of the "Budget" appears on the title-page in the form :—

"UT AGENDO SURGAMUS, ARGUENDO GUSTAMUS."
—PTOCHODOKIARCHUS ANAGRAMMATISTES.

His own explanation of the motto is on i. 138–9. One of his friends seems to have shared his anagrammania; but for this, and his reference to him as a "powerful mathematician," we should have had little hesitation in ascribing this anagram to De Morgan himself. Even yet we have some inclination that way, because "powerful" is ambiguous, even when applied to a mathematician; and De Morgan was no weakling, either in the physical or in the metaphysical sense. *Ptochodokiarchus* looks like a misprint (or slip of the pen) for *Ptochodochiarchus,* because there is a rare Greek word, πτωχοδοχεῖον, which appears to mean some sort of charitable institution. Thus the term might be applied to the master of a workhouse, or the Governor of Chelsea Hospital; but neither of these officials is likely to be a "powerful mathematician" in the ordinary sense.

Here the demon of anagram (=the man of A. De Morgan) suggests to us that Augustus De Morgan=August Sugar-demon; but this is mere child's play with sugar-plums, and we prefer *A snug modest augur,* one that (to revive an old pun) is never a bore.

It is a disgrace for any mathematician not to know of the existence, and general object, of the "Budget," and in writing this review we have acted on that assumption throughout. But to a reader in sympathy with the author, this book ought to be what Burton's "Anatomy" was to Samuel Johnson: the one work that would make him get out of bed before he intended. To take only a few examples: we have references to aviation (ii. 9: here Prof. Smith has a touching, appropriate, and illuminating comment, "The notes on this page were written on the day of the funeral of Wilbur Wright, June 1, 1912, the man who realised all of these prophecies, and then died a victim of municipal crime—of typhoid fever"); to wood-pulp paper; to plans for a universal language (i. 116); to the improbability of Christians sinking their differences (ii. 23), which suggests to De Morgan "the floor of the bottomless pit"; to the science (as we may fairly call it now) of meteorology; to the duties of an editor (of a journal or a book, as the case may be).

A friend of ours has expressed the opinion that no account of De Morgan is complete without some reference to his controversies with Sir William Hamilton (of Edinburgh). This is not the occasion for attempting to give a complete account of De Morgan; suffice it to say that in this matter he generously buried the hatchet, and that when he twits his opponent with discovering two things which are identical, yet one is greater than the other, he refers to the famous theory of the quantification of the predicate.

There are one or two cases where the editor has given us no information, although a comment would have been valuable and easily supplied. One of the features of this edition is that it gives us two portraits of De Morgan (both, apparently, reproduced from photographs). We are not told what the originals were, or the age of the sitter on each occasion. In the preface to the former edition Mrs. De Morgan refers to omissions made by herself from the text as it appeared in the *Athenaeum.* Among these is a "rather large" one on a quarrel about the telescope at Campden Hill, and Mrs. De Morgan looks forward to its insertion in a future edition. We have not been able to find it in this one; indeed, there is no evidence that Prof. Smith has consulted the *Athenaeum* at all.

One other case will appeal to all who, like us, regard University College, London, as their real *alma mater.* De Morgan says, "Some of the pupils of University College, in which all subdivisions of religion are (1866; *were,* 1867) on a level." The reader might infer that the original charter of U.C. had either been altered or infringed. This is not so; the fact is that an eminent Unitarian candidate for a chair was rejected, and De Morgan chose to think (rightly or wrongly) that this was due to religious prejudice, though, of course, no such reason was ever admitted by the electors.

We conclude with a quotation from the "Budget" which, at any rate, is opportune, and we fear has by no means lost its point (i. 289).

"So far as Mr. Goulburn was concerned, the above was poetic justice. He was the minister who, in old time, told a deputation of the Astronomical Society that the Government did not care twopence for all the science in the country." Later on, De Morgan says (1866, or so), "Matters are much changed"; thanks in great measure, *we* may add, to that German and English patriot, the Prince Consort. But are they *now* (1916)? and if so, *how?* We have seen it stated in print, and not contradicted, that one of our Government's experiments in economy has been to shut up the library of the Patent Office—the one first-class scientific library in London to which everyone has access, though it is hidden in a corner, and few there be that find it. "Patriots" are for tabooing every book in the German tongue, though if we could get all their latest books and papers on chemistry, and a first-

rate chemist to study them, we might spoil the Egyptians indeed. England's contempt for science, against which all who know have been protesting for a generation, will, if not amended, bring her down in sorrow to the ground, *whatever the issue of the present war,* which will be followed by one of much greater intensity, for which the weapons will be forged, not by hands, or machines, but by brains. G. B. M.

PHARMACOLOGY.

A Manual of Pharmacology. By Prof. W. E. Dixon. Fourth edition. Completely revised. Pp. xii+467. (London: Edward Arnold, 1915.) Price 15*s.* net.

PROF DIXON'S well-known and popular manual needs no recommendation at this stage of its career. It shows on every page the methods of an experienced and enthusiastic teacher and skilled demonstrator, and it has played no small part in the change, which is transforming the teaching of pharmacology in this country, from a rather profitless recital of materia medica, doses, preparations, and conventionally defined actions, into the reasoned presentation of a progressive, experimental science. The new edition retains the good qualities of its predecessors, and gains by additions to the admirable series of charts and mechanical records which illustrate the argument.

It must be confessed, however, that in some directions the new edition scarcely seems to justify its prefatory claim to have been so largely rewritten "that it almost constitutes a new volume." The last sentence of the preface, indeed, suggests that Prof. Dixon's intended revision may have suffered some forced interruption —as well might happen at a time when all scientific enterprise is liable to curtailment by more urgent national duties. The introduction of certain new sections has not improved the scheme of classification—always a difficulty to the writer of a pharmacological text-book. For example, a short section on "Drugs increasing the excretion of uric acid," now finds itself stranded, as it were by accident, in the midst of a chapter dealing with action on nerve-endings. This and similar anomalies convey the suggestion of a somewhat hurried shuffling of the sections.

But the arrangement of the material is a minor matter, and we attach more importance, as evidence that the writer's intentions have not been fully carried out, to the apparent absence of any addition to, or revision of, the sections dealing with some of the remedial agents, in regard to which knowledge has most conspicuously advanced since the previous edition was published. The use of salvarsan, for example, had scarcely passed beyond the experimental stage in 1912; and the statement that "arsenobenzol is certainly not free from danger, and a considerable number of deaths have followed its injection," was then a justifiable caution. But this same statement does not adequately summarise the experience available in 1915. The discovery of the significance of emetine, in the treatment of amœbic dysentery by ipecacuanha, was probably too late for inclusion in the 1912 issue; but it might reasonably be expected, under normal conditions, that an extensively rewritten edition, appearing in 1915, would make some reference to this very important advance. Yet the statement of the third edition, that ipecacuanha "has also a great reputation in the treatment of tropical dysentery, but its mode of action is unknown," appears in the fourth edition, without modification or addition; and we scarcely suppose that the author intended to leave it so.

In the section on serum therapy, again, we had expected to find some reference to antimeningococcus serum, and to the immune serum against the dysentery bacilli. Both can now show practical results second only to those of the antitoxic sera, and, if want of space were the trouble, we would willingly have forgone in their favour the section on the doubtful antistreptococcic serum, or even what seems to us a not very illuminating attempt to explain antitoxin-formation by an analogy drawn from ferment action.

We take comfort from the conviction that a fifth edition will soon be on the way, and we may be allowed to hope that a calmer state of the general atmosphere will give the author unhampered opportunity for dealing with those sections of his volume, which he has apparently been obliged to pass over in the edition under review. Meanwhile we wish the text-book a continuance of its well-deserved popularity, with student and teacher alike.

OUR BOOKSHELF.

The Wheat Industry for Use in Schools. By N. A. Bengtson and D. Griffith. Pp. xiii+341. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1915.) Price 3*s.* net.

THIS book is the first of a new series called the Industrial Series, which is designed to make use of industrial studies in education. The justification urged for such a course is that these subjects afford useful information, come into line with vocational training, and stimulate interest and clear thinking.

Beginning with an account of the wheat plant and the types in common cultivation, the authors pass on to the methods by which man has succeeded in growing wheat in enormous areas all over the globe. Old and new ways are both described, and the development from the early primitive forms to the present elaborate machinery is carefully traced out. After harvesting and threshing come transportation and storage, and the reader is taken behind the scenes and shown the workings both of small and large elevators in their various ramifications; as, for example, how country roads, wheat crops, and farm and elevator storage are all intimately linked with business operations and social questions generally. Next comes an interesting chapter on the factors in wheat production and the interaction of climate,

soil, insect and fungoid pests, the size of farms, and the use of machinery, etc.

The last section of the book deals with the different wheat-producing countries. Australia is described first, then the Argentine, and next the United States, which has a larger wheat production than any other country in the world; then follows an account of Canada, finally of the European and Asiatic wheat-producing countries.

The illustrations are well chosen and add considerably to the value of the book. Altogether it makes a very interesting volume, which we put down with the feeling that the authors have done their work well and produced something that will be of much value to teachers. E. J. R.

Post-Mortem Methods. By Prof. J. Martin Beattie. Pp. viii+231. (Cambridge: At the University Press, 1915.) Price 10*s.* 6*d.* net.

IT is now generally recognised that the diagnosis and scientific treatment of disease must be based on a sound knowledge of the abnormal conditions present in the various organs and tissues in cases of disease.

Such knowledge can only be obtained in the post-mortem room, and it is very important that the examinations should be conducted systematically and by some routine method of procedure. The object of the author of this book has been to set out a definite method of procedure, and such modifications of this procedure which may be demanded by special circumstances. We think that Prof. Beattie has successfully accomplished these aims; the book is thoroughly practical without being too full of detail, and the scheme of examination suggested is a sound one. A chapter is included on post-mortem examination for medico-legal purposes, and another on the examinations required in the various diseases; in this reference is made to the principal tropical maladies. Finally, in an appendix a summary is given of the methods employed for the preparation of museum specimens, the preparation of tissues and sections for microscopical examination, and of bacteriological culture media and stains. The book is illustrated with eight half-tone plates and some figures in the text. R. T. H.

The Year-Book of the Scientific and Learned Societies of Great Britain and Ireland. Compiled from official sources. Pp. viii+351. (London: Charles Griffin and Co., Ltd., 1915.) Price 7*s.* 6*d.* net.

THIS thirty-second issue of a very useful annual work of reference will be welcomed by many workers in science. We notice the inclusion of several new societies, and these additions serve to increase the value of the year-book. The particulars given about the British Association run to some eighteen pages, but they refer to the Australian meeting of August, 1914, no account of the proceedings of the Manchester meeting last September being included, though the particulars have long been available. The volume deserves a place among the reference books in every scientific library.

LETTERS TO THE EDITOR.

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

The Liesegang Phenomenon and Concretionary Structure in Rocks.

THE curious formations illustrated were produced during some experiments made to support a suggestion that the Liesegang phenomenon might be attributed to adsorption (*Science Progress*, x., 369, 1916). The tubes contained 15 c.c. of 1 per cent. agar gel, in which small quantities of either liver of sulphur or manganese sulphate had been dissolved, and were treated with 10 c.c. of a standard solution of the other reagent. Particularly in the case of the gels containing the polysulphides, the resulting stratification differed from that hitherto observed, in that many of the zones were separated into a number of concretions, which in some instances were joined by rods to those of the succeeding zone. The concretions were

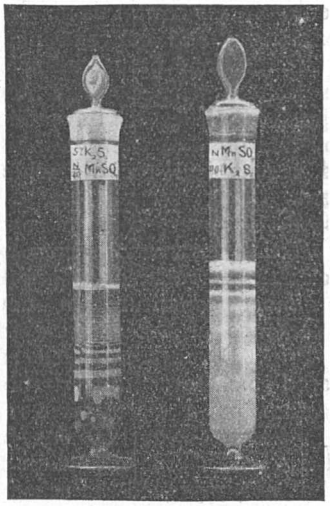


FIG. 1.

FIG. 2.

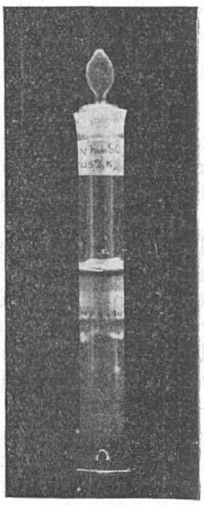


FIG. 3.

all sharply defined; the indistinctness of Fig. 2 is due to their being imbedded in the gel. The peculiar structure may be due to the presence in the gel of small nuclei in the shape of deposited sulphur, or possibly to the composite character of one of the solutes. The separate spheroids, once started, would grow by adsorption in the same way as the solid strata. To determine the exact conditions of their formation requires further investigation, but it should be possible to repeat the experiment with the carbonates of calcium and magnesium.

The structures appear closely to resemble the concretionary limestones described by Sedgwick (Trans. Geol. Soc. (2), iii., 1835), Garwood (*Geol. Mag.*, (3), viii., 1891), Abbott (Q. J. Geol. Soc., lix., 1903), and others. Indeed, certain specimens, which Mr. Abbott kindly showed me, appeared identical in detail with the formation of Fig. 3. To one who is not a geologist it is difficult, at first sight, to refuse the conclusion that similar causes have been at work in each case. Silicic acid gels are known to occur in nature. A gel may contain as little as 1 per cent. of silica. Should solutions of calcium and magnesium salts come into contact with a dilute silicic acid gel, containing alkali carbonates, under the proper condi-

tions, it seems probable that such calcareous formations, beneath a stratified layer, would result. The solutes in the gel and in the water might, of course, be interchanged. Since the limestone would be denser than the gel, the proportion of silica contained in the formations would be reduced to a very small figure. The unaffected gel would shrink by loss of water with time, and might eventually be washed away by the action of water containing alkali carbonates in which hydrated amorphous silica is readily soluble.

The zonal structure of some of the concretions themselves might be ascribed to the effect of different rates of adsorption of the mixed solutes in the gel. In the layer immediately surrounding the growing concretion one of the solutes would be exhausted first, allowing the deposition of pure carbonate. By the time the second solute had been completely extracted from the envelope, the precipitation of the first might have recommenced, and so on. The effect of the adsorption on the concentrations of the solutes would be felt at some distance from the adsorbing centres; so that different spheroids might be formed in regions of different concentration. Moreover, the concentrations of the solutes would gradually decrease as precipitation proceeded. This would account for the varying composition of the concretions. None of the arguments quoted by Prof. Garwood (*loc. cit.*) against the stalactitic theory of the origin of these formations appears to be incompatible with an adsorption hypothesis.

S. C. BRADFORD.

The Science Museum, South Kensington,
London, S.W., March 9.

International Latin.

THE small band of scientific men who have long been convinced that in Latin we have at hand the best possible universal language for scientific purposes will be gratified to note the matter has recently come to the fore in your columns, though the regrettable cause be the death of an eminent man. The urgent need of an international medium of scientific communication has by now become sufficiently obvious, and has led, not only to the advocacy of Esperanto, but to the manufacture, mainly in Germany and by typically German methods, of yet another "language," understood to be specially aimed at scientific requirements.

It seems desirable to point out some of the advantages of Latin as a latter-day antidote to the curse of the Tower of Babel. These may briefly be classified into the facts: (1) that Latin is to a large extent "on the spot"; (2) that it lends itself quite as well to the purpose in question as any living tongue; and (3) that it is a *language*, a vehicle of thought and style and expression, as distinct from a shorthand written in longhand characters.

(1) Do not let us be influenced by the notion that Latin is a stone-dead language. Written and spoken it survives to this day in the Roman Catholic world. Pharmacy has never given up the use of it. Within living memory the debates of the Hungarian Diet were held in Latin, and in many Continental universities dissertations, scientific and other, were couched in Latin, the use of which remains optional even at the present time. The flame has indeed died down, but there are smouldering embers waiting for the whiff that will kindle it anew.

The vitality of Latin stands on a far surer foundation, however, than one or two picturesque survivals. Is not a greater or less knowledge of Latin the hallmark of every man having some claim to education, whatever his nationality? Our traditional school system of teaching Latin would no doubt have to be modified if readiness in the use of Latin as a medium of communication were the object aimed at (which at present it is not); but even as things are, I venture to think that most of us would find the refurbishing and readjusting of whatever Latin we learnt at school not nearly so difficult as might at first blush be supposed. Knowledge acquired in early youth is a remarkably tenacious thing. Furthermore, it is impossible for an educated man ever to shake off a certain familiarity with Latin, owing to the persistence of Latin words and phrases, and of words derived from Latin, in everyday language.

(2) The principal requisite of a language for scientific purposes is that it should be capable of rendering a wide range of concepts both clearly and concisely. All those modern languages which have been brought into the service of science perform the task of accurate presentation on the whole adequately. One reason for this—possibly the chief reason—is that scientific literature is thickly larded with words and phrases of common international acceptation, and these, we may note, are mainly of Latin or Greek origin. They will fall into their places with the utmost sweetness when Latin is revived. As for conciseness, English, with the simplicity of its inflexions and constructions, perhaps bears the palm, but, it may be feared, rather at the expense of clearness. The very terseness of English often seriously hampers the writer or speaker who would avoid ambiguity. Hence the somewhat richer grammar of Latin is not really in the nature of a defect, and in any case Latin composition makes considerably less demand on the grammatical memory than German or Russian.

Is Latin sufficiently adaptable to modern scientific needs? Surely, yes. Repeatedly Latin has risen admirably to the occasion when applied to a precise and highly technical subject; one need only think of Justinian's "Code" and Newton's "Principia." A great number of new terminological vocables would, of course, have to be added to the limited Latin of classical times, but to assign the proper form, inflexions, and connotation to these words would be an easy task for an international committee, and would incidentally have a most beneficial effect in the direction of clearing scientific parlance generally. Chemistry, it may be mentioned, possesses a ready-made Latin terminology, handed on through the centuries by the pharmacists.

(3) The question must be faced whether we want an international language, like Latin, or an international Pidgin, like Volapuk, Esperanto, Ido, etc. I plead confidently for the former. A true language cannot be made to order; it must be evolved. The various well-meant attempts at artificial "languages," each fully conscious of its predecessors' infirmities, can only be regarded as a succession of experiments—tending to what? We may expect further attempts as time goes on, attempts yet more poverty-stricken, yet more remote from the least approach to amenity, and yet more incapable of expressing anything but bald facts. The logical outcome of the series would doubtless be something not essentially different from the system of algebraical signs, chemical formulæ, and arithmetical figures, which we already have. Language, on the other hand, enables us not only to state facts, but to modulate the statements of facts, to exchange views, to express personality, and so on. Language, moreover, has in itself the power of stimulating understanding and imagination, much as the savour of food stimulates its digestion. Science cannot dispense with notation, but no more can it dispense with language. And if anyone doubts that Latin is equal to any modern tongue in these ampler characteristics of language, let him but read his classics.

The scientific world, then, may do well to consider seriously the revival of Latin as an international

medium, and to do so before it is hustled into the acceptance of some factitious brew of sounds and letters. The universal language, in fine, need not be laboriously sought for. It has been with us all the time, like a neglected tool that we have only to clean of its rust and sharpen. Let us no longer neglect it.

W. A. CASPARI.

CHEMICAL ORGANISATION IN GERMANY DURING THE WAR.

VERY soon after the outbreak of war steps were taken in Germany to organise, control, and develop the supply and manufacture of the materials necessary for chemical industry, especially that part of it most closely connected with the manufacture of munitions of war.

The first interesting sign of this internal activity was the fusion, on August 8, 1914, of the two great industrial associations, the Zentralverband deutscher Industriellen and the Bund der Industriellen, under the title Kriegsauschuss der deutschen Industrie (War Committee of German Industry).

The next step was the formation of a large number of organisations and Zentralstellen, the function of which was the collection, control, and regulated distribution of the whole existing stock of war materials and crude products necessary for industry, especially in its relation to war. Thus were formed the Kriegsmetall Aktiengesellschaft and the Kriegschemikalien Aktiengesellschaft. Before the end of 1914 no fewer than twenty-eight such Zentralstellen had been formed, each dealing with a different kind of material or product. One has also been formed in Brussels for the purpose of taking stock of, and collecting, the available material found in Belgium. It is interesting to note that the German technical journals state quite openly that the Belgian stocks improved in many respects the condition of German industry, which had been somewhat shaken at the outset.

But in spite of this centralisation of control and supply, it appears that a good many difficulties have had to be surmounted. Although large stocks of Chilian nitrate had been collected before the war, the question of the supply of nitric acid was seen to be of vital importance. It appears that the Ostwald catalytic oxidation process (improved by Haber), which had been carried on before the war by the Badische Anilin- und Sodafabrik at Ludwigshafen (and also by another company at Vilvorde in Belgium), probably on a comparatively small scale, has been very largely extended. The commercial possibility of this depends, of course, on the fact that the Badische company had already developed on an enormous scale the synthetic production of ammonia initiated by the researches of Haber and Le Rossignol.

It must not be forgotten, too, that the manufacture of nitric acid from the air had been already developed in Austria by Pauling. Possibly this or similar processes (*e.g.*, Schönherr-Hessberger) have been extended since the beginning of the war. A significant fact is that the Griesheim-Elektron Company, which had started some years ago the manufacture of nitrogen peroxide in Switzerland, greatly extended these works after the outbreak of war, and sent the product in liquid form to Germany. Nitrogen peroxide is the "raw material" for the manufacture of synthetic nitric acid. It also makes quite good "poison gas." It appears that the nitrogen peroxide was allowed to pass through easily, as, no doubt, a harmless substance like that was not of any importance.

In order to make matters quite sure, the German authorities forbade the use of nitrates in agriculture. E. Haselhoff published an extensive paper giving the relative values as manure of a large number of substitutes for nitrate. Ammonium sulphate was recommended as of equal value, especially if put relatively deep into the soil, and preferably during autumn rather than spring. The value of urea and guanidine and their compounds was also considered, and close attention was given to calcium cyanamide, which is produced in large quantities in Germany. As regards phosphates, which are so important for manure, attention was directed to the deposits in the neighbourhood of Liège and Mons, and to the phosphorites of the Rhine and Lahn districts; also to Thomas phosphate slag.

In connection with the use of calcium cyanamide, the Prussian Department of State for Agriculture issued, at the beginning of 1915, a circular asking for rapid solutions of the following problems, namely: (1) Determination of the value of calcium cyanamide as manure, at the different seasons, for different soils, and for different crops. (2) Improvements in its *Streufähigheit* (capability of being strewn or spread).

For the first, three prizes of 150*l.*, 100*l.*, and 50*l.* were offered. For the second problem a prize of 500*l.* was offered for the devising of a new process, and another prize of 500*l.* if the process be adopted.

The Germans appear to have been obliged to take great precautions to avoid a shortage of sulphuric acid. In time of peace Germany obtains about 80 per cent. of her supply from outside, mainly from Belgium, where it is obtained as a by-product in the roasting of sulphide ores (zinc, lead, iron). But this source must have been practically stopped, in spite of the occupation of Belgium, since the ores treated in Belgium come mainly from Spain, North Africa, America, and Australia. The employment of sulphur can scarcely be feasible, unless Germany has succeeded since the outbreak of war in obtaining sufficient supplies from Italy and America. Swedish ores can, however, be handled, especially by means of mechanical roasters. There are also the Norwegian, Hungarian, and Styrian ores to be reckoned with. There are, however, many evidences that the employment of sulphuric acid has been put under the strictest control and supervision.

The question of substitutes for wheat and rye in the manufacture of bread has been very widely discussed. Amongst the substitutes or additions

suggested may be mentioned barley, potatoes, blood, sugar, etc. Many prominent specialists (*e.g.*, Zuntz, Kobert, Thiele, Neumann, Stokola) have written articles discussing the relative nutritive powers of various types of "composite" bread. Besides the new factories for synthetic ammonia and nitric acid, there is evidence that factories have been installed for the manufacture of aluminium hydroxide and aluminium, but no details have been published; though it is claimed that new methods of working have surmounted the difficulty caused by the want of French bauxite.

In spite of Germany's enormous production of zinc, the refining of the crude metal had not been practised to any considerable extent before the war. It is stated that this is now an established industry in Germany.

Suggestions have been made to avoid the use of sulphuric acid in the manufacture of hydrochloric acid by producing the latter directly by the direct combination of electrolytic hydrogen and chlorine. In order to save sulphuric acid C. Bruder has proposed to extract copper from poor ores by the use of alkaline solutions.

Acetic acid is a very important substance, as it is, for example, the source of acetic anhydride, monochloroacetic acid, and acetone, which are indispensable for the manufacture of drugs, dyes, and explosives.

As the American supply of grey acetate is now failing, suggestions have been made to prepare acetic acid from acetaldehyde obtained from acetylene. There appears to be no shortage of carbide, which is still coming freely from Norway and Switzerland.

Fatty oils and fats are indispensable, and Germany is bound to obtain a large amount from abroad. The Germans have expressed their satisfaction that the fatty oils solidified by the Normann process have been allowed to pass freely in, and have commented on the "fairness" of England in this respect. Stupidity would be, perhaps, a better word. A large amount appears to enter through neutral countries. Thus, according to statistics of Norwegian trade, published by the *Chemiker Zeitung* of August 4, 1915, the export of fatty oils from Norway in 1913 was 348 tons, whereas in 1914 it had risen to 2009 tons. The shortage of fats and oils is obvious, however, from papers such as that published by Bechhold, where it is suggested that all the fats which disappear down the kitchen sinks of Germany should be recovered, the quantity being calculated to be about one and a half million pounds per diem in Germany alone.

As regards the production of hydrogen gas, no doubt for war purposes, it is interesting to note that a single firm, Karl Francke, in Bremen, has erected eight new factories since the beginning of the war, each of which has a daily output of 60,000 cubic metres (more than two million cubic feet).

During the naphtha shortage, caused by the Russian occupation of Galicia, alcohol came somewhat into use as a liquid fuel.

In connection with the use of chlorine as a poison gas, it is interesting to observe the regular appearance in the *Chemiker Zeitung*, from May 29, 1915, onwards, of an advertisement asking for the delivery of 250,000 kilos of liquid chlorine. Also in different issues of the same journal, during the month of July, 1915, there are advertisements asking for the rapid delivery of complete plants for chlorine liquefaction. Interesting also in this connection are requests for delivery of large quantities of bromides, dated December 9, 1914, and March 10, 1915. There are also requests for liquid sulphur dioxide (January 30, 1915) and liquid hydrogen chloride (April 14, 1915).

The *Chemiker Zeitung* (vol. ii., p. 738, 1915) contains a reference to an article by Prof. Leo Vignon, of Lyons, comparing the proportional numbers of chemists in Switzerland, Germany, France, and England in comparison with their respective populations. The relative numbers given are: Switzerland, 300; Germany, 250; France, 7; England, 6. No doubt the low "chemical density" in France and England is a source of undeniable satisfaction to the readers of the *Chemiker Zeitung*. The figures are certainly astonishing, and we would commend them to the attentive consideration of British chemical manufacturers. A perusal of the German journals dealing with the industrial aspects of chemistry gives the impression that there is a pretty severe censorship as regards publication, for little can be gathered concerning the most vital points.

In conclusion I desire to express my best thanks to Dr. F. Schwers, of the University of Liège, who has rendered me valuable aid in the collection of such information as it has been possible to obtain.

F. G. DONNAN.

ECONOMIC GEOLOGY.[1]

THE exploitation of the mineral resources of this country, previous to the war, was, apart from the ordinary fluctuations due to variations in supply and demand, governed almost entirely by the cost of production as compared with that of importation. Materials required for the manufacture of many articles, in some cases even munitions of war, were bought in the cheapest market, with the result that certain minerals ceased to be worked, not because the supply was exhausted, but because they could not be produced at a profit; whilst others which had recently acquired an economic importance were not even diligently searched for.

With the outbreak of war the inconvenience of this policy became painfully manifest, and it is not surprising to learn, from the Director's preface to the first of these "special reports," that numerous inquiries were made at the Geological Survey Office as to the occurrence in Britain of various materials for the supply of which dependence had

[1] Memoirs of the Geological Survey. Special Reports on the Mineral Resources of Great Britain. Vol. i., Tungsten and Manganese Ores. Pp. iv+59. Price 1*s*. Vol. ii., Barytes and Witherite. Pp. iv+93. Price 1*s*. 6*d*. Vol. iii., Gypsum and Anhydrite; Celestine and Strontianite. Pp. iv+57. Price 1*s*. (London: H.M.S.O.; E. Stanford, Ltd.

been placed on imports. To meet the situation it was, therefore, determined to issue, as rapidly as possible, a series of memoirs on special subjects. For this purpose the Geological Survey was well equipped. In the course of their normal work, that of surveying the country first on the one-inch and then on the six-inch scale, they had acquired and recorded in the maps and memoirs relating to special districts a large amount of information as to the mineral resources of the country. But this information, except in the case of a few substances, such as oil-shales and china-clays, was not readily available to those interested in particular minerals. The preparation of these memoirs, therefore, consisted in collecting the information which is scattered through the various local publications extending over a period of sixty or seventy years, and in supplementing this, so far as time would permit, by special investigations in districts where the minerals in question occur.

Three memoirs have now been published. The first deals with ores of tungsten and manganese, the second with barytes and witherite, and the third with gypsum and anhydrite, celestine and strontianite. The same general plan is followed in each case. The introductory chapters deal briefly with the composition, properties, and uses of the substance, with the rise and progress of the industry in this country, and with statistics of production. Then follows the most valuable part from the practical point of view, namely, that which deals with the mines or quarries from which the minerals are or have been produced, and also with occurrences which have not yet been commercially exploited. Take as an illustration of the method of treatment the case of tungsten. Its principal ore, wolfram, usually occurs in association with cassiterite, from which it is not easily separated. Previous to the discovery, in comparatively recent times, of the use of the metal in the manufacture of high-speed steel and filaments for electric lamps, wolfram was regarded as a nuisance by tin-miners. It was thrown away on the dumps, and caused the abandonment of several Cornish mines, some of which have been reopened in recent years in consequence of improved methods of dressing the mixed ore and of the value of what was formerly a waste product.

In the special part of this memoir the mines, whether abandoned or working, in which ores of tungsten occur are individually described. In the case of each mine the locality is indicated, not only by name, but also by reference to the one-inch and six-inch maps and to latitude and longitude. When the name only of an old mine is given it is often extremely difficult to fix its precise locality, but by this method all difficulty is removed. In the case of abandoned mines the old records have been examined, and all available information is given as to the course of the lodes, their content in wolfram and other minerals, and their relation to the surrounding rocks. In the case of mines now being worked the information on these points has been brought up to date, and is, of course, much more complete. The position of each mine in relation to roads and railways is given, and, when information is available, its condition as regards water. From the above statement it will be seen that the requirements of the practical man have been supplied so far as possible.

The three memoirs already published have been produced by the existing staff of the Geological Survey, notwithstanding the fact that several of its members are serving with the Army in various capacities. In view of the urgency and importance of this kind of work, some of which has direct reference to the war, we venture to ask whether it would not be advisable to increase the output by utilising the services of unofficial geologists?

We congratulate the Director and his staff on the excellence of these memoirs, and on the rapidity with which they have been brought out; and we hope that it will not be long before they are followed by others of a similar character.

COLONEL SIR CHARLES WATSON, C.B., K.C.M.G., R.E.

WE regret to record the death of Colonel Sir Charles Watson, in London on March 15, at the age of seventy-one.

Sir Charles Watson was the son of William Watson, a well-known civil engineer of Dublin, and he distinguished himself in mathematics and modern languages at Trinity College. In 1863 he entered the Royal Military Academy, Woolwich, at the head of the list, and two years later was commissioned in the Royal Engineers. Interested in the scientific side of his profession, Watson took up submarine mining, which was then a new branch of military engineering, and was posted to the first submarine mining company in 1871. About this time, also, he interested himself in ballooning, though not until later was this branch of military science actively developed.

While at Chatham he came under the notice of General Gordon, who invited him and Lieut. Chippendale, R.E., to accompany him to the Sudan. They travelled with General Gordon to Khartoum and thence up the Nile to Gondokoro. Watson carried out such a survey of the White Nile and the Bahr el Tebel as was possible from the steamer, and his work was a great advance on the earlier maps of the river. From 1874 up to 1900 his work was the basis of all maps of this part of the Nile's course, and when the opportunity arose for a new survey of the Bahr el Tebel, Watson's observations, made twenty-seven years before, were of great value in determining the permanence of the river channel and the alterations which had taken place in its branches. He also made careful meteorological observations in the marsh region, and measured a discharge of the Sobat River at its junction with the White Nile. Invalided to England in 1875 he was again in Egypt in 1882, but both then, and again later when in the Egyptian Army, military duties prevented him from devoting much of his time to scientific work.

After his retirement from the Army, in 1902, he organised the British Section of the St. Louis International Exhibition in 1904. His interest in Egypt and the Sudan never waned, and in 1912 the latter was the subject of an address which he gave as president of the Geography Section of the British Association. His interest in the East, and in the scientific study of it, led to his accepting the presidency of the Palestine Exploration Fund in succession to his friend and brother-officer, Sir Charles Wilson, and in this position he not only supported the prosecution of scientific archæology, but also advanced our knowledge of the topography of southern Palestine.

Interested in metrology, he championed, in a work on the subject, the cause of British weights and measures as preferable to those of the metric system. His inquiries into the various standards of length led him into an interesting bye-path of history, and it was only last week that we published a paper by him wherein he showed the close connection of our present standards of length and area with the old Egyptian and Babylonian measures.

NOTES.

ON account of the restrictions imposed by the Government on the importation of wood-pulp and other materials used in paper manufacture, the supply of paper has been compulsorily reduced. In common with other periodicals, we are, therefore, under the necessity of reducing the size of NATURE; and we ask the indulgence of our readers for the cultailments which must be made while the limitations of paper-supply exist. It is particularly desirable that all contributors should confine themselves to essentials, points of prime importance, in order that our record of scientific work and events may still be as extensive as possible, though it must necessarily be less detailed. We trust that the present conditions are only temporary, and need scarcely say that immediately the normal supply of paper is available we shall revert to the usual number of columns.

THE *London Gazette* of March 13 notifies the appointment of 2nd Lieut. G. I. Taylor, R.F.C., to the temporary rank of Major in the Royal Flying Corps, while performing the duties of professor of meteorology. Major Taylor is a fellow of Trinity College, Cambridge, to whom the Adams prize was recently awarded. He is the author of the valuable report on meteorology in the voyage of the *Scotia*, undertaken for the Board of Trade. Up to the outbreak of war he held the Schuster readership of the Meteorological Office at the University of Cambridge. His predecessor in that appointment was Mr. E. Gold, now Commandant of the Meteorological Section, R.E., who was mentioned in Lord French's despatches, and has been nominated for the D.S.O. The professorship of meteorology to which Major Taylor is appointed is a new establishment, for which the Meteorological Office is responsible, for instruction and special researches in the structure of the atmosphere in the interest of the Royal Flying Corps.

WE regret to see the announcement of the death, on March 16, of Lady Kelvin: she survived by nine years her husband, who died on December 17, 1907. Lady Kelvin (*née* Frances Anna Blandy) was a daughter of the late Charles R. Blandy, one of the principal residents of Madeira. Lord Kelvin, then Sir William Thomson, first met her during one of the submarine cable-laying expeditions, in June, 1873. The acquaintance then made ripened into more than friendship, and a year later Sir William sailed to Madeira in his yacht, the *Lalla Rookh*, to claim Miss Blandy as his wife. They were married on June 24, 1874, and sailed back in the yacht. Early in August Lady Thomson was welcomed into the circle of family relations and university colleagues at Glasgow, and directed his household with dignity and grace. She became the inseparable companion of his after life, and accompanied him not only in his many summer voyages on his yacht, and on two trips to the United States, and on visits to foreign academies, but became a familiar figure at British Association meetings and other scientific gatherings. Soon after their marriage Sir William and Lady Thomson busied themselves over the building of his country house, "Netherhall," near Largs, in Ayrshire, the scene in after years of many family reunions and of extended hospitalities. It was to this house that Lord Kelvin withdrew when he retired in 1899 from his professorship at Glasgow; it was there that he died, and there also Lady Kelvin has died. Lady Kelvin from about twenty years ago had suffered from rheumatic troubles, and was accustomed to pay an annual visit to Aix-les-Bains for a course of treatment. It was during her return from that resort in September, 1907, that she was struck down by a severe paralysis, from which she had not recovered when Lord Kelvin died, and which left her infirm for the rest of her life, which she spent between the home at Netherhall and the residence in Eaton Place, Belgravia, which Lord Kelvin had taken after his elevation to the peerage in 1892. Lady Kelvin was fond of society, and played the part of hostess with stately dignity. She was president of the West of Scotland Women's Unionist Association, but otherwise took no considerable part in politics. The assiduous care and thought with which she devoted herself to Lord Kelvin during his declining years are known to all.

DR. D. H. SCOTT, F.R.S., has been elected a foreign member of the Royal Swedish Academy of Sciences, in succession to the late Count Solms-Laubach.

THE anniverary meeting of the Chemical Society will be held on Thursday, March 30, when Dr. Alexander Scott will deliver his presidential address, entitled "Our Seventy-fifth Anniversary."

THE Right Rev. Dr. J. H. Bernard, Archbishop of Dublin, has been elected president of the Royal Irish Academy in succession to Prof. J. P. Mahaffy, Provost of Trinity College, Dublin.

THE *Morning Post* of March 20 announces that Thursday last, being the seventieth birthday of the distinguished Swedish mathematician, Prof. M. G. Mittag-Leffler, he and his wife bequeathed their entire fortune to the foundation of a new International Institute for pure mathematics.

THE Secretary of the War Office announces that Surgeon-General W. Babtie, V.C., has been appointed to assist Surgeon-General Sir A. Keogh, Director-General Army Medical Services, especially in the work of supervision of invaliding and all questions connected with the physical fitness of the troops at home.

WE learn from the *American Journal of Science* that Prof. J. C. Moberg, of the University of Lund, Sweden, the distinguished palæontologist and stratigrapher, died on December 30, 1915, at the age of sixty-one years. His scientific work related in the main to the older Palæozoic formations of Sweden.

SIR THOMAS H. HOLLAND, F.R.S., professor of geology and mineralogy in the University of Manchester, has been appointed chairman of a Commission which the Government is forming to survey the economic resources and industrial possibilities of India, with the view of promoting business enterprise under the changed conditions that will follow the restoration of peace.

THE death of Sir Charles Ball, Bart., at sixty-five years of age, occurred on March 17 in Dublin. Sir Charles Ball was honorary surgeon to the King in Ireland, and regius professor of surgery in the University of Dublin, and the author of various works on surgery. The late Sir Robert Ball and Dr. Valentine Ball, director of the Dublin Science and Art Museum, were his elder brothers.

MISS GLADYS POTT, who recently visited France with a party of working women, under the auspices of the Board of Agriculture and the Board of Trade, will give an account of her experiences at a meeting, organised by the committee of the Women's Patriotic Bureau, 415 Oxford Street, to be held at the Kensington Town Hall on Friday, March 31. H.R.H. Princess Christian of Schleswig-Holstein has consented to be present; and the chair will be taken by the Lady Wantage. In view of the importance at the present time of training women in this country in farm work, and of interesting scientific agriculturists in the matter, it is hoped that the meeting will be largely attended by people disposed to assist the scheme.

THE twenty-fifth annual report of the council of the Institution of Mining and Metallurgy, presented at the annual meeting of the institution, held to-day, shows that in March, 1915, more than 300 members of the institution were serving with H.M. Forces. Since then the number has been more than doubled, and it now represents above 25 per cent. of the total membership. The membership of the institution on December 31 last was 2441, as compared with 2492 at the end of 1914. During 1915 thirty members of the institution lost their lives in the war. Sir Richard A. S. Redmayne has been elected president, in succession to Sir Thomas K. Rose.

ELIZABETH LADY LAWRENCE, whose death on March 18 we record with regret, only survived her husband, the late Sir J. J. Trevor Lawrence, by a little more than two years. She shared her husband's love of plants and beautiful flowers; and at their country seat at Burford, Dorking, was to be seen one of the finest private collections of conspicuous sorts, as well as many of the most interesting genera and species of both hemispheres. Lady Lawrence continued the long and honoured association of Sir Trevor Lawrence with the Royal Horticultural Society, and recently took an active part in the work of the fund organised by the society for the relief of ruined Belgian horticulturists. She was also keenly interested in astronomy, and had a wide circle of scientific friends, all of whom will long mourn her death.

WITH the approval of the King, Royal medals of the Royal Geographical Society have been awarded as follows:—The Founder's Medal to Lieutenant-Colonel P. H. Fawcett, for his explorations and surveys on the upper waters of the Amazon; and the Patron's Medal to Capt. F. M. Bailey, Indian Army, for his exploration of the Tsangpo-Dihang river in the hitherto almost unexplored country where it breaks through the Himalayas. Other awards adjudged by the council of the society are:—Murchison award to Lieut.-Colonel Whitlock, R.E., for his work in connection with the delimitation of the Yola-Chad boundary in 1903–5, and the Yola Cross river boundary in 1907–9; the Back award to Mr. Frank Wild, second in command of Sir Ernest Shackleton's transcontinental Antarctic Expedition, for his distinguished and long-continued services in the exploration of Australia; the Cuthbert Peek award to Mr. F. Kingdon Ward for his several enterprising journeys in the frontier regions between China and Burma, and to assist him in the further exploration of those regions; the Gill Memorial to Lieut.-Colonel E. M. Jack, R.E., for his distinguished service in the delimitation and demarcation of the Uganda-Congo boundary.

THE American *Museum Journal* for January, which has just reached us, contains a very interesting article by Messrs. Clark Wissler and Herbert Spinden, on the Pawnee human sacrifice to the morning star. According to the authors, the "historic home of the Pawnee was Nebraska." As a matter of fact, the Pawnee belonged to the very considerable Shoshone-Pawnee family, whose range was much wider. But, be this as it may, the authors have brought together some extremely useful facts in regard to the occasional sacrifice by these people of a young girl, always a prisoner of war. This was a religious observance, and the captive was treated as a goddess, till the day of the sacrifice. The custom seems to have come from Mexico, where prisoners of war were similarly treated, but in this case the victims were males. The authors give a very complete account of what is known of these ceremonies, and to this they add a number of most excellent illustrations.

THE *Museums Journal* for March very properly reprints the recent discussion in the House of Lords on the closing of museums, thereby affording those who are concerned with the conduct of such institutions a convenient source of reference to this epoch-marking event. For we have in this the measure of the value our rulers set upon the scientific work of the country. We talk much of the education of the "masses," but it is now abundantly evident that the "educated" have still much to learn. Many of the speakers during that debate seemed to be under the impression that the mental equipment attained at Eton suffices to meet all the demands of later life. Though some of the speakers were actually trustees of the British Museum, yet they displayed neither knowledge of the nature of the work of that institution, nor of museums in general.

THE flora of the Maltese Islands was first studied in 1827–31 by Prof. Stefano Tesaga, and in his "Floræ Melitensis Thesaurus" he enumerated 635 species of Phanerogams, 489 of which were natives of the islands. Then followed Delicata's "Flora Melitensis," with an enumeration of 726 species of flowering plants, and this formed the most complete account of the Maltese flora up to the present time. It is true that further additions to the flora have been made from time to time since then, noticeably by Dr. A. C. Gatto, Mr. J. F. Duthie, E. Armitage, and Col. M. J. Godfrey. Finally, Dr. Sommier, the well-known Florentine botanist, explored the flora in 1906 and 1907, and at that time arranged with Dr. A. C. Gatto to write a new flora of Malta, which was published in Italian at Florence at the close of last year, under the title of "Flora Melitensis Nova." We are indebted to Mr. G. Gambin, of Malta, for bringing this work to our notice, and also for an interesting review by Dr. J. Borg which appeared recently in the *Daily Malta Chronicle*. The new flora consists of 500 pages, and includes 916 species of Phanerogams and vascular Cryptogams, 78 Mosses, 18 Hepatics, 183 Lichens, 296 Algæ, and 499 Fungi. The flora on the whole is closely related to the Sicilian, though many plants are also found in North Africa. There are also a few interesting endemic species.

THE third part of "The Useful Plants of Nigeria," forming Additional Series No. ix. of the Kew Bulletin, has just been published. This part, consisting of pp. 343–536, includes the families Rubiaceæ to Labiatæ inclusive, and deals in detail with the plants of economic value contained in those families. The publication is a valuable companion volume to the "Flora of Tropical Africa," also emanating from Kew, and stands to the flora in a similar position as does Sir George Watt's classic "Dictionary of the Economic Products of India" to the "Flora of British India." Now that the "Flora of Tropical Africa" is nearing completion, it is to be hoped that the publication of the final part of this useful complementary volume dealing with the economic plants will not be long delayed. One of the most valuable features in "The Useful Plants of Nigeria" is the list of references cited at the end of each species, which appears to be well-nigh exhaustive in every case. The present part contains accounts of various rubber-yielding plants, tobacco, coffee, teak, *Achras Sapota*—the source of chicle gum—etc. With regard to this latter product, as, indeed, is the case with many other plants of economic importance, botanists are not yet certain as to the exact species or variety of tree which yields the commercial article. This publication is not only of value for our West African colonies, but is of great use at home as a source of information about the economic possibilities of tropical Africa.

P. PORSILD describes in *Meddelelser om Grönland*, vol. li., p. 253, the measures that have been taken to establish nature-reserves for plants in western Greenland, and he quotes a notice-board written in the Eskimo language, which is in itself good evidence of the spread of civilising influences.

IN *Physis* (the journal of the Sociedad Argentina de Ciencias Naturales) for November 10, 1915, F. Pastore describes some of the basalts that cover an enormous area in the plateau-land of Patagonia. At the base of the flows, which appear to have possessed great fluidity, tube-like vesicles have sometimes arisen, parallel to one another and several centimetres in length. This is clearly the same structure as that which gave rise to the "pipe-amygdaloids" of the British Isles. In the same number, in reference to a notice that appeared in NATURE of April 22, 1915, it is pointed out that R. S. Lull decided against the proboscidean nature of Pyrotherium before fully considering the characters of a skull described by Loomis. C. Ameghino afterwards urged the importance of the cranial features, and *Physis* hopes that Prof. W. B. Scott will now state his opinion of them.

PROF. H. F. OSBORN has contributed to a new part of the Annals of the New York Academy of Sciences (vol. xxvi., pp. 215–315) an exhaustive review of the Pleistocene formations of Europe, Asia, and northern Africa, with full references to the recent literature of the subject. It is written in the same style as his well-known volume on "The Age of Mammals," and may be regarded as a revision and extension of the Pleistocene chapter of that work, with the addition of new discoveries. A glance at this review makes it possible to realise how difficult is the interpretation of the local superficial deposits on which alone our knowledge of the latest period of geological time is based. It is scarcely surprising that geologists' views on the Pleistocene glaciation of the northern hemisphere are very varied.

THE use of submerged wire drags towed by two ships at a short distance from one another has considerable value in increasing the accuracy of large-scale charts. Experience has shown, again and again, that even in the most carefully sounded seas dangerous rocks may be missed and only found by a ship striking. The work is, of course, neither necessary nor applicable in deep waters, but from 1906 onward a large amount of submarine survey has been accomplished by wire drags on the coast of New England. The value of the method and the cost entailed are discussed in a paper published by the U.S. Coast and Geodetic Survey (Special Publication No. 29). Several diagrams show the apparatus and methods, but these were described in detail in an earlier publication (No. 21). In order to ensure that the bottom wire is at the right depth to catch all obstructions, it is not allowed to swing free in a single sweep from one vessel to the other, but is suspended from a line of buoys. And, furthermore, to obviate the necessity of the buoys being very close to one another, and yet to prevent the line sagging, cedar floats are attached to the line between the buoys. These serve to balance the weight of the line. The nature of the method only admits of its being used where the general contours of the sea bottom have already been determined by sounding. It appears that on the coast of New England the wire drag has disclosed many unsuspected rocks and reefs.

WE have received from the director of the Royal Meteorological Institute of the Netherlands a set of copies of the De Bilt declination, horizontal force, and vertical force curves on the principal days of magnetic disturbance of the year 1913. The preparation and circulation of such curves is an international scheme, De Bilt serving as headquarters for the selection of the days. On the whole, 1913 was a very quiet year magnetically, and none of the selected disturbances were very large. They include, however, several interesting movements, amongst others three "sudden commencements." The curves are clearly shown on good paper, and full details are given of scale values and base-line values.

MESSRS. A. GALLENKAMP AND CO., LTD., announce the issue of a set of models and other apparatus designed with the view of facilitating the teaching of military science. Four of these, bearing on field telephones, are now ready, and should prove of service to teachers in the various schools and colleges in which military instruction is in progress. The items consist of a diagram-model of the D Mark III. telephone, arranged so as to show the working and adjustment of the buzzer, models of the receiver and transmitter, both of which may be dissected, and a board showing the correct method of repairing a broken line in the field. The tracing of circuits and the arrangement of windings is made easy by the use of coloured cords, and an examination of the models should enable a beginner to form a correct idea of the working of the various parts. Models of this kind should be found specially useful at military training centres, as a telephonist who understands his instrument is far more trustworthy than one whose work is merely automatic. Full descriptions of the models are contained in the circular issued by the firm.

La Nature for February 26 contains an illustrated description of the Nice automatic public telephone system, which has been in operation since October, 1913, and has now 3000 subscribers. The subscriber wanted is called up by the sender of the message without the intervention of any person at a central office. This is done by means of a small circular disc with numbered holes round its circumference attached to the front of the ordinary telephone box. The sender who wishes to ring up, say, No. 2547, on taking down his receiver is automatically connected to a selector at the central office. On inserting his finger

in the hole numbered 2 of his disc, and rotating it to the stop at zero, two short currents are sent out, which move the arm of the selector to the second group of a thousand subscribers. A repetition of the rotation with the finger in the hole 5 moves the arm of a second selector on to the fifth hundred, and so on until the actual subscriber wanted is reached. When the receiver is hung up the sender's connection with the selectors is broken. The arrangements of the circuits of the selectors are shown by figures, and the author, M. E. Coustet, considers an automatic system of this kind the only solution of the present difficulty of apportioning the blame for delays between the subscriber and the *personelle* of the exchange.

IN the *Scientific American* of February 12 there is an account of an invention by Mr. J. B. Flowers of a new phonetic machine. The complete apparatus is still at an experimental stage, but much has been accomplished. Mr. Flowers has investigated the physical nature of whispered sounds lasting for short periods, say, the 1/50th of a second; and as a recorder he makes use of Einthoven's string galvanometer, acted on by an acoustical transmitter. The oscillations of the galvanometer were all photographically recorded on a revolving drum, and it is found that there is a definite form for each whispered sound. Thus there is always the same picture, say, for the sound B, and the number of times this picture is repeated in, say, 1/50th of a sec.—*frequency*—determines pitch, while *amplitude* of the components of the picture determines *intensity*. Thousands of experiments have been made, and thus Mr. Flowers has constructed a new phonetic alphabet, each letter of which has always the same form or curve. The next step was the invention of another instrument which would record the speech patterns, not as sounds, but as variations in intensity. This is accomplished with the aid of sensitive electrical resonators, varying in pitch; these act on a beam of light which vibrates on a selenium cell, and the sound patterns are reproduced by varying resistances acting on an electrically-driven pencil and drum. Speech sounds may also be directly recorded in this way, without the use of the string galvanometer. It is this part of the apparatus that appears to be incomplete, but it is said that the record so obtained "is fully as easy to decipher as that of a siphon recorder used in cable telegraphy."

PROF. O. D. CHWOLSON, in a paper, "Sur les poids atomiques," in the *Bulletin de l'Académie Impériale des Sciences* (Petrograd), discusses the numerical values of the atomic weights from the point of view of the part played by the number 4, that of the helium atom, which radio-active change has shown to be an integral part of the atoms of the radio-active elements. He shows that the number of elements approaching the value $4n$ is one and a half times greater than those approaching the value $4n+2$, where n is an integer, and that whereas the first class tend to approach the whole number, the second class tend to avoid it. Considering the departure of the atomic weights from whole numbers of the form $4n$ he discovers a preference for the values comprised within 0 and $\pm 0{\cdot}5$, and between ± 1 and $\pm 1{\cdot}5$, which may be attributable to the presence of an atom of hydrogen.

IN connection with the University of Calcutta, "extension lectures" are being delivered, and that on January 10, by Dr. P. C. Rây, the dean of the faculty of science of the University, is before us. The lecture consists of a brief *résumé* of original chemical researches carried out in Bengal in the last twenty years, and as an appendix a list of 126 papers contributed to various societies, such as the Chemical Society, Journal of the American Chemical Society, and others, is given. Some of these papers are of very considerable value and interest, and indicate enthusiastic work on the part of this newly created school, which is mainly due to the example and work of Prof. Rây himself. Prof. Rây's first published work was the "History of Hindu Chemistry," written about thirteen years ago, in which he showed there was considerable scientific spirit and also more or less empirical work amongst the ancient Hindus, as indicated in their religious writings, "Tantras," etc., written in ancient Sanskrit. It is, of course, only a man like Prof. Rây, well acquainted with Sanskrit and with a thorough knowledge of modern chemistry, who could have written such a work. In this book Prof. Rây deplored the decline of scientific spirit in India, and "lamented that the spirit of inquiry had died out amongst a nation naturally prone to speculation and metaphysical studies." He now writes:—"Little did I dream that in the course of a decade or so I should have to revise the estimate I then formed of the capacities of my own countrymen and chronicle that a bright chapter is about to dawn in our life-history." It certainly appears from the present activity of original chemical research in Bengal that a new spirit is abroad, and it is to be hoped that this will quickly spread over the remainder of India, and that the same spirit of research will embrace all the other sciences.

THE *Amateur Photographer and Photographic News* have just issued their seventh annual "Empire Number," an enlarged number that appeals especially to the Colonies and Overseas Dominions and those in this country who seek a more intimate relationship with them. It is well illustrated, and includes contributions, both pictorial and literary, from Africa, Australia, India, and other parts of the British Empire.

A NEW and revised edition of Yarrell, Newton, and Saunders's "History of British Birds," edited by W. Eagle Clarke, is in course of preparation for publication by Messrs. Gurney and Jackson. The late Mr. Howard Saunders placed all his collected notes for a new edition of the work at Mr. Eagle Clarke's disposal. A feature of the new edition will be a coloured plate of each species, the work of Miss L. Medland.

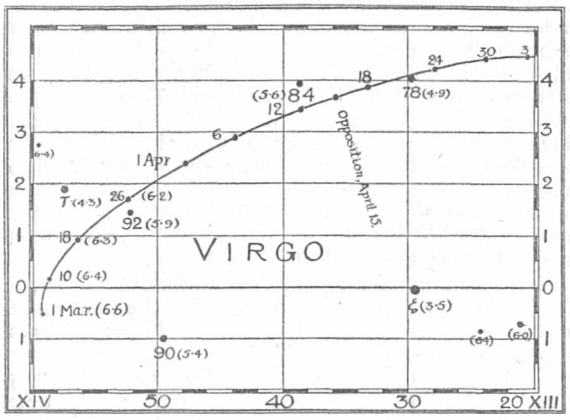
THE following volumes are in preparation for Messrs. Longmans and Co.'s "Text-books of Physical Chemistry"—Electro-Chemistry, part ii., Dr. E. B. R. Prideaux; Practical Spectrographic Analysis, Dr. J. H. Pollok; Crystallography, T. V. Barker. For appearance in the same firm's "Monographs on Inorganic and Physical Chemistry" the following are in preparation:—Electrolytic Dissociation Theory, Dr. J. C. Philip; The Physical Chemistry of Flames, J. E. Coates; Clays, Dr. J. W. Mellor; Catalysis of Gas Reactions, D. L. Chapman; The Electro-Chemistry of Non-Aqueous Solutions, J. W. McBain; Catalysis in Liquid Systems, Dr. G. Senter; The Rare Earth Metals, Dr. J. F. Spencer; Hydrates in Solution, Prof. E. A. Washburn; Adsorption, V. Lefebure and A. M. Williams.

OUR ASTRONOMICAL COLUMN.

OPPOSITION OF THE MINOR PLANET (4) VESTA.—G. Stracke has calculated an ephemeris for this planetoid for the period including the coming opposition on April 15 (Circular No. 502, *Astronomische Nachrichten*). Vesta is the only one of the very numerous swarm of lesser planets that at times becomes visible to the unaided eye, and although this opposition is not the most favourable possible, yet it occurs towards peri-

helion, and the apparent stellar magnitude will be 6·2. It will be upwards of four years before a better conditioned opposition takes place. The accompanying chart shows its apparent path. After about March 26 its magnitude does not appreciably alter during the period shown on the chart. The positions of the four stars nearest to the path are corrected for precession. The

PATH OF THE MINOR PLANET VESTA.



positions and magnitudes of the stars shown are otherwise taken from the catalogue of naked-eye stars prepared by Mr. T. W. Backhouse. Attention is especially directed to the very close appulse of the planet and the star Flamsteed 78, approximately during the early morning of April 22.

SPECTROSCOPIC OBSERVATIONS OF COMETS 1913*f* (DELAVAN) AND 1914*b* (ZLATINSKY).—N. v. Konkoly has published results of visual spectroscopic observations of these comets made during 1914 (*Astronomische Nachrichten*, No. 4833). The spectra of both were particularly bright, and presented a striking similarity. The sodium D line was seen in the spectrum of Delavan's comet. The mean of a large number of settings on the "bright yellow pearl," as it appeared on September 30, gave λ 589·6. Five hydrocarbon bands were measured in both, the wave-lengths for Delavan's comet on October 17 being 559·54, 543·50, 516·63, 488·38, and 472·38. In Zlatinsky's comet the band at λ 516 was the brightest, the relative intensities, from the red, being 0·5, 0·2, 1·0, 0·4, and 0·3.

AN ATMOSPHERIC EFFECT OF SOLAR KATHODE RAYS.—Reference was made in this column on October 28 to M. J. Maurer's observation of a new atmospheric optical effect synchronising with rapidly increasing solar activity. M. J. Maurer made a more extensive contribution to the *Meteorologische Zeitschrift* on the same subject, and attention is now directed to an English translation of this appearing in the U.S. *Monthly Weather Review* (vol. xliii., No. 11).

MR. IVAN LEVINSTEIN.

THE death, in his seventy-first year, of Mr. Ivan Levinstein, which occurred on March 15, at his residence at Hale, near Manchester, removes a conspicuous figure from the world of industrial chemistry. He went to Manchester about the year 1864 from Berlin, where he had studied chemistry at the Technical High School, and established himself in business in Blackley, in the heart of the dyeing industry of south-east Lancashire, as a manufacturer of aniline dyes, being himself not only his own actual producer, but his own salesman also. He quickly laid the foundations of a flourishing business, and soon began to identify himself conspicuously with the industry and commerce of the city, associating himself also with the active direction of other chemical enterprises like those of the Ammonia Soda Company of Plumbley, and Murgatroyd's Salt Company, of Middlewich. He was the active promoter of the fine chemical exhibit which attracted so much attention at the Manchester Jubilee Exhibition of 1887. He was also the founder and for some time the editor of the *Chemical Review*, one of the first technical journals established in this country. He was twice president of the Society of Chemical Industry, and vice-president of the Society of Dyers and Colourists and of the Manchester Chemical Club. He was for many years a director of the Chamber of Commerce and a past-president, and he was closely identified, for more than thirty years, with the development of the Manchester School of Technology, which owed much to his keen intelligence and sound knowledge of technical matters. The Manchester University, of the Court of which he was a member, awarded him the degree of M.Sc. in recognition of his many services to technical science. His name will always be remembered for his stout advocacy for the reform of the Patent Laws, which gave so unfair an advantage to the foreigner, and he undertook at great personal risk many successful actions against certain of the great German chemical firms in order to compel them to grant licences to manufacturers to work their patents in this country. As he once said, "they had patented the whole field of organic chemistry by their astute method of drafting their patents." His unwearied agitation resulted in the Act of 1907, of which he may truly be said, after efforts which had extended over twenty years, to be the real author.

METHODS AND APPLIANCES FOR THE ATTAINMENT OF HIGH TEMPERATURES IN THE LABORATORY.

WHAT was described as an informal discussion on the above subject was opened by Dr. J. A. Harker, F.R.S., on March 15 at a meeting of the Faraday Society. The meeting, which was presided over by Sir Robert Hadfield, F.R.S., attracted considerable interest, and many well-known experimenters in high-temperature work gave their experiences in the course of the discussion.

Dr. Harker, in the first place, described a recent type of carbon tube furnace at present in use at the National Physical Laboratory for standardising optical pyrometers. It is gratifying to know that the high-resistance, thin-walled carbon tubes employed are now made in this country. For many purposes graphite can be substituted for carbon. This material has the advantage of being easy to tool, but in order to increase its resistance, a spiral or zigzag groove has to be cut along the tubes, and the simple device of wrapping filter paper round the tubes prevents—when nothing but ash remains of the paper—the heat-insulating material from falling through the grooves. For this insulating material Dr. Harker recommends that highly flocculent soot known as paint-maker's lamp-black. Finally, the furnace must be completely closed in by a framework of wire-netting coated with cement to form a kind of solid ferro-concrete block. This is necessary on account of the carbon monoxide that is produced, as well as for thermal reasons. Copper bands wrapped round the ends of the tubes as terminals practically complete the furnace, but water-cooling is necessary to prevent undue heating at the contacts to keep down the voltage; indeed, attention to the terminal contacts is a necessary condition of smooth running, and inattention to this is a frequent source

of avoidable trouble in electric furnace work. The furnace shown in operation at the meeting consumed 100 amperes at 10 volts when running at 2000° C. This temperature was attainable in two or three minutes. A home-made transformer with about 100 primary turns wound in two halves and three separate secondary coils that can be connected in series or parallel enables the furnace to be run off almost any ordinary lighting circuit.

Mr. R. S. Whipple, among other speakers, testified to the value and convenience of this simple form of carbon tube furnace. It was stated that Northrup in America was using a similar furnace on a larger scale for gear hardening in a motor-car factory. A thermo-couple is attached to each piece of gear and the temperature is run up until the hump on the curve shows the recalescent point to have passed. The gear is then removed and quenched. One of the furnaces exhibited by Dr. Harker was made for a steel foundry at Sheffield for standardising optical pyrometers, of which a very large number were stated to be in use.

The discussion emphasised the fact that the great desideratum at the present moment for many requirements, both in the laboratory and the works, is a furnace that will have all the advantages of the carbon tube furnace, but which will not evolve carbon compounds. Dr. Rosenhain had used a vacuum furnace wound with tungsten wire for melting pure iron (melting point 1525±5° C.), but the tungsten became brittle after heating, and was soon useless. A resistance furnace using granular tungsten working in hydrogen or nitrogen was suggested as one substitute, and another was a carbon tube furnace with an inner tube and an indifferent gas between the two. It appears, however, that zirconia tubes are being experimented with, and a successful outcome of this work is hopefully anticipated. Zirconia is one of the best refractories known, and if it can be obtained pure in granular form almost any temperature will be possible with surface combustion. Dr. Rosenhain made the useful suggestion to coat carbon electrodes or tubes—even in ordinary commercial electric furnaces—with metallic copper, iron, or aluminium by means of the Schoop spray process, as a means of ensuring good electrical contacts.

For temperatures up to 1000 or 1200° C., tube or muffle furnaces heated with nickel-chromium wire were recommended by several speakers, some of whom have abandoned gas-heating altogether for temperatures below 1000°. On the other hand, some of the modern gas burners, of which several types were described, appear to give excellent results at high temperatures. Air under high pressure is essential, and so it appears is violent mixing of the air and gas—the cause of the great noise made by these furnaces. Mr. S. N. Brayshaw described the ingenious burner which bears his name, which is displacing the oxy-hydrogen flame, too local in its heating, for melting platinum. For many experimental metallurgical purposes the Richmond gas furnace was recommended.

INSECTS IN AFRICA AND THE EAST.

AN accurate description of the Indian lac insect (*Tachardia lacca*), founded on new observations of its life-history and habits, has long been wanted by students of economic entomology. They now find this provided in the recently issued Indian Forest Memoir (Zoology, vol. iii., part 1) by Dr. A. D. Imms and Mr. N. C. Chatterjee. The various stages are illustrated by beautifully executed coloured figures, and there are enumerations of the insect's food-plants and analyses of its important secretion. A remarkable feature is the dimorphism shown in the male, which may be either winged or wingless—the latter condition very rare among Coccidæ. The Tachardia is attacked by an alarming array of enemies, of which the caterpillar of a noctuid moth, *Eublemma amabilis*, is the most formidable. It is aided in its destructive efforts by several other caterpillars of Lepidoptera, a large number of beetles and their larvæ, and a host of hymenopterous parasites.

To the December part (3) of the Bulletin of Entomological Research (vol. vi.) Dr. J. W. Scott Macfie contributes observations on the bionomics of *Stegomyia fasciata*, the mosquito that is well known as the alternate host with man of the yellow fever parasite. The female insect pairs soon after emergence, and then must have a meal of blood before laying her eggs. Fertile eggs may continue to be laid for thirty-seven days without necessity for a second pairing. The prevalent belief that this mosquito sucks blood by night only is not confirmed, "but sometimes she refuses an offer to feed in daylight in favour of the next opportunity to feed in the dark." The male's taste is gentler, as his staple food is honey.

The same part of the Bulletin contains also notes, by Dr. W. A. Lamborn, on the habits of *Glossina morsitans*—the tsetse-fly that carries sleeping-sickness trypanosomes in Nyasaland. The insects are by no means confined to the mapped "fly-belts." The preponderance in number of males among flies captured on the wing, which contrasts with the close equality of the sexes as bred from puparia, is explained by the author as due to the male's habit of pairing as the result of violent capture rather than of courtship; hence the females shun the society of the opposite sex. The slimy secretion of the Glossina larva is believed by Dr. Lamborn to afford some protection against the attacks of certain ants. Puparia are rarely found parasitised by larvæ of Mutilla and other Hymenoptera, and the adult tsetses are sometimes caught and devoured by dragonflies. Dr. Lamborn described how a dragonfly, *Orthetrum chrysostigma*, hovered around his party of six "boys," swooping down and picking off a tsetse from the back of one who stooped to drink at a pool. Many specimens of the Orthetrum were captured in the act of devouring tsetses, which appear to be equally acceptable, whether fasting or filled with freshly-ingested blood, and this species of dragonfly is evidently very expert in catching Glossina. Another kind of dragonfly (*Crocothemis erythraea*), on the other hand, handled a tsetse so clumsily as to convince Dr. Lamborn that it is a novice with this special type of prey. A description with figures of several species of chalcids which Dr. Lamborn has reared from the Glossina puparia is given by Mr. J. Waterston (*t.c.* part 4).

An addition to our knowledge of the distribution of tsetses is contained in Dr. Schweiz's paper in the third part of the bulletin; he has traced *G. morsitans* in the Katanga district of the Belgian Congo far to the west of the great river. Dr. Schwetz writes also on the range and habits of *G. brevipalpis*—a fly often overlooked as it flies before sunrise and after sunset.

G. H. C.

INTERESTING FORAMINIFERA.

IN a fine memoir[1] on Foraminifera from the Kerimba Archipelago, Portuguese East Africa, Messrs. Edward Heron-Allen and Arthur Earland deal with no fewer than 470 species and varieties, of which thirty-two are new to science. There is a striking resemblance between the general facies of the gatherings at Kerimba and that of the late Mr. F W. Millett's collection from the Malay Archipelago. The

[1] Trans. Zoological Society of London xx (1914), pp. 363-90, 3 pls.; and *Ibid.*, xx. (1915), pp. 543-794, 14 pls., 3 figs. *See also* Proc. Zoological Society of London, 1915, pp. 295-8.

leading zoological feature is perhaps the great abundance of Miliolidæ, of which 122 species are reported, seventy-seven in the single genus Miliolina.

The authors have been fortunate enough to discover some very interesting new types. Thus there is Iridia with a diaphanous chitinous envelope covered over with very fine particles of mud and sand. It seems to be an Astrorhizid, is usually attached to sand-grains or shell-fragments, and may attain to the gigantic size of 8 mm. in diameter. Strange, probably abnormal, forms occur with a clear area on each side of the shell, perhaps indicative of liberation from between two large sand-grains. Similar, possibly identical, forms have been described by Rhumbler from a depth of 400 metres in the Antarctic, and named *Vanhoeffenella gaussii*, the "windows" being interpreted as adaptations to the very scanty rays of light. But this would not apply to the fierce glare of the Kerimba shore. Another remarkable new type is Nouria, with several species, some of which show very effective treatment of the material selected for shell-making. Thus in *Nouria harrisii* the test is entirely composed of sponge spicules arranged in a single layer with their axes more or less parallel to the long axis of the test, but so as to form a perfectly tapered neck and a regular fringe projecting around the mouth. There are sometimes spicules projecting aborally, which may serve to keep the animal erect in the surface layer of mud.

Experts will be interested in what the authors have to say in regard to D'Orbigny's *Pavonina flabelliformis* and his *Rotalia dubia* (seen again after ninety years!), in their revision of the lituiform species of Peneroplis, and in their very successful study of the double shells of Discorbina (apparently due to a kind of budding), and of the development of the peculiar dual nature of the terminal balloon-chamber which Earland noticed some years ago in *Cymbalopora bulloides*, D'Orbigny. But we shall rather refer to the remarkable discovery of specimens of *Cymbalopora tabellaeformis*, occupying little pits in mollusc shells. Each Foraminifer seems to be able to enlarge its crypt as its test grows; nay, more, to excavate tunnels in the mollusc shell. These tunnels radiate round the crypt and may attain to a length many times its diameter. They are for the accommodation of the pseudopodia. It is interesting that the living matter which habitually secretes carbonate of lime should also dissolve it, and the possibility is suggested that the solution may be helped by carbon dioxide given off (at night?) by the symbiotic Algæ which are usually associated with this Foraminifer. The authors are to be congratulated on the use they have made of their fine material, in connection with which the skill and energy of Dr. J. J. Simpson, who made the collection, should be remembered.

SCIENTIFIC EDUCATION AND INDUSTRIAL RESEARCH.

SEVERAL professional bodies have devoted attention lately to education and science in relation to industrial development; and it is not too much to say that they all appreciate the need for action in order to prepare for the strain of competition which may be expected to follow the cessation of hostilities. On Tuesday, March 14, the subject was discussed at the Institute of Journalists by the Circle of Scientific, Technical, and Trade Journalists, under the title, "The Sphere of the Scientific and Technical Press in Relation to Technical Education and Research," Mr. L. Gaster, chairman of the circle, presiding. The discussion was opened by Dr. W. Garnett, late educational adviser to the London County Council, and by Mr. A. P. M. Fleming, who has recently made a tour of inspection of research laboratories in the United States. Dr. Garnett's main suggestions are as follows:—

(1) Education in elementary and secondary schools must be more directly associated with *things* so as to develop self-reliance and resourcefulness, not to teach trades.

(2) A considerable proportion of teachers should devote a third year of training largely to practical work under conditions enabling them to become acquainted with the practice of some trades.

(3) A general knowledge of the phenomena of nature and of processes applied in industry must be more widely diffused by means of popular lectures and otherwise.

(4) More completely organised courses of instruction, without breach of continuity, must be provided for industrial workers of all classes, including the leaders of industry, together with the necessary scholarships, fellowships, or bursaries to enable the best students to carry on post-graduate research.

(5) Existing institutions must be improved and some new institutions must be provided, especially in the chemical trades, to enable scientific discoveries to be developed sufficiently to demonstrate the conditions under which they can be made commercially successful.

(6) Some alterations must be made in the patent law to enable the profits arising from investigations conducted wholly or partly at the public expense to be fairly divided between the State, the scientific worker, and the manufacturer.

(7) Trades should be organised for the purpose of superintending the research work in which they are interested, for the collection and dissemination of information and the distribution of work among firms in the manner in which it can be most effectively and economically carried out in the interest of the industry as a whole.

(8) The trade associations should be in close touch with the Advisory Council for Research, and the council should, where necessary, recommend the award of Parliamentary grants in aid of industrial research carried out under the direction of the associations and make provision for such work in cases in which trade associations are not available, but the Advisory Council should utilise to the utmost the services of societies.

(9) As an alternative the Advisory Council for Research should appoint technical committees representative of trades, or groups of trades, to assist it in the organisation of industrial research.

(10) The National Physical Laboratory should be the central institution for all physical measurements and standardisation, but for chemical processes a separate institution for a trade or group of trades will frequently be required for the work intermediate between the discovery of a new product or reaction in the research laboratory and the adaptation of the process to commercial manufacture.

(11) Some method of financing new processes which have been approved by a competent authority, other than the ordinary method of floating a company, is desirable, and this may be provided by some form of industrial bank.

It will be noticed that, among other points, Dr. Garnett pleads not only for increased specialised courses of training in science and technology, but also for a knowledge of natural facts and phenomena as part of the education of all. When this has been secured, it may be hoped that "members of Parliament will cease to wonder whether we shall *ever* know why the moon appears to change her shape, and we shall not be told that lard has only just been discovered as a source of glycerine, that mineral oil from Galicia

is equally useful for this purpose, that wool will take the place of cotton in the manufacture of nitrocellulose for propellants, or that a cargo of phosphate has been seized lest it should be used by the enemy for the manufacture of phosgene gas."

Dr. Garnett suggested that, perhaps, in course of time, the Committee of the Privy Council concerned with the development of scientific and industrial research may, as in other cases, be replaced by a new Ministry; and that a National Chemical Laboratory might be established corresponding to the National Physical Laboratory, though the diversity of chemical trades and interests suggests that several co-ordinated laboratories would be required.

Mr. Fleming's account of the enormous amount of industrial research being carried on in the United States by individual firms, and the increased provision being made for research in universities and technical institutions, shows that America is fully alive to the commercial advantages of such work. He stated that in the United States at the present time there are upwards of fifty corporations having research laboratories, costing annually from 20,000*l.* to 100,000*l.* each for maintenance; and he added:—"Some of the most striking features of the research work in America are the lavish manner in which the laboratories have been planned and which in many cases enable large-scale manufacturing operations to be carried out in order to determine the best possible methods of manufacturing any commodity developed or discovered in the laboratory; the appreciation of men of higher scientific training by industry, resulting in increasing numbers of students proceeding to their doctor's degree before leaving the university; the increasing attention given in the research laboratories to pure science investigations, this being, in my opinion, the most important phase of industrial research; the absorption of men who have proven their capacity for industrial research in such places as the Mellon Institute, the Bureau of Standards, etc., by the various industries in which they have taken scientific interest."

While much work of prime importance has been done by individual investigators in this country, there is a general lack of appreciation by manufacturers of the advantages to be derived from the application of science to industry, and a tendency to avoid the employment of scientifically trained men. Steps have been taken by the Royal Society to organise scientific workers, and the Chemical Society has formed committees representing all branches of chemical science. Similar organisations of technical experts have been brought together by engineering societies. What seems to be particularly needed is a combination of the forces of education, science, manufacture, and commerce, instead of bodies in which these interests are separately represented. The only body in which this combination exists is the British Science Guild, which was founded in 1905, with the express object of bringing home to all classes "the necessity of applying scientific treatment to affairs of all kinds." The present European crisis affords an opportunity of unique importance for the guild to impress upon all who are engaged in the executive functions of Government, and especially upon those who are engaged in the sphere of industry and commerce, the paramount claims of science in its most advanced aspects of training and research.

The events of the present war have shown with striking clearness, not only the advantage which systematic education in science and thorough organisation of scientific research in its various applications have given, whether from a chemical or engineering point of view, to the chief of the Central Powers with which the Allies are engaged, but they have shown with no less emphasis the extent to which in the region of scientific industry Germany has grown to be the most formidable rival of the United Kingdom.

This result is not due to any merely adventitious circumstances, but is the direct fruit of the sedulous cultivation of science and of scientific research during the last sixty years, especially in the highest educational institutions of Germany; and it is the result also of the frank and liberal recognition by the great departments of the State and by the leaders of industry and commerce of its vital importance to the economic progress and well-being of the nation.

The recent important memorial, signed by men of high scientific and technical eminence engaged in the various departments of pure and applied science, directed the attention of the public to the grave character of the problems involved. It is now necessary to invoke the aid of the influential technical associations concerned with the development and advancement of the great scientific industries, of the chambers of commerce in the chief industrial and commercial centres, and of bodies representative of the workers engaged in the service of the more important industries. It is necessary also to engage the influence and support of bodies charged with the development of agriculture, in respect not only of improved scientific means and methods of cultivation, but also of the introduction into agriculture of other products of high value, with a view to render the nation less dependent upon foreign sources for its food supplies.

It is of prime importance that consideration should be given to the conditions upon which the *personnel* of the public service is recruited, particularly in respect of the choice of the higher officials. We may thus ensure a much closer sympathy with, and a keener appreciation of, the value of science and of its close relation to national progress, with the consequent careful and generous consideration of the curricula of the schools, so as to include a fuller measure of observation and experiment, and provide the means whereby the gifted of all classes can avail themselves of the highest facilities for education.

With the object of giving effect to these purposes and aims the British Science Guild is preparing a statement which will be submitted to leading representatives of many national interests, and the whole subject will afterwards be brought before the Government and the nation. The technical Press could perform a useful service by directing attention to the opportunity which the guild affords of uniting industry with education and science for their common good.

USE OF FOSSIL REMAINS OF THE HIGHER VERTEBRATES IN STRATIGRAPHICAL GEOLOGY.[1]

THE study of fossil fishes, referred to in the presidential address to the society in 1915, raised the question as to whether animals of apparently the same family, genus, or species might not originate more than once from separate series of ancestors. The higher vertebrates, which inhabited the land, may most profitably be examined to throw light on the subject; for the land has always been subdivided into well-defined areas, isolated by seas, mountains, and deserts, so that animals in these several areas must often have developed independently for long periods. Students of shells are unanimous in recognising what they term homœomorphy, and trace immature, mature, and senile stages in the course of every race that can be followed through successive geological formations.

[1] Abstract from the presidential address delivered to the Geological Society of London on February 18, by Dr. A. Smith Woodward, F.R.S.

Vertebrate skeletons, which have much more numerous and tangible characters, and approach senility in more varied ways, should afford a clearer view of general principles.

Even among vertebrates the evidence that most concerns the geologist is not always easily interpreted. For instance, the Sparassodonta and horned tortoises of the Argentine Tertiary are so closely similar to the existing Thylacines and the fossil Miolania of Australia, that they are still sometimes quoted as proving the former existence of an Antarctic continent uniting the South American and Australian regions. On the other hand, they may be merely survivors of cosmopolitan races at the two extremes of their former range, with certain inevitable (but not altogether similar) marks of senility. In making comparisons, indeed, it is no longer enough to distinguish the fundamental and merely adaptive characters of animals; it is also essential to note separately those characters which depend on the early, mature, or senile position of the particular animals in the evolving series to which they belong.

Hitherto there seems to be only one case in which we have enough materials for forming a judgment as to whether a fundamental advance may occur more than once. Mammal-like reptiles are abundant in the Permian of North America and in the Permian and Trias of South Africa and other parts of the Old World. Recent studies have shown that all specialisations in the North American forms are in the direction of higher reptiles, while all those in the South African forms are in the direction of mammals. Hence, although there is evidence of two possible sources of mammals, only one appears to have produced them.

Among advances of lower degree, the origin of the monkeys or lower Anthropoidea may be considered. It is agreed that they arose from the Lemuroidea which were almost universally distributed over the great continents at the beginning of the Tertiary era. They seem to have evolved separately in America and in the Old World, but the two series are very sharply distinguished, although they form one zoological "suborder." When isolated on the island of Madagascar, some of these same animals acquired a few peculiarities of the American, others of the Old World Anthropoidea, but never really advanced beyond the Lemuroid stage, merely becoming senile just before their extinction. Hence, the Lemuroidea evolved in three different ways, and the resulting groups are very easily distinguished.

The study of the Tertiary Ungulata is especially important, because most of the groups arose either in North America or in the Old World, which were united and separated several times. It seems clear that, although each group probably originated but once in one particular area, its members soon diverged into several independently evolving series, each imbued with some definite impulse or momentum towards specialisation in the same way in the course of geological time, only at different rates. There were thus, for example, several distinct lines of horses and rhinoceroses, but all from the same source.

It is now well known that the characteristic South American Tertiary Ungulates arose in an isolated area, and many of their specialisations are curiously similar to some of those observed among European Eocene and Oligocene Ungulata which soon proved abortive or "inadaptive." They are, however, by no means identical.

While so many changes have occurred during the evolution of the vertebrates, the persistence of characters and the strength of heredity in numerous cases are still as perplexing as they were when Huxley first directed special attention to "persistent types."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. A. V. Hill, Humphrey Owen Jones lecturer in physical chemistry, and Mr. J. E. Davey have been elected fellows of King's College.

Mr. F. P. White, St. John's, has been elected to an Isaac Newton studentship for three years, and Mr. H. Jeffreys, St. John's, has been re-elected to a studentship for an additional year. The Allen scholarship for research in scientific subjects has been awarded to Mr. Franklin Kidd, St. John's.

LONDON.—Prof. H. Jackson, of King's College, succeeds Prof. A. W. Crossley as one of the representatives of the faculty of science on the Senate.

The report of the Military Education Committee for 1915 has been presented to the Senate. It states that the number of members of the University of London O.T.C. during the training year ended September 30 was 2209, of whom 1068 proceeded to commissions during that year. Up to the end of 1915, 2228 cadets or ex-cadets of the contingent had been granted commissions. Of these eighty-six had fallen in the war, and the honours and distinctions gained were one V.C., twenty-five military crosses, sixty-three mentions in despatches (four mentioned twice), and one Medaille Militaire. In addition, 273 commissions had been granted to graduates and students (other than cadets or ex-cadets), and these officers had gained four military crosses and ten mentions in despatches. Since the outbreak of war, eight monthly courses had been held in the officers' school of instruction in connection with the contingent, and more than 900 officers had passed through the school. Lists of officers who have fallen in the war and have gained distinctions are printed as appendices to the report.

OXFORD.—The Herbert Spencer lecture was delivered on March 15 by Prof. J. Mark Baldwin. Taking for his subject "The Super-State and the 'Eternal Values,'" Prof. Baldwin spoke of the distinction, on one hand, between instrumental and eternal or absolute values, and, on the other, between individual and super-individual values. Pointing out that these distinctions are not peculiarly German, he went on to show that with the advent of the present war it became evident that in the German conception the State is not a vehicle of simply individual or instrumental value. It is, according to the Germans, the expression of the full national will; it *is* value *per se*, summarising in itself the two super-individual values. The monarch symbolises this; no concession to the popular will is possible under such a conception, but the populace may be the recipient of free gifts from the State. Natural selection, or the survival of the fittest, is recognised, as, for example, in the victory of Turks over Arabs in the thirteenth century, or of Rome over Greece. Germany recognises two kinds of fitness—military efficiency and organisation. The spiritual and ethical weapon is wielded by the State alone. Military necessity knows no moral law; "might is right," *i.e.* super-individual might makes individual right. The observance of treaties is subordinate to the needs of the State; to be once a German is to be always of super-individual value; "Deutschland über Alles." So much for the German ideal. The opposed point of view makes itself felt in various domains, as in that of naturalisation, where the experience of the war has proved that documentary evidence is useless; in that of arbitration; and in that of cultural relations between peoples. In fine, Germany says that the nation is instrumental to the State; the democratic belligerents opposed to Germany hold that the State

has an instrumental value only, and that it is instrumental to the nation.

SHEFFIELD.—The council of the University has decided to institute a lectureship in Russian. It is understood that in view of the urgency of a knowledge of Russian in the trade of Sheffield, the necessary funds have been secured locally, and that an appointment to the lectureship will shortly be announced.

AMONG the bequests of Mr. J. S. N. Boyd, who died on February 1, leaving estate of the value of 32,646*l.*, are 2,100*l.* to Epsom College, for one foundation scholar, and the ultimate residue of the estate, after the death of his mother and sister, to the University of London for a professorship of pathology in the Medical School of Charing Cross Hospital.

IN the fire which, as stated last week (p. 49), destroyed the chemical laboratories of Cornell University, several members of the staff appear to have lost very valuable records and data, the work of years. We learn from *Science* that many notes of experiments and researches, manuscripts, and treasured records have been lost. In a business house such records would be placed in a fire-proof safe every day when not required, but the use of safes in laboratories is very rare. Perhaps the fire at Cornell University will lead to the introduction of fire-proof rooms or safes in all laboratories where records of original work are kept, in order to avoid the destruction of scientific material upon which no monetary value can be placed because it is unique.

IT is announced in the issue of *Science* for March 3 that the University of Buffalo has received actual and provisional endowment for the new department of arts and sciences amounting to 150,000*l.*; 20,000*l.* of this sum to be given outright by Mrs. Seymour H. Knox, who, with her children, proposes to increase this eventually to a total of 100,000*l.*; 50,000*l.* is given by General E. Hayes, for the first building upon the University site, provided 200,000*l.* be raised for like purposes before June, 1919. From the same source we learn that President Goodnow, at the commencement exercises of the Johns Hopkins University, on February 22, announced that the Consolidated Gas Company of New York, the American Gas Company of Philadelphia, and the Consolidated Gas Company of Baltimore, had interested themselves in the establishment of a laboratory at the University for research work as to the possibilities of coal-tar products. The purpose is to develop the aniline dye industry and other important branches in the coal-tar field.

THE experiment of holding a "Summer Assembly in Science" at the Scripps Institution for Biological Research at La Jolla, on the sea coast near San Diego, will be tried by the University of California next summer for the first time. The purpose is to disseminate among teachers and others interested in modern science the discoveries and new points of view which are resulting from the investigations of the research department of the University. There will be lectures, conferences, and demonstrations every afternoon of the six weeks by members of the scientific staff of the institution, and Tuesday and Thursday mornings will be devoted to lectures, laboratory, museum, and field work for small groups of students on the characteristic animal and plant life of the ocean waters along the shore of southern California. A course on "Local Coastal Physical Geography" will be conducted by Mr. W. C. Crandall, who as master of the *Alexander Agassiz*, the institution's sea-going scientific collecting vessel, has wide familiarity with the California coast. Half a mile of ocean frontage, with cliffs, sand beaches, and tide pools inhabited by a wide variety of sea-life, is the ideal locality which the Scripps Institution for Biological Research occupies. Any persons interested in science who wish to attend the assembly at the Scripps Institution from June 25 to August 5 next are requested to write as soon as possible to Prof. William E. Ritter, scientific director of the institution, at La Jolla, so that proper provision may be made.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—Sir J. J. Thomson, president, in the chair.—C. **Reid** and J. **Groves**: Preliminary report on the Purbeck Characeæ. The investigations, in aid of which a Government grant was made, relate to the remains of Characeæ found in the cherts and limestones of the Middle Purbeck beds of Dorset. A large amount of new material has been collected, and by treating the limestones to a long-continued drip of slightly acidulated water it has been possible to obtain specimens throwing much additional light on the structure of these plants. The principal results obtained up to the present are:—(1) The discrimination of a new genus, Clavator, characterised by (*a*) the production of remarkable thickened club-like nodes; (*b*) the presence of a utricle enclosiig the oogonium; (*c*) the production of numerous rosette-like groups of clavate processes on the stem and branchlets. (2) The discovery of a number of different types of fruit and vegetative parts showing that the Chara-flora of the period was rich and varied. The remains found belong to both divisions of the family Chareæ and Nitelleæ.—Prof. H. G. **Plimmer**: Notes on the genus Toxoplasma, with a description of three new species. Organisms bearing the above name have been found in the rabbit, gondi, dog, mole, and pigeon during the seven years that have elapsed since their discovery by Splendore in Brazil. Their systematic position is uncertain, but they are widely distributed geographically and as regards hosts. They are found as parasites in the mononuclear leucocytes, in which they occur in large numbers. Those described in the paper were found in a Fossa from Madagascar, in a fruit pigeon from the Aru Islands, and in a Say's snake from Mexico, this latter being the first found in a reptile. The results of the study of these parasites in the above-named animals point rather to their relationship with the Hæmogregarines than with the Leishmania or the Yeasts, as has been suggested.—F. **Sano**. The convolutional pattern of the brains of identical twins, a study on hereditary resemblance in the furrows of the cerebral hemispheres. This monograph is a contribution to the study of the comparative morphology of relative brains inaugurated by Spitzka, Karplus, and Schuster. Its interest lies in the fact that it describes the brains of identical twins. It also includes a study of nerve plexuses and other morphological points of interest, thus serving as a morphological contribution to the observations of the late Sir Francis Galton on the history of twins.

Royal Meteorological Society, March 15.—Major H. G. Lyons, president, in the chair.—Sir Napier **Shaw**: The meteorology of the globe in 1911. The year 1911 is still remembered for its fine, warm summer. As the sequel of a long series of discussions at meetings of the International Meteorological Committee and its commissions, the International Solar Commission, the International Commission for Maritime Meteorology and Storm Warnings, the International Commission for Réseau Mondial, as well as the Solar Physics

Committee of the Board of Education, which, through the Solar Physics Observatory at South Kensington, was concerned with the relation of solar and terrestrial phenomena, especially rainfall, the committee of the Meteorological Office authorised the preparation of an annual statement of the meteorology of the globe beginning with 1911. The volume for that year is now nearly ready for issue. It gives particulars of pressure, temperature, and rainfall for available stations in all parts of the globe at the rate of two stations for each 10° square of latitude and longitude. It also gives the differences from the normal in those cases in which normals existed or could be compiled. The values are given in absolute units for pressure and temperature. Positive and negative signs are therefore only used to indicate differences from normal, except in two cases of negative sign in the column for height which indicate that the stations are below sea-level. A brief discussion of the meteorology of the year is based upon the differences from normal.

MANCHESTER.

Literary and Philosophical Society, March 7.—Prof. S. J. Hickson, president, in the chair.—D. **Thoday**: Optical properties of chlorophyll. The author referred to the importance of chlorophyll, which enables green plants to utilise radiant energy from the sun in the synthesis of organic food substances from the carbon dioxide of the atmosphere. On this process the whole organic world, with few exceptions, directly or indirectly depends. A few classes of bacteria, *e.g.* the iron and the sulphur bacteria, are independent of organic substances, making use of carbon dioxide in *chemosynthesis* by means of chemical energy, liberated in the oxidation of ferrous carbonate and sulphuretted hydrogen respectively. In the green plant the direct utilisation of sunlight in *photosynthesis* depends on chlorophyll, and this fact makes the optical properties of chlorophyll of especial interest. Mr. Thoday demonstrated the red fluorescence of a chlorophyll solution, remarking that the sensitising action of this and other fluorescent pigments on photographic plates, and their toxicity to protozoa in extremely dilute solution only in the light, suggest that such pigments when exposed to light are especially active chemically.—Dr. H. G. A. **Hickling**: Variation in the colour of coal streaks. The colour of coals varies in proportion to the different amounts of carbon in the coals. The author exhibited a number of samples of the fluorescent solutions obtained by washing finely-ground coal-powder with benzene. He pointed out that the constituent of the coal dissolved by the benzene appears to be more especially characteristic of the bituminous or humic types of coal, little or no colour being obtained when the Cannel coals or anthracites are similarly treated.

EDINBURGH.

Royal Society, February 7.—Dr. J. Horne, president, in the chair.—J. M. **Thompson**: The anatomy and affinity of *Platyzoma microphyllum*. The paper dealt with the anatomy of a single specimen of the plant. There were simply-pinnate unbranched leaves springing from the upper surface of the condensed and horizontal rhizome, and small filiform leaves devoid of pinnæ inserted on the sides and lower surface of the rhizome. Between these two leaf types transitions were found. The heterophyly is considered a consequence of the adoption of the rhizomatous habit. A dichotomised pinnate leaf was described. The stele was of a unique type, and the sporangia, of which there were two types, large and small, were characterised by irregularities in form and variability in position of the annulus. The systematic position of the Platyzoma cannot yet be determined, and until fuller information regarding the nature of the spores is obtained it is proposed to leave Platyzoma in the Gleicheniaceæ.—Dr. R. C. **Davie**: The leaf trace in some pinnate leaves. This was a continuation of the former paper on the pinna trace in the ferns. Species of Polypodium from the forests and open sea coast in Brazil showed no variation in the method of giving off of the leaf trace, but modified the abaxial side of the leaf trace, increasing the number of strands where the leaves were long and heavily pinnate, decreasing them in short leaves. In species of Aspidium, Dryopteris, Polystichum, and other genera collected in Brazil it was found that the abaxial strands of the leaf trace were used directly in the supply of the pinnæ where these were large. With few exceptions the type of pinna trace is constant throughout a genus. The abaxial side of the leaf trace is dependent on local and individual peculiarities. Comparisons were made with the leaf trace of Cycads and of Monocotyledons and Dicotyledons.

PARIS.

Academy of Sciences, March 6.—M. Camille Jordan in the chair.—Pierre **Duhem**: The electrodynamics of conducting media.—M. **Liapounoff** was elected a correspondant for the section of geometry in the place of the late Paul Gordan.—Ernest **Lebon**: A new table of divisors of numbers.—Charles **Rabut**: New inverse invariants.—MM. **Girardeau** and **Bethenod**: The regulation of the charging circuit in installations of wireless telegraphy, using continuous high-tension current with rotating contact-breaker. Commenting on two recent notes of M. Bouthillon, it is pointed out that the proposed regulation is not new. References made to publications on this subject, dating from 1910.—A. **Bach**: A new reaction of urine. Nitrates are reduced in animal tissues by the joint action of a ferment and a co-ferment, neither of which separately possesses a reducing action. Both are present in fresh milk, and it is now shown that normal urine contains appreciable quantities of the co-ferment.—Jules **Welsch**: The geological constitution of the Poitou marshes.—Stanislas **Meunier**: Observations on the absence of the pelagic facies in the sedimentary series.—F. **Garrigou**: The age and mode of formation of water at the surface of the earth.—Fernand **Goud**: A new method of employing formol for disinfection at the front. Use is made of the vapours given off when formol (40 per cent. solution) is poured into a saturated solution of potassium permanganate. Direct experiment has proved that sterilisation of clothes by this method is more rapid than when day heat is used. Details of the process are given.—C. **Galaine** and C. **Houlbert**: A sulphur dioxide diffuser for disinfection and rat killing in the trenches, in hulls of ships, and in houses. The apparatus proposed consists of a vessel of liquid sulphur dioxide, a heating coil and a fan. The apparatus is claimed to be compact, easily manipulated, and efficient in action.—Auguste **Lumière**: The action of the hypochlorites on pus. It has been shown by M. Delbet that when pus is added to double its volume of Dakin's solution (0·6 per cent. sodium hypochlorite) sterilisation is not usually effected, and, indeed, for some organisms, increased vitality results. Experiments with pus containing various micro-organisms (tetanus, streptococcus, staphylococcus, etc.) show that when a quantity of sodium hypochlorite is added to pus insufficient for sterilisation, the organisms are rendered less virulent and their toxins are destroyed by oxidation. This destruction of toxins regenerates the culture medium (pus), hence the increased growth in M. Delbet's experiments. But the destruction of the toxins *in vivo* is favourable to the body resistance since it permits the intervention of the phagocytes.

BOOKS RECEIVED.

The Structure and Properties of the More Common Materials of Construction. By G. B. Upton. Pp. v+327. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 10*s*. 6*d*. net.

A Text-Book of Practical Physics. By Dr. H. S. Allen and H. Moore. Pp. xv+622. (London: Macmillan and Co., Ltd.) 8*s*. 6*d*. net.

Institution of Electrical Engineers. Wiring Rules. Seventh edition. Pp. 54. (London: E. and F. N. Spon, Ltd.) 6*d*.

Catalogue of the Fresh-Water Fishes of Africa in the British Museum (Natural History). By G. A. Boulenger. Vol. iv. Pp. xxvii+392. (London: British Museum (Natural History); Longmans and Co.) 30*s*.

Electrical Apparatus Making for Beginners. By A. V. Ballhatchet. Pp. 164. (London: P. Marshall and Co.) 2*s*. net.

The Meaning of Dreams. By Dr. I. H. Coriat. Pp. xiv+194. (London: W. Heinemann.) 5*s*. net.

Sleep and Sleeplessness. By H. A. Bruce. Pp. ix+219. (London: W. Heinemann.) 5*s*. net.

Human Motives. By Prof. J. J. Putnam. Pp. xvii+179. (London: W. Heinemann.) 5*s*. net.

Warwickshire. By J. H. Bloom. Pp. xi+144. (Cambridge: At the University Press.) 1*s*. 6*d*. net.

A Handbook of Colloid-Chemistry. By Dr. W. Ostwald. Translated by Prof. M. H. Fischer. Pp. xii+278. (London: J. and A. Churchill.) 12*s*. 6*d*. net.

A System of Physical Chemistry. By Prof. W. C. McC. Lewis. Vol. i., pp. xiv+523. Vol. ii., pp. vii+552. (London: Longmans and Co.) 9*s*. net each.

A History of British Mammals. By G. E. H. Barrett-Hamilton and M. A. C. Hinton. Pp. xviii. (London: Gurney and Jackson.) 2*s*. 6*d*. net.

Canada. Department of Mines. Mines Branch. Petroleum and Natural Gas Resources of Canada. Vol. ii., Description of Occurrences. Part i., Eastern Canada. Part ii., Western Canada. By F. G. Clapp and others. Vol. viii+404. (Ottawa: Government Printing Bureau.)

Mathematical Notes, published by the Edinburgh Mathematical Society. Edited by Dr. P. Pinkerton. Nos. 14, 15, 16. (Edinburgh: Mathematical Society.)

Ministry of Finance, Egypt. Survey Department. The Magnetic Survey of Egypt and the Sudan. By H. E. Hurst. Pp. 53. (Cairo: Government Press.) P.T.10.

The National Physical Laboratory. Notes on Screw Gauges. Enlarged issue, February 1. Pp. 29. (Teddington: W. F. Parrott.) 1*s*. 6*d*.

DIARY OF SOCIETIES.

THURSDAY, MARCH 23.

ROYAL SOCIETY, at 4.30.—The Main Crests of Ship Waves, and Waves in Deep Water due to the Motion of Submerged Bodies: G. Green.—Investigation of Atmospheric Electrical Variations at Sunrise and Sunset: E. H. Nichols.

ROYAL INSTITUTION, at 3.—Organic Products used as Propulsive and Explosive Agents: Prof. H. E. Armstrong.

INSTITUTION OF MINING AND METALLURGY, at 5.30.—Annual General Meeting.—Presidential Address: Sir Richard A. S. Redmayne.

FRIDAY, MARCH 24.

ROYAL INSTITUTION, at 5.30.—The Mechanism of Chemical Change in Living Organisms: Prof. W. M. Bayliss.

PHYSICAL SOCIETY, at 5.—A New Method of Determining Ionic Velocities: Mrs. Griffiths.—(1) An Explanation of the Migration of Ions; (2) A Method of Exhibiting the Velocities of Iodine Ions in Solution: Dr. S. W. J. Smith.

SATURDAY, MARCH 25.

ROYAL INSTITUTION, at 3.—Radiations from Atoms and Electrons: Sir J. J. Thomson.

ESSEX FIELD CLUB (at the Essex Museum, Stratford), at 3.—Annual Meeting.—Prehistory in Essex, as Recorded in the Journals of the Essex Field Club: S. Hazzledine Warren.

MONDAY, MARCH 27.

ROYAL SOCIETY OF ARTS, at 4.30.—Surveying: Past and Present: E. A. Reeves.

TUESDAY, MARCH 28.

ROYAL INSTITUTION, at 3.—Modern Horticulture—Plants and the Seasons (Seasonal Rhythm): Prof. F. Keeble.

ROYAL SOCIETY OF ARTS, at 4.30.—Next Steps in Empire Partnership: P. Hurd.

ROYAL ANTHROPOLOGICAL INSTITUTE (with the Prehistoric Society of East Anglia), at 2–4.—Grime's Graves and Allied Cultures: Dr. A. E. Peake.—The Pleistocene Succession in England: A. S. Kennard. At 5–7.—Hand Grips: Miss N. Layard.—Irish MS. and other Evidence of the Use of Stone Weapons, including Smooth Stone Celts within Historic Times: Rev. F. W. Hayes.

WEDNESDAY, MARCH 29.

ROYAL SOCIETY OF ARTS, at 4.30.—Pan-German Aspirations in the Near East: Dr. R. W. Seton-Watson.

INSTITUTE OF METALS, at 4.—Presidential Address. At 8.—Third Report to the Corrosion Committee: W. E. Gibbs, R. H. Smith, and Dr. G. D. Bengough.—The Electrolytic Method of Preventing Corrosion: E. Cumberland.—Note on some Tin-Aluminium-Copper Alloys: Prof. A. A. Read and R. H. Greaves.—Notes on the Analysis of Aluminium and its Alloys: W. H. Withey.—The Annealing of Nickel Silver: F. C. Thompson.—Electric Furnaces as applied to Non-ferrous Metallurgy: Prof. A. Stansfield.—Transformations in Alloys of Gold and Copper: Dr. N. S. Kurnakow, S. Zemczuzny and M. Zasedatelev.

THURSDAY, MARCH 30.

ROYAL SOCIETY, at 4.30.

CHILD STUDY SOCIETY, at 6.—The Child Delinquent: C. M. Chapman.

FRIDAY, MARCH 31.

ROYAL INSTITUTION, at 5.30.—The Spectra of Hydrogen and Helium: Prof. A. Fowler.

SATURDAY, APRIL 1.

ROYAL INSTITUTION, at 3.—Radiations from Atoms and Electrons: Sir J. J. Thomson.

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