THURSDAY, JUNE 27, 1918.

A COMPENDIUM OF PHARMACY.

The Practice of Pharmacy. By Dr. J. P. Remington, assisted by Dr. E. Fullerton Cook. Sixth edition. Pp. xxviii + 25 to 1987. (Philadelphia and London: J. B. Lippincott Co.) Price 35*s.* net.

OF all the American works on pharmacy none is so well known as Remington's. Since the publication of the first edition in 1885 its popularity has been maintained, and from a comparatively modest size it has grown to a stately volume of nearly 2000 pages. It must, however, be borne in mind that the author has put a very wide interpretation upon the term "pharmacy," and has not used it in the restricted sense in which it is commonly employed in this country. In "The Practice of Pharmacy" he has embodied to all intents and purposes the whole of the Pharmacopœia of the United States and also the National Formulary, appending notes to the monographs where necessary. He has dealt with crude vegetable drugs, unofficial as well as official, and with chemical drugs, both inorganic and organic, together with many of their derivatives and most of the newer synthetic remedies. Thus, for example, in the section on cellulose he treats of cotton, styptic cotton, pyroxylin, oxalic acid, acetic acid, acetone, tars, phenols, coal-tar and products obtained therefrom, thus covering an extremely wide range of subjects. Pharmaceutical testing, including biochemical assays, and reagents for the analysis of urine, for the examination of blood, and for bacteriology are also discussed.

"The Practice of Pharmacy" is, therefore, essentially a hand-book or compendium and a work of reference, rather than a text-book for students. For the former purpose it appears to be well suited, as there are but few subjects connected with pharmacy concerning which information is not to be found in it; whereas the ground covered and the arrangement of the subject-matter render it unsuitable for use by students as a text-book.

American pharmacists have for a number of years enjoyed the reputation of excelling in practical pharmacy, and the part of the volume dealing with this subject is well written and fairly complete, although it does not convey the impression that the American pharmacist is in this respect appreciably ahead of his British colleague. Among the pharmaceutical presses, for instance, the double-lever press, which is a powerful and handy press, and undoubtedly the best for use in the pharmaceutical laboratory, might well have been included. The section on ampoules, now so important a means of preserving and distributing sterile solutions for medicinal use, would be improved by a more detailed description of the methods at the disposal of the pharmacist for filling them.

The crude vegetable drugs have been classified according to the nature of their chief constituents, a classification that has recently been advocated by Prof. Tschirch, but is difficult to carry out as the constituents are in many cases insufficiently known. This section of the work, particularly as regards the constituents of the drugs, stands much in need of careful revision in the light of the many recent researches in this field. In some of the "liquors" also revision is necessary, as, for example, solution of arsenious and mercuric iodide, which is made by triturating arsenious iodide with mercuric iodide and water until solution is effected in which, the author says, "no chemical change occurs." That the finished solution is apt to darken in colour is well known, but the restoration to normal colour by shaking it with metallic mercury or arsenium is surely a questionable proceeding.

These minor defects, while not materially detracting from the utility of the book as a work of reference, indicate the desirability of securing for the next edition the collaboration of several experts to each of whom a section should be allotted for careful revision. The scope of the work is so extensive that it is only by such a combination of experts that a thoroughly satisfactory result can be attained. Nevertheless, Remington's "Practice of Pharmacy" will continue to be for British pharmacists a mine of information on American pharmacy.

RECENT CHEMICAL ANTISEPTICS.

A Handbook on Antiseptics. By Dr. H. D. Dakin and Dr. E. K. Dunham. Pp. ix+129. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1917.) Price 7*s.* net.

THE object of this little handbook, so the authors state, is to give a concise account of the chief chemical antiseptics which have been found useful for surgical purposes during the present war. It appears at a very opportune moment, for, in spite of the disapprobation with which these substances are viewed in certain quarters, there is no indication that, as accessories to surgical treatment, they are losing in favour—rather the contrary. The septic character of most of the wounds received in France emphasised, at an early period of the war, the importance of a searching and systematic study of antiseptics. The result has been an array of new active substances. And this fact furnishes an additional *raison d'être* for the volume under review. Dakin's hypochlorite solution, Lorraine Smith's eusol, the chloramine antiseptics of Dakin and his collaborators, Browning's flavine antiseptics, and Morison's so-called B.I.P. paste, which have supplanted to a great extent the older preparations, have all appeared during the last four years. In most of the larger military hospitals these substances are known and used, but there must be a number of surgeons who have not access to the information except through occasional detached articles in the medical Press.

But the book serves another purpose. The authors have sought to place the subject on something like a scientific basis. The importance of a standard method of testing is emphasised; the remarkable influence of media in this connection is referred to, and an attempt is made to explain (though at present little understood) the nature and mechanism of the action. The book is divided into chapters. The introductory chapter deals with various groups of antiseptics and their properties, the laws governing disinfection, the modes of application, and the influence of media. This is followed by chapters on particular groups, beginning with the chlorine group, in connection with which Dr. Dakin's name is so closely associated. The phenolic group, the group of heavy metals, the dyes, and miscellaneous antiseptics such as hydrogen peroxide, ozone, iodine, iodoform, boric acid, etc., are treated in successive chapters.

The final chapter is devoted to special applications of antiseptics, such as the disinfection of "carriers" and that of drinking water, and the production of electrolytic hypochlorite from sea-water for disinfecting ships.

Although the pursuit of this subject has been attended in recent years with remarkable success, it must be admitted that the methods have been mainly empirical and to some extent fortuitous. There is still a wide field for more systematic research and study, for there remains very much in the chemical action of antiseptics which is obscure. For a book of 129 pages, and of such small dimensions, the price of 7*s*. seems excessive.

J. B. C.

MILK HYGIENE.

Principles and Practice of Milk Hygiene. By Prof. L. A. Klein. Pp. x+329. (Philadelphia and London: J. B. Lippincott Co., 1917.) Price 12*s*. 6*d*. net.

THIS book, as its title implies, has been written particularly for the veterinary inspector, but, nevertheless, there is in it a great deal of information which will be of value to the analyst, the bacteriologist, the sanitary inspector, and the dairy student.

A clear account is given in the first chapter of the Zeitzschman theory of milk secretion, according to which two distinct phases are to be recognised in the process. The first is the slow secretion of milk during the intervals between milking, whilst the second phase begins at the bidding of the stimulus due to the act of milking.

The chemical and physical properties of milk are dealt with in the usual way, and there is also a good description of the biological properties. This is followed by an outline of the various groups of bacteria commonly found in milk, and the changes which they directly or indirectly bring about.

Defects of milk, whether due to bacteria or to some disease of the animal, are dealt with very fully, and there is a good account of the influence of disease upon milk. Naturally, a prominent place is given to tuberculosis, and the writer divides cows which are liable to cause infection into three classes: (*a*) those suffering from tuberculosis of the udder, (*b*) those having normal udders, but showing disease in other parts, (*c*) those which exhibit no clinical symptoms, but react to the tuberculin test.

As a result of much careful investigation it would appear that the most hopeful lines upon which to work in order to obtain a supply of milk free, or relatively free, from tubercle contamination is to apply the tuberculin test and examine the cows frequently. Full particulars as to methods of examination and the interpretation of symptoms are given later on in the book.

Stress is laid upon the necessity for careful inspection of the cowshed and premises and the maintenance of a high standard of cleanliness in milking, feeding, cleaning, water supply, etc. The use of a partly covered milk-pail is also recommended, and this practice has increased considerably of late years in the United States.

There is one sentence in the chapter upon farm inspection which cannot be too strongly impressed upon all those who are connected with the production of milk; it is this: "The hygienic qualities of milk depend very largely upon the conditions existing at the source of supply." Many enlightened public bodies in this country have acted for some time past upon this axiom with excellent results. The score system of dairy inspection is also explained.

One chapter deals fully with pasteurisation, whilst the rest of the book is devoted to details of the methods used in the examination of milk.

OUR BOOKSHELF.

The Problem of Man's Ancestry. By Prof. F. Wood-Jones. Pp. 48. (London: S.P.C.K., 1918.) Price 7*d*. net.

IN this booklet Prof. Wood-Jones has expanded the substance of a lecture which received considerable attention from the Press when delivered at King's College, Strand, during the past spring. A new hypothesis as to man's origin is put forward and a new place is given to man in the zoological scale—a place far apart from that occupied by the anthropoid apes, with which Prof. Wood-Jones considers man has only a most remote relationship. To explain the number of "primitive" anatomical characters which are to be found in the human body and the number of "human" features which are to be found in that aberrant and diminutive primate Tarsius, the author supposes that both man and Tarsius have sprung from a common stem—one the root of which is represented in the Lower Eocene strata by Anaptomorphus and Necrolemur. "If man is a more primitive mammal than are monkeys and apes, and if he undoubtedly belongs to their phylum, then it follows that, far

from being a descendant of the apes, he may be looked on as their ancestor."

No one who has patiently analysed the structural characters of man and of anthropoid apes, and noted the points in which they resemble each other and those in which they differ, can find a perfectly satisfactory genealogical tree to account for the distribution of the points of resemblance and points of difference. That difficulty must remain so long as we are ignorant of the manner in which heredity works in moulding anatomical features. But to one who has tried to solve these difficulties, Prof. Wood-Jones's hypothesis, while clearing away minor difficulties, substitutes much greater ones. We cannot, on his hypothesis, explain the very remarkable and unquestionable structural community which binds man and anthropoid apes together, unless we fall back, as Prof. Wood-Jones has done and as the late Prof. Hermann Klaatsch did, on "convergence phenomena." There can be no progress in anatomy, any more than in cultural anthropology, unless we presume, until the opposite is proved to be the case, that similarity of structure and identity of custom presuppose a common origin. A. K.

The Genera of Fishes from Linnaeus to Cuvier, 1758–1833, Seventy-Five Years with the Accepted Type of Each. By D. S. Jordan, assisted by B. W. Evermann. Pp. 161. (Leland Stanford Junior University Publications: University Series.) (California: Stanford University, 1917.)

THE aim of this list, which must have involved much labour, is "to give stability to nomenclature" by altering, for the sake of priority under new rules enacted by various committees the mission of which thus to revolutionise has never received general sanction, most of the names with which we are familiar and the change of which would defeat the very object for which the use of Latin names is intended. We are glad botanists have almost unanimously repudiated such suggestions, and we trust to the good sense of the zoologists of the future to treat in like manner these attempts at upsetting nomenclature, and thus adding to the difficulties not only of systematics, but, even more, of every other department of biology. The writer of this notice is determined to continue, as in the past, to respect old names which have been universally in use, even if they do not conform to the strict rule of priority, which should be applied only when no serious harm can result from the point of view of stability in nomenclature.

We are referred to a Committee of Zoological Nomenclature, including several Germans, in May, 1917 (*sic*), with an appeal for "the fullest criticism both as to matters of fact and of opinion before placing the contents of this paper before the International Commission." We doubt if a commission so composed will ever meet again, and such seems to be also the impression of its president, as conveyed in the address delivered by him to the Zoological Society of France in January, 1915. G. A. BOULENGER.

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 Promotion of a Closer Union between England and Italy.

THE utility, even the necessity, of a more intimate union between the democracies of the Entente will make itself felt still more urgently after the war than it does now. After the war, in fact, and even if its issues be as we wish and firmly trust they will be, there certainly will still be the danger that the hegemonic aspirations of Germany will again arise, and that she will renew her attempts at economic, technical, and scientific penetration for political purposes. On the other hand, the international division of labour, and the necessity arising from it that each country should avail itself of the complementary production and work of the other countries, will certainly continue after the war; so that, if this division of labour among the countries of the Entente is not organised, and if there does not come to pass a closer intellectual and moral union between Britain, France, and Italy, the last-named country sooner or later cannot but have recourse again, and in large measure, to Germany for all those productions and services needed to complete her own.

It is not enough, however, that Britain will produce henceforth all those manufactures which we formerly imported from Germany; nor will it be enough that she can furnish them at prices so low as to compete with Germany; nor yet will it be enough that the British manufacturers will understand the necessity of furnishing all those large supplies of goods on credit and affording all those facilities in the way of long credit with which Germany coaxed our markets. Certainly all these are measures that Britain must adopt immediately if she wishes to regain this market. If formerly, when she was the only producer of given machines or goods, she might well expect the customers spontaneously to come to her without needing to give herself too much trouble to secure them, now that she has a competitor so dangerous as Germany, Britain, too, must take due pains to acquire and preserve in our country an ever-widening circle of customers.

But, I repeat, even all these facilities will not suffice. For the economic penetration of one country by another must always be accompanied, and often even preceded, as Germany well understood, by a whole process of intellectual and moral penetration.

Let not the fact, for instance, seem insignificant that while almost no British firm is accustomed to write in Italian to Italian customers, the Germans, on the contrary, did so in always increasing measure. It is but too well known how they studied our needs and tastes in order to satisfy them. The insinuating work, often undignified, but persistent and able, of their commercial travellers has been remarked by all as one of the most important means used for the conquest that they had made in a few years of the world's markets in general, and of ours in particular.

As regards the intellectual side, properly speaking, no one can fail to recognise what valuable arms for Germany's penetration here among us in Italy she had in her books and periodicals, especially scientific and technical. These books and periodicals were in course of time considered so necessary to the students both of technical high schools and universities that where, in our secondary schools, there was the option

between English and German, a proportion always greater from year to year chose the latter. Our future technical and scientific men thus completed their instruction with German books and periodicals; and when their studies were finished, and they entered the great arena of industrial and scientific life, the influence of this intellectual training, to a great extent of the German stamp, had its after-effects on all the scientific, technical, and economic relations of our country with Germany.

It is, therefore, necessary that Britain, throwing aside not only in politics, but also in all the varied forms of international relations, its proud device of "splendid isolation," should understand the full necessity of this reciprocal moral and intellectual penetration of our two countries, and convince herself that no efforts to produce and intensify it can ever be great enough.

I should be glad, for example, to see that in the British commercial schools Italian commercial correspondence should be taught; that the principal industrial and commercial firms in Britain should meanwhile, as soon as the war is over, call for Italian young men to conduct their correspondence with Italy in Italian; and that an ever-increasing number of British young men should be sent every year to Italy—whether to our commercial schools and commercial universities or to our largest industrial, commercial, and banking houses—to exercise themselves in Italian and to know better the economic life of our country. Both in Britain and in Italy special sections of the respective commercial schools and commercial universities should be devoted to the preparation of commercial travellers and agents, perhaps also commercial consular officials, through the careful study of the commercial and industrial needs of each country.

Then it would be of fundamental importance, as we have just now said, to see to the reciprocal penetration of a technical and intellectual sort. The exchange of teachers and students in the universities and other superior schools, which will no doubt have been already thought of, will aid this not a little. Very useful also in this regard will be the establishment, not only in Milan and London, but in all the principal cities of Britain and Italy, of Italo-British institutes. And no less is it to be recommended that British books should be more largely bought by the public Italian libraries, and Italian books by British libraries; and that in every important city in Britain and Italy should be formed associations of the studious, the technical men, the manufacturers, for the purpose of founding reading-rooms, in which would be found all the important foreign reviews—scientific, technical, economic, legal, political, historical, literary, artistic, and so on.

But all this would certainly be not yet sufficient. If Britain wishes to regain in other countries for its book production, both technical and scientific, the place from which Germany was gradually ousting her, her authors must no longer assume a point of view too strictly or exclusively British, but must "internationalise" themselves more, as precisely the Germans did. It is necessary, in other words, that the British books and periodicals, both technical and scientific, should look more frequently than they do now to see what is being done and thought outside their own country; that due account should be taken of this in order to get out of that isolation from the rest of the world which is such a hindrance to their diffusion in the countries that are not Anglo-Saxon; that they should take more care to divest themselves of their exotic appearance, which to us Latins is more marked in them than in the book production of any other country, derived from archaic systems and methods, such as their systems of measure and the like, which have hitherto disdained to give place to systems and methods now become international.

At the same time, British publishers might be asked to give more attention, and on broader lines, to advertising their books in the countries not Anglo-Saxon. Let me be allowed to quote in this connection a typical fact, drawn from my personal experience. In the first years of existence of the international review *Scientia*, of which I have the honour to be editor, no one would believe the difficulties we met in obtaining gratis from British publishers their books for which we asked in order to review them; while the German publishers hastened to send us works costing as much as forty, sixty, or more marks, and after our first request continued sending books of their own accord, many British publishers answered us, even with regard to works costing only 5*s*. or 10*s*., that the greatest concession they could make us was to let us have them at half-price. The result was, of course, that in the early days of *Scientia* the German works reviewed in it were three or four times as many as the British, and certainly through no fault of ours.

Then courageous publishers, or publishing trusts formed for the purpose, ought to put out in Britain English translations of Italian technical and scientific works, and in Italy Italian translations of works in English. The British public must, in fact, cease to appreciate only what is British, and become convinced that in other countries there may be something good which deserves to be known. In this connection the fact is significant that before the war our review above-named had in Germany a circulation four or five times larger than it had in Britain. It was a sign that the German public recognised more than the British public the utility and interest there was in following attentively the international movement of ideas, and appreciated more the scientific production of other countries.

But a measure which we consider would be of more avail than any other to effectuate this closer moral and intellectual union between Britain and Italy, and in general between all the peoples of the Entente, is that already advocated by the writer in Italian, French, and British periodicals, and taken into most favourable consideration by all the scientific and political Press of the Allied countries: the establishment, for each of the principal branches of science, of periodicals, international as regard collaboration, but "Ententist" as to editing and publishing—that is to say, scientific periodicals which might fulfil for each branch of science that function which *Scientia* exercises for scientific synthesis in general, embracing, as it does, all the sciences. Here I add that the same thing could and should be done as to technical periodicals relating to each of the principal branches of industry. A periodical, for example, devoted to electrical engineering, or to certain branches of it, jointly edited by the most eminent British, French, and Italian electricians, published by three of the principal publishing firms of the three countries, which would publish articles in the language of the respective authors, but accompanying the text, where this is English or Italian, with the French translation: think how efficacious a work could be done in the way of maintaining in continual mutual contact our engineers and our manufacturers, of making known and introducing in each country the products of the others, of organising in the three countries all the production in that particular branch of industry, of settling and forming the due arrangements for facing German competition. Suppose that such "Ententist" periodicals—perhaps with the financial co-operation of the larger industrial firms in each line, for whom the sum required for the purpose would be but a trifle—sprang up in each of the principal branches of industry and commerce. Who does not

see how effective and close a union between our countries of the Entente would in the end be wrought and consolidated by these organs of high industrial control or co-ordination?

In some of the principal industries, therefore, let this first step be taken on the long road still to be travelled. To travel it to the end, once this first step is taken, we shall then be drawn by the shining goal itself that has to be reached: that of the truly intimate union of our two countries, and the federation of the peoples of the Entente on which depend the liberty of the peoples and the peaceful and just re-ordering of the nations.

EUGENIO RIGNANO.

Editor of the International Review *Scientia*.

Earth-Rotation

The Eötvös Revolving Balance.

IN the issue of NATURE for March 21 Prof. Boys directed attention to a very interesting experiment performed by Baron Eötvös, in which the oscillations of a revolving balance were shown to be an effect of the rotation of the earth.

Precise details of the experiment are lacking, but it would appear that the beam of the balance was adjusted so that its centre of mass lay upon its horizontal axis of swing, and that the latter was compelled to revolve in its own horizontal plane with a definite angular velocity. It was observed that oscillations were set up the amplitude of which was limited by the damping resistance of the air.

In the article referred to Prof. Boys gave reasons for thinking that the expression given by Eötvös for the amplitude in terms of the physical constants involved was incorrect, and offered another in its stead. I think, however, that there is little doubt that when the experiment is performed in the way which the published accounts indicate the Eötvös formula is right.

Suppose we take as a system of moving axes of reference principal axes of inertia of the beam of which one coincides with the axis about which the beam swings. Let this be the axis of x, and let it make at the time t an angle ωt with a horizontal line drawn to the west, ω being the angular velocity with which the balance revolves. Let the axis of z make an angle ψ with the vertical; then if Ω is the angular velocity of the earth and λ the latitude of the place of experiment, the angular velocities of the axes are

$$\omega_x = -\Omega \cos\lambda \sin\omega t + \dot{\psi}.$$
$$\omega_y = -\Omega \cos\lambda \cos\omega t \cos\psi + (\Omega \sin\lambda + \omega) \sin\psi.$$
$$\omega_z = \Omega \cos\lambda \cos\omega t \sin\psi + (\Omega \sin\lambda + \omega) \cos\psi.$$

If A, B, C are the corresponding moments of inertia, and if we represent the resistance of the air by a couple $-N\dot{\psi}$, we obtain as the equation for small oscillations of the beam about the horizontal

$$A\ddot{\psi} + N\dot{\psi} + (C - B)\omega^2\psi = (A + C - B)\omega\Omega \cos\lambda \cos\omega t.$$

Assuming the beam to be essentially a long, narrow rod, we may put $B = 0$ and $C = A$, and with these simplifications we obtain for ψ the expression

$$2A\Omega \cos\lambda \sin\omega t/N.$$

It is seen at once that the expression is essentially the same as that obtained by Eötvös. The terms representing the free oscillations are omitted, as such oscillations will ultimately be damped out by the resistance of the air. In simplifying the equation, the assumption is made that $A\Omega$ is small compared with N. It seems probable that Eötvös used a "small" balance in order to ensure that this condition should be satisfied, for if we compare similar balances $N \propto L^4$ and $A \propto L^5$, where L denotes a linear dimension. If this condition were not satisfied, the character of the motion would be considerably modified.

J. B. DALE.

King's College, June 12.

I HAVE to thank Prof. Dale for pointing out the very serious error that I made when I assumed that the variation of centrifugal force was the only action operative in the Eötvös revolving balance, and I must apologise to Mr. Korda for having treated his account of this beautiful device as inaccurate as well as inadequate.

C. V. BOYS.

The Discovery of the New Star in Aquila.

CAPT. E. V. PIPER, of Fowey, Cornwall, was observing meteors on the night of June 7–8 between 12h. 30m. and 13h. 0m. G.M.T., and saw seven. He recorded a 1st mag. one at 12h. 45m., which shot to just below Altair from a little above a bright star to the west which he could not identify. This star had a green tinge, and was equal in lustre to Altair. Though he knew the constellations and all the brighter stars in this region very well, he was struck with the strange object to the right of Altair. Mrs. Piper, who came out on the balcony from which Capt. Piper was observing, also remarked on the green colour and flashing light of the star.

Capt. Piper saw the star again on the evening of June 8 at 9.18 p.m., and was puzzled at its appearance, but considered that it meant some phenomenon already well known to astronomers. On Monday, June 10, he saw an announcement in the newspapers that a new star had been discovered in the position where the strange object had attracted his notice on the morning of June 8.

The whole of the facts and circumstances of the observation have been investigated by Mr. T. H. L. Hony, of Fowey, who is an amateur astronomer, and is convinced of the perfect trustworthiness of the details.

Capt. Piper has occasionally sent me accounts of meteors, and they have been very good. It seems to me that the difficult feature to understand in connection with the observation of the star on the morning of June 8 is that it was as bright as on the following night. We know that these objects rise very rapidly to a maximum. The Perseid nova of February, 1901, increased from less than 12th magnitude on February 20 to 2·7 magnitude on February 21 after an interval of twenty-eight hours!

W. F. DENNING.

Bristol, June 18.

The Food of the Rook.

THERE is still so much difference of opinion among those who, like the writer of the note in NATURE of June 6 (p. 271), have examined the contents of the stomachs of rooks as to the economic position of these birds that the time has come when a committee of scientific men should be invited to sift the extensive evidence that is now available and issue a report.

I am in agreement with Dr. Long that the method of balancing one grain of corn as beneficial against one insect as injurious is most fallacious. The corn found in the stomachs of rooks in the summer months (May and June), and a great deal of the corn gathered by the rooks on the roadside or after gleaning in the autumn, would never be garnered by the farmer, but an injurious insect that escapes the visitations of the birds is always capable of considerable mischief.

The case against the rook is not yet proven, but the evidence should be collected together and submitted to the consideration of a scientific jury.

SYDNEY J. HICKSON.

The University, Manchester, June 22.

DR. LONG (NATURE, June 20, p. 304) raises a point which I think must appeal to many. The potential damage, represented by the 23·9 per cent. of injurious insects, is surely the one factor upon which everything depends; and, difficult though it is to see just how the necessary information is to be acquired, we are scarcely justified, so I am inclined to think, in arriving at any conclusion without it.

Is it not a fact that the Hungarian Central Office for Ornithology reached the conclusion, after careful investigation, that the rook is of service both to agriculture and to cattle-breeding?

H. ELIOT HOWARD.

Hartlebury, June 22.

"Harbour Engineering."

LEST it should be assumed that I tacitly acquiesce in certain sins of omission alleged in the review of the second edition of the above book, which appeared in NATURE of June 13, may I point out that the matters in question (slipway construction, durability of concrete in sea-water, mechanical handling of material, etc.) are discussed so fully in the companion volume on "Dock Engineering," to which they are equally, if not more, appropriate, that it seemed undesirable to include any extended notice of them in "Harbour Engineering"? Reference to this fact is to be found in several places (pp. 147, 265, etc.).

BRYSSON CUNNINGHAM.

June 20.

UNITS AND UNITY.

THE note that appeared in NATURE of March 7 (p. 14) about the nomenclature of temperatures in centigrade degrees measured from a zero 273° below the normal freezing point of water invited further contributions on the subject of units, and other circumstances transform the invitation into an imperative demand. The report of Sir J. J. Thomson's Committee on Science Teaching, without making a definite recommendation for the adoption of metric units, deliberately adjusts its scheme of education in such a way as to make familiarity with metric units a part of general education. What is the use of doing so if metric units are not to be used for the practical affairs of life? Our present situation is ridiculous. Every boy and girl at school who "does science" now learns that metric units are the universal medium of scientific expression, and is practised in their use. At the same time, we cry out for more science in our practical life. What can we expect from our appeal? A boy goes home at the end of term and tells his father that he has been doing science, weighing in grams, measuring lengths in centimetres, pressures in millimetres of mercury, and temperatures in degrees centigrade. Surely the most natural remark for any naturally minded parent to make is that his boy need not pay any attention to that, because, if it had any bearing at all upon practical life, he would certainly have been taught to use pounds or grains, inches, and Fahrenheit degrees, and not the outlandish things that nobody uses after he has left school. There is a story told of Adams, the astronomer, who, in a Swiss hotel, asked for a bath, and was particular that the water should be at 100°. After a long time, the maid came and said she had done her best, but she could not get it above 95°; and I doubt if, even at this day, the President of the Royal Society himself uses the same unit for his bath-water and his water-bath.

If science is to be a part of practical life, the units of science and the units of practical life must be the same. One thing or the other: either practical folk must learn to use metric units, or British men of science must use British units in their laboratory courses. The present divorce between education and practice is ruinous for both. If we want instruments according to metric measures, we get them from instrument-makers who understand such measures, not from those who do not—that is, we tend to get our scientific instruments mostly from abroad—and so on in everything. Hitherto men of science have not cared, because we can use either measure with equal facility, and we take a little pedantic pleasure in being bilingual in that sense. It is the same with our language. We take a tiny pride in the small difficulties of pronunciation that stand in the way of its being a *lingua franca*; we sneer at any attempts to bring spelling into agreement with pronunciation; we advocate the learning of Esperanto or Ido instead, to avoid international jealousy, forsooth. Shakespeare wrote "Gloster," but we lose marks if we do not write "Gloucester"; classical authors wrote "gage," but we must write "gauge," and we chuckle inwardly when our friends write "guage." There is a *ton* of "the high life" in knowing that "C-h-o-l-m-o-n-d-e-l-e-y" is pronounced "Marchbanks" which we are all proud of; and meanwhile English is set down as impossible for the use of the world at large.

The attitude of mild complacency with our own superior knowledge runs through everything. I have heard it said quite recently that meteorology stands in the way of the adoption of metric units. Certainly that is not true of the Meteorological Office. Since May 1, 1914, we have gone a step further than most people in using C.G.S. units for pressure, millimetres for rainfall, metres per second for wind velocity in the Daily Weather Report, and we use absolute temperatures wherever we dare. We have even gone so far as to use milliwatts per square centimetre for solar radiation, instead of the preposterously unscientific unit gram-calories-per-square-centimetre-per-minute. But it is difficult to keep these things going without the support of those who could help. The United States Weather Bureau and the French Meteorological Service, and some others outside, have gone with us. In this country nobody but the Meteorological Office appears to

be willing to stand the racket of bringing metric units into practical use.

Some years ago, before the war, I represented to an authoritative committee that for aeronautical purposes a dynamical unit of wind velocity was practically essential, and asked for a judgment between metres per second and feet per second, and was told that "feet per second" was the more appropriate unit. The reason has been voiced for me by one of my own staff—that he himself could manage metric units well enough, but the weaker brethren would understand feet per second better; and for the same reason I find we are drifting back again to miles per hour out of kindness to the less well-informed. The superior person will not look at milliwatts per square centimetre as a unit for solar radiation; people might think he was unacquainted with the literature of the subject.

This supposed consideration for the weaker brethren is a mere will-o'-the-wisp. It is the teacher with years of experience who finds it really hard to change his habit. Well-meaning people tell me that atmospheric pressure expressed in millibars has no meaning for beginners, and there is the same tendency to slip back, into inches, because, forsooth, people will understand them better. The supposed simplicity is quite fallacious. The majority of mankind who use barometers do not understand pressure measured in inches; in fact, they have never thought about pressure at all, but simply about barometric readings, which are another matter. From the foundation of the Meteorological Department of the Board of Trade in 1854 millions of barometer readings have been reported to the Meteorological Office from the sea, from ships of the Navy and the mercantile marine; but until reports by wireless were introduced about ten years ago, so far as I know, not a single barometric pressure—only the raw materials for getting it. And the result of requiring pressure instead of readings in the wireless telegrams was as instructive for the observer as it was for the office. Under the old plan the observer read the barometer; it was marked in inches, but did not read in inches, of course; he gave the number of the barometer, so that we might look out its index error, and the reading of the attached thermometer, so that we might get the correction, and some clerk in the office had to make out the pressure. It is to be noted that in meteorology the difference between the first reading and the pressure is not a mere trifle, but sometimes more than the differences of pressure which we map. After these sixty-four years of reading barometers without knowing the meaning of what was read, some jolt is necessary to persuade people to understand what we really mean, not in theory, but in actual working practice, by the pressure of the atmosphere; and the use of a real pressure unit is by far the best form of jolt. When the Israelites crossed the Jordan they were ordered to set up a pillar of stones so that their posterity might ask the question, "What mean ye by these stones?" And so the question, "What mean ye by millibars?" is the first step in the enlightenment of many practical men about the realities of atmospheric pressure in meteorology. And, strange as it may seem, our marine observers, who are practical men, are not in the least unwilling to regard the innovation in that light. No objection to the change has come from them. What other and more ordinary educational institutions think about it I have never heard; they have probably not considered it at all. It is, of course, deplorable that there are so few people within reach of any inquirer who can give him the answer to the question that leads to enlightenment; but that is another story.

So with temperature: the schools and universities use the Centigrade scale and zero. I defy anybody who is used to the practical convenience for meteorological purposes of the Fahrenheit scale to face the change to the Centigrade scale and zero, which would flood our tables with negative quantities, without asking himself: "What means this zero?" And if he does ask himself the question he must realise that, besides avoiding for ever negative values in meteorological work of every kind, the adoption of the so-called absolute scale sets up a pillar round which much information of the utmost interest and importance is twined. The expansion of gases, the transformation of heat into work, the radiation into open space, all depend upon the absolute temperature, which, therefore, has some reality about it. There may be small discrepancies, as Prof. Marvin has pointed out; but they are not of the first order. In these days, when temperature is of real significance in all sorts of ways, I cannot imagine how a teacher has the courage to face a pupil with a negative temperature, and to go on doing it seems to me to be either inveterate habit or simple obscurantism. And yet I find, now that flying men are beginning to record temperatures in the upper air, they are on the way to give us negative temperatures on the Fahrenheit scale because (I suppose) they understand them! To me the practice appears to be based, not on thought, but on simple thoughtlessness.

There is a time for everything, and the present seems to be the time for a change of units. Take, for example, the decimalising of our coinage. Let it be granted that we cannot change the pound because that would mean translating all the recorded values from the time of the introduction of the sovereign. To change the shillings and pence into decimals is, from that point of view, a small matter. The stumbling-block has always been the penny, because there were so many hundreds of millions of things sold for a penny that a change in the penny would ruin either the traders or their customers. But now the penny has lost all its significance; everybody wants it changed. A penny paper is seeking a new price; it costs three halfpence or twopence or threepence; a penny stamp now costs three halfpence. Why does not the Chancellor of the Exchequer put stamps in terms of hundredths of a pound? The opportunity is a golden one for the nation, and

incidentally for the Exchequer because any unconsidered fractional difference might go there.

It is time for those who think that a unified system of measurement is worth having to make a push for it. It is scarcely likely that, to the open mind, there can be any real difference of opinion as to the units which should be chosen. It is one of the truisms of science that the same reasoning always leads to the same conclusion. All the traditional obstacles have disappeared, and, above all things, we want to get on. Another era with the schools and universities using one set of units and all practical people using a different set is almost as deplorable an outlook as peace by negotiation.

NAPIER SHAW.

PROF. H. G. PLIMMER, F.R.S.

BIOLOGICAL and medical science has sustained a great loss by the passing away of Henry George Plimmer on Saturday last, June 22. Plimmer had contributed much by his writing and influence to comparative pathology during his life, and his last illness interrupted a valuable and strenuous research on trench fever. During his earlier years he prepared himself for a scientific career by visiting and working with the great pioneers of that time, and it was doubtless owing to the influence of men like Pasteur that the direction of much of his subsequent research was due. He always kept up his Continental interests, and often took part in the proceedings of foreign scientific congresses.

For many years Plimmer was connected with the Royal College of Surgeons and with the Zoological Gardens, which afforded him great opportunities for investigating pathological problems. About three years ago he was appointed to the chair of comparative pathology at the Imperial College of Science and Technology, which had been founded by the munificence of an anonymous donor.

The scientific, as well as the sterling human, qualities of Plimmer found abundant opportunity in his new post. His lectures were eagerly attended by a large body of students, and as this attendance was quite voluntary, it is no small tribute to his genius that the room was often crowded, even to overflowing. Gifted with an unassuming and sympathetic nature, as well as possessed of a knowledge of the world, his help and advice were often sought by those in trouble or difficulty, and many a young man would readily acknowledge the debt owing to his kindly help and wise counsel.

Plimmer was a fellow of the Royal Society, as well as of many other learned societies, both at home and abroad, and his contributions to science are scattered through their Proceedings and Transactions. He was an accomplished microscopist, and his presidential address to the Royal Microscopical Society is a model of critical and scholarly research.

This is, however, neither the time nor the place to attempt a full account of his scientific labours. That must come later. But Plimmer's interests were not restricted to the pursuit of science. Endowed with many and varied gifts (he was, for example, a musician of the very first rank), it was often a matter of surprise to many of his friends that he could have possibly found time and opportunity to develop and excel in them as he actually did.

It is hard to speak of Plimmer as a friend in sufficiently measured terms, and those who knew him best are best able to appreciate the rare qualities of the man. Partly Stoic, partly Epicurean, and largely something wholly his own, he was a delightful companion. Added to a philosophical and discriminating enjoyment of the best that life has to offer, his loyal and unselfish nature endeared him to a wide circle of devotedly attached friends. Perhaps the most that can be said of any man is that the world is a better place for his having lived in it, and this is emphatically true of Plimmer.

J. B. F.

DR. E. A. NEWELL ARBER.

THE death of Dr. Newell Arber, on June 14, in his forty-eighth year, after a long illness, adds another name to the already long list of palæobotanists whose obituary notices have appeared in these columns during the last two or three years. After taking his degree at Cambridge, Arber was appointed university demonstrator in palæobotany in 1899, a post which he held at the time of his death. He devoted himself heart and soul to the study of fossil plants both by his own researches, extending over a wide field, and by his ever willing help to the students whom he taught: through his energy a large number of fossil plants were added to the Sedgwick Museum, and the well-arranged and carefully named collections bear witness to his methodical and careful curatorship. In 1909 he married Miss Agnes Robertson, an accomplished botanist, who has recently been re-elected to a fellowship at Newnham College.

In addition to numerous papers, Arber published four books: a British Museum Catalogue of the Plants of the Glossopteris Flora (1905), a work which is much more than a compilation and is indispensable to palæobotanical and geological students; "Plant Life in Alpine Switzerland" (1910); a volume on the coast scenery of North Devon (1911); and a very useful book on coal, one of the "Cambridge Manuals," which has been translated into Russian. Much of his original work was concerned with British Carboniferous plants: he by no means confined himself to collecting and describing specimens, but made valuable contributions to the stratigraphical problems connected with the floras. He was particularly interested in the Kent coalfield and added considerably to our knowledge of the floras of the Forest of Wyre, the Forest of Dean, and other coalfields. He published papers on the anatomy of Sigillaria, in collaboration with Hamshaw Thomas, Medul-

losa, Lyginopteris, Cupressinoxylon, Dadoxylon, and other genera. A memoir, published this year, on the earlier Mesozoic floras of New Zealand, an extension of a shorter paper read to the Royal Society, is an especially valuable addition to our knowledge of a much neglected subject. Two papers written in collaboration with his friend Major Parkin, on the origin and evolution of the Angiosperms, afford evidence of Arber's power of treating in a philosophical spirit difficult and controversial problems. Among other papers, mention may be made of one on the past history of ferns, and of those on Glossopteris, in which the sporangia are described for the first time, Lagenostoma, Psygmophyllum, Yuccites, Zamites, and Pterophyllum.

Arber had made for himself a name as an authority on the economic side of palæobotany, primarily in connection with the Kent coalfield. It is impossible, in a short article, to give an adequate account of his original work; his output was much greater than that of most men of his years, and, in view of the difficulties with which he had to contend, the amount he was able to accomplish compels our admiration. Arber was a man of strong convictions and had the courage of his opinions; he was unsparing of himself in his devotion to the science which he loved and to the service of his university. Those who knew him well felt for him a deep affection and can most sincerely share the grief of his devoted wife, with whom he enjoyed a true companionship of heart and work. A. C. SEWARD.

NOTES.

THE Board of Trade has appointed, with the concurrence of the Ministry of Reconstruction, a Committee to examine and report upon the water-power resources of the United Kingdom and the extent to which they can be made available for industrial purposes. The members of the Committee are:—Sir John F. C. Snell (chairman), Mr. G. S. Albright, Sir Dugald Clerk, F.R.S., Dr. J. F. Crowley, Mr. H. F. Carlill, Mr. P. Dawson, Prof. A. H. Gibson, Mr. V. Hartshorn, J.P., Dr. H. R. Mill, Mr. A. Newlands, Mr. G. C. Vyle, Mr. A. J. Walter, Mr. Ralph Walter (Ministry of Reconstruction), and Mr. D. J. Williams. Mr. R. T. G. French is the secretary, and all communications intended for the Committee should be addressed to him at 10 Princes Street, Westminster, S.W.1.

THE twenty-ninth annual meeting of the Museums Association will be held at Manchester on July 9–11 under the presidency of Mr. E. Rimbault Dibdin. Among the subjects to be discussed are:—"The Museum in Relation to Art and Industry," H. Cadness; "The Application of Art to Industry and its Relation to Museum Work," S. E. Harrison; "The Museum and Trade," T. Midgley; and "Arrangement of an Ethnographical Collection," B. H. Mullen.

AT the annual meeting of the American Institute of Electrical Engineers, held last month, Col. J. J. Carty, U.S. Signal Corps, was presented with the Edison medal of the institute in recognition of his services in developing the science and art of telephone engineering.

WE regret to note that the death of Mr. John H. Heck is recorded in *Engineering* for June 21. Mr. Heck was senior engineering surveyor to Lloyd's Register of Shipping in the Glasgow district, and was sixty-seven years of age. He read many papers on engineering subjects before the Institution of Naval Architects, the North-East Coast Institution of Engineers and Shipbuilders, and other technical societies.

THE death is announced in his forty-ninth year of Dr. C. C. Trowbridge, assistant professor of physics at Columbia University, New York. Dr. Trowbridge had made notable contributions to the knowledge of meteors and of the mechanics of bird-flight. One of his principal services to Columbia University was his development of the E. K. Adams precision laboratory, one of the best-planned and best-equipped laboratories in America.

THE registrar of the Institute of Chemistry has received a letter from the Board of Education stating that the Ministry of National Service has cancelled the arrangements made in connection with military service to students of chemistry. The effect of this cancellation is that any student of chemistry in Category B (i), C (i), or B (ii), or in Grade 2, who has hitherto been protected under the arrangements in question will be called up, if otherwise available for service.

WE learn from the *Lancet* that Prof. S. J. Pozzi, professor of clinical gynæcology in the University of Paris, was fatally shot on June 13 in his consulting-room in Paris by a lunatic patient. Prof. Pozzi was born at Bergerac (Dordogne) in 1846. He was educated at the lycées of Pau and Bordeaux, becoming a student of medicine in Paris in 1869, where he was an apt pupil of Paul Broca. From 1885 to 1894 he acted as secretary-general of the French Congress of Surgery, and in 1895 was elected to the Academy of Medicine. He was an honorary fellow of the Royal College of Surgeons of England and an officer of the Legion of Honour.

THE council of the Royal Society of Arts announces that the next award of the Swiney prize will be in January, 1919. Dr. Swiney died in 1844, and in his will he left the sum of 5000*l*. Consols to the society, for the purpose of presenting a prize, on every fifth anniversary of his death, to the author of the best published work on jurisprudence. The prize is a cup, value 100*l*., and money to the same amount. The award is made jointly by the Royal Society of Arts and the Royal College of Physicians, and is given alternately for works on medical and on general jurisprudence. On the last occasion of the award, in 1914, the prize was awarded for general jurisprudence. It will, therefore, be offered on the present occasion for medical jurisprudence.

ONE of the tasks of the General Staff at the War Office during the war has been the issue of a *Daily Review of the Foreign Press*, the scope of which has been extended from time to time by the preparation of supplements dealing with special subjects. A fortnightly Technical Supplement, compiled with the co-operation of the Institution of Civil Engineers, was added to the list in January last, and since then has been widely circulated through official channels for the assistance of naval and military workers. We are now informed that it has been decided to place the Technical Supplement on sale, and the issues of May 28 and subsequent numbers may be obtained at the cost of sixpence through any bookseller or directly from H.M. Stationery Office at Imperial House, Kingsway, London, W.C.2.

THE council of the Institution of Electrical Engineers is prepared to receive papers on the subject of "The Co-ordination of Research in Works and Laboratories," with a view to the paper being read and discussed at one of the ordinary meetings of the institution in London, and also before one or more of the local sections. Papers should not exceed 15,000 to 20,000 words in length, and the council will award a special premium of 25*l.* to the author of the paper which best fulfils the objects of the discussion, provided such paper reaches the standard aimed at by the council. Papers should be sent to the secretary of the institution not later than November 4 next. It is the intention of the council to publish the selected paper (which will become the property of the institution) in the Journal, together with the discussion. Competitors intending to submit papers are invited to communicate with the secretary.

THE latest part of the *Geologische Rundschau* (April, 1918) contains much news of geology and allied sciences in Germany and Austria. Prof. W. Branca has retired from his professorship in Berlin, and has been succeeded by Prof. J. Pompecki, of Tübingen. Prof. E. Kayser has similarly retired in Marburg, and his successor is Prof. R. Wedekind. Prof. L. Milch, of Greifswald, has followed the late Prof. Hintze as professor of mineralogy in Breslau, and Prof. E. Hennig, of Berlin, has become professor of geology at Tübingen. Prof. O. Abel has been made ordinary professor of palæobiology in Vienna. The long list of courses of lectures in the universities during the winter semester 1917–18 includes not only the usual general subjects, but also many special subjects in preparation for research. Among these may be mentioned the atomic structure of crystals, the science of gem-stones, alpine geology, palæontology of mollusca, of fishes, amphibia, and reptilia, evolution of the mammalia, the Ice age and early man, and the principles of palæobotany. There are a few technical lectures on coal and petroleum, on the geology of Germany, and also one course at the Colonial Institute at Hamburg on "The Geological Conditions of the German Protectorates." An appreciative obituary notice of Prof. E. W. Benecke, who died at Strasburg on March 6, 1917, aged seventy-nine, is accompanied by a fine portrait.

MR. T. T. WATERMAN gives a full history of the Yana group of Indians in North-eastern California in the University of California Publications in American Ethnology and Archæology (vol. xiii., No. 2, February). They are distinguished from their neighbours not so much by physique and culture as by language. They are important because, for certain rather extraordinary reasons, a few members of the group remained conservative much longer than the other Indians in California, retaining their primitive mode of life in a very unusual degree until 1908.

THE REV. S. S. DORMAN discusses native ideas of cosmology in the *South African Journal of Science* (vol. xiv., No. 4, November, 1917). The origin of these is obscure, but the writer remarks that the Abenanswa may be a mixed remnant of the old Hamitic stock; Semite and Hamite are very closely related both in blood and language, and very probably had the same or similar legends of Creation. If so, the Abenanswa, like the Masai, could have derived their legends from the north, and the Bantu may have learned them in a more or less complete form. But, on the whole, the writer leans to the conclusion that the Bantu ideas of cosmology are purely their own, and are thus an index of the mentality of that race.

IN an interesting article entitled "Some Early Artists of Gloucester," published in vol. xl. of the Transactions of the Bristol and Gloucestershire Archæological Society for 1917, Mr. St. Clair Baddeley discusses the so-called Roman walls of the city. None of the earlier historians—Æthelwerd, Fosbroke, or Atkins—record any tradition of such walls. They were not discovered during the excavations of 1818, nor during the Shire Hall extension in 1909, and it seems clear that Romano-British Glevum never had anything more substantial than the powerful fosse and vallum of other Roman settlements. The remains shown as "Roman" walls are not Romano-British; they are entirely medieval, though probably occupying the convenient line of the Romano-British fosse, and it seems clear that the small Romano-British Glevum, having in its rear the Severn, had no need of elaborate defences. The walls belong to the Norman period when Gloucester became an outpost, like Chester, to guard the country from the incursions of Welsh horsemen.

MESSRS. HEADLEY BROS. have sent us two "Papers for the Present," namely, (1) "The Modern Midas," (2) "The Banker's Part in Reconstruction," published by them for the Cities Committee of the Sociological Society. These two papers are the first of a series on economic and social problems intended to educate public opinion in the direction of certain schemes of reconstruction. Their object is to reverse the tendency to centralisation and bureaucracy, in which Germany set a bad example to Western civilisation, and to substitute for it local and spontaneous action in every sphere of life, social, political, and economic. This is combined with an insistence on communal rights, the two objects being reconciled in the maxim, "Individualise the State, socialise the Community." The two papers under notice cover the financial side of this policy. They advocate the conscription of incomes for the period of the war, the nationalisation of credit and of the credit machinery, and the use of the latter for promoting production after the war on lines profitable to the community and beneficial to the worker. On the negative side, the two chief objects of attack are the gold standard and the anti-social powers of modern finance in private hands.

WE have received from the Carnegie Institution of Washington a volume entitled "European Treaties bearing on the History of the United States and its Dependencies to 1648." It is edited by Mr. F. G. Davenport, and contains the original texts, with translations and notes, of forty treaties and Papal Bulls, which all deal with the struggle for participation in trade and territorial possession of the lands newly discovered in the fifteenth and sixteenth centuries. The originals of these documents are difficult of access, particularly to the American student, so the present collection should prove very useful. While mainly of historical value, there is much in the early documents of geographical interest. Spanish dominion in the West and Portuguese dominion in Africa and the East were prompted by the Papal Bull of 1493, assigning to Castile the exclusive right to lands west of the meridian situated 100 leagues west of the Azores, lands discovered before Christmas, 1492, to be excepted. A later treaty pushed this line to 370 leagues west of the Cape Verde Islands, and both Portugal and Castile agreed to send caravels with pilots and astrologers to determine the location of the line. But this demarcation never took effect. The confusion caused in territorial rights in the Moluccas by the Pope's failure to extend his line to the further side of the globe is illustrated in later treaties. This confusion had been intensified by the

Bull of 1514, giving Portugal the rights to all lands discovered by her in her voyages to the East irrespective of their longitude. The gradual settlement of these questions is traced in later treaties.

SOME valuable medical studies are in course of publication by the Leland Stanford Junior University, California. Of these we have received "Bone and Joint Studies," by Profs. Leonard W. Ely and J. F. Cowan, and "The Pathology of Nephritis," by Prof. W. Ophüls. In the latter it is considered that many forms of inflammation of the kidney are due to bacterial infections, commonly streptococcal.

ROCKY MOUNTAIN spotted fever is a typhus-like disease occurring in limited tracts of country adjacent to the Rocky Mountains. It is conveyed by the bite of a tick (*Dermacentor andersoni*). Dr. S. B. Wolbach has found present in the endothelium of the blood-vessels a peculiar bacterium which he surmises is the causative organism of the disease (*Journ. Medical Research*, vol. xxiv., 1916, p. 121). He has also found the same organism in infected ticks, but not in ticks proved to be non-infective (*ib.*, vol. xxv., 1916, p. 147). Further studies show that the characteristic lesions of the disease in man are practically restricted to the blood-vessels of the skin and genitalia (*ib.*, vol. xxvii., 1918, p. 499).

IN the May issue of the Journal of the Board of Agriculture Mr. R. Robson discusses the probable causes of the poor crops of clover seed obtained in Essex last summer. Popular opinion was inclined to ascribe the seed shortage primarily to the dearth of bees, owing to the ravages of the Isle of Wight disease. This might certainly account for the failure of white clover (*Trifolium repens*), since there is a general consensus of opinion that the honey-bee is here the chief pollen-carrier. In the case of red clover (*Trifolium pratense*), however, the predominant *rôle* is played by humble-bees, and there is no clear evidence that their numbers had been sensibly reduced by the disease. An alternative explanation of the small crop is the activity of the very destructive weevil, *Apions apricans* (Herbst), which was extremely prevalent last year. The first-cut clover when stacked was infested with maggots resulting from eggs laid by the weevil in the clover flowers, and within a few days the resulting weevils emerged in myriads from the stacks and proceeded to devour the surrounding clover, and then passed on into the field to lay eggs for the next generation. Every head of clover in which eggs were laid would produce few or no seeds. The weevils move preferably along the ground, and it was found possible to trap large numbers by means of bands of cloth coated with tar and pitch stretched round the stacks, or by means of a trench containing water and tar. The opinion is expressed that the depredations of the weevil were the primary cause of the seed shortage, and farmers are advised to adopt measures to prevent the egress of the second generation of weevils from their stacks of first-cut clover.

NOW that the electro-culture of crops has reached a position of prominence in the public regard, and has even attained the dignity of being invested with a Government Committee, it will probably be a matter of surprise to many that the idea of stimulating plant-growth by means of electricity is more than a hundred and fifty years old. An interesting article in the April issue of *Science Progress* contributed by Messrs. I. Jørgensen and W. Stiles commences with the statement (quoted from Priestley) that the first experiment on the electrification of growing vegetables was made by Mr. Maimbray in 1746. The fact that our present-day knowledge of the subject is but little greater than that of the middle of the eighteenth century is attributed by the authors to the stagnation of the science of the living plant. The vast majority of the researches on electro-culture made since Maimbray's original experiment are on the same lines as the older ones, and give similar results—*i.e.* most show the beneficial influence of electrification, whilst a minority show no such improvement. The physiological investigations in reference to the subject have dealt with the process of assimilation, transpiration, respiration, irritability, and protoplasmic movement in plants, but in no case have the experiments been conducted in such a way as to furnish any information as to the influence of definite electrical conditions on any one of these processes at any definite stage in the history of the plant. The most important work on electro-culture is that of Lemström, who was the first to treat comparatively large areas of land under crops. His work made it clear that the overhead electric discharge will affect the life of the plant in all its phases, and he concluded that the best results are obtained (1) with the network positively charged, (2) by applying the discharge morning and evening, and (3) by having the general conditions favourable to plant-growth. The authors urge that all the investigators have failed to realise (i) the necessity for measuring the discharge, and (ii) that the stimulating effect depending on its intensity and time of application may differ for different stages of the plant's life, and may appear long after it is applied.

THE Bulletin of the Hawaiian Volcano Observatory for February last is noteworthy for two exceptionally impressive illustrations of the surge of lava in the crater of Halemaumau against central crags rising some 70 ft. above it.

THE glacier that occupied the Irish Sea during the maximum extension of Quaternary ice in the British Isles has played a large part in the distribution of superficial materials, and Mr. J. de W. Hinch (*Irish Naturalist*, vol. xxvii., p. 53) gives an excellent review of recent work in the area, and of the evidence which has rendered the hypothesis of an interglacial submergence both untenable and unnecessary.

A NUMBER of substances crystallise from solutions, taking up water of crystallisation. This water is absorbed in molecular quantities, and is generally given up again easily with gentle heating. Little is known as to how the water is bound in the crystal. Investigations on this question are outlined in the *Annalen der Physik* for February 15. A number of different forms of alum are examined, and conclusions are drawn, from spectrum methods, of the structure of the crystals.

A GERMAN firm advertises (*Stahl und Eisen*, February 28) a new air-filter, which is said to be made entirely of iron. The special advantages claimed are:—Great durability and perfect freedom from fire risk; constant resistance (equivalent to from 3 to 4 mm. of water); no oil, grease, or water is employed, the filter being quite dry. There are no running costs for power or attendance, and no spare parts are necessary. Cleaning can be done easily by unskilled workmen. The filter is small in bulk, and can be adapted to the space available. The total capacity of this type delivered or under construction is said to exceed one million cubic metres per hour.

P. SAXL, in the *Gesundheitsingenieur*, describes his investigations on the effect of silver in destroying bacteria in water. It has for a long time been recognised that water that has passed through copper tubes has

certain antiseptic properties, and also that metallic silver immersed in the water has an antiseptic action. On this action the author has based the operation of a drinking-water sterilising station. By filling a glass bottle to the brim with water, immersing a silver wire in the bottle so as to reach right down the neck, allowing the bottle to stand for fourteen days, and then pouring out the water, the bottle is found to be left in such a condition that if fresh water is poured in and a silver wire again inserted, the water is rendered germ-free for eight hours. Tests showed that typhoid, cholera, and dysentery bacteria could be destroyed in this way.

IN *Science* for April 26 Prof. S. W. Parr, writing upon developments in the chemical industries of the United States resulting from war conditions, refers to the question of potassium supplies, and indicates the progress which has been made towards rendering the States independent of German sources. At present there is much leeway to make up. Whilst more than 40,000 tons of potassium salts will be produced this year, the pre-war imports were nearly seven times this quantity. Nevertheless, recent developments are both interesting and encouraging. The brines of Nebraska and California are just now by far the largest source of available potassium compounds. Next comes the kelp of the Pacific Coast, the utilisation of which is still in the developing stage, but progressing rapidly. More important still are the alunite deposits in Utah, which likewise are being worked, as yet, on a relatively limited scale. "We are also," says Prof. Parr, "just beginning to get glimpses of the possibilities of potassium salts from cement furnaces, from the greensand of the Eastern States, and from the felspars in various localities. At the present rate the potash problem seems in a fair way of solution."

A VERY interesting lecture delivered before the Chemical Society on February 21 by the Hon. R. J. Strutt on "Active Nitrogen" is reported in the April issue of the Journal of the society. If a stream of rarefied nitrogen passes through a tube in which a vigorous jar discharge is maintained, and then into a second vessel in which there is no discharge, it exhibits a brilliant yellow light in the second vessel. This "after-glow" persists in favourable circumstances for several minutes after the discharge has been shut off. The fact that the luminosity can be maintained only by the passage of the nitrogen from a state of higher to one of lower potential energy would alone suggest the presence of a special form of nitrogen, but this became a certainty when it was found that the gas reacts with gaseous hydrocarbons forming hydrogen cyanide and with metallic vapours giving nitrides. The existence of this "active" nitrogen does not depend on indirect evidence or on obscure spectroscopic phenomena; the hydrogen cyanide can be isolated and identified in the ordinary chemical way. When nitrogen purified by prolonged heating at 300° over sodium is employed the glow is invisible through blue glass, but if oxygen or one of its gaseous compounds (*e.g.* carbonic oxide or dioxide) is introduced into the glowing gas a bluish-violet light is exhibited at the confluence of the two gases. Active nitrogen does not react with hydrogen or oxygen, and the best conditions for its production are a low-pressure and a Leyden jar discharge. Tiede and Domcke were right in asserting that pure nitrogen does not give the phenomenon, but wrong in stating that oxygen is necessary. Other impurities, such as carbonic oxide or dioxide, methane, ethylene, hydrogen sulphide, or mercury vapour, will act equally well.

IN a paper published in the *Monthly Weather Review* for December last Prof. R. DeCourcy Ward discusses the subject of "Meteorology and War Flying." The paper is on the usual lines, and points out how important some knowledge of meteorology is to the airman, and how the various elements—pressure, temperature, etc.—influence flying. Perhaps the most interesting part is that relating to clouds and thunderstorms. Prof. Ward states that it is much safer not to fly in a thunderstorm, and then goes on to give instructions as to the best course to pursue when an aviator finds himself hemmed in between enemy country and an advancing storm.

THE April part of the Proceedings of the Physical Society of London contains two papers on critical angle refractometers of the Pulfrich type by Mr. J. Guild, of the National Physical Laboratory, and by Mr. F. Simeon, of Messrs. Hilger, respectively, which serve as a good illustration of the way in which improvements in instruments can be effected by co-operation between the makers and the users of the instruments. The critical angle refractometer is the most convenient instrument to use in the determination of the refractive indices of glasses of different compositions, and it has been used at the National Physical Laboratory in the examination of more than two thousand specimens. The experience of the instrument gained in the course of this work is embodied in Mr. Guild's paper, and there seems little doubt that in the near future an instrument will be constructed which will give the absolute refractive index and the dispersion of a specimen of glass to the fifth figure after the decimal place.

AN article on the nonius, its origin, theory, and use, by Senhor A. R. Machado, has been published in the *Revista de Quimica pura e aplicada* (Oporto, II. Série, Ano iii., 1918). Being a countryman of Pedro Nunez, the author calls a vernier a nonius, and proceeds to trace the history of this instrument from the book "De crepusculis" by Nunez, published in 1542. In reality, there is no resemblance between the contrivance of Nunez and that of Vernier, published in 1631. Nunez proposed inside the graduated arc of a quadrant to draw concentric arcs and to divide them respectively into 89, 88, 87 . . . 45 equal parts, so that the alidade would always (more or less accurately) touch a division-mark on one of the forty-six circles. Though ingenious, the proposal was anything but a practical one on account of the difficulty of dividing a quadrant into eighty-three or sixty-seven parts. It was improved, though not made much more practical, fifty years later by Curtius, whose idea was published by Clavius. There is nothing new in all this; see, for example, Delambre's "Histoire de l'astronomie moderne," i., p. 253, or Cantor's "Geschichte der Mathematik," ii., p. 580. But no one put a small auxiliary arc on the movable alidade before Vernier. The author of the paper next describes the various uses of the vernier, including Mannheim's double one (vernier de vernier), proposed in the *Journal de Physique*, 1873, to meet the case where none of the divisions of a vernier coincide exactly with a division on the principal scale.

MESSRS. *J. and A. Churchill* announce a translation, by G. W. Robinson, of Dr. M. Gina's "Chemical Combination among Metals." In it the relation between chemical composition and physical properties is discussed. The main portion of the book consists of an account of all intermetallic systems in which compounds occur. Messrs. *C. Griffin and Co., Ltd.*, will shortly publish "Simple Experimental Hygiene, Physiology, and Infant Management for the Use of

Teachers," by K. M. Curwen, with an introduction by Dr. G. W. Reid, County Medical Officer of Health and School Medical Officer for Staffordshire. Messrs. *Longmans and Co.* will issue shortly "Canning and Bottling Fruit and Vegetables," by Mrs. Goodrich, with a preface by Prof. F. W. Keeble. The work deals with simple methods of preserving, such as bottling in jam-jars, drying and salting, and with all up-to-date methods of preserving fruit without sugar.

OUR ASTRONOMICAL COLUMN.

THE NEW STAR IN AQUILA.—The new star in Aquila has continued to decrease in brightness at about the same rate as Nova Persei of 1901. On June 21 and 22 it was observed to be about 3rd magnitude, and its reddish colour had become quite pronounced. Prof. Fowler found that the hydrogen lines were still very brilliant on these dates, and that the most remarkable change since June 16 was the appearance of a broad bright band in the blue, about λ464. The enhanced lines of iron in the green were visible, and also the group of bright and dark lines about the position of D. There was also a dark line near λ615, which had not been noted in the earlier observations, and the continuous spectrum had diminished in brightness. The principal features of the spectrum were readily observed with a Zöllner star spectroscope on a 3-in. telescope.

Observations of the spectrum of the nova communicated by Mr. Harold Thomson are in general agreement with those of Prof. Fowler, but attention is also directed to a relative brightening of the line λ532 as compared with that at λ517.

In the *Times* for June 19 Father Cortie gave a brief account of a remarkable photograph taken with the prismatic camera at Stonyhurst on June 15. The exposure was from 10.35 to 11.35 G.M.T., and the photograph appears as if the spectrum had suddenly changed at about 11.5, and as suddenly returned to its original state about five minutes before the end of the exposure. The modified portion of the spectrum shows a second set of bright hydrogen lines, strongly displaced towards the red sides of the normal lines, which are also present, and an enormous receding velocity would be required to explain the displacements. Prof. Fowler has had an opportunity of examining the photograph, and informs us that there are certain features which suggest that an explanation may be found in an instrumental displacement. Apart from this, however, the photograph is a valuable record of the spectrum on the date in question. The bright hydrogen lines consist of three or more components, and there are numerous ill-defined fainter lines, besides several apparent dark lines. The chief features appear to be generally similar to those of Nova Persei at a corresponding phase.

DISCOVERY OF A COMET.—The first cometary discovery of the year was made by Mr. Reid at the Cape of Good Hope. It appears as a faint round nebulosity, and is moving south 48′ daily. Its position, June 12·25 G.M.T., was R.A. 9h. 16m. 36s., S. decl. 8° 10′. It is invisible in northern latitudes, setting shortly after sunset.

BULLETINS OF THE HECTOR OBSERVATORY, N.Z.—From recent bulletins of the Hector Observatory, Wellington, N.Z., it would appear that the Government astronomer, Mr. C. E. Adams, is endeavouring to make the institution as useful as possible to the general public. Bulletin No. 10 gives tables of the rising, meridian passage, and setting of the moon during the present year at places on the standard meridian (12h. east of Greenwich) in south latitudes 35°, 40°, and 45°, and it is shown by examples how the times for other places may be obtained by interpolation. The latest arrangements adopted for the time service are explained in Bulletin No. 11. The standard mean-time clock has been fitted with contacts, by which signals are given at the beginning of every hour of G.M.T., and repeated after the lapse of 1, 2, 4, and 5 minutes in each case. A similar system is adopted in connection with the wireless signal sent out at 22h. G.M.T. Another bulletin, issued in February, gives particulars of the occultation of a 6th magnitude star by Venus on March 3, according to calculations made by Pte. Arthur Burnet, secretary of the Leeds Astronomical Society.

Meeting, 1918, London

THE BRITISH SCIENCE GUILD

THE twelfth annual meeting of the British Science Guild was held at the Mansion House on June 19, the Lord Mayor presiding. The adoption of the annual report was moved by Prof. R. A. Gregory, and seconded by Sir Edward Brabrook. After alluding to the loss sustained by the guild in the death of Sir Alexander Pedler, for many years hon. secretary, Prof. Gregory gave a summary of the work of the various committees on education, the metric system, and the dyes industry. The last-named emphasised the strong financial support given to the German dye industry, aggregating more than 50,000,000*l.*, whereas the total capital of the colour-producing firms in the United Kingdom is only about four millions. In this country the chief need is to survey the great variety of products under manufacture, allocating the work in such a way as to avoid duplication of plant and effort. Reference is made in the report to the British Scientific Products Exhibition to be held at King's College, London, for four weeks during August–September. It is hoped that the exhibition will be helpful in illustrating the need for scientific research in relation to various arts and industries, and the results already achieved in this country in this direction since the war.

After the adoption of the report, an address was given by Lord Sydenham, the president of the guild, on "Education, Science, and Leadership." Our projects of national reconstruction, it was remarked, tend to accentuate industrial and commercial efficiency. But there are other problems the solution of which will require an enlightened democracy and instructed leadership. Our education, besides aiming at material efficiency, must inspire ideals. Lord Sydenham showed, from data relating to universities in this country, in Germany, and in America, that facilities for higher education are still not what they should be. At present only one child in a thousand from the elementary schools reaches a university. National education should provide equal chances for natural talent wherever found.

A paper by Sir Algernon Firth was read, in the absence of the author, by Sir Ronald Ross. The author sought to dispel the impression that manufacturers were not sufficiently alive to the need for research work in their industries, and quoted from the reports of a Board of Trade Sub-Committee to show the efforts being made to bring this matter before the notice of the authorities. Industries were not infrequently hampered owing to lack of knowledge in Government departments. For example, the growth of the dye industry was checked at the start by the refusal of duty-free alcohol. Besides developing facilities for research, it was necessary to provide inducements for youth to make use of them. In this respect we might learn from the enlightened attitude towards college education prevalent in the United States.

Sir Henry Newbolt, who followed, likewise emphasised the vital importance of true education, both of the mind and of character, to the future of this country. It might be true that science had not yet received the centuries of devoted effort bestowed on the humanistic studies, and was in process of development. But ultimately the impression that there was any antagonism between humanistic and scientific study would disappear. In both cases there was a search after truth and a similarity in general aims, and both demanded gifts in the teacher not only of intellect, but also of character.

A vote of thanks to the Lord Mayor and speakers was moved by Sir William Beale, and this terminated the proceedings.

THE IMPORTANCE OF THE NON-METALLIC INCLUSIONS IN STEEL.

IT is impossible to manufacture steel which does not contain non-metallic inclusions to a greater or less extent. These have an important effect on its properties, particularly in producing defects and causing failures to a degree which is not sufficiently realised. Mr. A. McCance, who presented a most able study of this subject at the May meeting of the Iron and Steel Institute, states that much defective steel is bad solely because of the number of non-metallic particles which it contains, and that fully 90 per cent. of the failures due to faulty material which have come under his notice are traceable to this cause alone. He states further that when material has cracked under a stress which experience shows it should safely have carried, it is advisable to examine the crack along its whole length, and when this is done, in many cases it will be found that the crack passes through groups of inclusions, while in cases in which it can be traced to its origin it is not unusual to find that it has started from a segregation of non-metallic particles. He treated a piece of steel in such a way as to produce slight intercrystalline brittleness, and then stressed it above the elastic limit. A number of small cracks appeared, and in nearly every case they started from one or more non-metallic inclusions.

He next heat-treated a heavy slab known to contain inclusions, and carried out tensile tests on pieces machined along the length in the direction of rolling, and also at right angles to this direction through the thickness of the slab. The length-test was in the same plane as the centre portion of the thickness-test, so that they were in every way comparable. The results obtained were as follows:—

	Elastic limit Tons per sq. in.	Ultimate stress Tons per sq. in.	Percentage elongation on 2 in.	Percentage contraction
Length (A) ...	24	43·2	27·0	65·8
Thickness (B) ...	18	34·5	4·0	16·8

These remarkable differences in properties, particularly as regards the ductibility of the steel, are due solely to the presence of the non-metallic inclusions, which in the fractured tensile surfaces of (B) appear as thin circular discs. McCance goes on to point out that these have acted as small areas of zero strength which have lowered the effective area of the test piece, though this is not the only effect they have, and he considers the distribution of stress in such a composite material. It has been proved experimentally by two different methods that the stress at the edge of a circular hole is three times that of the average. In the case of inclusions the elastic properties of which differ from those of the surrounding steel, the differences in stress at the edges will not be so great as for holes, but the edge-stress will still be greater than the average. "In steel, therefore, which possesses even slight brittleness the presence of inclusions may give rise to cracks when such material is stressed, though in steel which has received proper thermal treatment during rolling, forging, etc., inclusions, so long as they are evenly distributed and small, will have an effect which is quite negligible. It is only when they begin to form groups that they have a detrimental effect, and this power which they have to segregate is, unfortunately, without control in the existing state of our knowledge, so that the only way to minimise the chance of segregation is to lessen the number of inclusions present."

In his paper McCance considers the method of occurrence and composition of the various non-metallic inclusions and how they are formed. According to him, there is no evidence that any of them are soluble in molten steel. In other words, they exist as suspensions, and therefore do not obey the laws governing the segregation of elements soluble in liquid steel. Being lighter, they tend to rise to the surface. Assuming, as he does, that the particles exist as spherical globules (density=4), and that the viscosity of liquid steel is about the same as that of mercury, he calculates their velocity of rising (undisturbed) as follows:—

Diameter of particles	Velocity of rising
$10{\cdot}0 \times 10^{-3}$ cm.	80 cm. per minute.
1·0 ,,	0·8 ,,
0·1 ,,	0·008 ,,

Taking for purposes of illustration an ingot of 140-cm. length, which set in twenty minutes from the time the mould was filled, and ignoring convection currents, he calculates the percentage of the number of particles of each size which would be entrapped in the solid metal thus:—

Diameter of particles	Per cent. entrapped
All over $3{\cdot}0 \times 10^{-3}$	0
,, ,, 2·0 ,,	54
,, ,, 1·0 ,,	88
,, under 0·5 ,,	100

Convection currents play an important, though uncontrollable, part in determining both the position and size of the inclusions in every steel ingot. Inasmuch as the viscosity of the steel diminishes as the temperature rises, the metal should be cast as high above that of the liquidus as is practicable.

The greater part of the paper contains a detailed study of the identification and mode of occurrence of the inclusions commonly met with, *e.g.* manganese sulphide and its oxidation products, manganese silicates, iron oxide scales and silicates, acid open-hearth slags and their reduction products, fluxed refractory materials, and oxide inclusions. Iron sulphide, which is scarcely ever encountered, and the action of aluminium on the sulphides of iron and manganese are also dealt with. By means of various etching reagents any inclusion can be classified as a sulphide, a silicate, or an oxide, though research is required for the working out of more suitable reagents than at present exist.

In his final section the author discusses the equilibrium conditions in liquid steel. He considers that ferrous oxide plays a most important *rôle* in determining the origin and occurrence of inclusions, and that all the evidence favours the view that this substance is present in the liquid. The addition of manganese in the form of ferro-manganese causes the re-

action Mn+FeO=Fe+MnO to take place, and the oxides so formed, if uncombined, further form inclusions. The reduction, however, is never complete. Inclusions of this type contain invariably between 60 and 70 per cent. of MnO and from 21 to 28 per cent. of FeO, and this is an expression of the equilibrium relations between the two oxides. Silicon and aluminium also act strongly on ferrous oxide, and to an enhanced degree as compared with manganese. The ferrous manganous oxide complex passes, if sufficient silica is present, into a silicate, and ultimately into manganese silicate only. In the author's words, therefore, ferrous oxide "is an influence for evil in every class of steel, for when it is not removed it is the cause of blow-hole formation, and when it is removed from solution it leaves as a non-metallic inclusion a record of its previous existence."

It would appear, therefore, that in the manufacture of steel the chief desideratum, if inclusions are to be kept down to a minimum, is to finish with a bath containing the minimum of ferrous oxide. This is achieved in practice by working at as high a temperature as possible, which produces not merely less oxide in the steel, but also less iron in the slag, *i.e.* a more silicious slag, and the theoretical justification for it is clearly shown in the paper. H. C. H. C.

EDUCATION, SCIENCE, AND LEADERSHIP.[1]

SINCE the last annual meeting of the guild all questions of education have been under discussion, and we now know better where our weakness lies and the extent and nature of our needs. In the number of our institutions providing higher education America alone stands ahead of us. Sir Robert Hadfield has pointed out that Great Britain and Ireland have one university per 2½ millions of population as compared with one million in America. In the Dominions, on the other hand, where the population is relatively sparse and the distances great, the proportion is one university to two-thirds of a million of people. This numerical comparison is, however, misleading, except that it indicates educational centres capable of extending their activities. The true criticism is the number of students who undergo a complete course of training. Of full-time students only 4400 entered our universities in 1913–14, and of them several hundred were foreigners who would later leave this country. Putting the output of university and technically trained men and women in another way, it appears that per 10,000 of population there were sixteen full-time students in Scotland, thirteen in Germany, ten in the United States, six in Ireland, five in England, and five in Wales. The figure given for the United States includes only students at universities and technical schools of recognised standing. If all students taking four-year courses at these institutions were included, the rate per 10,000 of population would be doubled. It is impossible not to believe that these figures help to account for the high standard of intelligence in Scotland and America, and for the success of the Scottish and American peoples in many spheres of activity, while the relative backwardness of England, Ireland, and Wales must exercise an influence in public life.

The financial test shows a deplorable inferiority to the United States and Germany, and must indicate roughly the relative importance attached to higher education in these countries and our own. Thus the total income of State-aided modern universities and university colleges in England and Wales is about 700,000*l.*, of which 34 per cent. is derived from Parliamentary grants. The corresponding figures for Germany are nearly 2,000,000*l.* and 80 per cent., and the University of Berlin alone receives from the State an annual grant nearly equal to that given to all our universities and university colleges. The annual income of the American universities and colleges is 20,000,000*l.*, of which 7,000,000*l.* is at the disposal of the colleges of agriculture and mechanical arts. Private benefactions towards higher education in the United States amount to more than 5,000,000*l.* a year. With us they do not reach one-twentieth part of this sum.

The only possible inference from these figures is that, as compared with the United States and Germany, our higher education is lamentably inferior in quantity. We are not producing trained leadership sufficient for our needs, and the diffusion of knowledge is pitifully inadequate to the requirements of a modern State. If an analysis of the kind of training received by our governing classes were possible, it would be found that scientific knowledge was exceedingly rare and even non-existent in some quarters where it is essential. Sir Robert Hadfield states that in one important Government institution devoted to educational work about 90 per cent. of the principal officials have received a classical training, and only 5 per cent. have been educated in science. Mistakes and inertia in the direction of public policy and in administration are thus explained. There is not enough knowledge of the right kind in Governments, departments of State, or Parliaments, while, in the world of industry, a sufficient supply of trained research workers cannot at present be obtained. Until this requirement is fulfilled the development of new industries on a large scale must be impracticable.

The excellent report of Sir Joseph Thomson's Committee on the position of natural science in education throws a flood of light on our national deficiencies, and points the way to educational reconstruction. The Committee justly claims for sound science teaching that "it quickens and cultivates directly the faculty of observation. It teaches the learner to reason from facts which come to his notice. By it the power of rapid and accurate generalisation is strengthened. Without it there is real danger of the mental habit of method and arrangement being never acquired."

All thoughtful students of our public affairs must admit that, alike in peace and in war, our leaders in all classes have shown a certain lack of the qualities which science training can impart, and that national interests have suffered grievously for this reason. The power of reasoning from facts and of "rapid and accurate generalisation," combined with the habit of "method and arrangement," is the best possible qualification for Cabinet Ministers as well as for all leadership on lower planes; and the British Science Guild has persistently urged that science should take a prominent place in the education of our public servants.

The Committee recalls the fact that the neglect of science was noted by a Royal Commission on the public schools more than half a century ago. The position of scientific instruction in the United Kingdom was also surveyed in detail in 1870–75 by a Royal Commission, of which the seventh Duke of Devonshire was president and Sir Norman Lockyer, the founder of this guild, secretary. But although there has been advance in recent years, it has required the shock of a world-war to make us wide awake to our shortcomings. The champions of classical learning are now moderate in their claims. The Council for

[1] From the presidential address delivered at the annual meeting of the British Science Guild, June 19, by the Right Hon. Lord Sydenham, G.C.S.I., F.R.S.

Humanistic Studies declares that the future citizen should possess knowledge, not only of the physical structure of the world, but also of "the deeper interests and problems of politics, thought, and human life," and that he needs "scientific method and a belief in knowledge even more than physical science." This marks a change of attitude, and the advocates of the dominance of science in education would agree with the proviso that applications of science unknown to the ancients determine the conditions of health and of economic stability in modern life, and that a "belief in knowledge" and method in pursuing it are best inculcated by the study of law in the natural world.

The great merit of Sir Joseph Thomson's report is that it discloses the present causes of the weakness of science in our education. The universities as a whole now show a bias in favour of science teaching, but there is a deplorable lack of students, due partly to weakness in the schools, and partly to the influence of scholarship examinations in which classics predominate. Thus the old universities, by their scholarship systems, tend to discourage science teaching in the public schools, and the public schools react upon the preparatory schools. It follows that many of the most intelligent boys are deterred from entering upon a scientific career. It is also possible that some class prejudice, based upon long tradition, dating back to the Renaissance, may still operate against science training. The recommendations of the Committee are wise and far-reaching, but I can give only the barest indication of their objects and scope. Nature-study in primary schools up to the age of twelve is to be the foundation, and instruction in science up to the age of sixteen is enjoined upon all secondary schools, physics and chemistry to be taught, because all other sciences, to which they should be treated as passports, require some knowledge of them. Mathematics should be connected with science at an early period. The general aims of a science course at school age are defined with the view of securing two educational objects of primary importance:—

(1) To train the mind to reason about things the boy observes himself, and to develop powers of weighing and interpreting evidence.

(2) To develop acquaintance with broad scientific principles and their application in the lives of men and women.

No better foundation for the training alike of the statesman, the leader of commerce and industry, and the manual worker can be laid down. The Committee was strongly impressed with the importance of manual work at school-age, and, speaking from personal experience, I am certain that I owe much to the handling of the file and the lathe before I entered the Army, although mechanical pursuits at one time caused me to neglect other studies. I believe that if all classes underwent some manual training there would be a better understanding of the dignity of labour. Rightly distrusting examination tests of the conventional type, the Committee recommends the inspection of all schools.

Higher standards of teaching power, co-ordinated training from the primary school to the university and to the post-graduate stage, with a lowering of fees and a liberal allocation of scholarships to be awarded for "intellectual merit and promise," and not in accordance with the results of set examinations—such are the educational ideals which are set before the country. By these means we may hope in time to develop intelligence now wasted, as the Committee points out, to supply our present deficiency of experts in all branches of science, and to secure more orderly methods of administration and a higher average of leadership.

SCIENTIFIC RESEARCH AND INDUSTRIAL DEVELOPMENT.[1]

AT the request of my friend, Lord Sydenham, I am pleased to support the work which has been so ably carried on by the British Science Guild, now under his leadership. I do so principally for two reasons: First, because of the importance of the work; secondly, because I believe that an erroneous impression exists in many quarters as to the attitude of the producing interests of this country to this work, and I wish to endeavour to remove this impression.

There has been, I fear, a tendency in certain quarters to misjudge the attitude of manufacturers upon this subject. The impression seems to prevail that they are not fully alive to the necessity for research work in connection with their industries. This may be true in some quarters, but, speaking generally, I think there is no body of men more keenly alive to the necessity for a very great development in the application of science to industry.

Among employers there are comparatively few who have studied science or taken degrees in science before entering a business career, but the number of those who have done so has been steadily growing, and is certain to have a great influence upon the future of industry. Further, there is a large number, chiefly of the smaller manufacturers, who have grown up to the practice of "rule of thumb" methods, and will probably never depart from them.

There is, however, a large number, and they are chiefly of the most enterprising and intelligent kind, who have a keen appreciation of what science has done, and may yet do, for their industries, and are alive to the necessity of employing men of scientific attainments, and of encouraging others to undergo a training in science. In my industry I believe there are very few firms which do not employ chemists for the purpose of their business. Mine has never been without them for many years, and has found the value of their services.

I think we cannot absolve Parliament from a share—and that a large one—of the responsibility for our deficiency in scientific research as compared with some other countries. Not only has it been most niggardly in the provision that it has made for the study of science: it has persistently ignored, time after time, the claims of business men for legislation that would enable the application of scientific discoveries to take place, and encourage the application of these discoveries for business purposes. The most familiar illustration of this is the trade in aniline dyes. I maintain that the blame for the unfortunate position of this industry at the beginning of the war rests chiefly upon Parliament. Many times the demand was made by the dye producers that alcohol should be allowed free of duty for dye-making; but requests were refused, and the advantage of free alcohol was enjoyed by the German producers, which rendered economic production here, in competition with them, impossible. Further, year after year we went to the Board of Trade to give us a patent law that would be fair and reasonable, and not protect the foreigner and his inventions without reciprocal treatment in his country, but until Mr. Lloyd George became President in 1906 nothing was done. These, in my opinion, are the two chief causes why the aniline dye trade was virtually lost to this country, and the blame for it rests upon the Government and upon Parliament, and not upon the business man.

The principle that trade must be left severely alone

[1] From an address by Sir Algernon F. Firth, Bart., read at the annual meeting of the British Science Guild held at the Mansion House on June 19

and nothing be done to stimulate production at home, and that the only thing that counted was to buy in the cheapest market, prevailed here for far too long a period. This war has shattered our self-complacency in the application of this principle. People have learnt a great deal more about business and understand better what is in the national interest, and I hope a different system is going to prevail in the future.

In order to give you evidence of the interest that commercial bodies are taking, and have taken, in this subject, I want to put before you a few facts. During the last six months of 1915 I was chairman of the Sub-Committee appointed by the Board of Trade to take evidence from twelve minor industries which had all been developed in this country in competition with former German supplies. This report was issued to Parliament and published in January, 1916. The first recommendations that we made were:—"That the Committee thought that larger sums should be placed at the disposal of the new Committee of the Privy Council, and also with the Board of Education, for the promotion of scientific and industrial research and training.

"That the universities (the old universities as well as the new universities) should be encouraged to maintain and expand research work devoted to the needs of the main industry or industries located in their respective districts, and that the manufacturers engaged in those industries should be encouraged to co-operate with the universities in such work, either through their existing trade associations or through associations specially formed for the purpose. Such associations should bring to the knowledge of the universities the difficulties and needs of the industries, and give financial and other assistance in addition to that afforded by the city. . . .

"In the case of non-localised industries they should be advised to seek, in respect of the centres of research, the guidance of the Advisory Council of the Committee of the Privy Council for Scientific Research."

In the report we referred to evidence that was put before us to the effect that certain universities are taking up specific forms of research work. For instance, Sheffield University has taken up the subject of glass; at Stoke-on-Trent they are dealing with pottery—hard porcelain, china, and earthenware; and Manchester University is, I believe, equipping itself for studies in connection with the paper trade. I believe that we have got to specialise in the different universities in research work which is interesting to the trade in their localities, and prevent a great deal of the overlapping which now exists.

We followed this up at a meeting of the Associated Chambers of Commerce, when more than five hundred delegates were present from all parts of the country. We considered the development of industry after the war, and passed unanimously this resolution:—

"That His Majesty's Government be urged to inquire into the desirability of fostering and safeguarding those industries in this country which have since the commencement of the war been engaged in the manufacture of articles formerly made, to a large extent, in enemy countries, or any industries which have in the past suffered seriously from German and Austrian competition; and further, for the development of industries generally, His Majesty's Government be urged to provide larger funds for the promotion of scientific research and training."

In June of the same year the Imperial Council of Commerce, representing the Chambers of Commerce of the whole Empire, held meetings in London and passed the following resolution:—"This conference urges that throughout the Empire larger funds shall be provided by the respective Governments in order that the fullest facilities may be given for the promotion of scientific research and training in their relation to our commercial and industrial development."

Before these meetings I went to Sir Alfred Keogh, the head of the Imperial College of Science and Technology in South Kensington, and suggested that, seeing these matters of applied science and scientific research were so prominently in men's minds in chambers of commerce, not only in Great Britain, but also throughout the Empire, he should arrange for the delegates to pay a visit to the Imperial College in order to enable them to realise what is actually being done there. He immediately agreed, and showed us such of the work as was possible in a two hours' visit, when we could have profitably spent two days informing ourselves of the activities of this magnificent college of science. I believe that out of those who went, only three had ever been there before. A fact that Sir Alfred Keogh stated to us made a great impression; it was that before the war there were only a thousand students at this college, and it could quite easily hold two thousand. We ought to be sending on students to a place like this from the whole country, so long as there is an opening for them. We should send them when they have specialised in industrial subjects in order to broaden their minds and increase their knowledge. Sir Alfred stated:—"You will recognise, gentlemen, that the industries of this country are not fully alive to the importance of science, nor are the academies sufficiently aware of the importance of industrjes in the educational programme." This, we were bound to admit, was an accurate statement of the position.

We are not the only nation that is taking steps in the direction of promoting scientific research. The United States are fully alive to the importance of the matter, and are keeping thoroughly posted on all steps taken here. My experience there—and it is a long one, being a manufacturer in America myself—is that men who are looking to be heads of businesses in the future spend far longer at universities and technical colleges before going to their business than we have been in the habit of doing in this country. We have undoubtedly been remiss in this respect, but I think that general sentiment is changing.

We must realise that scientific research is one of the most important questions that are coming before us in the industrial reorganisation that will follow this war. We must all be impressed by this great factor: that business conditions are not going to be the same in this country or in the world when this great war is over. The war will have to be paid for, and to do so the production of everything, agricultural as well as industrial, has got to be stimulated through all agencies and by improved methods generally. Labour will have to alter and relax all foolish and uneconomic restrictions on output, and I believe in most cases is prepared to do so; but at the same time employers will have to scrap antiquated methods. They have got to root out many old prejudices, and must realise both the possibilities and responsibilities of their position. Our methods have been wasteful in the past; there will be no room for waste in the future. Everything must be turned to account and made the best use of. The old idea that business consists only of buying and selling to the best advantage, or in producing by known methods only, is exploded. A knowledge of world-markets and of opportunities must be more widely diffused and appreciated. Industrial organisation will probably exist in larger units, affording greater opportunities for ability and the application of scientific knowledge. The attainment of the maximum production in industry should be the great object of

us all. To secure this, scientific handling of materials and processes is necessary. Constant research, both on general and on particular or individual lines, is essential. This is becoming recognised by producers throughout the whole country.

For these reasons I consider that the British Science Guild has a great field for its activities, and if it continues to press for the attainment of these objects I am sure that it deserves the cordial and hearty support of all who are interested in the safety and expansion of all those industries upon which the future of this nation so largely depends.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. C. R. A. Thacker, late scholar of Downing College, has been elected to a fellowship at Sidney Sussex College. Mr. Thacker was placed in the first class of the Natural Sciences Tripos, part i., in 1911, and part ii. (physiology) in 1912. He is attached to the Special Medical Board of the Ministry of Pensions.

LEEDS.—Capt. M. J. Stewart has been elected professor of pathology and bacteriology in the University. He received his commission in the R.A.M.C. (Territorial Force) in May, 1915, and has served as pathologist to the East Leeds War Hospital, and in a similar capacity in France. A few months ago he was recalled to Leeds, and, at the request of the University Council, undertook the acting headship of the department of pathology and bacteriology. In addition to his hospital and teaching work Capt. Stewart has devoted much time to original research on pathological questions, and has a long list of publications to his credit.

LONDON.—The Senate announces a bequest of 2000*l.* for the engineering faculty of King's College under the will of Lieut. R. C. Hodson, a former student in the engineering department of the college, who was killed in France last year; also a donation of 51*l.* from Miss Gertrude Jones for the purposes of the Galton Laboratory at University College.

Grants have been made by the Senate out of the Dixon Fund for the year 1918–19 as follows:—100*l.*, Mr. Birbal Sahni, to enable him to continue last year's research on Indian fossil plants at Cambridge; 60*l.*, Mr. James Morrison, to enable him to continue research on the igneous rocks of the Lake District; 15*l.*, Dr. H. B. Cronshaw, for expenses in connection with research on the Connemara serpentine rocks.

A resolution was adopted by the Senate on June 19 expressing gratification that the King's College Hospital had decided to open its medical school to women students—"a step which is in entire conformity both with the wishes and the policy of the University."

The following doctorate has been conferred:—*D.Sc. in Geology*, Mr. A. E. Trueman, an external student, for a thesis entitled "The Evolution of the Liparoceratidæ," and other papers.

OXFORD.—The lately published report of the Delegates of the University Museum directs attention to the very large number of members of the teaching staff, research workers, and service staff of the museum and departments who are now serving in the Navy or Army, or are otherwise engaged in work directly connected with the war. A large part of the museum is still occupied by the school of military aeronautics. A new dissecting-room for women medical students has been provided by the liberality of the Clothworkers' Company, a deficit over the sum allotted being generously met by Sir William Osler. Among the special investigations carried on in the several departments have been work on the agglutination curve in relation to typhoid and paratyphoid fevers, tetanus, "mustard gas," the commercial production of toluene from petroleum, the sulphonation of benzene and the manufacture of synthetic phenol, and the preparation of new chloroamides for use as antiseptics. A considerable amount of research work has also been published on subjects not directly connected with the war. The curator of the Pitt-Rivers Museum reports a very large accession of specimens by donation, chief among which are the examples presented by Lady Tylor from the collection of her late husband. Other important accessions have been received from Mr. J. H. Hutton, Mrs. Braithwaite Batty, Mr. A. S. Kenyon, and Major R. G. Gayer Anderson.

THE HON. SIR C. A. PARSONS has consented to fill the office of president of the Polytechnic School of Engineering, Regent Street, in succession to the late Mr. C. Hawksley.

WE learn from a message from the Rome correspondent of the *Times* that the British Institute at Florence was formally opened on June 21 by Sir Rennell Rodd, Ambassador to the Court of Italy, who said that as Florence was the intellectual centre of Italy, the British Institute in Florence would provide facilities for the study of English by practical and scientific methods, the courses including classes in English history, geography, and literature. An attempt would also be made to explain and illustrate the chief problems of the British Empire. It was hoped that in the future the institute might become a point of contact between the principal British and Italian universities.

AT a series of conferences held during the present year representatives of the non-professorial teaching staffs of the universities and university colleges of England, Ireland, and Wales decided to take joint action for the purpose of securing an improvement in status, tenure, and salary. A memorandum has been prepared setting forth the present conditions of service and remuneration, which are admitted to be unsatisfactory by all conversant with the facts, and suggesting various remedies. Of these the most important is that the lecturing staff should be divided into three grades. The lowest grade would comprise appointments of a probationary character to last not more than three years. At the end of that time the junior lecturer or demonstrator should cease to hold the appointment, or, if it is desired to retain his services, he should be promoted to the next grade, that of lecturer on the permanent staff. The highest grade would be composed of senior lecturers and lecturers in charge of departments. It is suggested as essential that there should be a definite minimum commencing salary in each grade, with substantial annual increments, and that lecturers should have a greater security of tenure, more time for study and research, and more adequate representation on bodies that control the teaching in each university or college than prevail under existing arrangements. The memorandum is being presented to the governing bodies of each university or university college concerned, and there is reason to believe that the recommendations contained in it will receive favourable consideration. No improvement of salaries, however, can be expected without substantial aid from increased Treasury grants, and the promoters of the movement intend to make representations to the Government that such increases of grant should be given as would make it possible for governing bodies to meet the not unreasonable claims which have been put forward.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 13.—Sir J. J. Thomson, president, in the chair.—Admiral Sir Henry **Jackson**: Experiments on the effect of the vibration of a stretched wire forming part of a closed electric circuit. A large thermo-microphone consisting of a long loop of wire warmed by an electric current, subjected to vibration produced by sound-waves, continued to respond to and record the effect of the vibration in suitable receiving apparatus after the electric battery had been cut out of its circuit, and when the wire was at the same temperature as the air. This result of the wire's vibration could not, therefore, be solely attributed to the wire being maintained at a different temperature from that of the surrounding air by an electric current in it. The response to the sound and other vibrations was generally recorded by means of an amplifier and telephones. Experiments were carried out to elucidate the cause of the phenomenon. It is shown that resonance plays an important part. No definite conclusions, however, can yet be drawn as to the quantitative effect of altering tension or length of wires, or their displacement, on current generated, nor does the energy expended in producing vibration appear to be proportional to the effect produced, unless resonance is present.—A. **Mallock**: Note on the effect of wind-pressure on the pitch of organ-pipes. The fact that the pitch of an organ-pipe is to some extent dependent on the pressure of the wind supply is well known, but no satisfactory explanation of this dependence has hitherto been offered. In the present note some experiments on the subject are described in which water instead of air was used as the oscillating fluid. It is shown by photography that the lateral motion of the fluid jet or lamina which maintains the oscillation is always in the direction of the oscillating flow, and also that the oscillation is not (or only very feebly) maintained unless the jet breaks up into eddies before striking the "lip" of the pipe. It is suggested that the rise of pitch which occurs when the jet velocity is increased depends on the jet acting as an injector. Part of the fluid belonging to the oscillating flow becomes involved in the eddies of the jet, and is accelerated by energy drawn from this source, thus diminishing the amount of energy which would otherwise have to be taken from the oscillating system. In effect, this action reduces the oscillating mass, and thereby increases the frequency. The results obtained with the water oscillator are compared with Lord Rayleigh's experiments on organ-pipes, and it appears that the variation of frequency with the pressure of the fluid supply is similar in type in both cases.—Dr. A. E. **Oxley**: The diamagnetism of hydrogen and the value of the magneton.

Optical Society, June 13.—Prof. F. J. Cheshire, president, in the chair.—H. **Lee**: A chart for finding the number of lenses in, and size of, a block. The chart shows by two series of intersecting curves the number of lenses it is possible to place in any ring of a block (up to ten rings) when the maximum diameter of the block, the diameter of the lens, and the radius of curvature to which the lenses to be worked are given. Any case likely to arise in the workshop can be at once determined by interpolation between the curves shown. The diagrams exhibited are for the two cases when the first ring contains one lens and three lenses respectively. The formulæ from which the charts were calculated are given.—H. S. **Ryland**: The prevention of filming in enclosed optical instruments. (1) The filming is independent of the nature of the glass; (2) the film itself is always alkaline; (3) it is progressive; (4) it is avoided by absolute cleanliness during the assembling of the instrument, by taking care that no soap or animal matter is left upon the glass surfaces, and that no volatile as water-bearing material is used inside an enclosed instrument.—T. **Smith**: Charts for assisting in the selection of suitable glasses for cemented doublets. Use is made of two charts sliding one over another in the manner in which a slide-rule is used, one of the charts being transparent. A single variable suffices to determine very approximately the numerical relation between the various spherical aberrations for all cemented doublets made from two given glasses. Chart No. 1 contains curves corresponding with constant values of this variable, the independent variables being the difference in the refractive indices of the two glasses and the logarithmic difference of their powers. The second chart consists of points defining the available types of glass, the scale in one direction varying with the type of chromatic correction desired. The glasses are selected by superposing one chart on the other and finding two representative points on No. 2 which satisfy the condition that one point lies on the curve of No. 1 corresponding with the required type of spherical correction when the other point is on the origin of chart No. 1.

PARIS.

Academy of Sciences, June 3.—M. P. Painlevé in the chair.—G. **Humbert**: The number of classes of indefinite forms of Hermite.—G. **Bigourdan**: The observatory of the Louis-le-Grand College (last period) and the astronomical work of the French expedition to Pekin. Historical account of work done during the period 1753 to 1782.—M. **Hamy**: The diffraction of the solar images.—Y. **Delage**: Lymphatic bleeding as a means of deintoxication. In cases where there is a limited amount of a toxin in the system, and where bleeding followed by transfusion is too dangerous, the possibility of a lymphatic bleeding is suggested, with a subsequent introduction of a sufficient quantity of artificial blood serum. The operation would admittedly be difficult, on account of the smallness of the lymphatic vessels and the nature of their walls.—Ch. **Depéret**: An attempt at the general chronological co-ordination of Quaternary times.—G. A. **Boulenger**: The Helodermatid lizards of the Upper Eocene in France.—G. **Giraud**: A partial differential equation, not linear, of the second order, connected with the theory of hyperfuchsian functions.—A. **Buhl**: The volumes swept out by the rotation of a spherical contour.—E. **Belot**: The great velocities in novæ and the vortex theory of cosmogony.—A. **Véronnet**: The contraction of stars and equilibrium of nebulæ.—E. **Léger**: α-Oxycinchonine. The compound previously described as oxycinchonine is shown to be α-oxydihydrocinchonine, and is formed by the addition of a molecule of water to cinchonine.—J. **Peyriguey**: A waterspout in the Gharb.—D. **Berthelot** and R. **Trannoy**: The evolution of the saccharine principles of the sorghum and the influence of castration. In normal times sorghum cannot compete with beetroot or sugar-cane as a source of sugar. Owing to the presence of levulose, glucose, and gums, the sorghum juices crystallise badly. Moreover, after the plant is cut the saccharose reverts, and this phenomenon is even shown by the growing plant after a certain date. As the plant is easily grown, the juices expressed in a domestic fruit-press may be used in syrup form with advantage under present conditions.—L. **Lindet**: The influence that the vegetable function of yeast exerts on the yield of alcohol: a new interpretation of the fermenting power.—J. **Nageotte**: The value of the ultramicroscope in histological investigation. The ultramicroscope can render great services to histology,

but reasons are given to show that negative results must not be taken as proving absence of structure.—J. **Amar**: The psychograph and its applications. Description and photograph of an apparatus for graphically recording reaction times.—F. **Maignon**: Researches on the toxicity of egg-albumin. The influence of the season on the sensibility of the organism to nitrogenous intoxication. A diet of white of egg alone is incapable of supporting life or maintaining weight in the white rat. The rats on this diet die rapidly in May and October of an acute intoxication of the central nervous system, whilst they die slowly by starvation in August and January.—M. **Lécaillon**: The action of the venomous bites of *Ammophila hirsuta* on the caterpillars of *Agrotis ripae*.

June 10.—M. P. Painlevé in the chair.—G. **Humbert**: The representation of an integer by indefinite, ternary quadratic forms.—J. **Boussinesq**: The graphical integration of the problem of sandy flow in the case of a *terre-plein* with free undulating surface maintained in front by a curved wall.—E. **Ariès**: Saturated vapour-pressures of pentatomic bodies. The only conclusion which can be drawn from the existing experimental data is that stannic chloride, methyl fluoride, and chloroform in a state of purity ought to have saturated vapour-pressures which satisfy the law of corresponding states.—J. **Pérès**: Certain functional transformations.—M. de **Pulligny**: The approximate quadrature of the circle.—H. **Bourget**: The intrinsic brightness of the starry sky.—Sir F. W. **Dyson**, MM. **Luizet**, **Moye**, and C. **Sola**: Telegrams announcing the appearance of Nova Aquilæ.—M. **Brillouin**: Biaxial media.—P. L. **Mercanton**: The magnetic state of some prehistoric pottery. The examination of five further examples confirms the results given in an earlier note that the terrestrial magnetic inclination in the bronze in Switzerland was nearly zero.—M. **François**: A new method for the determination of mercury with zinc.—J. **Martinet**: The isatic acids. Details are given of the preparation of 5-methylisatic acid, 5 : 7-dimethylisatic acid, and α-naphthisatic acid. These acids dissolve immediately to a yellow solution in alkalis without passing through the intermediate violet colour of the corresponding isatins.—J. **Bougault**: The amide function. The author's work on the acidylsemicarbazides and the acidylhydroxamides leads him to the conclusion that the acid amides are normally of the constitution R,C(OH),NH instead of the usually accepted $R.CO.NH_2$.—A. **Guilliermond**: Metachromatin and the phenolic compounds of the plant-cell.—C. **Janet**: *Botrydium granulatum*.—H. **Bierry** and P. **Portier**: Vitamines and symbiotes. The bacteria isolated from the tissues of normal animals (symbiotes), like the vitamines, are abundant in the teguments of seeds and in many animal fats, and their temperature of destruction, about 120° C., is also near the temperature of the alteration of vitamines, and it is suggested that there is a relation between the symbiotes and the vitamines. Preliminary experiments showed that symbiotes are perfectly tolerated when introduced into vertebrates. Animals (rats, pigeons) fed on a diet deprived of vitamines were reduced to the pathological state described by various workers. The injection of cultures of living symbiotes under the skin or in the peritoneum produced a rapid recovery in twenty-four to forty-eight hours. These results were repeated and confirmed by experiments lasting several months.—Y. **Delage**: Remarks on the preceding paper. Attention is directed to the fact that the animals in the pathological state described still contain symbiotes in their tissues, and it is difficult to see how the introduction of more of the same bacteria could be responsible for the effects observed.—Mlle. Marie **Goldsmith**: Sensorial perceptions in *Eupagurus Bernhardus*.

BOOKS RECEIVED.

Forestry Work. By W. H. Whellens. Pp. 236. (London: T. Fisher Unwin, Ltd.) 8*s.* 6*d.* net.

Chemistry for Beginners and School Use. By C. T. Kingzett. Third edition. Pp. 151–211. (London: Baillière, Tindall, and Cox.) 2*s.* 6*d.* net.

A Primer of Engineering Science. By E. S. Andrews. Part ii. First Steps in Heat and Heat Engines. Pp. ix+67. (London: J. Selwyn and Co.)

DIARY OF SOCIETIES.

THURSDAY, JUNE 27.

ROYAL SOCIETY, at 4.30.—Periodic Irrotational Waves of Finite Height: Prof. T. H. Havelock.—The Diffraction of Electric Waves by the Earth: Dr. G. N. Watson.—Sounds Produced by Drops Falling on Water: A Mallock.—Concerning Emotive Phenomena. II.: Periodic Variations of Conductance of the Palm of the Human Hand: Dr. A. D. Waller.—The Mechanism and Control of Fibrillation in the Mammalian Heart: Prof. J. A. MacWilliam.—The Development of the Sea Anemones, *Actinoloba dianthus* and *Adamsia palliata*: Dr. J. F. Gemmill.—The Occurrence of Multinucleate Cells in Vegetative Tissues: R. Beer and Agnes Arber.—The Epithelial Sheath of Hertwig in the Teeth of Man, with Notes on the Follicle and Nasmyth's Membrane: Dr. J. H. Mummery.—*And other Papers.*

FRIDAY, JUNE 28.

PHYSICAL SOCIETY, at 5.—A New Method of Measuring Alternating Currents and Electric Oscillations: I. Williams.—Demonstration of Coupled Vibrations: Prof. E. H. Barton and Miss H. M. Browning.

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