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*"To the solid ground*
*Of Nature trusts the mind which builds for aye."*—WORDSWORTH.

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THURSDAY, FEBRUARY 10, 1916.

## DEFECTS AND REMEDIES.

WHEN, thirteen years ago, Sir Norman Lockyer delivered before the British Association his address on "The Influence of Brain Power on History," it is not too much to say that his statement of the need for the promotion of intimate relations between statecraft, industry, science, and education fell mostly on inattentive ears. The lessons in modern history taught by that address were unmistakable, and the statement of consequences of continued neglect of scientific factors of national progress was prophetic, yet little heed was given to these subjects until the outbreak of hostilities revealed the weakness of our industrial position in comparison with the powerful and highly-organised forces fighting against us. War has caused an awakening which the pleasant times of peace failed to bring about; and our newspapers and magazines —general and technical, trading and scientific— are now giving attention to the subject and are publishing articles by men of science, manufacturers, and others on the provision to be made to ensure that close co-operation between scientific research and industrial development which is essential to the advance of a civilised community.

The points which are being discussed, and the views expressed, have been familiar to most men of science for many years; and Prof. E. B. Poulton was good enough to say in his recent Romanes lecture: "It would not be right to speak on the national neglect of science without acknowledging with gratitude the patriotic position taken for many years by the journal NATURE. If only the warnings given again and again in its pages had been heeded, I am confident that long before this time Germany's complete defeat and the freedom of the world would have been achieved."

We have waited a long time for public enlightenment as to the relation of science to national affairs, knowing that while consideration of the subject was confined to scientific circles, it would remain outside the realm of practical politics, where measures and administrative action are not determined by foresight so much as by expediency. Now that the war has shown the truth of the predictions of our scientific Cassandras, there is more reason to believe that action will be taken to avert the consequences of neglect in the past and to provide the conditions of advance in the future.

A letter signed by a number of distinguished men of science, published in the daily papers a few days ago, and referred to in our issue of February 3 (p. 640), directed attention to some of the defects in our national organisation as regards what may be termed scientific equipment. Though science enters into every part of modern life, and scientific method is necessary for success in all undertakings, the affairs of the country are in the hands of legislators who not only have little or no acquaintance with the fundamental facts and principles signified by these aspects of knowledge, but also do not understand how such matters can be best used to strengthen and develop the State. Our administrative officials are also mostly under the same disabilities, on account of their want of scientific training. They and army officers are educated at schools where science can receive little encouragement: "Of the thirty-five largest and best-known public schools thirty-four have classical men as headmasters"—they do not take up scientific subjects in the examinations for the Civil Service, because marks can be much more easily gained by attention to Latin and Greek; they need not take science for entrance into the Royal Military College, Sandhurst, which is "probably the only military institution in Europe where science is not included in the curriculum"; and the result of it all is that science is usually regarded with indifference, often with contempt, and rarely with intelligent appreciation by the statesmen and members of the public services whose decisions and acts largely determine the country's welfare.

The defects of a system that places the chief power of an organisation which needs understanding of science in every department, in the hands of people who have not received any training in scientific subjects or methods, are obvious. Some remedies are suggested in the recent statement to which we have referred; and the signatories anticipate the time when the Board of Trade will be replaced by a Ministry of Science, Commerce, and Industry, while leading scientific men and inventors are admitted to the Privy Council, and are given influential positions in the State service.

We are in complete sympathy with the views to which the men of science who signed the statement have given their support; indeed, all the points to which public attention has now been directed have on many occasions been dealt with in these columns. The British Science Guild was founded to urge all responsible authorities to give science its rightful place in national affairs, and it has persistently put forward these claims for

the past ten years or so. It is not a scientific society, or a Chamber of Commerce, or an educational association, but a national organisation in which the activities of all these bodies are united by the common bonds of scientific efficiency for the good of the State. While, therefore, the publication of the letter on the neglect of science is opportune and welcome, it seems unnecessary to form a "Reorganisation Committee," to which communications are to be addressed. The executive and other committees of the British Science Guild include leading representatives of all departments of pure and applied science, of many branches of commerce and industry, and of educational work from the primary school to the university. It is not unreasonable to suggest, therefore, that the new and anonymous Reorganisation Committee, which has secured the signatures to the recent statement, should exert its activities through the British Science Guild, instead of acting independently of the guild, and thus presenting a divided front to the forces to be overcome.

It is satisfactory to note that the White Paper [Cd. 8181] on British trade after the war, published last week, refers to the valuable work done by the guild with the object of promoting the manufacture of laboratory glassware in the country. Shortly after the outbreak of the war, the Technical Optics Committee took up the question of the supply of optical glass and instruments, and a committee was formed with the Association of Public School Science Masters to deal with the matter of laboratory glass. This committee found that glass manufacturers were disinclined to invest in new plant without some security against foreign competition after the war, but the difficulty was overcome by the guild sending a circular to more than a thousand schools and education authorities asking if they were prepared to undertake to use British-made glass during the war and for a period of three years after, provided that the prices were not prohibitive. The list of hundreds of schools and authorities which have given this general undertaking is published in the journal of the guild, just issued, and it should be of the greatest service to British manufacturers of laboratory glass. The same committee of the guild has rendered like valuable assistance by specifying the chief sizes and shapes of glassware required for laboratory purposes. These reports, and the enterprise of the Institute of Chemistry in determining and publishing formulæ for the manufacture of glasses of many kinds hitherto obtained mostly from abroad, have done more to give practical and scientific support to British glass manufacturers than any Government Department has accomplished since the outbreak of hostilities.

We give elsewhere the main points and recommendations of the recent White Paper, in so far as they relate to scientific matters. It is encouraging to find that the influence of scientific research upon industry, and the need for the State to make adequate provision for its promotion, are generously acknowledged. The nation has been ill-prepared against industrial expansion in the modern sense, and therefore it has found itself in an inferior position in times of war. The British manufacturer is now called upon to become an industrialist, and to co-operate with the scientific investigator in the promotion of industry as a whole. The British man of science must similarly cultivate a fuller interest in industrial applications, and appreciation of technical experience; and the change of attitude will act progressively both on science and industry. Finally, science should speak with a collective authority, and demonstrate by the conduct of its own affairs that it is capable of organised action and clear leading. We want to preserve the practical character of the British nation and yet to develop it to meet modern needs. That there can be successful organisation in manufacture is shown by the Ministry of Munitions; that the people can organise is proved by the position of the Trade Unions; that they can co-operate is evident from the success of the Co-operative Wholesale Society. It remains to develop still further the great principles—to organise and co-operate—among artisans, manufacturers, and scientific workers in order that our national capacities may be employed for the utmost good.

## PSYCHOLOGY.

*The New Psychiatry: being the Morrison Lectures delivered at the Royal College of Physicians of Edinburgh in March,* 1915. By Dr. W. H. B. Stoddart. Pp. iv+66. (London: Baillière Tindall, and Cox, 1915.) Price 2*s.* 6*d.* net.

IT is the accepted duty of this journal to recognise all interests in natural knowledge, and as problems of the mind are included in this group we may fittingly and appropriately refer to the above volume. Mental problems are not easy to solve, and the old methods of observation and induction—hitherto called psychological analysis—have of late given way to what has been described

as "psycho-analysis," the assumed utility of the latter claiming for it a fresh title under the name of the "new psychiatry." Its author is Sigmund Freud, of Vienna, and one of its most brilliant exponents is K. Yung, of Zurich, who has lately tended to break away completely from the teachings and practice of the so-called "Freudian school." This school has few disciples among thoughtful and reflective men and women. In this country healthier conditions and a more natural and ethical view of life maintain, and we recognise that man is not an animal dominated by crude instinct and base passion, as the disciples of Freud maintain, but that he is a responsible being, fashioned after the image of God, and endowed with mental, spiritual, and physical attainments which can be proved by an experience not that of men of science only.

The causes, attributed by those whose lives are spent in the investigation of nervous and mental disorders to these pathological conditions, are observed chiefly in heredity, environment, education, fatigue, and various intoxications, whether these are generated within the body or introduced into it from without, the latter, for instance, being the poisons of alcohol, syphilis, tuberculosis, etc.; but the disturbing effects of strong emotion, grief, anxiety, and worry caused by any one specific event, such as a moral emotion, are also not excluded. Charcot, Hack Tuke, Savage, Janet, and many others have connected mental and nervous disorders with vivid emotional experiences, as also with the memories of these and with the conserved and revived ideas of such memories. It has been recognised that these memories may remain in the subconscious field, although capable of rising into the conscious mind under certain normal and abnormal conditions. It is the claim of the disciples of Freud that they can by "psycho-analysis" disclose the workings of this unconscious mind through the examination of spontaneously uttered thoughts, *i.e.*, "free-association," and that all conscious thought and action are coloured and influenced by the unconscious ones, which, indeed, are looked upon as the springs of action of all conscious ideas, which implies that the unconscious mind is the primitive soil out of which all conscious thoughts originate, and out of which all intellectual processes grow. Freud considers the conscious active mind of thought, feeling, and will to be a commingling of the unconscious and the conscious, in which the lower level supplies the motive force, whilst the upper regulates it. Thus there are many mental states which may be packed together in the mind at one time, though one or more of them may be repressed; as Bergson states, they may be compressed like steam in a boiler, so they may not rise to the conscious level of expression.

It is within the knowledge of every practising physician that certain sensations or experiences are able to determine certain attitudes of mind which may appear after their memories have faded, and the hypothesis that the memories of past experiences are potential agencies in determining certain abnormal mental symptoms is also an acknowledged fact. The teachings of Freud have certainly tended to elucidate many facts in the unconscious field. He maintains, for instance, that in the education of children many incidents are remembered, although more are forgotten; yet they remain engraved upon the marble of the unconscious mind. He cites the trend of social and ethical education to be mainly in the direction of repressing natural tendencies, suppressing feelings and passions, personal wishes and sentiments, which is thus a constant effort for the learning pupil, but which it succeeds eventually in more or less completely controlling. These tendencies, so repressed, may at any time become uppermost, and then give rise to wishes, longings, delusions, unfulfilled desires, dreams, or obsessions.

Dr. Stoddart's lectures are an eloquent brief for this Freudian school, and if his advocacy had ended here we should have been satisfied, interested, and gratified; but he carries his support to the extreme limit of Freudian disgust, and some parts of the lectures are unwarrantable, painful, and unjustifiable. Freud and Dr. Stoddart both believe that there is an unwillingness to recall or evoke painful feelings, that these are kept under by an assumed ego, the "endo-psychic censor," or, more briefiy, the "Censor"—a purely artificial inhibiting factor. Lapses of memory, which cause us not to do things we wish to do and intend to do, drop out of the mind owing to their lack of interest, and not owing to the working of an active and repressive force. It is claimed for Freudism that a solution is obtained to the problems of grammar, language, literature, art, and religion, and this ambitious aspiration we should willingly have passed by; but because the purpose of psycho-analysis is to discover some unpleasantly painful or shameful event in the past history of the patient, because these are taken to be the root cause of most cases of mental perversion, and because sexual matters are placed as the bed-rock of most cases of insanity—a hypothesis which is not only unjustifiable and unproven, but is also an insult to the clean mind of an innocent sufferer—we are compelled to remonstrate. The method of psycho-analysis practised by this school of the "new psychiatry" has been responsible for suggesting lewd, objectionable, and

bestial thoughts to a pure mind, and such practices should be repressed with all the strength of a controlling hierarchy—if such there be? It has been well said that "a diagnosis in the Freudian sense is a diagnosis of the mind that made it."

In Dr. Stoddart's lectures there is much that concerns the psychiatric specialist, as he is interested in all the attempted explanations of perversion, but there is little here for the scientific seeker after truth. The first chapter deals with fundamental psychical instincts; the second with the technique of psycho-analysis; and the last with its application. We are not in sympathy with much that is said by Freud's English exponent, and we assert from practical experience and a definite knowledge of the effect of psycho-analysis upon those among whom the craft is practised—in so far as it is a probing for hidden and forgotten sexual occurrences—that it is repulsive, disreputable, and ethically objectionable.

ROBERT ARMSTRONG-JONES.

## *THE ENERGY CHANGES IN VITAL PROCESSES.*

*Principles of General Physiology.* By Prof. W. M. Bayliss. Pp. xx+850. (London: Longmans, Green and Co., 1915.) Price 21*s.* net.

WITHIN recent years many workers in the domain of physiology have made use of the more modern physical and chemical methods in their investigations, as is evident even from the most cursory study of present-day physiological and bio-chemical literature. Such a book, therefore, as that which Dr. Bayliss has just given us is of inestimable value to all who recognise that an approach to the study of physiology through the avenue of energetics is one that is bound to prove of great value. To deal satisfactorily with the principles of general physiology from this viewpoint requires, however, the expenditure of so much labour that at first sight it appears unlikely that one writer can take the whole burden upon his own shoulders. Dr. Bayliss has taken infinite pains in the preparation of a well-reasoned presentation of the physico-chemical laws which govern vital processes. Every page shows evidence of a critical study of the literature, much of which, at least until recently, lay outside the region of the physiologist. One of the great advantages which will result from a careful study of this book will undoubtedly be the direction of the attention of the reader to the physico-chemical literature of which the writer has made such good use.

The first chapter deals with certain of the properties of protoplasm, but naturally in a very brief form, as the subject is discussed from a variety of points of view in the subsequent chapters. The next seven chapters, along with chapter x., are in many respects the most valuable. They deal with such subjects as the laws of energetics, surface action, the colloidal state, permeability of membranes, osmotic pressure, the action of electrolytes, and catalysis and enzyme action. In the very interesting chapter on surface action, the properties of substances at their boundaries with other phases, for example, surface tension and electric charge, and their influence on solubility and chemical reaction, are dealt with before taking up the subject of adsorption. The parts played by mechanical surface energy and the electrical energy changes at a surface are carefully differentiated, and in the study of the combined effects of the two factors, the higher value of the latter is referred to. The changes subsequent to adsorption, removal from surface to interior or actual chemical combination, and the control of the rate of chemical combination by the preliminary adsorption process, are dealt with in a most interesting fashion. The section on the electrical charge on colloids and the part played by electrolytic dissociation on the same is, as one would expect, a most excellent one. That most important subject in colloidal chemistry, namely, the action of electrolytes on colloidal particles, receives due attention, the work of Hardy, Perrin, Burton, and Mines being specially referred to.

In dealing with the proteins from the physico-chemical point of view, it might have been advisable to give a rather more detailed account of amphoteric electrolytes in order to lead up to such subjects as the iso-electric point or zone and its relation to the denaturation or coagulation zone.

In the chapter on the permeability of membranes and the properties of the surface of cells, a very excellent account is given of our present knowledge, but the subject requires so much further work that the time has not yet come when a clear account of the various factors, physical and chemical, can be given. In the chapter on osmotic pressure, and also later on in the chapter on secretion, the writer refers to the influence which would be exercised by differences in permeability in various parts of the cell membrane; for example, the surface next the blood vessels compared to the surface next the lumen of the tube. A somewhat similar mechanism has been described by Lepeschin in certain organs of plants.

The chapter on electrolytes and their action is a most interesting one, but it would be advisable for the reader to supplement it by a study of a

text-book on physical chemistry dealing with the same subject. There is a slip in the equation of the dissociation constant in Ostwald's "Dilution Law" on p. 186.

Henderson's work on the maintenance of neutrality in the organism is very clearly described. In the carbonate phosphate equations given on p. 199 the proportion dissociated of $NA_2HPO_4$ in decimolar concentration is given as 0·04 instead of 0·64, as is evident from the proportions required to obtain a hydrion concentration of $1 \cdot 10^{-7}$. There are other slight numerical errata in this summary of Henderson's work.

We can only allude briefly to the remaining chapters, which are of a more purely physiological type. The essential characteristic of all is the originality of the treatment. Recent work in protein and carbohydrate metabolism receives due attention, but, as one would expect, the later chapters on catalysis and enzymes and on secretion receive much more elaborate treatment. The author very rightly directs attention to the necessity for very careful examination of all cases of supposed anti-ferment production. Undoubtedly in many cases the influence of alterations in hydrion concentration and adsorption have not been sufficiently considered in experiments on the production of antibodies.

The section dealing with excitation and inhibition will be read with the greatest interest and profit by all physiologists.

A slight alteration in the order of the closing chapters might have been advisable. The section on electrical changes in tissues receives an essentially modern treatment. It is somewhat pathetic that the older work in this, as in other departments of physiology, has been entirely displaced. There is no reference to the work of Du Bois-Reymond, just as in the subject of reflexes we find no reference to Pflüger's work. In the scope of this brief review we can refer only to the excellent articles on the action of light, on respiration, and on the action of hormones, drugs, and toxins.

The work as a whole requires careful study, and will undoubtedly serve as an incentive to research in many departments of physiology. It is written in a very pleasant style, and its value is enhanced by the interesting portraits of men of science whose work has contributed to the advance of physiology along the lines dealt with in this work. English physiology is indeed fortunate in numbering among its most able research workers one who has been able to enrich the science by this most valuable contribution to general physiology.

T. H. M.

## A HANDBOOK FOR WIRELESS TELEGRAPHISTS.

*Handbook of Technical Instruction for Wireless Telegraphists.* By J. C. Hawkhead. Second edition, revised and enlarged. By H. M. Dowsett. Pp. xvi+310. (London: The Wireless Press, Ltd., 1915.) Price 3*s.* 6*d.* net.

THIS "Handbook of Technical Instruction for Wireless Telegraphists" would more suitably be entitled a "Handbook for the use of Marconi Operators in Wireless Telegraphy," because it deals almost exclusively with the methods and apparatus of the Marconi Company. It is divided into three parts: the first concerned with the elementary facts of electricity, the second comprising a couple of chapters on electromagnetic waves and receiving sets, and the third explaining the special appliances and systems of apparatus in use in the Marconi Company's installations.

Except for the fact that operators on board ship have not generally space in their cabins for many books, it is difficult to see why so much of this book should be occupied with the elementary information on electrical facts given in dozens of other manuals. In the first chapter the authors suggest that the term "difference of potential" is identical in meaning with the term "electromotive force." But this is not the case. We can have electromotive force created under conditions in which the term difference of potential has no meaning. Apart from one or two little defects in exposition, the information in part i. is useful so far as it goes, but would scarcely be sufficient for instruction taken alone, and would be unnecessary for operators who have already obtained a grounding in the elements of electrical knowledge elsewhere.

Part iii., which deals with the special apparatus of the Marconi Company, is, on the other hand, very useful, and is characterised by many excellent diagrams and photo illustrations of actual apparatus. The schemes of connection and internal arrangements of apparatus are particularly good and valuable, since the operator out of reach of land is thrown entirely on his own resources if anything goes wrong with his apparatus. The great experience of Marconi's Wireless Telegraph Company in land and ship installations has enabled them to perfect, in a very high degree, the details of all their apparatus so as to render it, so far as possible, absolutely certain in operation and highly efficient.

A very interesting chapter is that on the Marconi standard 1½-kilowatt wireless telegraph set, which is that mostly used on board ship, every detail of which has been the subject of the most

careful thought and invention on the part of the company's experts.

The concluding portion of this chapter deals in an especially interesting manner with the details of the receiving sets employing the Marconi magnetic detector, the crystal, and the Fleming oscillation-valve detectors. The balanced crystal and valve-detectors used for eliminating atmospheric disturbances are extremely well described. Chapter v. in part iii. is occupied with a description of the 5-kilowatt "battleship" set, which has particular interest at the present moment.

The following chapter is concerned with the portable and pack sets used in military work.

For a reader, even although not professionally a wireless telegraph operator, who has some general electrical knowledge, this practical part of the book will have considerable interest, and it can be strongly recommended as containing a concise, detailed account of the apparatus most used in the conduct of those wonderful feats of wireless telegraphy to which so many travellers by sea have owed escape from death. Altogether, the book is a useful addition to the library of the wireless telegraphist, and its excellent illustrations and good make-up are creditable to both authors and publishers. A very good feature is the intermingling of photo reproductions showing the actual appearance of the apparatus, with well-drawn schemes of connections showing the arrangement of the circuits.

## OUR BOOKSHELF.

*Manual of the New Zealand Mollusca.* By H. Suter. Atlas of plates; 72 plates with descriptions. (Wellington, N.Z.: John Mackay, Government Printer, 1915.) n.p.

THE appearance of this volume of plates completes the publication of Mr. Suter's "Manual of New Zealand Mollusca." Nearly every species described in the text has been figured, thereby enhancing the value of the work as a book of reference. The illustrations reach a high level of excellence, and the figures generally are clear, well drawn, and adequate in detail. The least satisfactory are those on plates 2, 7, and 50, in which the details are so obscured that the figures are almost useless.

The weakest part of this volume is that devoted to Nudibranchs. Only fifteen out of thirty-seven species are illustrated, and only eight of these figures (plates 36 and 37) are sufficiently good to aid in the identification of species. These Mollusca must be studied alive, and the figures drawn and reproduced in colour to be of any service. The difficulties of obtaining such figures and the high cost of reproduction have doubtless precluded their use in this work. The explanations of the figures are accompanied by a note of the actual size, presumably of the specimen figured, and references to the text, details for which those who use the work will thank the author.

We renew our congratulations to Mr. Suter and the New Zealand Government on the publication of this volume of plates. The author has earned the thanks of conchologists the world over, and particularly of students of Mollusca in the Dominion, for undertaking the work and for the thoroughness and care with which it has been done. W. M. T.

*Morphology and Anthropology.* A Handbook for Students. By Dr. W. L. H. Duckworth. Volume i. Second Edition. Pp. xiv+304. (Cambridge: At the University Press, 1915.) Price 10*s.* 6*d.* net.

IN the eleven years which have elapsed since Dr. Duckworth's indispensable manual made its first appearance, there has been a rapid growth in all those branches of knowledge on which "Morphology and Anthropology" are based. This is especially the case as regards our knowledge of the anatomy of the Primates—particularly of the anthropoid apes. Hence in the present edition of his manual Dr. Duckworth has found it necessary to expand that section which deals with the anatomy of the Primates and with the position of the Primates in the mammalian phylum to such an extent that it now appears as a separate volume. In its present shape this volume gives an excellent introduction to a systematic study of the anatomy of man and of the animals which are closely related to man in structure and in origin. So far as we know, there is no other book in the English language which covers the same ground.

By turning over and comparing the pages of the present and past editions, particularly the illustrations, one is struck by the progress made during the past eleven years. During that time the cortical areas of the brain of man and every group of ape has been worked out; Dr. Duckworth has chosen excellent figures to represent this and other aspects of our progress. This volume is more of the nature of a new work than of a new edition, so much has it been rewritten, expanded, and in every way improved.

*Heaton's Annual. The Commercial Handbook of Canada and Boards of Trade Register,* 1916. Pp. 506. (Toronto: Heaton's Agency; London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd.) Price 5*s.*

THE twelfth issue of this useful yearly work of reference contains, in addition to its usual contents, which have been described on previous occasions, a new section entitled "Where to find it." This part provides a guide to Dominion and Provincial Government reports and other standard publications showing those contents of interest to travellers, intending settlers, and others, and how the reports and books indexed may be procured. The volume may be commended especially to teachers of commercial geography who should find its mass of conveniently arranged information invaluable.

## 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.*]

### Latin as a Universal Language.

IN the notice of Prof. Guido Baccelli in NATURE of January 27, you mention that at the meeting of the eleventh International Congress of Medicine in Rome in 1894 he made a powerful appeal for the introduction of Latin as a universal language all over the world. This proposal seems to me so important and valuable that it should not be passed over with a simple reference, but should, on the contrary, receive the most careful consideration, not only from the councils of our universities, from the heads of schools, and from educational authorities in general, but from all business men and all lovers of their country.

It is generally conceded that the study of Latin is one of the best means of training a schoolboy's brain. But an objection which is daily gaining force is that Latin occupies far too much of a schoolboy's time, and it is given undue prominence in examinations to the exclusion of other subjects of more value. Except for its use as a subject of training, Latin, as at present taught in most schools, is only of use to a few scholars, and the majority of those who have spent several painful years in acquiring it at school find little or no use for it in after-life, and more or less completely forget it. But the case would be very different if Latin were generally taught, not as a dead, but as a living language; as, indeed, it is taught already in a few schools. Just as the boys in the Balearic Islands are said to have acquired their skill in using the sling by the necessity of bringing down their dinners by it from places out of their reach, so boys can learn very quickly to speak Latin correctly if they have to ask for their food at table and other things they want in that language.

As is said in your notice of Prof. Baccelli, a very slight alteration in the present curriculum would enable boys to speak Latin, but if it is to be a universal language a mode of pronunciation common to all countries must be employed. I am aware that the Board of Education has succeeded in introducing the reformed pronunciation in the secondary schools controlled by it, and that the rules of the Classical Association are now widely adopted; so that the foundations of a universal system have been laid. But while boys can learn to speak Latin correctly in school, it is out of school hours that they must learn to speak it fluently. If the head boys in a school could be made to see that they will render valuable service to their country by setting a good example and speaking Latin in the cricket ground, football field, and in talks amongst themselves, the small boys will immediately follow suit, it will become the fashion to talk Latin, and very soon every boy in the school will speak Latin as fluently as he speaks English. But to gain the approval of the boys, Latin ought to be taught in a different way from what it usually is, and the making of Latin verses should be left out, for though it may be useful in after-life to scholars and literary men it is useless to most others, it consumes a great deal of time, and it is intensely disliked by most boys. Greek should be regarded as a luxury and not as a necessity.

The need of a universal language has been making itself more and more felt of recent years in proportion as intercommunication between different countries has increased. In order to supply this want various attempts to frame a universal language have been made, such as Volapuk and Esperanto. Though a certain amount of success has been claimed for both of these, yet neither has attained to anything like the position of a universal language.

As compared with Dutch or Germans, and especially with Russians, Englishmen are, in general, very poor linguists, and I think it is partly in consequence of this that German commerce has, before the war, been successful in many countries at the expense of the English. When this awful war is over, Germany will again try to oust the English from the world's commerce, and to embroil the present Allies with one another by every means that ingenuity and malice can suggest. Unless Englishmen all learn to speak French, Italian, and Russian, how can the necessary rapprochement be kept up? French and Italian are comparatively easy, but Russian is very difficult, and it may be the most necessary of all. Latin may not be taught at present so universally in Russian as in English schools, but if Latin were adopted by the English, French, Italian, and Russian Governments as the recognised medium of intercommuncation there can be little doubt that in a very short time Latin would resume the place it once held as the language in universal use all over the civilised world. LAUDER BRUNTON.

### Belgian Soldiers in Holland.

WE venture to appeal to men of science to help in the admirable work which is being done by Prof. Antoine, of Louvain, on behalf of Belgian soldiers who escaped with our Naval Division from Antwerp, and are now interned in Holland.

With the sympathetic approval of the Dutch authorities, Prof. Antoine has organised at Harderwijk, in the camp of Zeist, courses of instruction in agriculture and horticulture, and hopes to start a course of forestry.

Lectures are given in elementary botany, chemistry, and surveying. In addition to these general lectures, special courses are given on general agriculture, diseases of plants, agricultural machinery, book-keeping, the elements of zoology, and animal physiology of farm animals. A general course in dairy work, and special courses on the chief branches of horticulture are also to be included in the programme. Three airy and well-lit rooms are available for the purpose of instruction, but there is a great need for teaching accessories—diagrams, models, and collections. We appeal, therefore, to your readers for help in supplying the following requisites:—

(1) Wall diagrams, botanical and zoological (the latter relating to insects and farm animals).

(2) An electric lantern and lantern-slides illustrative of natural science and agricultural and horticultural processes.

(3) Books on British agriculture and horticulture.

(4) Surveying instruments.

(5) Zoological and botanical models and specimens.

(6) Microscopes, simple and compound, and accessories.

We shall be greatly obliged if those of your readers who are in a position to make contributions will, in the first place, communicate with M. H. van Orshoven, Comité Officiel Belge, 21 St. James's Square, London, S.W.

With a list of promises before us, we shall be in a position to prevent unnecessary duplication of gifts from those willing to help in this good work. Already direct appeal to manufacturers, publishers, and others has resulted in many gifts of samples of feeding-stuffs, fertilisers, seeds, books, diagrams, etc. We may add that at the end of the war, Prof. Antoine proposes to present the collections to the University of Louvain.

Judging from our own experience, there are few laboratories which do not contain diagrams and appa-

ratus which, though they have passed out of current use, are none the less valuable. A spring-cleaning of the laboratories would result in many useful discoveries of this kind, and the dedicating of them to this purpose would "bless him that gives" as well as "him that takes."

WILLIAM SOMERVILLE.
FREDERICK KEEBLE.

### Germany's Aims and Methods.

THOSE of us whose educational experience has taught us to see behind the scenes of English official life in scientific matters for the last two or three decades will be prepared to endorse the scathing indictment brought against English officialdom by Sir William Ramsay in his article in NATURE of January 27, on "Germany's Aims and Methods." My own experience, extending over eighteen years as the senior science master of Wellington College, led me to form conclusions which were put forward in the 'eighties and the 'nineties through the editorial courtesy of NATURE, and are therefore easily accessible. To give pointed illustration of this, I may quote a remark made more than twenty years ago to me in a letter from a professor at the Royal Military Academy, Woolwich, where cadets were trained for the artillery, and (prospectively) for the Royal Engineers. He spoke with just indignation of science being treated as the "fifth wheel of the coach." Germany has made it the *first* wheel of her coach, and has startled the British public by the discovery that the Germans seem to be very clever people, as the scales have fallen from unwilling eyes, and the academical nose has learned that experimental chemistry and research are something more than "Stinks."

Sir William Ramsay rightly condemns the principle of selection for the Civil Service, and no one with first-hand knowledge of the facts will gainsay his conclusions on that head. But that covers only a part of the ground; and we need not hesitate to say that, if the brain-energy expended in the controversies about the retention of Greek at Oxford and Cambridge in the past twenty or thirty years had been directed towards making *some one branch of science essential* (along with the present minimum of mathematics) *for all degrees*, the outlook for England in this war would have been brighter than it is to-day. The country would also have been saved from the evil results of blank vacuity of mind on elementary matters of science on the part of the majority of our statesmen and legislators, who receive their 400*l*. a year as members of the House of Commons, while the more general application of scientific ideas and methods to commerce and manufactures might have saved us from the disadvantage at which we are placed in this world struggle, as this war is opening people's minds to see (not without alarm) how many things we had allowed ourselves to become dependent on Germany for in the course of a generation. A. IRVING.

Bishop's Stortford, January 31.

### Instruction in Science for Military Purposes.

IN response to requests from a number of important centres, I subjoin a syllabus covering the essential points to be taught to officers, N.C.O.'s, and men who have only a limited time at their disposal taken from other military duties. Experience has shown that much valuable work may be done by following on the lines suggested, all extraneous matter being excluded. The scheme has been found to be satisfactory for all ranks; in the case of officers, however, who have had some previous training in science, the matters may be treated in a more advanced manner. Teachers will find N.C.O.'s and men very keen and intelligent, and completely useless men quite rare. An excellent chance is now afforded by the men called up under Lord Derby's scheme, of which all teachers who can should avail themselves.

In arranging for a class regular attendance should be insisted on. Reports on the abilities of each student are much appreciated by commanding officers, who are thereby assisted in making a correct choice for special duties. All lectures should be illustrated by experiments so far as possible, and parts of instruments described by reference to good-sized models, or, failing these, well-executed diagrams. A class should not exceed twenty in number, and questions should be freely invited.

#### FIELD TELEPHONES.

Time required, about twelve hours, of which the first three should be devoted to the elements of electricity, as required for this subject. The general ground is covered by the writer's lecture, published in the Journal of the Royal Society of Arts for September 3, 1915. All practical details will be found in "The Field Artillery Telephone," by J. Young, obtainable only from Cattermole, Woolwich, price 9*d*. The necessity of learning the Morse code should be strongly impressed on all.

*Preliminary.*—Vibrations; sound—analogy between gramophone and telephone. Elementary idea of electric current; pressure, rate of flow and resistance. Conductors and insulators—function of a tapping-key. Permanent magnets—action between similar and opposite poles. Electromagnets—rule for polarity.

Induced currents—induction coil—how alternating currents are produced in secondary.

Cells—meaning of + and − poles. Description of "inert" dry cell; how to test for efficiency; useful life. How to couple cells in series. Condensers—elementary notion, action on direct and alternating currents.

*Service Telephones*, chiefly the "D Mark III." (If the actual instruments are not available, models will be found useful.) Typical circuit for field telephones. Earth returns. Description of microphone and receiver (service patterns). Action of a single-reed buzzer. Polarised double-reed buzzer of D Mark III.: adjustments, current required for efficient working. Complete circuit of D Mark III. telephone. Circuit of Stevens's telephone. Tests for efficiency of telephones: likely defects; how remedied.

*Lines.*—Single and multiple lines. Repairing broken lines. Causes of overhearing. How to tap into an existing line. Telephone exchange, simple form.

*Practical Work.*—Examination of cells with voltmeter; connecting in series. Rewiring a transmitter and receiver. Repairing a broken line of stranded steel wire (very important). If instruments are available, one or two exercises in the field in laying lines and communicating by speech and Morse code on the buzzer may be given.

#### POISON GASES.

Full details of this subject are not made public. The teacher must use his judgment as to gases likely to be used; chlorine may be taken as typical. The best absorbents of each gas should be stated, together with information about helmets and their proper use. Stress should be laid on the necessity of complete absence of exertion and administration of oxygen in rendering first aid to a sufferer. A description of oxygen apparatus as used in mines should be given. Two or three hours may be given to this subject.

#### RANGE FINDERS.

Lectures on this subject should be directed to an understanding of "one-man" range finders, and par-

ticularly to the Barr and Stroud type. A full description of Service instruments may be found in the "Handbook of Artillery Instruments," 1914 (Wyman and Sons, price 1*s.* 6*d.*).

Reflection of light from plane surfaces. Reflecting prisms. Bending of a ray of light by prism. Lenses, positive and negative. The mekometer. Full description of Barr and Stroud range finder. Time required, about three hours.

EXPLOSIVES.

In general, it will be found advisable to restrict the teaching of this subject to officers, the treatment being decided by the time available and the previous chemical knowledge possessed by the class. The common explosive compounds and mixtures may be dealt with, stress being laid on the precautions to be taken in handling. The Service "Text-Book of Explosives" may be consulted, but can no longer be regarded as up to date. Beyond imparting general ideas and useful hints, this subject is too specialised for the average teacher to undertake to advantage.

It is hoped that the above hints will prove of service to the numerous correspondents who wrote me concerning my letter in NATURE for January 20, to whom I have not been able to reply individually. The syllabus may be amplified at the discretion of the teacher if time permits. What is here given is the minimum information that should be imported.

CHAS. R. DARLING.

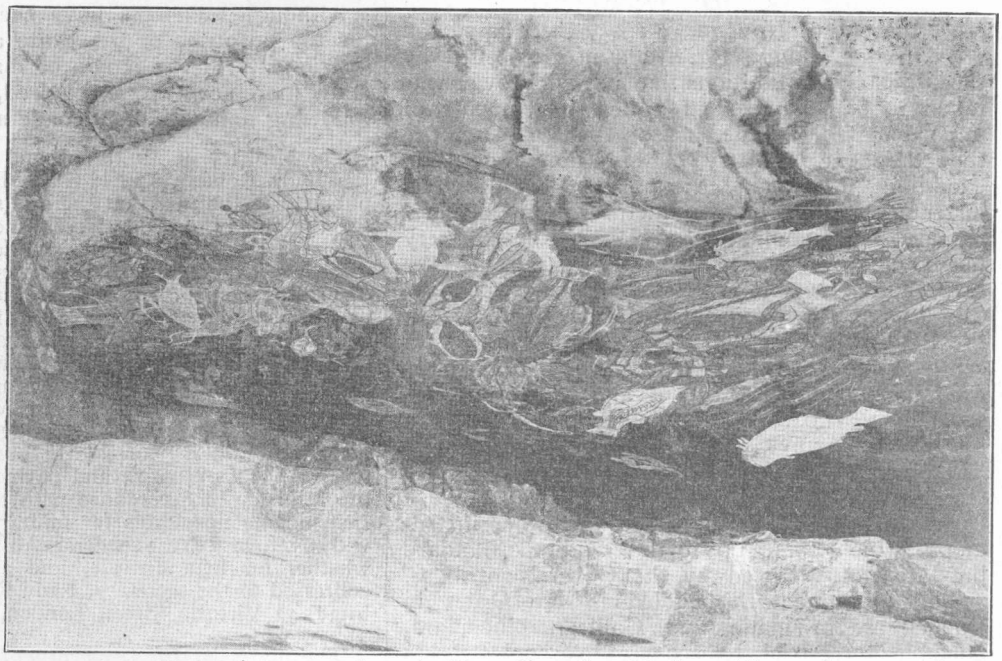
City and Guilds Technical College, Finsbury, E.C.

## *A LAND OF DILEMMA.*[1]

THE most perplexing Australian problem is that of the Northern Territory, and all interested in the present efforts to solve it will welcome Miss Masson's interesting sketches of that vast land of dilemmas. The book deals with various phases of life and work in the Northern Territory, and records the impression of a keen and sympathetic observer who had unusual opportunities for insight into its present condition and prospects. The work owes part of its charm to its graphic expression of the attractiveness of the country and the author's friendly sympathy with all classes of its people. The first chapter gives an excellent summary of the political history of the Territory, which began with a jealous scramble between South Australia and Queensland, who were inspired by blind lust for acres; it records the slow disillusionment of the successful claimant, the transfer of the country to the Commonwealth, and the attempts now in progress to discover its possibilities and determine the best methods of developing them.

The author indicates the chief questions which the country is putting to its administrators, but does not answer them. She is doubtful whether the aborigines can be saved from extinction, and bears emphatic testimony to their amiability and intelligence.

"The quickness of the average native is a surprise to those who have always heard that the Australian aboriginal belongs to one of the lowest races extant. The blackfellow's mind is that of an absolutely uneducated, intelligent child. He has the same acuteness of observation, the same power of mimicry, the same irresponsible nature, the same unerring sense of justice that tells him whether he is being fairly treated or no. He is as unhesitating in his likes and dislikes, as difficult to compel, as easy to persuade" (p. 154).



Native paintings on a rock near the Alligator River. From "An Untamed Territory."

Miss Masson explains that the demoralisation of the blackfellows has been due to the Chinese, and gives an illuminating account of the trial of some blacks for the murder of a white trader. Of the guilt of the accused there was no real doubt, but the court obviously gave them every advantage; some of them, though clearly guilty, were acquitted owing to a technical lack of evidence, inevitable when legal processes evolved in the Old Bailey are adopted in untamed bush. The death sentence on those convicted was altered to imprisonment for life in the luxurious security of the Darwin jail. The account of the trial leaves

[1] "An Untamed Territory. The Northern Territory of Australia." By Elsie R. Masson. Pp. xii+181. (London: Macmillan and Co., Ltd., 1915) Price 6*s.*

an impression of bewildered justice, loth to judge blackfellows by European standards and yet conscious of the added jeopardy to the defenceless pioneers by failure to avenge a murdered settler. Miss Masson does not hide the difficulties with which the Northern Territory is confronted; she notes the high and rising cost of labour and the need for faith and patience. Statistics throw little real light on the present progress of the territory; so Miss Masson's sketches should prove a contribution of permanent value to its literature, as an instructive picture of the country during the most critical stage in its development.

J. W. G.

## *OPTICAL INSTRUMENTS AND THE MINISTRY OF MUNITIONS.*

AT the end of November, 1915, there appeared in the *London Gazette* a notice issued by the Minister of Munitions under which power was taken to commandeer all optical instruments of importance for the defence of the realm. Since that date the Ministry of Munitions has been examining the available supply of such optical instruments, both in manufacturers' and dealers' hands. The examination, which has been a very heavy piece of work, had for its purpose the enforcing of certain restrictions placed upon the sale of such instruments under the Defence of the Realm Act Regulations, 1914, and it was recently announced that traders can only offer such instruments for sale if and when they are specially marked. The announcement appears in the January Army Order, in which it is stated that "two marks will be used, one indicating instruments which do not come up to the standard Government requirements, and the other instruments which come up to the required standard but are not required by the Government."

The instruments scheduled in the Order in Council are prismatic and Galilean binoculars, portable terrestrial telescopes, telescopic sights for rifles, periscopes and hyposcopes, prismatic compasses, as well as range-finders, mekometers, telemeters, clinometers, angle of sight instruments, apparatus for control of fire, dial sights, directors, and field plotters.

It will be noticed that the announcement does not specify for the information of general readers the actual marks which are being used; and, therefore, it will probably be of interest to describe them here. The first of the marks referred to is the broad arrow with the left-hand barb omitted, thus:  . This mark is engraved or otherwise marked on instruments which have been examined under the instructions of the Ministry of Munitions and come within the terms and schedules of the Order in Council referred to above, but do not fulfil all the conditions specified by the Government as necessary for naval or military service. The instrument is not necessarily defective, but the mark means that in some optical or mechanical detail or details it is considered unsuitable for naval or military use. It would, therefore, be well for an intending purchaser to examine carefully an instrument bearing the mark.

The second mark which may be found upon such instruments is the broad arrow with the stem omitted, thus:  . This has been engraved or marked upon instruments which satisfy the Government's specification as instruments suitable for naval and military use, but not at present required by Government, and which therefore, presumably, may be disposed of by traders. Such instruments have satisfactorily passed the Government tests.

Instruments which do not come within the terms of the Order have not been marked, such instruments not being of the types required in quantity by the military authorities.

Although measures have been taken to secure for the purposes of the State all suitable optical instruments in the hands of makers and dealers, many more seem to be required, judging from the following announcement made a few days ago:—

> The Ministry of Munitions and the management of the Lady Roberts's Field-Glass Fund desire to give publicity to the fact that there is still a great demand for the supply of field-glasses and telescopes for the troops in the field. Both prismatic and ordinary field-glasses are required, but not opera-glasses. The owners of such instruments are urgently requested to place them at the disposal of the fund, either by way of loan or sale. It is hoped that owners who are unable to lend their instruments will, in any case, be willing to sell them to the Government at a valuation figure. With this object in view, the Ministry of Munitions has made special arrangements to value any instruments offered for sale if found suitable for military or naval purposes, and payment will be made by the Ministry in accordance with the valuation figure. Instruments unsuitable for military or naval purposes will be returned to the senders. All instruments sent in, whether for loan or sale, and all letters should be addressed to the secretary, Lady Roberts's Field-Glass Fund, 72 Victoria Street, London, S.W.

The necessity for Government taking such steps at this critical time to supply the requirements of the naval and military authorities is an ample and striking justification for the demand, to which reference has been made from time to time in these columns, for the establishment of a National Institute or School of Technical Optics, which would have for its main object the placing of this country in a position in the future in which it would not be dependent on any foreign country for an adequate supply of instruments so vital for modern naval and military efficiency. Incidentally, such an institute would also secure national independence in the supply of the still more numerous and highly specialised optical instruments so essential in the arts of peace.

The importance of the subject has long been insisted upon by the British Science Guild, and the Technical Optics Committee of the guild has prepared several valuable reports upon it. This committee, after a full investigation of the evidence available, shortly after the outbreak of hostilities forwarded to the Board of Trade a report,

which was published in NATURE of March 25, 1915 (vol. xcv., p. 103), pointing out the urgent need for the provision of adequate facilities for systematic scientific and manual training in technical optics, and referring to recommendations made in July, 1914, for the establishment of a national institute, but no official action appears to have resulted. The main points of the position of the country as regards the manufacture of optical instruments and related matters are clearly stated in the report to which we have referred, and a course of action is indicated. Lack of official encouragement has been largely responsible for loss of our optical trade in the past, and for the action which the Ministry of Munitions has now had to take to provide sufficient instruments for purposes of war. If the Government neglects to provide for the future in a matter of such national importance as the promotion and development of scientific optical manufacture, it will lose an opportunity never likely to occur again. The need for a national institute is undoubted, and the outlay required is so small in comparison with the advantage to be gained by its establishment, that we cannot believe the delay in dealing with the matter is due to financial considerations, but rather to want of knowledge and to official incompetence.

## *THE SOUTH AFRICAN SEA-FISHERIES.*[1]

THIS report is of considerable general interest, since it contains an account of the development of the sea-fisheries in South African waters and a discussion of the factors, real and problematical, affecting the general productivity of the fisheries. Trawl-fishing by means of modern vessels began early in the 'nineties of last century, but for one reason or another most of these early enterprises were not successful. In 1895 the Cape Government took the matter up, and arranged to carry out a general biological survey. A steam vessel, the *Pieter Faure,* was designed and built specially for this work, and various new trawling grounds were discovered and investigated. As a result of this preliminary survey various private fishing companies began operations, some of which were unsuccessful. At present there are about eight steam-trawlers regularly engaged in fishing in South African waters, and an industry, limited in its scope, has apparently been well established. Such statistics as are available show a general rise in the productivity of the fishery, or at least, that it is being maintained; it is difficult to be certain as to the trend of the figures.

In South Africa, as in home seas, there have been misgivings as to the effect on the continuance of the yield of fish of various causes. Fluctuations occur and cause much discussion and demand for remedial measures, or prohibitions and restrictions by legislation. In the case of a fishery where these fluctuations may be due to natural, uncontrollable changes or factors, or to variations in private enterprise, or to causes, such as over-fishing, which can be controlled, it is always difficult to know what is best to be done. Many of the causes alleged for the supposed diminution of the Cape sea fisheries seem to European readers to be imaginary. The noise and disturbance due to the running of trains along the sea-coast; firing guns; the use of dynamite; sea birds, seals, and porpoises; the increase of shipping, etc., would scarcely be regarded in Europe as competent causes. Nevertheless, the sea fisheries off the South African coast are very restricted, and factors which we could scarcely regard as operative in the North Sea may be significant in South African waters. A very good case is made out in the report for the destruction of large numbers of sea fishes by sudden changes in sea temperature due to the extension of cold bottom currents; by changes due to local submarine volcanic disturbances; and by the fouling of the water by masses of decaying plankton. All these are surely matters for scientific investigation, and this is all the more desirable since they are matters of exceptional marine biological interest. The really important thing in relation to the South African marine fisheries at present—more important than the promotion of private enterprises—is good, well-equipped, scientific, and statistical investigation.

The report deals with other matters of special interest. The crawfish (*Iasus lalandii*) has become a very important economic crustacean, and fairly large quantities are now canned and exported. It is the object of very careful fishery observations, and of good zoological investigation. There are reports on the destruction of fish and fish-spawn by netting; very interesting and well-written observations on the habits of South African fishes; an account of the snoek-fishes (allies of the mackerels); descriptions of three new species of marine fishes; and the first part of a catalogue of South African fishes in general. The volume is, altogether, one of much interest and value to science, apart from its special objects in relation to the local fishing industry. J. J.

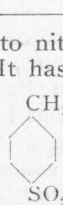
[1] Marine Biological Report No. 2, for the year ending June 30, 1914. Pp. 167+2 charts. (Union of South Africa, Cape Province, 1914.)

## *NEW ANTISEPTICS.*

BRIEF notices have already appeared in the Press and a fuller account in the *British Medical Journal* (August 25, 1915) on the use of sodium hypochlorite solution, made slightly acid with boric acid, for the treatment of wounds. This solution was first introduced by Dr. Dakin and applied with great success in the hospital at Compiègne and in other military hospitals. But this was not the only antiseptic submitted to examination and experiment at the Compiègne hospital.

An account by Drs. H. D. Dakin, J. B. Cohen, and J. Kenyon has just appeared in the *British Medical Journal* (January 29, 1915) on *chloroamine.* This compound, like many others in which

chlorine is linked to nitrogen, has strong germicidal properties. It has the following structure:




and was first prepared in 1905 by Dr. Chattaway, who, however, did not discover its antiseptic action. It is most conveniently obtained by adding sodium hypochlorite to toluene sulphonamide. It is a colourless, crystalline substance, which in the solid form is quite stable, and when dissolved in water can be kept unchanged for many months. It is without corrosive action, is non-toxic, and does not coagulate protein. Its germicidal action is, molecule for molecule, about four times that of sodium hypochlorite. It is, however, less irritating than the latter, and can be used at a concentration five to ten times as great.

A report from Staff-Surgeon A. R. Fisher on the use of chloroamine in the treatment of wounds of the mouth and jaw appeared in the *British Medical Journal* for January 15, and the cases described, though few in number, are reported as "distinctly encouraging." Finally, mention may be made of the use of electrolysed sea-water for the disinfection of hospital ships. The large number of sick and wounded recently brought home from the Near East in hospital ships made the question of disinfection imperative. Though the production of hypochlorite by the electrolysis of salt solution for bleaching purposes, and the powerful antiseptic properties of hypochlorite so produced, have long been known, the idea of electrolysing sea-water on the vessel which is to be disinfected is a novel one, and due to Dr. Dakin, who has successfully solved the problem of disinfection in this simple, cheap, and effective way. The apparatus consists of an electrolytic cell, which, with a current of 65–75 amperes and 110 volts, yields a solution of 2 parts per 1000 of hypochlorite in five minutes at a cost of about 3*d*. per 100 gallons. This solution, diluted with an equal volume of sea-water, is sufficiently strong to sterilise floors, decks, latrines, etc. It has been used on the *Aquitania* on her last two voyages, with excellent results.

## *NOTES.*

SINCE we went to press last week the report of the Committee on Retrenchment, which led the Government to decide on the closing of museums, has been published. We have not space here to analyse its arguments, but this is the less necessary since they were speedily countered in a letter to the *Times* of February 4 by "A Biological F.R.S." This seems to have closed the newspaper discussion, and we are now waiting to see the effect of to-day's deputation to the Prime Minister, organised by the Museums Association. Among the speakers will be Lord Sudeley, Sir Ray Lankester, and the director of the National Museum of Wales. The petition to be presented has been signed by leading men in all parts of the country. The provincial museums recognise that the action of the Government is intended as an example for them to follow, and they fear that they may be subjected to pressure through the Local Government Board. They will not, however, submit without a protest, and that protest will be made on purely patriotic grounds, for the municipal and other museum authorities know very well the admirable educational work that is being carried on among all classes of the population by their institutions. It is not only in London that our soldiers are deriving pleasure and profit from the museums; at Colchester, for example, the presence of soldiers in training has raised the annual attendance from 29,564 to 339,933, to which latter figure must be added some 18,000 for Sunday afternoons in the winter months. Meanwhile, it is stated by the *Neue Freie Presse* that in Germany and Austria all libraries, museums, and picture-galleries are open as usual, and the reasons given for closing them in this country are regarded as "a declaration of moral bankruptcy," more striking than the economic weakness which so fatal and futile a decision is held to reveal.

AT the annual general meeting of the Society of Public Analysts, held on February 2, Mr. G. Embrey was elected president for the ensuing year.

THE Royal Swedish Academy of Science in Stockholm has elected Prof. E. B. Poulton a foreign member as a token of its appreciation of Prof. Poulton's work in zoology, and especially in entomology.

THE work of completing the laboratory building and first range of plant houses at the Brooklyn Botanic Garden is now proceeding. We learn from *Science* that the completion of these buildings at this time has been made possible by the donation, by three friends of the garden, of 20,000*l*. on the condition that a like sum be appropriated for the same purpose by the city of New York.

AT the meeting of the Chemical Society held on February 3 the second of the series of lectures arranged by the council to be delivered during the present session was given by Prof. W. H. Bragg, who chose as his subject, "The Recent Work on X-Rays and Crystals, and its bearing on Chemistry." Dr. Alexander Scott, president, was in the chair, and the meeting was largely attended. After the delivery of the lecture, a discussion was held, in which Prof. H. E. Armstrong, Mr. William Barlow, Lieut. Bragg, and Sir William Tilden took part.

THE death of Prof. John Wyllie, emeritus professor of medicine in the University of Edinburgh, occurred on January 25 at the age of seventy-two years. Prof. Wyllie held various appointments in Edinburgh hospitals from 1868 to 1900, when he succeeded Sir Thomas Grainger Stewart as professor of medicine in the University, and occupied the position until 1914. His chief published work on the disorders of speech was published in 1894. He was also the author of a number of papers in medical journals.

MR. C. W. BEEBE, curator of birds to the New York Zoological Society, has sailed for British Guiana, where he intends to establish a tropical zoological station for observation and research. His primary

object will not be the collection of specimens—though he hopes to send home a steady stream of living creatures with special attention to the rarer types—but the intensive study of birds and animals in their own haunts. He proposes to build a bungalow at the edge of the jungle, and to equip it with a complete laboratory outfit. The Government of British Guiana has offered Mr. Beebe the use of its botanical gardens and of wild Government land. His associates in this expedition will be Mr. I. Hartley, Mr. P. Holmes (whose interest is in photography and work with insects), and Mr. Carter, a collector.

THE shortage of synthetic dyes in this country and the United States has naturally greatly increased the demand for certain vegetable dyestuffs, which have in their turn risen in price, and in some cases are proving very difficult to obtain. In particular there has recently been a serious scarcity of logwood in this country. In the past the chief British sources of supply of this wood have been Jamaica and British Honduras, but some years ago the Imperial Institute investigated the possibility of exporting logwood from another British Colony—Mauritius. A trial shipment of this logwood was found to be of excellent quality, and in 1912 an offer to take a considerable quantity of the wood was obtained from a leading British dye firm. At that time, however, the price offered for the wood was not high enough to encourage the export, but, in view of the higher value at present ruling, the Imperial Institute has now succeeded in arranging for a considerable supply of Mauritius logwood to be utilised in this country.

A BRITISH Industries Fair is to be held by the Board of Trade in the ground floor courts of the Victoria and Albert Museum on February 21–March 3. The co-operation of the Board of Education, in permitting the use of the museum for the present practical object, is, says the *Times*, a healthy evidence of the desire of the Government to give to British industries and manufacturers some of that official assistance and encouragement by which the commerce of other countries, of Germany especially, has been so largely built up. For the forthcoming fair at South Kensington the Board of Trade has already sent out some 20,000 invitations to probable buyers in foreign countries, and invitations will in due course also be sent to about 80,000 persons in the British Isles, the names having been largely compiled from lists of customers which the manufacturers themselves have put at the disposal of the commercial department of the Board. The manufactures included in the exhibition will be: (1) toys and games; (2) china and earthenware; (3) glass; (4) fancy goods; and (5) printing and stationery.

DR. J. G. BOWMAN, of Chicago, director of the American College of Surgeons, is reported by *Science* to have stated recently that the college has obtained from its fellows an endowment fund of 100,000*l.*, to be held in perpetuity, the income of which only is to be used in advancing the purposes of the college. The college has been in the process of formation for the last three years. It has a temporary office in Chicago, and it is probable that permanent headquarters will be decided upon within a few days. The president is Prof. J. M. T. Finney, head of the surgical clinic of Johns Hopkins Hospital, Baltimore. The college is modelled after the Royal College of Surgeons of England, and has the support, it is said, of nearly all the leading surgeons in the United States and Canada. The college, which is not a teaching institution, but rather a society or a college in the original sense, now numbers about 3400 fellows in Canada and in the United States.

DR. RODOLPHE ENGEL, whose death was announced in NATURE of January 27, was born at Fegersheim, in Alsace, in 1850. His father, who was professor of botany in the faculty of medicine at Strassburg, was transferred after the Franco-German war to the new University of Nancy, where his son, after serving his time in the army, completed his studies, and was the first doctor of medicine of the new faculty. Shortly after he graduated doctor of science at the Sorbonne, and became successively professor of chemistry in the faculty of medicine at Montpellier and at the Ecole Centrale des Arts et Manufactures, where his teaching powers were greatly appreciated. Prof. Engel devoted himself to both pure and applied chemistry. Thus he investigated creatine, taurine, the synthesis of aspartic acid, the allotropic form of arsenic, and many crystallised hydrochlorides of metallic chlorides. It was to Engel's ingenuity that the process of transforming potassium chloride into carbonate in the cold by the intermediate formation of a double salt of magnesium is due, a process which was exploited by Germany and used at Strassburg for many years. Prof. Engel was also engaged in the commercial production of plastic substances such as viscose.

MR. E. HERON-ALLEN has been elected president of the Royal Microscopical Society for the ensuing year. In his presidential address, delivered on January 19, he referred to the extensive field now covered by work in microscopy. The microscope is now an indispensable adjunct, not only to every branch of science, but also to most trades. But though its applications have thus been widely dispersed, its essential and peculiar scientific principles remain as a field of specialised scientific inquiry, and this becomes more apparent every day in these times of profounder and ever-widening research. At the present time the society has an excellent opportunity of increasing its influence on the development of microscopic technique and appliances, and the programme for the new session should attract to the meetings many fellows of the society, as well as other scientific workers. Next week Messrs. Rousselet, Earland, and Heron-Allen will give an exhibition, and a joint paper "On the Progress and Development of Vision and Definition under the Microscope." In March Prof. J. Arthur Thomson will deliver an address on "Original Factors in Evolution"; and in April Prof. Benjamin Moore, one on "Early Steps in the Evolution of Life." Later, Mr. J. E. Barnard will deal with the progress and results of some of his studies in branches of microscopic research. A paper is expected from Prof. S. J. Hickson, and one by Mrs. Helen P. Goodrich, upon the history of, and the recent work done

upon, the mysterious dental disease known as pyorrhœa. At all the meetings a special feature will be made of the technical methods to be employed with the view of showing the obtained results in the highest perfection which the progress of scientific microscope construction has rendered possible.

IN the January number of *Science Progress* Dr. F. A. Mason gives a second instalment of his article on the influence of research on the development of the coal-tar dye industry. This deals first with the synthesis of substantive dyes, and then with the technical production of indigo, the new vat dyes, and the sulphur colours. A very interesting account is given of the indigo problem. "In 1880 a step was taken which could only have happened in Germany, and where the boards of directors were composed largely of able and far-seeing chemists: the two great firms of the Badische Company at Ludwigshafen and Meister, Lucius, und Brüning at Hoechst joined forces in order to attack the problem systematically, and entered into an agreement to carry on researches conjointly, sharing profits and results." It was only after nearly twenty years that the problem was solved, and then the solution came as the result of an accident; it is now well known that the commercial success of the manufacture of indigo had its origin in the accidental breaking of a thermometer in the naphthalene undergoing oxidation to phthalic acid by strong sulphuric acid. The presence of a trace of mercury acting as a catalyst, and so enormously improving the yield of phthalic acid, made possible the artificial productions of indigo at a remunerative price, and led to the gradual extinction of the native industry, which formerly was valued at four or five millions sterling. The interesting later competition between the naphthalene process and the phenylglycine process is dealt with, as well as the connection between this industry and the development of processes of making liquid chlorine, hydrogen, and synthetic nitrates, which have played so important a part in the present war.

WHETHER the differences in the choice of food exhibited by the crossbill in Ireland are to be attributed to tastes formed by these immigrants in separate centres of dispersal is discussed by Mr. C. B. Moffat in the *Irish Naturalist* for January. The birds which effected a settlement after the invasion of 1888 showed a decided preference for the cones of the larch, while those which formed part of the invasion of 1909 chose rather the cones of the Scotch fir. Observations made during the summer of 1915 showed that while larch cones were abundant they were comparatively neglected in favour of the Scotch fir. The author also casts doubt on the generally accepted belief that the cones of the Spruce fir form the staple food of the common crossbill, in the Continental parts of its range, those of the Scotch fir being exclusively eaten by the larger parrot crossbill.

FROM the annual report of the Department of Agriculture, Nyasaland, we learn that the extension of tea-growing in the Mlanje district is very satisfactory and that good prices have been realised. Cotton is still the most extensive cultivation in the Protectorate, but the commercial cultivation of Egyptian cotton has now ceased after exhaustive trials, the type compared with Nyasaland Upland proving unprofitable, probably owing to its sensitiveness to climatic variations and to its susceptibility to bacterial blight. The total acreage under cultivation in the Protectorate is a good deal less than that reported in the previous year, largely due to the abandonment of Ceara rubber and to the sad loss of several of the younger planters in the defence of Karonga. Afforestation at Zomba and Mlanje with the native Mlanje cypress (*Widringtonia Whytei*) is being continued, and the extensive Eucalyptus plantations near Zomba and Blantyre have made remarkable growth. This tree is undoubtedly destined to be the fuel tree of Nyasaland.

A GREAT deal of useful information about Egypt is contained in the Egyptian Government Almanac for 1916 (Cairo: Government Press), a small paper-covered volume costing one shilling. It is, in fact, an epitome of the geography, commerce, industries, Government and public services of the country. There is even a list of the Government publications, the only omission in which is a summary of the maps published by the survey department. There is, however, a short article dealing with the work of the survey.

A MAP of South and Central Africa on a scale of 1 to 5,000,000 has just been published by Bartholomew. The coast from Dar-es-Salaam to Mombasa is shown in an inset on an enlarged scale, as are also the principal ports. We notice that South-West Africa is outlined in red, and the colouring of German East Africa and the Cameroons may be considered transitional, as the brown colour appears only as a border. The map is finely executed and clear, and should be useful in following the forthcoming operations against the Germans in East Africa. There are one or two corrections in the railways needed. Upington and Warmbad are now linked by rail—an important factor in General Botha's subjugation of South-West Africa. The map is sold at half a crown.

IN the course of a lecture on the romance of the Indian Surveys (Journal of the Royal Society of Arts, January 21) Sir Thomas H. Holdich commented on the policy that the Indian Government had shown with regard to frontier exploration since the war with Afghanistan. Up to that time a good deal had been done by individual effort, which was then discouraged, if not forbidden, by Government. While the discountenance of irresponsible travellers may be necessary in the interests of the peace and security of the frontier, it is a policy that cuts two ways. Undoubtedly it has curtailed the possibilities of seizing on favourable opportunities for securing geographical knowledge. For half a century we learnt nothing of the wild border hills fringing the great plateau of Afghanistan and Baluchistan, or of further Kashmir, or the great Tibetan tableland, all of which, from a military point of view, it was essential we should know. Sir Thomas Holdich contrasted this policy with that pursued by Russia during the same period, or that which would most certainly have been pursued by Germany had she been in our place, and he doubts whether the excessive caution of our Government was not misplaced.

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THE State Geological Survey of Connecticut, U.S.A., has published a useful illustrated summary of the fossils of the well-known Triassic formation of the Connecticut Valley, by Prof. R. S. Lull, of Yale University. It is now generally agreed that the rocks themselves are deposits formed on continental land, either in lakes or streams, or accumulated by winds, and their chief interest consists in the large areas covered with the well-preserved footprints of reptiles and other animals. Prof. Lull devotes attention chiefly to the footprints and to a discussion of the few reptiles already known from the same formation which may have made some of them. The large majority of the footprints are evidently those of dinosaurs, but a few are more satisfactorily ascribed to primitive crocodilians.

WE have received from the Peabody Museum of Yale University reprints of four papers by Prof. R. S. Lull on the distribution of dinosaurian and mammalian remains in the Cretaceous formations of Wyoming, and on the skeleton of a Pleistocene ground sloth, *Mylodon harlani*, from Rock Creek, Texas. With the Mylodon were found a nearly complete skeleton of the extinct horse, *Equus scotti*, and remains of a new species of horse, which are described in another paper by Mr. E. L. Troxell. The Cretaceous and Tertiary remains of birds in the Marsh collection in the Peabody Museum are catalogued and described by Dr. R. W. Shufeldt in a paper reprinted from the Transactions of the Connecticut Academy (February, 1915). The fossil cycads in the same collection are still being studied by Dr. G. R. Wieland, with valuable results; and the Palæozoic fossils are dealt with by the director of the Palæontological Laboratory, Prof. Charles Schuchert, who is to be congratulated on the activity which the Yale school continues to display.

THE unusual size of the science reports of the Tôhoku Imperial University, Sendai, Japan, is partly atoned for by the beauty of their photographic illustrations. In No. 1 of vol. iii. (1915), Hikoshichirô Matsumoto describes "Some fossil mammals from Sze-chuan, China," and introduces us for the first time to the contemporaries of Stegodon in China. This Late Pliocene fauna resembles that of India and Java, a new genus, Proboselaphus, representing the Boselaphus of the latter. H. Yabe contributes three papers to No. 1, vol. v. (1915), the first of which, written in English, should be read in connection with Suess's conclusions as to the tectonics of south-western Japan. The third paper, in German, discusses the genus Halysites. The author, in the classification of the forms of this problematic coral, lays stress on the absence, presence, and stage of development of connecting tubes between the corallites, and illustrates this point in photomicrographs of cross-sections of the species.

THE February issue of the Monthly Meteorological Charts of the North Atlantic and Mediterranean, issued by the authority of the Meteorological Committee, includes an instructive graphic summary of the results of the exploration of the atmosphere and of highest flights of kites, aeroplanes, and balloons. It shows that the greatest height reached by a *ballon sonde* was some 22 miles, where an absolute temperature of 221° was recorded. The average height reached by *ballons sondes* is about 10 miles. The highest ascent of a manned balloon was made in Berlin in 1901, when a height of more than 10 kilometres was reached, and a temperature of 231° absolute was registered. It is noted on the diagram that above 10 kilometres no clouds occur, and that from this height to about 37 kilometres the temperature is almost the same. Above a height of two kilometres the temperature is, on the average, below the freezing point of water. Above a height of nine kilometres mercury freezes, and at about seven kilometres the average temperature is equal to the lowest ever recorded in the British Isles. The illustration shows also the heights of certain mountains and the temperatures recorded at their summits, and the general levels at which the chief types of cloud occur.

IN the annual number of the Journal of the Scottish Meteorological Society Dr. A. Crichton Mitchell gives a summary of some important investigations carried out by Dr. G. W. Walker, the head of the Indian Meteorological Department. In his search for trustworthy factors upon which might be based a possible forecast of the Indian monsoon rains, Dr. Walker has subjected the suggestions of various authorities to critical statistical analysis. He finds that a definite relationship involving a variation in the opposite direction exists between the Indian monsoon rainfall and the snow accumulation on the Himalayas, the pressure at Mauritius, and the rainfall at Zanzibar respectively. Further, a distinct relationship involving a variation in the same direction exists between the Indian monsoon rainfall and the pressure in the Argentine, and a less definite relationship of the same kind between the monsoon rains and the previous year's pressure in India. Dr. Walker shows how the various factors may be combined in an equation from which the variation from normal of the monsoon rainfall may be calculated, but the results so far obtained, while distinctly encouraging, point to the existence either of errors in the available data or of factors yet unknown. An interesting point is the demonstrated absence of any definite relationship between the Indian monsoon rainfall and the Indian temperature in May of the same year. If, as is generally held, the Indian monsoon is largely caused by the prevailing high temperature over the low grounds of India itself, one would expect that a year of high temperature would be also a year of high monsoon rainfall. Dr. Walker suggests that the absence of any relationship of the kind may be due to our ignorance of the effect of solar radiation upon the upper layers of the atmosphere, and that a high rainfall may possibly be connected with excessive heating of the upper rather than of the lower air.

THE opening of the Upper Jhelum Canal in the Punjab on December 9 last marks the concluding stage of a series of engineering operations which have extended over a period of ten years, and involved an expenditure of nearly 3,000,000*l*. It is the last instalment of the triple canal scheme, which, in its turn,

forms part of the system of seven great perennial canals distributing the flow of the Jhelum, Chenab, Ravi, and Sutlej Rivers in an equable and scientific manner over 17,000 square miles of country, otherwise, and formerly, only suitable for the raising of camels and beasts of pasture, but now adapted to agricultural development. The irrigation area of the seven canals already exceeds 4½ million acres, 1½ millions of which are devoted to wheat and ¾ million to cotton. When fully developed, the triple canal scheme will add another 1¾ millions acres to the total. The necessity for the perennial canal system arises from the fact that in the Punjab there are two distinct agricultural seasons and two annual crops, both essential to the successful financial working of the land. During the first of the seasons, that is, in the six hot months (April to September) the ground is plentifully supplied with moisture from the melting snows of the Himalayas, in conjunction with the ordinary rainfall. In the second six months, the cold period, the rainfall is at a minimum and the rivers carry but low supplies. The conservation and uniform distribution of the water is, accordingly, a matter of extreme importance. The introduction of the canals has been attended by very satisfactory results, and the complete realisation of the project will, it is hoped, prove, from an economical and administrative point of view, a success of considerable magnitude.

"WHEN the accelerations of three points of a rigid body are given, the acceleration of any point is known." This statement has been partly verified by Burmeister and others. In the Bulletin of the American Mathematical Society (vol. xxii., 3) Prof. Peter Field shows that the problem can be solved very simply by using the expressions for the accelerations which are ordinarily given in text-books on mechanics, and by this method the kinematical meaning of the solution is also evident.

THE attempts to obtain a hydrodynamical solution of the problem of eddy formation in the wake of a moving solid have hitherto met with only very partial success. A solution was attempted by Von Kármán for motion in two dimensions on the hypothesis that a steady motion exists in which the vortices retain the same arrangement relative to the body. In a paper in the Proceedings of the Royal Society of Edinburgh (vol. xxxv., 1, No. 9) Mr. H. Levy has now shown that such a distribution can never be stable. Unfortunately, the pressure equation, which the author describes as "a necessary condition in any hydrodynamical problem," is incorrect except in cases of steady motion, of which the present is not necessarily one, and the results therefore appear to require further confirmation.

THE problem of the personal equation is always interesting, but somewhat elusive of direct estimation in complex operations. In the *Psychological Review* (vol. xxiii., No. 1) J. H. Harris records the results of some experiments which he has conducted for some time on subjects engaged in estimating moderately large samples of bean seeds, either for germination tests or for determining the mean weights for different seeds. The advantage of the method lay in the fact that the subject could compare his estimate with the true value, and so attempt to profit by his experience. As a result of many observations and careful computations, he finds that the personal equation is remarkably little affected by experience, while, on the contrary, steadiness of judgment is unmistakably influenced by previous experience.

PART 1 of vol. xii. of the Bulletin of the Bureau of Standards contains an account of an examination of twenty radiation pyrometers by Messrs. G. K. Burgess and P. D. Foote, of the bureau. All the ordinary types of instrument were tested, and from the results obtained a number of general conclusions are drawn. In general, radiation pyrometers behave not as perfectly black, but as grey bodies, and the law connecting the indication of the instrument with the temperature of the source deviates from the fourth power by plus or minus 0·5. The principal errors of the instruments examined were due to faulty design and construction, but dirty or oxidised mirrors may produce errors of the order of 100° at 600° C. Smaller errors may arise owing to stray reflections, convection currents, and wrong focusing. The types of black-body furnaces in use at the bureau are described, and some account is given of the use of the pyrometers for the estimation of the temperatures of non-black bodies.

WE have received a reprint of an interesting article on telegraphic transmission, contributed by Major W. A. J. O'Meara to the *Royal Engineers' Journal*. He points out that during the past seventy years or so, although great improvements have been made, the source of energy almost universally employed for transmitting the signalling wave impulses is at constant potential so that square-topped waves are sent. The sine wave, he is convinced, would be preferable. He supports the views to this effect recently expressed by Lieut.-Col. Squier in a paper before the Physical Society. The sine wave is the only one which can pass through the cable without changing its characteristic form, and the harmonics required to build up the impressed square-topped wave are absorbed in the cable, and merely represent a surplus charge for each signal, which must be got rid of before the succeeding signal can be sent. Lieut.-Col. Squier's proposal is to utilise an uninterrupted alternating current of pure sine wave form, and to alter the impedance of the transmitting circuit at the zero point of the wave. This will alter the amplitude, and by making each semi-wave of either sign represent an elemental signal, but giving the dot twice the amplitude of the space semi-wave, and the dash twice the amplitude of the dot, the Morse alphabet can be sent with the maximum rapidity and efficiency.

REFERRING last week (p. 633) to Messrs. Isenthal and Co.'s new list of rheostats, we expressed the hope that they would continue to manufacture the resistances in England after the war. Messrs. Isenthal believe that even if after the war the present strong feeling against German-made goods should somewhat subside, a great many of their clients will always prefer to buy the British-made article. Moreover, having invested a not inconsiderable sum in the necessary machinery, press tools, and jigs required for the

manufacture of the rheostats, they hope to retain and extend the markets opened to them by the temporary paralysis of German export trade. Messrs. Isenthal also inform us that they find "by careful organisation, by manufacturing the component parts of these rheostats in very large quantities, *i.e.* practically making the whole rheostat except the winding in very large quantities," the instruments do lend themselves to mass production. Before the war they did not consider themselves justified in incurring the expense and work required for such methods of manufacture, and therefore purchased the apparatus from abroad. But they add:—"The closing of our relations with the central Continent has given just that impetus which was needed for us to set aside *ordinary* commercial considerations, hence our present facilities for manufacturing this apparatus."

## *OUR ASTRONOMICAL COLUMN.*

ASTRONOMICAL OCCURRENCES.—Mars, now nearly as bright as Sirius, will be in opposition early on Friday. Jupiter and Venus, so conspicuous in the western twilight, reach conjunction about 3 a.m. on February 14. Their nearest approach takes place earlier, about midnight, Venus being 26′ S. Even at 7.30 p.m., February 13, they will be only 32′ apart. The moon occults a 3·2 mag. star, ε Geminorum, on February 14. As seen from Greenwich disappearance occurs at 11h. 3m. The moon is in conjunction with Neptune on the evening of February 16 at 6h. 24m. Geocentrically the planet will be 1° 2′ S. Comet 1915*e* (Taylor) can still be glimpsed with a 3-in., but is not a suitable object for such a small aperture. The following positions are from a continuation of the Copenhagen ephemeris for Greenwich midnight:—

| | h. m. s. | ° ′ |
|---|---|---|
| Feb. 11 ... | 5 30 22 ... | +24 21·3 |
| 15 ... | 36 45 ... | 25 39·0 |
| 19 ... | 43 48 ... | 26 50·8 |

SHIFTS OF WAVE-LENGTHS.—Modern measurement of wave-lengths, in striving successfully after an accurate third decimal figure, has begun to detect all kinds of causes that result in wave-length alterations. In solar spectroscopy, in addition to the well-known pressure and motion effects, the recondite theory of relativity and the ubiquitous anomalous dispersion championed by Freundlich and Julius respectively have afforded explanations of the observed displacements. In the one case it is an intense gravitational field that is adduced as competent; in the other the mutual effect of neighbouring lines. In the laboratory length of arc, its internal pressure, distance from pole, impurities, change of electrical conditions, have been described as the source of displacement by Royds, Albrecht, St. John, Burns, and Bilham. The latter, working in Prof. Fowler's laboratory at South Kensington, has now studied the special case where the adventitious element itself gives rise to strong lines (*Astrophysical Journal*, December, 1915). A number of iron lines in the regions of H and K were measured in the spectrum given by a carbon arc fed with Fe filings, and also when the arc was fed with a mixture of filings and calcium chloride, the calcium lines being measured in both cases. The results obtained in this very interesting research indicate that some lines are susceptible, whilst others have constant wave-lengths. The K line of calcium is found to differ by 0·008 A. in the two sources. One hesitates to think of the array of conditions it will become necessary to introduce into the specification of standard lines.

FURNACE SPECTRA OF COBALT AND NICKEL.—To the metals (Fe, Ti, V, and Cr) whereof the electric furnace spectra have already been investigated in such painstaking and accurate manner by Dr. King, must now be added Co and Ni (*Astrophysical Journal*, vol. xlii., No 4). Fourteen pages are given up to tabular matter similar to that for the elements previously studied. Attention may be directed to some results of an unexpected character; thus not only is the violet end found relatively rich in lines, but all the enhanced lines of cobalt (except only λλ 3878·90 and 3904·23) in the region of shorter wave-lengths than λ 4077·56 have been classified as furnace lines. Another peculiarity is the fact that each of the classes I., II., and III. contain some lines that attain a maximum in the furnace and are weaker in the arc, thus affording, as regards the lines of Class III. A, a group of lines special, perhaps, to a range of temperature of some 500° C.—a feature worthy of further attention.

## *THE ELECTRO-THERMIC SMELTING OF IRON ORES.*

THE rapid growth of the application of the electric furnace to the metallurgy of iron and steel is certainly the most noteworthy feature of the development of this industry during the last decade. Ten years ago "electric steel" was largely a novelty. To-day there is scarcely a branch of this highly diversified and complex industry in which electrothermic heating has failed to secure a footing and to justify itself. This progress is all the more remarkable when it is remembered that the steel manufacturing industry "owing to its age and importance, and also to the capital invested in it, is one of the most conservative and settled of all industries."[1]

The earliest uses to which electric furnaces were applied were to the production of (1) ferro-alloys, containing iron, carbon, and such elements as tungsten, molybdenum, vanadium, etc., which indeed cannot be made in fuel-fired furnaces; and (2) of the highest classes of carbon and alloy tool steels, where they competed successfully with crucible furnace products. Having "made good" up to this point, they were next developed, not in direct competition with Bessemer and open-hearth furnaces, but as important adjuncts to them, and within the last seven years a great variety of products—*e.g.*, gun, tyre, and axle steel, wire and plate billets, and rail and girder steel—are manufactured with their aid. Such processes may be classed as electrothermic refining, for they take the metal as delivered by the Bessemer or open-hearth furnace, and, owing to their high temperature and more neutral atmosphere, permit the formation of refractory basic and even reducing slags, *e.g.*, calcium carbide, which carry the refining of the steel to a further stage, and produce a purer and more trustworthy metal. Especially has this been the case with the manufacture of rail steel in Germany and America, where it has been found that the trustworthiness of the steel is so much increased by electrothermic refining that the railway companies are willing to pay considerably more for rails produced in this way. Mention must also be made of the application of the electric furnace to the production of mild steel castings—always a difficult operation—where a very fluid metal can be obtained, and a better separation of gaseous and other impurities. Heroult[2] recently quoted instances in which it had been found to be unnecessary to anneal such materials at all, since their properties were fully as good as those of the best rolled mild steel made in

[1] "Electrothermal Methods of Iron and Steel Production." By J. B. C. Kershaw, p. 3.

[2] Transactions of the Eighth International Congress of Applied Chemistry. New York. September, 1912.

fuel-fired furnaces. These are only some of the most important branches of steel production where the electric furnace is firmly established.

It has always been recognised that the most serious competitor the electric furnace had to meet was the blast furnace. In this case the coke performs two functions. It has to supply not only the necessary heat, but also the carbon for the reduction of the ore and the carburisation of the metal. It is only the former which can be replaced by electric heat, and the horse-power year would have to be supplied at the extraordinarily low figure of about 1*l.* if it is to compete with the modern coke-fired blast furnace. It is not surprising, therefore, that there are few localities which have been found to provide the necessary conditions for electrothermic iron-ore smelting. In fact, there are only two countries where the conditions have permitted headway in this direction to be made, viz., Sweden and California, and of these Sweden is in a much stronger position. Of unusual interest, therefore, is the recent publication of Bulletin No. 344 of the Canadian Department of Mines, entitled "The Electrothermic Smelting of Iron Ores in Sweden," by Dr. Alfred Stansfield, who visited Sweden in 1914, inspected the principal smelting works, and made a careful study of the economic operation of the furnaces, reporting on the general position as it affected the possibility of establishing a similar industry in Canada.

Two main types of furnace exist: (1) the Elektrometall furnace, in which the ore is preheated and partially reduced in a shaft before it reaches the smelting chamber; the heating of the ore in the shaft and the chemical reduction of the iron in the ore being materially assisted by the circulation of the furnace gases, which is characteristic of this furnace; (2) furnaces of the Helfenstein, Californian, and Tinfos type, in which there is no provision for preheating the ore. Any shafts employed are merely for the purpose of introducing the ore charge conveniently, and the main object of the design is to obtain a large and substantial furnace for smelting iron ores by electrical heat.

In Sweden the Elektrometall furnace has been largely used, and is in regular commercial operation at Domnarfvet, Hagfors, and Trollhättan, but experiments are being made with a modified Helfenstein furnace. In Norway, which Dr. Stansfield also visited, the Tinfos furnace is in operation on a moderate scale at Notodden. At Domnarfvet there is one 4000-h.p. furnace, producing about 30 tons of charcoal iron daily, and the output of the furnaces at the other places mentioned varies for the most part between 20 and 25 tons per diem. A considerable variety of irons, open-hearth and Bessemer, acid and basic, are produced. On June 4, 1915, seven furnaces were in operation and ten others in course of construction. The output of the furnaces is not large—compared with the 400 to 500 tons daily output of the hard-driven American coke blast furnace it is small—but it is as large as that of the charcoal blast furnaces which they replace. Dr. Stansfield concludes (p. 7):—"The electric furnace has now become a dependable and economic appliance for regular commercial use. The iron obtained from it is even better than that from the charcoal-iron blast furnace using the same ores and fuel. *The cost of making the iron, using cheap Swedish water-power, is somewhat less than in the charcoal blast furnace.* The amount of iron that can be made with a definite supply of charcoal is three times as much in the electric furnace as in the blast furnace. These considerations appear to represent the foundation of the present electric iron-smelting industry in Sweden." In fact, in this country the electric furnace is ousting the blast furnace.

That section of Dr. Stansfield's report which deals with the heat distribution and technical efficiency of the Trollhättan Elektrometall furnace is of particular importance. The large shaft of furnaces of this type depends for its effectiveness on the circulation of the gases which ascend from the hearth, as otherwise the contents would not be sufficiently heated, so that the question to be investigated resolves itself into the *desirability of the gas circulation system.* Does the circulation of the gases cause a large enough economy to justify the expense and inconvenience of the large stack and the circulation apparatus? From calculations made by Messrs. Leffler and Myström, as well as himself, Dr. Stansfield draws the following conclusions.

"(1) The heat utilised in the reduction of the iron, melting the pig-iron and slag, and in other necessary parts of the smelting operation, amounts to from 63 to 74 per cent. of the whole electrical supply, this figure increasing in the later periods.

"(2) The principal source of loss is the radiation of heat from the roof and other parts of the furnace and the heat lost in the cooling water supplied to electrode holders, collars, and other parts. These losses varied from 31 to 19 per cent. in these tests, decreasing in the later periods.

"(3) The amount of the potential energy or calorific power of the gases escaping from the furnace top varies from 84 to 74 per cent. of the heat equivalent of the electrical supply, and is in each case *more than the whole heat utilised in the smelting operation.* The object of the gas circulation is to utilise as far as possible, *in the furnace stack*, the reducing and heating power of the carbon monoxide in the furnace gases; but even when this has been done to the greatest extent that is practicable, the remaining gas has a heat value greater than the net heat requirements of the smelting operation, or about 75 per cent. of the whole electrical supply.

"(4) The sensible heat carried out of the furnace by the escaping gases is unimportant . . . and no considerable loss of heat is occasioned in the same manner by the gas circulation system."

Collecting the results of all the calculations it appears:—"(1) That without circulation the escaping gases have a heat value about equal to the net heat requirements of the furnace; (2) that with the gas circulation about one-fourth the value of the escaping gases is utilised in the furnace, thus saving about 11 per cent. of the coke and 7 per cent. of the electrical energy." It is evident, therefore, that if the calorific power of the escaping gases could be perfectly utilised the furnace could be run with a small fraction of the power that is needed at present, and that the circulating system only effects about one-fourth of the large saving that is theoretically possible. At present it scarcely looks as though this increased the efficiency of the smelting furnace to an extent commensurate with the complication and expense entailed, particularly when it is remembered that the escaping gases could be utilised for converting the pig-iron into steel. Dr. Stansfield's calculation leads him to conclude that the gas produced in making one ton of pig-iron in the electric furnace would almost suffice for the production of one ton of steel in the open-hearth furnace.

H. C. H. CARPENTER.

## *GEOLOGICAL WORK IN CANADA.*

THE Museum Bulletins of the Geological Survey of Canada include a number of papers on natural history and anthropology, and afford a rapid means for the publication of scientific work. No. 4 ("The Crowsnest Volcanics," by J. D. MacKenzie, 1914) describes igneous rocks from south-west Alberta, and

establishes, under C. W. Knight's name of "blairmorite," a trachytic type consisting of analcite crystals up to an inch in diameter, embedded in a green and sometimes aphanitic matrix. Orthoclase (sanidine), pyroxene, and melanite also occur. The analcite arose at an early stage in the consolidation of the rock, and may amount to 75 per cent. by volume. No. 15 is also a petrographic paper, on "The Gay Gulch and Skookum Meteorites," by R. A. A. Johnston, describing and illustrating two specimens, probably from the same fall, which contain about 80 per cent. of iron and an unusual proportion of nickel, from 15 to 18 per cent.

In both Nos. 17 and 18, attention is directed to the relics of early Palæozoic strata that occur within the broad pre-Cambrian area of Ontario and Quebec. In some cases (Bull. 18, p. 22) patches of Palæozoic limestone have been preserved by down-faulting, and E. M. Kindle and L. D. Burling show that the sea in which they were formed spread very widely over the Laurentian upland south-east and east of Hudson Bay. The scarp-like southern face of the Laurentian plateau, which is so marked a feature of eastern Canada, is attributed to post-Cambrian faulting. The Palæozoic rocks have been dropped about 1000 ft. over a stretch of 300 miles, forming the lowland fringe along which the Canadian Pacific Railway runs from Ottawa to Quebec. No feature of such magnitude has been traced in the topography of the old undulating plateau on which the Cambrian strata were laid down. In Bull. 17 M. Y. Williams describes an outlier of Lower Ordovician dolomite, containing pebbles worn from the Huronian, near Haileybury, on Lake Timiskaming. Patches of Niagara strata also occur farther north, and the pre-Cambrian surface was evidently "washed by both Trenton and Niagaran seas."

In Memoir 39 of the Geological Survey of Canada M. E. Wilson describes the "Kewagama Lake Map-Area, Quebec," which lies north of Lake Timiskaming, on the watershed between the Ottawa system and Hudson Bay. Pillow-structure, the origin of which is once more reviewed, occurs very commonly in the Abitibi (Keewatin?) volcanic series. The name Laurentian is wisely rejected for the granite and gneiss of the district, since they are intrusive in the Abitibi rocks, though older than the Cobalt series. A great Quaternary lake, named Lake Ojibway by A. P. Coleman (p. 104), occupied the region during the retreat of the Labradorian ice-sheet, and laid down seasonally stratified beds of clay and "calcium carbonate," which are well illustrated on plate xxvi. The clay is assigned to the summer, and the calcium carbonate to the winter seasons. It would be interesting to have an explanation of the deposit of the latter material. From remarks on p. 105 we may be led to infer that the spring, when water flowed abundantly from the melting snows, was followed by a season of drought and evaporation; but was this dry season necessarily postponed until the winter?

Several memoirs have been recently issued dealing with British Columbia. Their photographic illustrations emphasise the frequency of great uplifted plains, in which post-Glacial streams have cut deep V-shaped notches. The Cretaceous sea, and the Eocene sea which continued it in places, were driven out of the region by an uplift accompanied by folding, after which, probably during Miocene times, "a long period of crustal stability ensued, during which what is now the Yukon plateau, as well, possibly, as the coast range and other adjoining tracts, were reduced to a nearly featureless plain" (D. D. Cairnes, Mem. 37, 1913, p. 45). The same author (Mem. 67, 1914, on "The Yukon-Alaska International Boundary, p. 27) states that the elevation of this plain took place "during late Miocene, Pliocene, or early Pleistocene time." The steep excavations made in the peneplane of the Keele Mountains, shown in plates iv. and v. of this memoir, and the continuity of much of the upland, suggest a late date for the elevation. In opposition to the older views of R. A. Daly, C. W. Drysdale (Mem. 56, 1915, "Geology of Franklin Mining Camp," p. 44) recognises the peneplane well within the Cordillera of British Columbia, and attributes its development to the Pliocene rather than to earlier epochs of denudation. On the other hand, L. Reinecke (Museum Bull., No. 11, 1915, p. 39) finds no evidence of the formation of peneplanes in the southern part of the interior plateaus of British Columbia since the Oligocene lavas were poured out. "Differences of elevation of 2000 ft. are of constant occurrence within 10 miles of each other"; the average slopes of the plateau-surfaces measure between 160 and 300 ft. to the mile; and the author states that the country before its uplift reached a stage of late maturity rather than old age. He sustains this position by a number of interesting sections.

An important petrographic detail occurs in C. W. Drysdale's memoir on Franklin Camp (No. 56). Intrusive alkalic rocks of Miocene age have penetrated at the Kettle River a conglomerate that is either Eocene or Oligocene. This was unconsolidated at the time of the intrusion, and (p. 82) "the syenite has permeated and saturated the conglomerate and fine grit for at least 50 ft. from the main contact. . . . Pseudomorphs of syenite after the more permeable pebbles and matrix occur." Even quartzite pebbles show "the presence of minute alkalic feldspars with characteristic trachytic structure." This replacement of the Kettle River pebbles has been tested by microscopic sections, and no original pebbles of alkalic rocks occur in the conglomerate. The syenite has elsewhere given rise to trachytic flows at the surface, and the trachyte, where it overlies the Kettle River formation, has penetrated at least 5 ft. down into the grit. On plate xi. a junction of trachyte and sediment is shown, where contorted films of silt are seen included in the lava as portions of a composite rock.

R. A. Daly, in Memoir 68 (1915), describes "a geological reconnaissance between Golden and Kamloops, B.C., along the Canadian Pacific Railway." He finds that the oldest known rocks of British Columbia are the Shuswap sediments, which were originally muds and sands, with some gravels, washed from a lost land-surface of quartzose, granitic, or gneissose character. The existing gneisses result from the intrusion of granitoid magmas, also pre-Cambrian, into the Shuswap series. The composite mass became uplifted and denuded, and a geosynclinal was then developed (p. 154) in the eastern belt of the present Cordilleran region. In this hollow accumulations went on from late pre-Cambrian (Beltian) to Lower Carboniferous (Mississippian) times. The sea, however, did not reach the western belt until the Upper Carboniferous epoch. The Canadian Cordillera attained its full length and breadth as a result of folding at the end of the Cretaceous period. The author (p. 157) hesitates to refer the final uplift to late Pliocene times, in face of the deformation of the Lower Miocene and older strata that took place before the Pliocene period opened. One of his most important conclusions is the continuity of deposition (p. 93) in the Beltian and Cambrian sediments of the Selkirks. The schistose nature of the Shuswap sediments leads the author (p. 44) to a useful discussion of "statical metamorphism," as recognised by Judd. The sediments were affected by the superincumbent load before their further metamorphism by *lit par lit* injections of granite. Dynamic metamorphism further modified them, and the composite gneisses associated with them, in post-Cambrian time (p. 50). The mountain-land-

scapes that illustrate this memoir are of wide interest and considerable beauty.

C. H. Clapp has described the south-east of Vancouver Island in Memoir 36 (1913). The interest of the metamorphosed volcanic and sedimentary rocks in this region lies in the fact that they are largely of Lower Mesozoic age, and have been invaded and altered, and in part replaced, by granitic batholites in Upper Jurassic and possibly Lower Cretaceous times. The gneisses thus produced finally offered a denuded surface on which Upper Cretaceous conglomerates have been laid down. The drowned valleys of the Vancouver region are shown to have become elevated by some 250 ft. since a maximum of submergence in early Glacial or Interglacial times (pp. 109 and 127). The topographical and geological maps required for use with this memoir are folded in a pocket at the end, in accordance with the present very useful custom of the survey.

The beautiful country of fjords and islands that results from the subsidence of the Cordilleran coast is dealt with by J. A. Bancroft in Memoir 23 (1913), on "The Coast between the Strait of Georgia and Queen Charlotte Sound, B.C." The Upper Mesozoic intrusions again play a large part, and the relations of the batholites to the roofs above them, and the production of "roof-pendants," like those studied by C. Darwin in South Africa, can be well seen in the deep sections provided by the fjords (p. 105). An orbicular "hornblende gabbro," which might well be called a diorite, occurs in Midsummer Island (p. 94), and is regarded as a product of spherulitic crystallisation during the consolidation of the invading magma.

The remarkable discoveries of silver-cobalt ores at a railway-cutting in Ontario only thirteen years ago led to the rise of the great mining centre of Cobalt. The mineral veins are associated with sills of dolerite (diabase), and the tracing out of the igneous sheets has greatly widened the mining area. W. H. Collins describes the "Gowganda Mining Division," west of Lake Timiskaming, in Memoir 33 (1913). As at Cobalt, the principal ores are native silver, smaltine, nickeline, and copper pyrites. The silver has been deposited as a fine network through the other minerals after their formation. Other memoirs of economic importance are Nos. 47 (1914) and 65 and 66 (1915), on the "Clay and Shale Deposits of the Western Provinces." In these references are required from the plates to the pages of the text. Plate iv. in Memoir 65, showing suspended clay in jars, is without any obvious explanation.

Prof. R. C. Wallace, of the University of Manitoba, issues a pamphlet through the editorial department of the Winnipeg Industrial Bureau on "The Geological Formations and Mineral Resources of Manitoba," accompanied by a geological sketch-map.

Among the separate sheets issued by the Geological Survey of Canada we may note Map 53A, described in Memoir 20, covering south-eastern Nova Scotia, on the scale of 1 : 250,000. The foundation-sheet and the colouring may serve as types of the beautiful work produced by the Government departments of the Dominion.

J. B. Tyrrell (Trans. Royal Soc. Canada, vol. ix., 1915, p. 89) interestingly connects all the gold-bearing veins in the pre-Cambrian rocks of central Canada with the Algoman epoch of igneous intrusion. The albite-diorites which then invaded the pre-Animikean series seem to have been especially associated with "chrysogenesis." It should be noted that the Algoman batholites of gneiss and granite are not themselves rich in gold. The term Huronian is relegated in this paper to rocks above the great unconformity recognised by Logan and Lawson alike. Hence the Algoman epoch is pre-Huronian; but its rocks are intrusive in the Timiskaming Series, and the gold veins may occur, therefore, in the older "Laurentian" gneisses and in the Keewatin Series invaded by these masses. Mr. Tyrrell points out that the presence of gold veins in central Canada will now serve to mark the rocks in which they are found as "pre-Huronian," that is, older than the great unconformity.

G. A. J. C.

## *CHEMISTS AND MANUFACTURERS.*[1]

AMONG the many lessons which we are learning as the result of the war, not the least important is the fact that experimental science in general, and chemistry in particular, is not merely an interesting intellectual occupation, but one of the foundation-stones on which national progress rests, and that its continued neglect could only lead to disaster, and end in our complete defeat by more progressive and far-seeing nations.

The ignorance of the value of scientific knowledge shown by our people is very great, and, unfortunately, many of our rulers are little, if at all, better informed. As a consequence, much inertia still remains to be overcome, and a great deal of leeway has to be made up. Happily, signs are not wanting that we are at last directing our footsteps on the right path, and those of us who know, and who have the real interests of their country truly at heart, will earnestly pray that our progress along that path may be certain and rapid.

At the outbreak of war, the authorities were seemingly unaware of the vast and multifarious services rendered to the State by professional chemists, and of the extent to which the welfare of the nation depended upon the adequate utilisation of their services. As a result, many hundreds of highly-trained chemists were to a great extent wasted by being put to military duties which could easily have been performed by men whose normal activities were of no special value to a nation at war.

This state of affairs lasted until a few months ago, when the authorities apparently began to appreciate the facts of the situation, and the Board of Trade issued a circular of instructions to local tribunals under Lord Derby's scheme, together with a "list of occupations (reserved occupations) of cardinal importance for the maintenance of some other branches of trade and industry." Since then the Board of Trade has issued a further schedule of "reserved occupations," in which occurs the following important paragraph:—"Chemists: Analytical, Consulting Research Chemists (not to be accepted for immediate enlistment or called up for service with the Colours without the consent of the Royal Society); Chemical Laboratories: Head Laboratory Attendants."

It will have been noticed that chemists are not only not to be enlisted, but are not allowed to enlist without the express permission of a recognised body, the only other persons in the schedule who are treated similarly being "licensed pilots, officers, and crews of vessels belonging to the General Lighthouse Authorities and lighthouse-keepers"—that is to say, men whose services are absolutely essential for the public safety.

During the past eighteen months the columns of the technical and of the general Press have been inundated with letters and with articles bewailing the neglect of chemical science in this country, and deploring the want of appreciation of the services of chemists so often shown by manufacturers. That we have shamefully neglected the claims of science is a

[1] From the presidential address delivered to the Society of Public Analysts and other Analytical Chemists on February 2, by Mr. A. Chaston Chapman.

fact of which many of us have been painfully aware for a good many years, and one which through the stern teaching of the war is gradually being brought home to the bulk of the nation. This, however, is a matter which is intimately bound up with our whole system of education, and until that system has been thoroughly reformed it is hopeless to expect that chemistry and the other experimental sciences will take their proper position.

So far as our colleges are concerned, I feel very strongly that a more thorough training in analytical chemistry is desirable, and I would, in addition, venture to suggest that the present curriculum of those chemical students who intend to become professional chemists should, whenever possible, be amplified so as to include a further year of study. During this post-graduate year, the student should be trained by thoroughly competent and specially selected teachers under conditions approximating more to those of the technical than to those of the academic laboratory.

Whilst words fail to express the indignation which one sometimes feels at the miserable wages (the word "salary" would be out of place) offered to men who have devoted several years and a not inconsiderable sum of money to their training, yet, on the other hand, the young chemist seeking a position should remember that his future lies very largely in his own hands. The manufacturer on his side must understand that in engaging the services of a young chemist from one of our universities he is getting the partly-manufactured material, and not the finished product. He should be told that his future employee is merely a well-trained apprentice who knows how to use the tools of his craft, but will have to be given time in which to find his feet and to learn something of the new conditions under which he will have to work. It is here that our university professors can do much to prevent misunderstanding and disappointment by pointing out to manufacturers the limitations of the men whom they may be recommending.

A good many manufacturers (I am not, of course, referring to the heads of large concerns where many chemists are employed, and where their functions are thoroughly well understood and appreciated) do not always know very clearly what they want. They have a vague idea that some sort of chemical assistance is necessary in a modern factory, and they consequently go to one of our colleges and state that they want "a chemist." As one of the objects of our colleges is very properly to find employment for the men they have trained, he is offered the services of a man who has perhaps just finished his chemical course, but knows little or nothing of the nature of industrial chemistry or the requirements of the factory.

It is at this point, however, that the trouble to which I have alluded commences, for the young man in question is offered to the manufacturer labelled "chemist" without any qualification at all. As a very general rule no intimation is given to the manufacturer that his prospective employee is little more than a senior student, and, in the absence of any statement to the contrary, there is some justification for regarding him as thoroughly competent not only to carry out the routine work of the factory, but also to undertake industrial research, to cheapen production, and to effect improvements in the manufacturing processes concerned. At the end of the year, in many cases, nothing very definite has resulted, no additional profit has been made, and there is no obvious improvement in the factory working, and the manufacturer is very apt to give emphatic expression to his disappointment, and to inveigh against science in general and chemistry in particular.

I wish it to be understood that my remarks apply especially to the general works chemists, to whom is entrusted the testing of the raw materials and finished products, and the exercise of a general scientific supervision. With the more important question of industrial chemical research it is quite impossible to deal within the limits of an annual address. I would only say that chemists competent to initiate and to carry through to a successful issue the kind of investigations which are of importance to manufacturers are, comparatively speaking, few in number, and that the chemical investigator, like the poet, must be born. He may be shaped, but he certainly cannot be made, and it would save not a little disappointment if it were recognised more generally on the industrial side that men possessing all the special qualities of intellect and of character which go to make a successful chemical investigator are not very frequently combined in any one man, and that the chances of obtaining the services of such a man in a more or less haphazard way, and at a salary which would be rejected with scorn by many an artisan, are not very great.

Summarising the points on which I have briefly touched in this address, I would appeal for—

(1) Greater sympathy, freer intercourse, and closer co-operation between the two great branches of the chemical profession—the teachers and the practitioners.

(2) The establishment of chairs of analytical chemistry in our universities and colleges as a practical step towards securing the more adequate treatment of that important branch of our science.

(3) The more general provision in our universities and colleges of post-graduate facilities for acquiring a good general knowledge of certain subjects which form an indispensable part of the professional equipment of every technical chemist.

## *SCIENCE AND BRITISH TRADE.*[1]

WE were appointed on July 13, 1915, to be a Sub-Committee to prepare and submit a Report showing what steps should be taken to secure the position, after the war, of firms who have undertaken industries in consequence of the Exchange meetings leading up to the British Industries Fair, held under the auspices of the Board of Trade.

The following were the branches of industry to which it appeared that our inquiries could most usefully be directed, having regard to our terms of reference:—(i) Paper manufacture; (ii) the printing trade (including colour printing); (iii) the stationery trade; (iv) the jewellers' and silversmiths' trade; (v) cutlery; (vi) fancy leather goods; (vii) glassware, including table glass, laboratory ware, and glass bottles; (viii) china and earthenware; (ix) toys; (x) electrical apparatus; (xi) brush, etc., trade; (xii) hardware.

The value of the imports into the United Kingdom of goods of the kinds included within the scope of our inquiry may be taken as approximately 16,000,000*l.*, and of this total nearly 7,700,000*l.* represented goods of German origin, and 500,000*l.* goods of Austro-Hungarian origin. But it has to be remembered that there is also a large German and Austro-Hungarian export of these classes of goods into other parts of the British Dominions. In the absence of strictly comparable statistics, no absolutely definite figures can be given, but we estimate that the total value of such goods imported into the five self-governing Dominions and India in 1913 cannot have been less than 3,000,000*l.* Austro-Hungarian competition is noteworthy only in the case of jewelry and glassware. As regards German competition in the branches of trade under review, it is limited, as a rule, to certain special lines of goods

[1] Abridged from the Report of a Sub-Committee of the Advisory Committee to the Board of Trade on Commercial Intelligence with respect to measures for securing the position, after the war, of certain branches of British industry. (London: Wyman and Sons, Ltd.) [Cd. 8181.] Price 2½*d.*

and does not extend to the whole range of articles included in the class; and in a number of cases the exports of United Kingdom manufactures included under the same general heading are larger than, or nearly as large as, the foreign imports. This is so as regards paper for printing and writing; printed paper hangings; stationery (other than paper); cutlery, china, and earthenware; telegraph and telephone apparatus; unenumerated electrical goods and apparatus; and electrical machinery. The only cases in which the values of the imports of foreign-made goods are largely in excess of those of the exports of United Kingdom manufactures included under the same general headings are—paper for packing and wrapping; jewelry; fancy leather manufactures; flint glass and manufactures thereof; toys and games; and magnetos, which have been practically a German monopoly.

We proceed to the consideration of the detailed representations as to the ways in which Government assistance might be given to the various branches of industry which have been under our examination.

The value of scientific research in industry and the desirability of Government assistance in the promotion thereof, was generally recognised both in the memoranda furnished to us and by the witnesses who appeared before us, though it was admitted that British manufacturers and workmen have not always shown themselves in the past sufficiently appreciative of the value of scientific investigation into industrial problems, or of technical training. In a number of cases reference was made to the valuable assistance given by technical institutions to German industry, and, though no very definite evidence on the point was adduced, we see no reason to doubt the validity of the opinions expressed. As regards the particular British industries with which we are now concerned, very valuable work is being done in respect of glass by the University of Sheffield and the Institute of Chemistry (by the latter body especially as regards chemical glassware and optical glass); in respect of hard porcelain, and china and earthenware generally, by the School of Pottery at Stoke-on-Trent, which is an interesting example of combined trade enterprise; and in respect of paper, by the Manchester Institute of Technology, which, however, though fully equipped, is stated to exercise only a local influence and not to be utilised by the trade generally. All these institutions are said to be handicapped by inadequate financial resources. The representatives of the paper-making industry expressed a strong desire for Government assistance towards scientific investigation as to substitutes for resin size and aniline dyes, and for paper-coating materials hitherto imported, and also in the manufacture of parchment, grease-proof and other special papers. In the case of the printing trade we were informed that much assistance could be given by research work in respect of colour-printing and the application of photography to printing and lithography, whilst as regards the Birmingham jewelry trade it was stated that research into certain metallurgical problems and into the production of semi-precious stones would be advantageous. The electrical industry, of course, provides a very wide field for scientific industrial research.

At an early stage of the inquiry our attention was directed to the fact that an extensive scheme of State-aid for industrial research had recently been established by a committee of the Privy Council, and is, we understand, to be carried out by that Department in close communication with the Board of Trade. We are informed that a strong advisory council has been appointed, and that a number of applications (including requests for assistance from the Sheffield University, the Institute of Chemistry, the Stoke Pottery School, and the British Electrical and Allied Manufacturers' Association) are already before that body, and that the first grants are being made. We were accordingly able to refer to the new council and the funds at its disposal those witnesses who expressed the desire for State assistance in this direction, and to point out to them that the council in its consideration of any applications for help to any particular trade would no doubt be largely influenced by the extent to which the trade had already shown or would show a disposition to help itself. The new scheme is necessarily experimental, but it is capable of much enlargement, and we have no doubt that if British manufacturers are ready to co-operate with the Government in this matter and to avail themselves of the facilities put at their disposal, the operation of the scheme will be of very great value to British industry.

The Electrical Trades' Association urged that a Government inquiry should be instituted into the desirability of adopting decimal coinage and the metric system, both for this country and in the Dominions. The use of the metric system is, of course, already permissible; as to any Government action beyond that we are aware that opinion is divided; and we content ourselves with recording the suggestions.

The representatives of the stationery, silversmiths', fancy leather goods, mechanical and other toys, glass and magneto industries all urged upon us that many manufacturers, in putting down plant and finding capital for lines of manufacture which hitherto had been mainly or entirely German or Austrian, either to supply the home deficiencies caused by the cutting-off of the foreign supplies or to endeavour to supplant German trade abroad, were reasonably entitled to expect that the Government would safeguard them from the effects of unrestricted foreign (especially German and Austrian) competition after the war, especially as their action had been undertaken with direct Government encouragement, and in some instances (notably chemical glassware and magnetos) had been of substantial service in the conduct of the war.

In this connection we desire to direct special attention to the case of magnetos. Briefly, the facts are that prior to the outbreak of the war the trade in magnetos, which are of great importance for all forms of motor-cars and aircraft, as well as for other purposes, was virtually monopolised by the Bosch Company of Stuttgart, a very powerful organisation with great resources. The result was that at the sudden commencement of the war there were no manufacturers in this country where the normal demand was about 5000 magnetos per week; since then it has substantially increased, especially for military and naval purposes. A number of British firms took up the manufacture, and with the assistance of Sheffield in respect of the production of magnet steel, they have succeeded in making magnetos which have passed the Government tests and are asserted to be as good as the Bosch products. The firms are receiving large Government contracts, and there seems to be no doubt that in this instance (which is specially important as being one of a "key" industry) a considerable British manufacture could be built up which *inter alia* would guard against a repetition of the serious difficulties caused in the early stages of the war by our dependence on foreign supplies. The one obstacle is the reluctance of the firms concerned to commit themselves to further capital outlay, and the unwillingness of outside capital to come to their assistance, unless assured of some security against the strenuous efforts which the powerful Bosch concern will undoubtedly make after the war to break down the new British enterprise.

The representatives of this industry asked that Government assistance might be afforded them in the

shape of (1) an undertaking that the Government Departments concerned in motor transport and the air services would undertake to make use only of British magnetos made (so far as practicable) only of British parts—such undertaking to be for a term of years after the conclusion of the war; and (2) the extension to all magnetos of the import duty of 33⅓ per cent. imposed upon magnetos imported as parts of motor-cars. We reported to the President of the Board of Trade that, in view of the importance of the manufacture of magnetos for military and naval purposes, its position as a "key industry," the efforts which the manufacturers have made, and the undoubtedly severe competition from the powerful Bosch interests which they will have to encounter after the war, we were unanimously of opinion that Government assistance might be given in the two forms desired by the industry.

Apart from proposals for the imposition of import duties on foreign goods, other suggestions put before us for the protection of British manufactures in other ways included the restriction of British Government contracts to British goods, or a preference to such goods in respect of price. The reasonableness of this claim was strongly urged upon us by representatives of the new magneto industry, and also in the case of table glassware. In this connection we were informed that at the instance of the British Science Guild a large number of educational institutions and authorities have already undertaken not to purchase any chemical glassware of foreign manufacture for a period of three years after the war, provided that an adequate supply of British manufacture is forthcoming.

RECOMMENDATIONS.

*Scientific Industrial Research and Training.*—(*a*) Larger funds should be placed at the disposal of the new Committee of the Privy Council, and also of the Board of Education, for the promotion of scientific and industrial research and training.

(*b*) The universities should be encouraged to maintain and extend research work devoted to the needs of the main industry or industries located in their respective districts; and 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 State.

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

(*c*) An authoritative record of consultant men of science, chemists, and engineers, and of persons engaged in industrial research, should be established and maintained by some suitable Government Department, for the use of manufacturers only.

*Copyright.*—The United Kingdom copyright law should be brought into line with that of the United States.

*Patents.*—(*a*) The efforts which have been made to secure uniformity of Patent Law throughout the Empire should be continued. (*b*) The provisions of the law as to the compulsory working of patents in the United Kingdom should be more rigorously enforced, and inspectors should be appointed to secure that such working is complete and not (as has frequently been the case) only partial. (*c*) The fullest possible information as to enemy patents should be given to British firms during the war, and every practicable assistance for their use.

*Trade Marks.*—All German and Austrian goods imported into the United Kingdom should be required to be marked with an indelible mark, "Made in Germany" or "Made in Austria-Hungary," and goods imported from other foreign countries should be similarly marked either with the country of origin or with the words "Foreign Made" or "Not British." Such marking should be in all cases on the actual goods and not merely on the package.

*Transport.*—A definite policy for the improvement and extension of the canal system of the United Kingdom should be formulated, with a view to its being carried out so soon as the national finances shall permit.

*Financial Assistance.*—(*a*) The joint stock banks should be invited by his Majesty's Government, so soon as opportunity offers, to consider the possibility of affording a greater measure of assistance to British industrial enterprise. (*b*) All Government Departments, local authorities, and statutory bodies entrusted with the control of moneys raised by taxes or rates, should be under legal obligation to purchase, so far as possible, only goods produced within the British Empire.

*Trade Exhibitions.*—The following broad principles should be adopted in respect of future trade exhibitions:—(*a*) Trade exhibitions should be held under the control of the Board of Trade; (*b*) exhibitions should be exhibitions of manufacturers' wares for traders, and should not be organised with the view of attracting the general public; (*c*) exhibitions should not be too general in scope, but should be for a limited number of branches of industry at a time, according to the importance and dimensions of each particular industry in this country; (*d*) at least one year's notice of the intention to hold any particular exhibition should be given to manufacturers.

*Establishment of a Ministry of Commerce.*—His Majesty's Government should be urged to consider anew the advisability of establishing a separate Ministry charged solely with the safeguarding and extension of British industry and trade, and freed from the regulative duties in respect of railways, shipping, and harbours, and the duties in respect of labour, which at present devolve upon the Board of Trade.

*Extension of the System of Trade Commissioners.*—The appointment of Trade Commissioners, responsible, and reporting directly, to the Board of Trade, should be extended to the principal foreign countries.

*The Consular Service.*—The organisation of the Consular Service should be dealt with so soon as possible after the completion of the report of the Royal Commission on the Civil Service, with a view to the increase of its commercial utility.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

ABERDEEN.—At the recent meeting of the University Court, intimation was received of a munificent benefaction to the University by Sir Alexander McRobert, Cawnpore, India, and of Douneside Lodge, Tarland, Aberdeenshire. Ten years ago Sir Alexander instituted a research fellowship in the University for the purpose of encouraging the investigation of the cause, prevention, and treatment of cancer. An annual sum was placed at the disposal of the University to meet the salary of the fellow and necessary working expenses. The fellowship has been held in succession by Drs. Bertie R. G. Russell, Alex. Greig Anderson, and Harold A. Haig, and some important investigations

have been carried out by them on the nature of cancerous growths. Sir Alexander McRobert has now placed the foundation on a permanent footing by handing over securities to the University which will yield an annual return of about 750*l*. It has been arranged that the foundation shall take the form of a lectureship, attached to the department of pathology. The lecturer will conduct research with a view to the elucidation of the problems of cancerous and other malignant diseases, and will also give instruction on subjects connected with his investigations.

SHEFFIELD.—The council, at its meeting on February 7, appointed Dr. A. J. Hall (senior physician, Sheffield Royal Hospital) to the professorship of medicine, in succession to Dr. D. Burgess.

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A NOTE in the *Sunday Times* records that on February 4 Lord Hardinge, the Viceroy of India, laid the foundation-stone of the new Hindu University buildings to be erected at Benares. The estimated cost will amount to about 2,000,000*l*.

THE following appointments have been made in connection with the Royal College of Physicians of London:—Sir Thomas Barlow to be the Harveian orator for the present year, Dr. H. W. G. Mackenzie the Bradshaw lecturer, and Dr. W. J. Howarth to be the Milroy lecturer for 1917.

IT was stated in the manifesto issued last week on the position of science (see p. 640) that communications to the Reorganisation Committee should be addressed to 107 Piccadilly, London, which is the address of the Savile Club. The secretary of the Reorganisation Committee now asks that such communications should be addressed to him at 11 Airlie Gardens, London, W.

THE Government of Madras has inaugurated a scheme of lectures for the education of villagers in sanitary principles. Model lectures on various subjects affecting the daily life of the villagers have been prepared by the Sanitary Commissioner, and the idea is, we learn from the *Pioneer Mail*, to translate these lectures into the principal vernaculars of the Presidency in language easily understood by the people, and to get them delivered to villagers through the agency of the sanitary and educational staff, surgeons, and other competent persons, who may have sufficient interest in the movement.

IN addition to the war work being done in the departments of physics and arts and crafts of the Reading University College, to which reference was made in our recent note on the December issue of the *Reading University College Review*, we learn that the chemical department of the college is active in a similar direction. The work consists in the preparation of synthetic drugs for the Admiralty, and in connection with the Royal Society's Sectional Chemical Committee. Several old students have obtained temporary posts as chemists in explosive works, and a number are on the waiting list of the National Physical Laboratory for assisting in physical and engineering experiments upon war problems.

THE following gifts to higher education in the United States are announced in the issues of *Science* for December 31 and January 7 last:—A gift of 15,000*l*. to the Harvard Medical School; this is the balance of the bequest of Morrill Wyman, who established the Morrill Wyman Medical Research Fund, the income of which is to be applied in promoting investigation concerning the origin, results, prevention, and treatment of disease. Dr. Rudolph A. Witthaus, known for his work in chemistry and toxicology, who died on December 19 last, left most of his estate of more than 30,000*l*. to the New York Academy of Medicine. Dr. Witthaus left to the Academy of Medicine all his books and the estate for the benefit of the library. Grinnell College has received 10,000*l*. from an anonymous donor. The college is conducting a campaign for new endowment and buildings. Recently a parcel of land in Kansas City, valued at 30,000*l*., was turned over to the college. The alumni of the college are raising funds for new buildings, the construction of which will be commenced next spring, which will cost about 50,000*l*. It is now said that the estate left by the late Mr. Amos R. Eno is likely to amount to 3,000,000*l*. Provided the will filed for probate last October stands, in the face of the contest being made by Mr. Eno's next of kin, Columbia University's share of the estate will be about 1,400,000*l*.

FURTHER gifts to higher education in the United States are recorded in the issue of *Science* for January 21. Mr. George T. Baker has made a further gift of 10,000*l*. to Cornell University; Barnard College, Columbia University, has received 20,000*l*. from Mr. James Talcott; a new chair at the University of Pennsylvania, to be known as the Dr. Isaac Ott chair in physiology, has been endowed through the legacy received from the estate of the late Dr. Isaac Ott; and the sum of 50,000*l*. has been given by Mrs. Russell Sage to the Emma Willard School in Troy to found a department of domestic and industrial art. The new department will occupy the buildings recently vacated by the school on the completion of new buildings made possible by a gift of 200,000*l*. from Mrs. Sage in 1907.

THE Department of Agriculture and Technical Instruction for Ireland has issued a circular (Form S. 125) giving particulars of the technical school examinations it will hold during the present year. The Department's scheme of examinations is designed to follow courses of instruction extending over four years in commerce, building trades' work, applied chemistry, electrical engineering, mechanical engineering, domestic economy, and art. Examinations in all subjects of the courses will be held this year in May. Certificates will not be issued by the Department in respect of the first and second years' examinations of any course, but pass lists will be issued to the local school authorities. It is intended that the courses of instruction of which these examinations will provide a test should include not only theoretical, but also practical and laboratory work.

NOTICE has been given that the fourth election to Beit fellowships for scientific research will take place on or about July 15 next. Not more than three fellowships will be awarded. Applications must be received on or before April 15. Forms of application and all information may be obtained, by letter only, addressed to the Rector, Imperial College, South Kensington, London, S.W. The annual value of every fellowship is 150*l*., and its tenure is for one year, which may be extended by the trustees for a further period not exceeding one year. So long as the fellow is a graduate of a British University, or holds some approved diploma, he may be of any nationality provided he is of European descent by both parents. Every candidate must be under the age of twenty-five years on the date of election. Fellows are attached to a department of the Imperial College of Science and Technology, and work under the supervision of a professor in accordance with the arrangements made by the head of the department.

THE returns of the registration of students for November, 1915, of thirty of the universities in the United States are tabulated and analysed in an article by Mr. J. C. Burg, of Northwestern University, in the issue of *Science* for January 21. The largest gains in

the number of students, including the summer attendance, were registered by the following universities (the number in brackets giving the increase in the number of students):—California (2375), Pennsylvania (900), Minnesota (892), Chicago (837). The University of California, with a total of 10,555 students, was the only institution with a gain of more than 1000 students. Omitting summer students, the largest gains for 1915 are those of Pennsylvania and Minnesota. Four universities enrolled more than 7000 students, viz., Columbia (11,888), California (10,555), Chicago (7968), and Pennsylvania (7404). The article also provides some interesting statistics as to the number of students taking different branches of study. In engineering Michigan now leads with 1498 students, followed by Cornell with 1347. The largest medical school is at New York University, where 509 students are now enrolled. The school of commerce of New York University has 2639 students, and Pennsylvania comes next with 1889. The school of education at Columbia numbers 1972 students, as compared with 897 at Pittsburgh. These figures as to subjects are exclusive of summer students. The largest summer session in 1915 was at Columbia, where 5961 students were enrolled. At California a remarkable increase last summer of 2012 brought the number of summer students to 5364.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society,** February 3.—Sir J. J. Thomson, president, in the chair.—Prof. W. **Bateson** and C. **Pellew**: Note on an orderly dissimilarity in inheritance from different parts of a plant. In a recent paper the authors gave evidence as to the genetics of the wild-looking "rogues" which appear as the offspring of high-class types of peas. Among other peculiarities, it was shown that $F_1$ plants resulting from crosses between rogues and types were in their juvenile condition intermediate, showing influence of the type parent, but on maturing they become rogues and have exclusively rogue offspring. The authors interpreted this to mean that the type-elements are left behind in the basal parts of the plant. In the variety Gradus certain intermediates (offspring of types) were observed to give mixtures of types and rogues. In such intermediate plants the characters often change with age, the lower parts being more type-like, the upper more rogue-like. Preliminary sowings of seed from these intermediates indicate that when their offspring consists of types and rogues, *the types come predominantly from the lower pods and the rogues from the upper pods.* The three sets of facts are therefore consistent in indicating that there is an orderly segregation in the body of the plant, the type-elements being predominantly in the lower parts.—H. M. **Woodcock**: Observations on Coprozoic flagellates, together with a suggestion as to the significance of the kineto-nucleus in the Binucleata. The paper deals with the first results of a comprehensive study of the *coprozoic* flagellates of goats and sheep. The coprozoic fauna comprises those forms which pass through the alimentary tract in a resting, encysted state, and undergo all the active phases of their life-cycle in the (moist) dung.—S. B. **Schryver**: Investigations dealing with the phenomena of clot formations. Part III.—Further investigations of the cholate gel. It is shown that there is a marked similarity between certain vital activities of cells and the behaviour of cholate gel. (1) The erosive action of certain organic substances on the cholate gel runs parallel with their narcotic and cytolytic actions. (2) Gel formation by calcium chloride is inhibited by sodium, magnesium, and other chlorides. The same substances can also cause gel erosion, but the erosive action can be antagonised by the addition of relatively small amounts of calcium salts. (3) To explain the parallelism between certain biological actions of organic substances and the antagonistic action of inorganic salts, on one hand, and the action of these substances on the cholate gel, on the other, it is suggested that the cell membrane or cytoplasm is constituted by a heterogeneous system of lipoids, proteins, etc., held together in a magma containing a gel-forming substance with physical properties similar to those of the cholates. On such a hypothesis, the biological action of certain substances can be explained in a manner more satisfactory than is possible by the assumption of the "lipoid" theory of Hans Meyer and Overton.—J. M. **O'Connor**: The mechanism of chemical temperature regulation. Anæsthetised cats or rabbits, when not shivering, consume oxygen in proportion to their body temperature. When shivering, more oxygen is consumed than would otherwise be consumed at that body temperature. The onset of shivering is dependent on the brain temperature being below a point more or less fixed in a given animal. The amount of "extra oxygen" consumed during shivering is proportional to the extent to which the average skin temperature is below this point. This point towards which the animals regulate chemically varies in different animals between 30° and 39° C.

**Mathematical Society,** January 13.—Sir Joseph Larmor, president, and later Prof. A. E. H. Love, vice-president, in the chair.—Sir J. **Larmor**: The transition from vapour to liquid when the range of the molecular attraction is sensible. In the theory of capillarity, and of change of state, the hydrostatic pressure $p$ is defined, in physical illustration, as the difference between two much larger quantities, the repulsion $\varpi$ due to molecular motion, and the mutual attraction P of the molecules. Its graph, in the Andrews-Thomson diagram, determines the critical point and the conditions for change of state. It is a definite quantity only where the density is unform; thus it loses its meaning inside interfacial layers of rapid transition, though under fluid conditions it is transmitted across such layers. The instability in homogeneous fluid, and consequent separation of phases, which ensues when $dp/dv$ becomes positive, is essentially a matter of the internal constitution of the fluid, and ought to be so deducible. It is found, however, that the homogeneous medium is unstable for variation of density when $d(p-\mathrm{P})/dv$ is positive: whereas instability from external stress, when the density is not disturbed, occurs within the narrower limits for which $dp/dv$ is positive. When the range of attractions is sensible there will thus be arcs of internal instability along the isothermals above the critical point, for which, however, separation into two phases, vapour and liquid, cannot occur. It might be imagined as relieved by gradual falling away of the medium to modified states of molecular aggregation; and, in fact, the question arises, why this type of change should be regarded as excluded in the usual theory, notwithstanding the aptness of the van der Waals equation. An S-shaped convolution of the isothermal is still the condition for abrupt transition of state. Other conditions restricting the form of such law of attraction as is compatible with the existence of a homogeneous phase are noticed.—T. W. **Chaundy**: (1) A note on the uniform convergence of the series $\Sigma a_n \sin n\theta$. (2) A condition for the validity of Taylor's expansion.—G. H. **Hardy**: The average order of the arithmetical functions $\mathrm{P}\Delta(x)$.—$(x)$ and C. E. **Weatherburn**: Green's dyadics in the theory of elasticity.—G. N. **Watson**: A problem in "Analysis Situs."

**Geological Society,** January 19.—Dr. A. Smith Woodward, president, in the chair.—H. **Bury**: The physical geography of Bournemouth. The curves of the plateaux in the Hampshire basin (including that of Bournemouth) show a marked relation to the main river-valleys, indicating that the latter were in existence before the plateau-gravel was deposited. The fact that this gravel everywhere covers the main watersheds is inconsistent with the theory of deposition on simple river-terraces, and points to widespread floods and the formation of gravel-sheets at one or more periods. Palæoliths are most frequent at low levels (below 140 ft. O.D.), but occur up to 350 ft. O.D., where their presence must be due either to a vast accumulation of gravel in Chellean times, or to channelling at later dates. The Chines along the coast of Bournemouth Bay did not originate at the cliff-edge and grow inland, but are the over-deepened bottoms of older and longer valleys. A similar double structure is seen in the Chines of the south-western corner of the Isle of Wight, where it is due to the destruction of part of the valley of the Yar by the sea since the deposition of the valley-gravel; and it is suggested that the Bournemouth Chines are due to the breach of the Solent River by the sea at the same late period. The 140-ft. bluff, running all across Hampshire to the sea-cliff at Goodwood, is comparable with the 100-ft. terrace of the Thames, and was probably formed in an estuary in pre-Chellean times. The rate of recession of the cliff in the western part of Bournemouth Bay is estimated at about 1 ft. per annum. It may be more in the eastern part. The angle of the cliffs is said to have become steeper of late years; but this is not true of the western part of the bay, and it is desirable that the observations on which the belief rests should be published.

**Linnean Society,** January 20.—Prof. E. B. Poulton, president, in the chair.—Miller **Christy**: The definition of "right" and "left" in relation to coiled, rolled, revolving, and similar objects: a problem in scientific terminology. The author referred to such terms as "right" and "left," following or against the sun (in northern latitudes), "clock-wise" and "counter clock-wise," as used by biologists, and also cited terms used by mathematicians which could not be used by naturalists with any advantage. He advocated the usage postulated by Linnæus, in his "Philosophia botanica," p. 103, before he became confused and altered his definition to an absurdity, and recommended the use of the heraldic terms "dextral" and "sinistral" as unambiguous terms.—H. W. **Monckton**: Some aspects of the flora of the Bagshot district. This communication deals with the area occupied by the geological formation known as "The Main Mass of the Bagshot Sands." About half is in Surrey, the remainder being nearly equally divided between Berkshire and Hampshire. The greater part was until recent times a tract of pine-woods, heaths, and peaty swamps, and its character was mainly due to the sandy nature of the Bagshot formation and the gravels resting upon it. The flora of much of the area resembles that of the Oak-Birch-Heath Association ("Types of Brit. Vegetation," ed. by A. G. Tansley, Cambridge, 1911, p. 101). Other parts fit in well with the Heath Association, *op. cit.*, p. 105. Much of the high ground forms plateaux covered with gravel some 10 to 15 ft. thick, and on it are found the usual heath-plants. *Illecebrum verticillatum* is perhaps the most interesting plant found in the district.

MANCHESTER.

**Literary and Philosophical Society,** January 25.—Prof. S. J. Hickson, president, in the chair.—Dr. H. F. **Coward** and F. **Bailey**: Causes of luminosity in coal-gas flames. A stream of coal-gas was passed through a tube immersed in solid carbolic acid and ether, at −79° C. This condensed completely all the benzene, toluene, and similar substances, but allowed the whole of the ethylene to pass forward with the gas. The luminosity of the flame of the issuing gas was very feeble in comparison with that of the original gas. Measurements carried out by Mr. W. Buckley at the Corporation Gas Works, Rochdale Road, Manchester, showed that a particular coal-gas lost 78 per cent. of its illuminating power by this treatment. The benzene hydrocarbons therefore contribute far more to the luminosity of coal-gas flames than does ethylene, in spite of the fact that the volume of ethylene present is usually three to five times the volume of benzene vapour.—Prof. S. J. **Hickson**, Dr. W. M. **Tattersall**, and others: Animal symmetry and the differentiation of species.

EDINBURGH.

**Royal Society,** January 24.—Dr. Horne, president, in the chair.—Dr. J. E. **Mackenzie** and Dr. **Ghosh**: The optical rotation and cryoscopic behaviour of sugars dissolved in (*a*) formamide, (*b*) water. To previous results already published the authors have added experiments for *β*-*d*-glucose, *β*-*d*-galactose, and maltose. As in the case of the water solutions of these sugars, the constant rotation shown when there is equilibrium between the two multiplications is found to be the same whether the starting point be the *α* or the *β* modification. The phenomena are of the same nature in non-aqueous and aqueous solutions. Any explanation of mutarotation reactions must account for such actions taking place in the absence of water.—Dr. **Ghosh**: Note on the sublimation of sugars. It was shown that under diminished pressure rhamnose and fructose sublime. Up to this time the only sugar which had been observed to sublime was glycolose.—W. **Collinge**: A revision of British Idoteidæ, a family of marine Isopoda. The object was to revise the diagnoses of the British genera and species, and set forth, in greater detail than has hitherto been done, their structure and the classification and affinities of the family. The investigation was carried out in the Gatty Marine Laboratory of St. Andrews University.

DUBLIN.

**Royal Dublin Society,** January 25.—Prof. J. A. McClelland in the chair.—Prof. Hugh **Ryan** and T. **Dillon**: The hydrocarbons of beeswax. Inconsistencies in the results obtained in the analysis of beeswax led to an examination of the action of potash-lime on alcohols. The volume of hydrogen evolved by the interaction of higher primary alcohols and potash-lime is nearly but not quite in accordance with the equation:—

$$C_nH_{2n+1}\,CH_2OH + KOH = C_nH_{2n+1}\,COOK + 2H_2.$$

Higher secondary and tertiary alcohols, such as pentadecyl-*p*-tolyl carbinol and heptadecyldimethyl carbinol do not evolve hydrogen when heated to 250° C. with potash-lime, and similarly the volume of hydrogen evolved by the action of alkali on glucose corresponds very nearly to the one primary alcoholic group in the sugar. The solids extracted by petroleum ether from the product of the action of potash-lime on myricin contain a small percentage of oxygen, and for this, as well as other reasons, the "potash-lime method" of determining hydrocarbons in beeswax yields results which are too high.—Prof. Hugh **Ryan** and M. J. **Walsh**: Desoxyhydrocatechintetramethyl ether. The chromane formula for catechin proposed by A. G. Perkin and Yoshitake exhibits the genetic relations of the phlobatannins, the flavone, and the anthocyan dyes, much more clearly than the coumarane

formula of S. von Kostanecki and V. Lampe, although the latter formula accords better with the chemical behaviour of catechin.

**Royal Irish Academy,** January 24.—Rev. J. P. Mahaffy, president, in the chair.—Prof. J. A. **McClelland** and Rev. R. **FitzGerald**: The photo-electric properties of leaves. The paper deals with the photo-electric power of leaves and gives numbers for leaves of various types. It also deals with the extraction of chlorophyll from leaves and the activity of the solutions thus obtained. It is also shown that distilled water in which leaves have been immersed has considerable photo-electric activity. The concluding portion of the paper deals with the increase of photo-electric power produced by the action of oxidising agents on the water extracts and on certain organic substances.

PARIS.

**Academy of Sciences,** January 17.—M. Camille Jordan in the chair.—Gaston **Darboux**: An extension of Poncelet's theorems relating to polygons inscribed or circumscribed about conics.—Armand **Gautier** and Paul **Clausmann**: Fluorine in the vegetable kingdom. A table is given of the quantities of fluorine and phosphorus in various parts of the plant. In the choice of material special attention has been paid to substances utilised as food for men and animals. In plants the leaves are the organs richest in fluorine, the smallest quantities being present in stem, wood, and bark. The ratio of phosphorus to fluorine in the different organs of the plant follows no simple relation, but, as in animals, the two elements increase and decrease together.—Henri **Douvillé**: The Cosmoceratideæ; the history of a family of Ammonites, from a posthumous memoir of Robert Douvillé.—Ch. **Platrier**: The solutions of certain linear integral equations of the third species considered as limits of equations of the second species.—M. **Angelesco**: A class of polynomials with a single variable.—J. **Priwaloff**: The convergence of conjugate trigonometrical series.—Amé **Pictet** and Tsan Quo **Chou**: The formation of pyridine and *iso*quinoline bases starting from casein. Casein was hydrolysed by hydrochloric acid in presence of formaldehyde (added gradually as methylal), the product dried and distilled with lime. The mixture of bases obtained, amounting to 9 per cent. of the original casein, was freed from primary and secondary bases by treatment with sodium nitrite. From the residual tertiary bases pyridine, *iso*quinoline, and homologues of these were isolated. None of these bases were obtained if formaldehyde is not present during the hydrolysis of the casein.—S. **Reich**: The nitration of phenylpropiolic acid. Under suitable conditions *para*- and *ortho*-nitrophenylpropiolic acids can be obtained by direct nitration. No *meta* acid could be isolated.—G. **Friedel**: The observations of Hoga and Jaeger relating to certain lack of symmetry of crystal radiograms. A discussion of the possibility of these results being due to a slight imperfection in the orientation of the crystal plate. An error of 1° or 2° would suffice to produce all the phenomena described.—G. **André**: The displacement of potash and phosphoric acid contained in certain rocks by some substances employed as manures. Finely powdered minerals containing potash yield appreciable amounts of potash to water alone, and this amount is markedly increased if certain substances present in manures are added. Chalk, salt, and calcium sulphate produce about the same effect; sodium nitrate, and especially ammonium sulphate, cause larger amounts of potash to go into solution. The results of similar experiments on the extraction of soluble phosphate from apatite are also given.—H. **Bouygves**: The culture of the sugar-beet in the south-west of France. The yield per hectare has been found to be somewhat larger in the south (Lot, Lot-et-Garonne, Gironde, and Dordogne) than in the north, and the yield of sugar is not inferior.—M. **Bassuet**: The treatment of old wounds arising from the war. A contribution to the discussion of the hypothesis of micro-organisms remaining latent in old, and apparently healed, wounds. On treating open wounds of long standing by a polyvalent serum, either by injection or by simple local dressings, many cases have been observed of the formation of an abscess rich in pus at a distance from the point of injection or treated wound; but always forming under the scar of an old healed wound. Frequently (thirty-one cases out of forty-nine) fragments of clothes, splinters of bone, pieces of projectile, and, in one case, a drainage tube 7 cm. long, have been eliminated by the abscess. The local cure takes place rapidly, and coincides with a marked improvement in the general state of the patient. Out of 421 cases, after treatment without being cured during periods of eight to fourteeen months in various hospitals, 282 have been discharged cured.—L. G. **Seurat**: The morphology and phylogeny of the Acuaridæ.

CALCUTTA.

**Asiatic Society of Bengal,** January 5.—W. H. **Phelps**: Some Calcutta spiders. Among the points dealt with were:—*Cyrtophora citricola*: Their individuality, variety of characteristics, individual markings, industry and skill, elaborate snares, adaptability to artificial light, notwithstanding their home is in the garden or the jungle, nesting and snare building, aviating, skin casting, etc. *Spariolenus tigris*: A detailed description was given of nest building, the laying of eggs, the development of the egg into the young spider, with a time-table.—M. S. **Ramaswami**: A new species of Tephrosia from Sind. In this paper a hitherto unknown species of Tephrosia (family Papilionaceæ) with curious falcate or circinnate pods is described in Latin and in English. The distribution of this new plant is Sind and Rajputana. A plate with figures of parts of the plant, including floral dissections, is appended.

## BOOKS RECEIVED.

Manuals of Chemical Technology. v., Sulphuric Acid and Sulphur Products. By Dr. G. Martin and Major J. L. Foucar. Pp. viii+77. (London: Crosby Lockwood and Son.) 7*s.* 6*d.* net.

A Text-Book of Geology. By Profs. L. V. Pirsson and C. Schuchert. Part ii., Historical Geology. By Prof. C. Schuchert. Pp. vi+405–1026. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 12*s.* net.

A Meteorological Treatise on the Circulation and Radiation in the Atmospheres of the Earth and of the Sun. By Prof. F. H. Bigelow. Pp. xi+431. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 21*s.* net.

Graphics and Structural Design. By Prof. H. D. Hess. Second edition. Pp. viii+435. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 12*s.* 6*d.* net.

Third Appendix to the Sixth Edition of Dana's System of Mineralogy (completing the Work to 1915). By Prof. W. E. Ford. Pp. xiii+87. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.) 6*s.* 6*d.* net.

The London Matriculation Directory. January. (London: University Tutorial Press, Ltd.) 1*s.* net.

Annals of the Solar Physics Observatory, Cambridge. Vol. iii., part 1, August. The Solar Rotation in June, 1911, from Spectrographic Observations made with

the McClean Solar Instruments. By J. B. Hubrecht. Pp. 77. (Cambridge: At the University Press.) 9s. net.

Heaton's Annual. Twelfth Year. Pp. 463. (Toronto: Heaton's Agency.) 5s.

Canada. Department of Mines. Geological Survey. Memoir 80. Huron and Wyandot Mythology. By C. M. Barbeau. Pp. xiv+415+xi plates. (Ottawa: Government Printing Bureau.)

The Theory of Abstract Ethics. By T. Whittaker. Pp. viii+126. (Cambridge: At the University Press.) 4s. 6d. net.

An Introductory Course of Practical Magnetism and Electricity. By Dr. J. R. Ashworth. Third edition. Pp. xvii+96. (London: Whittaker and Co.) 2s. net.

The Journal of the Institute of Metals. Vol. xiv., No. 2. Pp. ix+289. (London: Institute of Metals.) 21s. net.

Forty-fourth Annual Report of the Local Government Board, 1914–15. Supplement containing the Report of the Medical Officer for 1914–15. Pp. xxxiv+100. (London: H.M.S.O.; Wyman and Sons, Ltd.) 6½d.

Proceedings of the Liverpool Geological Society. Cape Memorial Volume: On the Igneous and Pyroclastic Rocks of the Berwyn Hills (North Wales). By the late T. H. Cope. Pp. 115. (Liverpool: C. Tinling and Co., Ltd.)

Ray Society. The British Marine Annelids. Vol. iii., part ii. Plates. Polychæta—Opheliidæ to Ammocharidæ. By Prof. W. C. McIntosh. Plates lxxxviii–cxi. (London: Dulau and Co., Ltd.) 25s. net.

Memoirs of the Indian Museum. Vol v., No. 3, December. Fauna of the Chilka Lake. Crustacea Decapoda. By S. Kemp. Pp. 199–325. (Calcutta: Indian Museum.) 9 rupees.

Board of Education. Examinations in Science and Technology, 1915. Examination Papers and Reports of Examiners. Pp. 140. (London: H.M.S.O.; Wyman and Sons, Ltd.) 9d.

A Critical Revision of the Genus Eucalyptus. By J. H. Maiden. Vol. iii., part 4. Pp. 63–79. (Sydney: W. A. Gullick.) 2s. 6d.

## DIARY OF SOCIETIES.

*THURSDAY*, FEBRUARY 10.

ROYAL SOCIETY, at 4.30.—The Theory of the Helmholtz Resonator: Lord Rayleigh.—The Oxyhydrogen Flame Spectrum of Iron: Sir N. Lockyer and H. E. Goodson.—The Consumption of Carbon in the Electric Arc. III. The Anode Loss: W. G. Duffield and M. D. Waller.—Surface Friction. Experiments with Steam and Water in Pipes: C. H. Lander.—The Structure of Broadened Spectrum Lines: T. R. Merton.

ROYAL INSTITUTION, at 3.—Measurement of the Brightness of Stars; Visual and Photographic Magnitudes: Sir F. W. Dyson.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Testing of Underground Cables with Continuous Current: O. L. Record.

OPTICAL SOCIETY, at 8.—Optical or Visual Signalling: Dr. W. J. Ettles.

MATHEMATICAL SOCIETY, at 5.30.—(1) Theorems on Straight Lines Intersecting at Right Angles; (2) The Classification of Rational Approximations: J. H. Grace.—Infinite Derivates: Mrs. G. C. Young.—The Bilinear Curvature and other Functions of Independent Directions on a Surface: E. H. Neville.—The Attraction of Equiangular Spirals: Dr. Brodetsky.

*FRIDAY*, FEBRUARY 11.

ROYAL INSTITUTION, at 5.30.—Egyptian Jewelry: Prof. W. M. Flinders Petrie.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Annual General Meeting.

PHYSICAL SOCIETY, at 5.—A General Bridge Method for Comparing the Mutual Inductance between Two Coils with the Self Inductance of one of them: Prof. C. H. Lees.—An Enclosed Cadmium-Vapour Arc Lamp: Dr. H. J. S. Sand, D.Sc.

*MONDAY*, FEBRUARY 14.

ROYAL SOCIETY OF ARTS, at 4.30.—Flemish Architecture: Rev. Dr. H. West.

*TUESDAY*, FEBRUARY 15.

ROYAL INSTITUTION, at 3.—Nerve Tone and Posture: Prof. C. S. Sherrington.

ROYAL STATISTICAL SOCIETY, at 5.15.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—Oil Shales, especially those of Dorsetshire: W. Hardy Manfield.

*WEDNESDAY*, FEBRUARY 16.

ROYAL SOCIETY OF ARTS, at 4.30.—Women's Work During and After the War: The Hon. Lady Parsons.

ROYAL MICROSCOPICAL SOCIETY, at 8.—The Progress and Development of Vision and Definition under the Microscope: Messrs. Heron-Allen Earland, and Rousselet.—An Experiment with the Ultra-microscope: J. E. Barnard.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Rainfall of Nigeria and the Gold Coast: C. E. P. Brooks.—South African Coast Temperatures: Dr. J. R. Sutton.

*THURSDAY*, FEBRUARY 17.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* The Action of Cobra Venom: Prof. A. R. Cushny and S. Yagi.—Gametogenesis and Sex Determination in the Gall-fly, *Neuroterus lenticularis*. III.: L. Doncaster.—The Structure and Development of the Skull and Laryngeal Cartilages of Perameles, with Notes on the Cranial Nerves: Philippa C. Esdaile.—Physiological Investigations with Petiole-Pulvinus Preparation of Mimosa-Pudica: J. C. Bose and S. C. Das.

ROYAL INSTITUTION, at 3.—Variable Stars: Sir F. W. Dyson.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—A Synthetic Method of Determining Geographical Regions: Dr. J. F. Unstead.

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