THURSDAY, JANUARY 26, 1911.

THE SCIENTIFIC MEN OF AMERICA.

(1) *American Men of Science. A Biographical Directory.* Edited by J. McKeen Cattell. Second edition. Pp. viii+576. (New York: The Science Press, 1910.)

(2) *Leading American Men of Science.* Edited by D. S. Jordan. Pp. vii+471. (New York: Henry Holt and Co., 1910.) Price 1.75 dollars net.

THESE two books bear very similar titles, but they are nevertheless of totally different character, for whilst the first is an exhaustive dictionary of all the men of science at present living in the United States and Canada, the second consists of a series of biographical sketches of seventeen men of science who have all passed to the majority, but the period of whose activities range from the time of the foundation of the American Republic until last year. Prof. Simon Newcomb, who contributed one of the sketches to this volume, is himself the subject of another, and he died as lately as June 11, 1909.

(1) Turning our attention to the first volume, we may say at once that it constitutes a most valuable record. Under each name are given all the particulars which can be crammed into a small paragraph. We are informed not only as to the nature of each man's present position, but also as to that of every other position which he has occupied since graduation, and an outline of the nature of his contributions to scientific knowledge is appended. A full list of his degrees and other academic distinctions is likewise given. For the compilation of such a record no one could be better fitted than the editor, Prof. McKeen Cattell, who has taken such a large part in the organisation of American science, and is sometimes affectionately nicknamed by his colleagues, "the Lord Pooh-Bah of American science." The only doubt which rises in one's mind as to the utility of so complete a work is occasioned by the very frequent changes of position which occur in the American scientific world; for whereas in the older Eastern universities the tenure of a chair is almost as secure as in Europe, it is of the slenderest character in many of the newer institutions. Cases are not unknown of a newly-appointed president "sacking" almost half his staff, but the situation is not without its compensations, for dismissal by no means connotes disgrace, and the discharged members of the staff usually succeed in finding other posts before long.

The book which we are considering now appears in its second edition, but its first edition was issued in 1906. If it is to serve as an accurate guide to the addresses and positions of American men of science a new edition every year will be required. To the alphabetical list of names, Prof. Cattell has added about fifty pages dealing with the conclusions, at which he arrived by the use of statistical and graphic methods on the mass of material out of which the book is constructed. We may be permitted to hesitate before accepting Prof. Cattell's belief in the possibility of quantitatively estimating the "amount" of scientific ability which an investigator possesses. Prof. Cattell secured the cooperation of 120 "leading men" of science, to whom were submitted the names of their colleagues in their respective sciences. These names were then arranged in order of merit by each of them, and the final position of each man of science in the scale of merit was determined by the average of the positions assigned him by this "judicial committee" of his colleagues. It seems to us that the "probable error" involved in these estimates is so large as to vitiate almost entirely the value of the tables. Some of the minor conclusions, however, which Prof. Cattell draws are of interest. Judged by the number of scientific positions and by the number of men of science born there, Boston and the surrounding parts of the State of Massachusetts are still the intellectual centre of the country. The States of the middle west rank high when we consider the very recent origin of their universities, whilst the south constitutes, relatively speaking, an "intellectual desert."

Prof. Cattell has some weighty words to say about the inadequacy of the remuneration doled out to those who give their lives to scientific work. Next to the "bearing and rearing of children," he considers that creation in science and art is the most important service that can be rendered to the State, and he adds that

"No one can know that his work is of value except by the reflected appreciation of others, and in the existing social order the most adequate expression of this appreciation is direct payment for services rendered."

And again :—

"If the scientific man in the government service receives the salary of a clerk and is subject to the orders of a superior he will be treated like a clerk, *and in the end will deserve no better treatment.*"

Space forbids us to pursue this important subject further, but now that the daily Press is endeavouring to find reasons for the aggressive vigour of the German nation in commercial matters, there is irresistibly recalled to the writer's mind the occasion on which he joined in the International Zoological Congress in Berlin. On that occasion the Imperial Government placed at the disposal of the congress both Houses of Parliament. Important members of the Cabinet were deputed to assist at the general meetings, and the streets of Berlin were cleared by a police force, whilst the Kaiser "reviewed" a procession of members of the congress. The imagination staggers in the attempt to picture this state of affairs in England, but one cannot help wondering whether the attitude of respect to pure knowledge displayed in such acts has not just as much to do with Germany's success as her judgment in the matter of tariffs.

(2) The seventeen essays contained in the volume entitled "Leading American Men of Science" are of very unequal merit. Some of them, notably that by Mr. Slosson on Count Rumford, and those by Mr. Stone on the two American ornithologists, Wilson and Audubon, are charmingly written, and a great deal more interesting than most "short-story" romances, but others, possibly on account of their less

interesting subject-matter, are much duller compilations. The title "American" is given its widest possible connotation, for whereas Benjamin Thompson, later Count Rumford, was born in America, and with American versatility, served on both sides in the Revolutionary war, yet the whole of his scientific career was passed in Europe, and in London he founded the Royal Institution; on the other hand, Louis Agassiz was born in Switzerland, and only went to America as a man of science of established reputation when he was forty years of age. The word "leading" also by no means always signifies pre-eminence in research, for amongst the seventeen immortals we find the names of chemists like Silliman, and zoologists like Baird and Goode, who are remembered rather for their successful efforts to build up scientific institutions than for "epoch-making" research. The two last-named are associated with the development of the United States Fish Commission, and Dr. Goode, in addition with the building up of the National Museum in Washington.

But amongst the most interesting biographies from certain points of view is that of Prof. Willard Gibbs, who devoted his life to the working out of abstruse principles in mathematical physics, and produced results of such high importance that American students studying physics in Berlin were set to master the work of their own fellow-countryman, about which they had previously known nothing. That in a country so full of "hustle" and of the utilitarian spirit, a position should be found for such a man in which the sole duties were to instruct four or five advanced students in his speciality, augurs well for the intellectual future of America. A similar feeling is called to one's mind by the case of a brilliant investigator prematurely cut off, whose name has been, as we think, unadvisedly, omitted from this list; we refer to Prof. Charles Ward Beecher, of Yale, who described the anatomy of Trilobita. In his case also his teaching duties were light, and did not extend over more than five or six weeks in the year, and all the rest of his time was devoted to research; and the tangible results of his researches in palæontology, after they had been described in publications, were deposited in the museum, which was in this way built up. If with Prof. Cattell we consider that

"if he is to be regarded as a benefactor who makes two blades of grass grow in the place of one his services would be immeasurably greater who could enable two men of science to flourish where one had existed before,"

then the University of Yale, to which Prof. Willard Gibbs also belonged, must take high place in the rank of benevolent institutions.

One of the most valuable features of the volume under review is the account which it gives of the investigations of those of its subjects who were renowned for research. This account is presented in such a way as to be intelligible to the reader who is not a specialist. The editor, President Jordan of Leland Stanford University, has prefixed a preface in which are some things well worthy of being emphasised. "In the extension of coordination of human experience," he says, "lies the only permanent wealth of nations. And in this view is found the keynote of the present volume." Again :—

"As we understand better the universe around us our relations to others and to ourselves, the behaviour of our race becomes rationalised. It becomes possible for us to keep ourselves clean and to make ourselves open-minded, friendly, and God-fearing."

The spirit to which these lines give expression and which is reflected in the lives recorded in this volume is the better leaven of democracy. While to many at a distance the American Republic seems a seething mass of blatant and utterly unscrupulous commercialism in which the professor is regarded by the rich as a mere hired servant, and by the poor as a half lunatic "crank," yet on a nearer view it is seen that his disinterested devotion to truth does not fail of its reward, for nowhere else in the world are the dicta from the professorial chair given such wide publicity by the Press, and nowhere else have they such influence with the "sober second thoughts of democracy."

E. W. M.

THE FABRIC OF PHARMACY.

Chronicles of Pharmacy. By A. C. Wootton. Vol. i., pp. xii+428. Vol. ii., pp. v+332. (London: Macmillan and Co., Ltd., 1910.) Price, two vols., 21*s.* net.

IN the preface to this very interesting and attractive work, Mr. Wootton tells his readers that his original intention was to trace back to their authors the formulas of the most popular of our medicines, but that during the course of his researches he was tempted to stray into various by-paths. Few of those who take up the "Chronicles of Pharmacy" will regret that the author succumbed to such temptation and extended his investigations beyond the limits to which he had originally intended to restrict them.

The title is well chosen. The work does not profess to be a systematic history of pharmacy but a series of contributions in which the author shows how kings, quacks, philosophers, priests, men of science and others have contributed to build up the fabric of pharmacy and mould it into its present form. It has been well said that no subject can be thoroughly grasped and properly appreciated until its history is known, and this is undoubtedly true of pharmacy, yet how few pharmacists have any adequate knowledge of their profession or of the long series of modifications through which many of the preparations they daily handle have passed before acquiring the composition given to them to-day? Such information Mr. Wootton now offers them, and in a form so fascinating that, having once commenced to read, it is difficult to lay the work aside until the end is reached. From first to last the attention of the reader is riveted to the subject by the romance which the author has so skilfully delineated.

The work is divided into twenty-four chapters. From the first, which deals with the myths of pharmacy, the author passes to pharmacy in the time of the Pharaohs, of the bible, of Hippocrates, of Galen, of the Arabians, and of Great Britain. "Dogmas and Delusions," "Masters in Pharmacy," "Royal Pharmacists," "Chemical Contributions to Pharmacy,"

and "Medicines from the Metals" complete the first volume. Of the ten chapters in the second volume the most interesting are "Animals in Pharmacy," "Some Noted Drugs," "Familiar Medicines," "Noted Nostrums," and "Names and Symbols."

The state of pharmacy in the time of the Pharaohs is illustrated by a very concise but sufficiently complete account of the celebrated Papyrus Ebers, which is made more realistic by the reproduction of one of its pages. Comparison of the preparations prescribed in this historically invaluable collection of recipes with those employed in this country three thousand years later affords food for reflection; such comparison is easy, for several of the paragraphs are literally translated, and can be read side by side with several from Cockayne's "Leechdoms, Wortcunning and Starcraft," which soon follow in the same volume. The chapter in which these are quoted ("Pharmacy in Great Britain") makes very interesting reading for British pharmacists. Here the reader is introduced to a number of celebrities who have taken active part in the development of pharmacy in this country, and is made acquainted with the circumstances that ultimately resulted in the formation of the Pharmaceutical Society of Great Britain.

But perhaps the most interesting and certainly the most novel chapters in the work are the three that deal with "Noted Drugs," "Familiar Medicines," and "Noted Nostrums." In them the author was at his best, and it is not difficult to see that these were the chapters that lay nearest his heart. They constitute the first systematic attempt to compile a history of preparations and medicines the names of many of which are household words. Black draught, diachylon plaster, Dover's powder, sal volatile, hiera picra, and many others are discussed. The expert will speedily realise the lengthy and patient investigation that must have been needed to discover and sift the facts here presented in small compass. Full use has evidently been made of the literary treasures in the library of the Pharmaceutical Society, where Mr. Wootton was frequently to be seen deeply engaged in the study of old volumes. Probably few pharmacists are aware that the original formula for diachylon plaster was compiled during the reign of the Emperor Tiberius, or that hiera picra could be purchased in Rome or Alexandria two thousand years ago as it can be in London to-day; in both cases the principal constituents have remained the same though the adjuncts have varied. So also the chapter on "Noted Nostrums" contains most instructive accounts of remedies so familiar to the pharmacist as James's fever powder, Ward's paste, St. John Long's liniment, Warburg's tincture, and others. Moreover, it is impossible to read these chapters without insensibly acquiring a considerable knowledge of the changes through which pharmacy itself has passed.

Mr. Wootton's "Chronicles of Pharmacy" must be regarded as a very valuable contribution to the history of pharmacy, particularly in this country. It is written in scholarly style, is of absorbing interest, and shows abundant evidence of painstaking research. Though the pleasure felt in perusing it is tempered with regret that the author should not have lived to see the publication of his work, it is fortunate he should have had, in Mr. Peter MacEwan, an accomplished literary friend, able and willing to undertake the task of revising the proofs before the work was finally submitted to the public.

HENRY G. GREENISH.

THE CHICAGO TEXT-BOOK OF BOTANY.

A Text-Book of Botany for Colleges and Universities. By Prof. J. M. Coulten, late Prof. C. R. Barnes and Prof. H. C. Cowles. Vol. i., Morphology and Physiology. Pp. viii+484+xii. (New York: American Book Co., 1910.) Price 2 dollars.

IT is a difficult task, nowadays, to write a text-book of botany, because the subject has become so large as to render it impossible to treat even the more important sections of it within reasonable limits of space. Any attempt of this kind must be judged on the basis laid down by the authors, and from this point of view we think the new Chicago text-book has scored a distinct success.

The subject-matter is divided into morphology, dealt with by Prof. Coulter, physiology by the late Prof. Barnes, and ecology by Prof. Cowles. In the volume just issued the first two topics are treated. The section of ecology will, we understand, be published shortly. The book as a whole is organised on the general plan of study pursued at the Hull Botanical Laboratory of the University of Chicago, and general interest will be aroused in its appearance since this laboratory is one of the most active centres of botanical research in America.

We confess to a feeling that the subject has suffered from compression, but it may be taken, after all, that the text-book is rather a reminder than a source of the more important topics of instruction given in the lecture-room and the laboratory. One feels this, especially in the portion dealing with morphology. Prof. Coulter must have found it a hard task to pick out of the immense mass of material just the matter that would best serve his purpose, but we fancy that many who belong to a class more advanced than those who are officially known as students, will find the book useful. He has, we think, very successfully eluded the rather stereotyped grooves, and has modified the perspective of his part of the work. There is a freshness, and that indefinable sense of first-hand acquaintance with the matter in hand, which in spite of the inevitable brevity imposed by limitations of space, cannot fail to appeal favourably to the reader.

After a general survey of the various groups of plants, in which not only the results of recent work are incorporated, but a large number of new figures are introduced, Prof. Coulter concludes with a chapter on organic evolution. It need scarcely be said that the pages devoted to this question are interesting, but we feel inclined to join issue with the author on one point. In dealing with variation, he says that the difference between what is known as natural selection and mutation consists in the fact that the former deals with fluctuating variations which are small, while the latter depends on large variations. But surely the matter is not really a quantitative but a

qualitative one. Fluctuating variations *may* be (and sometimes are) very considerable, while mutational changes *may* be extremely small. The difference between them may perhaps be best appreciated by saying that a fluctuating variation is the outcome of a changed environment on an otherwise unchanged mechanism, whilst a mutation is the result of a changed internal mechanism, and even with a constant environment the product will not be identical with that of the unchanged type reacting with a similar environment. It is the change of the vital machinery which *necessarily* will shift the metabolism of the organism into a new channel, and henceforth will produce a new form, stable, until once more the constitution, or chemico-mechanical framework of the race, undergoes further modification. The change itself may be small or it may be large, but it is essentially in its occurrence at all, and independently of its magnitude, that the production of a mutation depends. Furthermore, that to this *new constitution* is owing the circumstances that mutants are on such a different plane from fluctuating varieties so far as reversions are concerned. It may be argued that this smacks rather of hypothetical statement than of proved explanation of the facts, but it may be urged that fluctuating variations and mutations at any rate do express *distinct kinds* of variations, that these are not merely quantitatively different, and that it is therefore probable that they depend on the existence of different factors, in the two categories.

The second portion of the volume deals with plant physiology. It is written in the incisive style we have been accustomed to expect from the late Prof. Barnes; the arrangement of the material is good, and the mode of presentation appears to us to be very well suited to the requirements of those classes of students for whom it is designed. A cautious attitude which is much to be commended on general grounds is observed towards many "explanations" of physiological phenomena. Many interesting data not commonly met with in works of this kind are included, and render the book valuable to student and teacher alike.

It will be apparent from the foregoing that we expect the "Chicago Text-book" to take its place as a valuable addition to the class books of botany, and we hope the appearance of the concluding part may not be long delayed. J. B. F.

PRACTICAL ZOOLOGY.

Leitfaden für das zoologische Praktikum. By Prof. Willy Kükenthal. Fünfte umgearbeitete Auflage. Pp. viii+320. (Jena: Gustav Fischer, 1910.) Price 7 marks.

IT is a significant fact that no British zoologist has yet thought it worth while to write a text-book of practical zoology on the lines of Prof. Kükenthal's admirable work, which has now reached its fifth edition. The reason is perhaps to be found in the fact that zoology is so very lightly esteemed by those who have the ordering of our educational system. For this no doubt zoologists themselves are largely to blame. The specialisation of original research during the last twenty years has led to the accumulation of an enormous number of facts, which, though valuable and interesting in themselves, are from the educational point of view to a very large extent redundant.

The student is expected to familiarise himself with a vast mass of minute morphological, embryological, and systematic details, as well as with a great deal of more or less speculative matter, much of which has not yet stood the test of time. He can scarcely see the wood for the trees, and realises that the subject has become one of the most difficult, if not quite the most difficult, which he can take up for examination purposes. At the same time, the almost complete absence of zoology from our school curricula renders the subject comparatively useless from the point of view of the student who is qualifying himself as a teacher. In Germany the study of zoology appears to be much better appreciated, and this is probably largely due to the fact that teachers treat it more reasonably and do not expect their students to accomplish an impossible task.

The work before us affords an excellent survey of the animal kingdom from the laboratory point of view. It is divided into twenty "Kurse," each dealing with a special group of animals. We do not know how long each "Kursus" is supposed to occupy, but the subject-matter dealt with in each would in this country be regarded as far too much for a single practical class. Thus the frog, the pigeon, the lizard, and the rabbit are each dealt with in a single "Kursus," and so are no fewer than thirteen types of Protozoa. Each "Kursus" consists of technical instructions, a general review of the group or groups dealt with, and a special description of selected types.

The plan of the work is very well carried out, and the numerous illustrations are excellent. Students of Marshall's "Frog," or Marshall and Hurst's Zoology, would no doubt regard the treatment of types as very superficial, but it is at any rate an open question whether it is not more important to gain a really comprehensive first-hand knowledge of the animal kingdom than to attempt to deal with a very small number of types in great detail. It must be borne in mind that Prof. Kükenthal's book is apparently intended for students of "Hochschulen," who are only taking a single year's work in zoology. For those who are able to take two or three years we do not doubt that the mode of treatment adopted in the English text-books above named would be preferable for the first year, but a work such as that under review, sufficiently amplified, is badly wanted for more advanced students in this country. A. D.

IONISATION OF GASES BY COLLISION.

The Theory of Ionisation of Gases by Collision. By Prof. John S. Townsend, F.R.S. Pp. xi+88. (London: Constable and Co., Ltd., 1910.) Price 3*s.* 6*d.* net.

IN various papers published during the last ten years Prof. Townsend has developed a theory of the ionisation of gases by collision, and has published experimental results which give it strong confirma-

tion. In this small book he now gives a connected statement of all his work.

The phenomena attending the passage of electricity through gases are in many cases very complex, but it has certainly been evident of late years that the fog which has covered the field of exploration is beginning to lift. Here and there we are able to see clearly for a little way and to grasp the relations of various points to one another. The simple and satisfactory theory of ionisation by collision, which Prof. Townsend has worked out, is an instance of this improvement. He shows in the first chapter of his book how electrons set free by the action of ultra-violet light or other agents from one wall of an ionisation chamber grow in number as they are guided across the chamber by a sufficient electric force. Collisions with gas molecules add fresh electrons to the stream, and when the force is not too great the number which eventually reach the opposite wall is an exponential function of the width of the chamber. He bases his explanation on the assumptions that (1) an electron must acquire a certain velocity before it can ionise a gas molecule by colliding with it; (2) a successful collision adds one, and only one, electron to the stream; (3) an electron after a collision, successful or not, has lost all the energy it previously possessed, and starts its career afresh. These assumptions can hardly be quite accurate, and the remarkable agreement between the calculated and the experimental results seems almost more than there is any right to expect. It is quite a satisfaction to find that the agreement does not hold in extreme cases, and that the failure is, as the author points out, in the right sense. The third assumption is certainly not always true; Prof. Townsend has himself shown, in later papers not discussed in this book, that an electron can acquire considerable energy in an electric field when moving through a very dry gas; in other words, that the electron does not then give up all its energy at each collision. Again, it is interesting to find that electrons are not to be supposed to be incorporated with the atoms with which they collide; or at least that it has been found possible to ignore such an effect. If the idea is a correct one, it seems unlikely that β-rays can ever be incorporated with atoms with which they collide. Thus the undoubted success of Prof. Townsend's theory opens up further questions of great interest.

In the second chapter it is shown that the positive ions must acquire far more energy than the negative before they can ionise. It is only when the electric force is very great that the influence of the positive ion is perceptible. When, however, the force reaches a certain value the combined action of the positives and the negatives is sufficient to multiply a small initial ionisation indefinitely, and there is a "discharge." The "sparking potential" can be calculated from the ionising coefficients of positives and negatives, as previously found by experiment, and here again there is an excellent agreement between calculation and actual test. A careful explanation is also given of the difference between the sparking potential and the potential necessary to maintain a discharge once started.

The argument of the book is generally quite clear, but there are occasional obscurities. On p. 23, for example, the statement is confused, though essentially accurate of course. "The element dy of these paths" is not a proper phrase.

The book is a welcome record of very useful and interesting work.

TWO PHOTOGRAPHIC ANNUALS.

(1) *Penrose's Pictorial Annual. The Process Year Book.* Edited by W. Gamble. Vol. xvi., 1910–11. Pp. x+192. (London: A. W. Penrose and Co., Ltd., n.d.) Price 5*s.* net.

(2) *The British Journal Photographic Almanac*, 1911. Jubilee issue. Edited by George E. Brown. Pp. 1348. (London: Henry Greenwood and Co., n.d.) Price 1*s.* net; cloth, 1*s.* 6*d.* net.

(1) "THE Process Year Book" has for its object the display of specimens of work done by each of the many and various processes of reproduction. Care is taken that each process is represented by a sample obtained with the maximum of efficiency of that process. The volume thus gives the reader an idea of the standard of the workmanship of to-day attained in each case, and also a comparison between the different kinds of results that can be secured.

There is no doubt that many of the processes of reproduction of to-day are really very fine, and a glance through these pages will probably make the reader think that it seems scarcely possible to produce better work. Yet those who are closely associated with the subject, and they are the people who know the true failings, take a somewhat pessimistic view. Thus the editor in last year's annual was of the opinion that the beautiful processes were on the downward grade, and in this volume he states "it cannot be said that the situation is much changed." The race for speed and large output, coupled with no time or desire to experiment, are among the reasons he gives for this halt, or rather retrograde movement.

Nevertheless the volume before us demonstrates that a very high stage of efficiency has already been reached, and it is possible that because such rapid progress in advancement as previously made is not maintained now, this pessimistic view is held.

The amount and quality of the work embodied in this volume is a credit, not only to the editor, Mr. William Gamble, but to the publishers, Messrs. Percy Lund Humphries and Co., Ltd., and the proprietors, Messrs. A. W. Penrose and Co., Ltd. A large number of brief but interesting chatty articles on various branches of the subject are interspaced among the large number of illustrations, and the variety and high standard of the latter are to be highly commended.

Every trouble has been taken to give credit to those who have contributed to the volume, and it may be said that this issue even excels the very excellent volumes which have been noticed before in these columns.

Not only will the book be of high interest to all

acquainted with reproduction processes, but it should be consulted by those who wish to gain an idea of the many methods available. As a picture book alone the volume is cheap at the price of 5s.

(2) This very serviceable publication celebrates its jubilee in the present year. This series of almanacs commenced its life as a wall or sheet calendar, and appeared as a supplement to the *British Journal of Photography* in the year 1860. The current volume is decidedly bulky, and weighs 2·75 lb. Appropriately, it passes in review its past history, and contains a number of portraits of editors and publishers, past and present.

Our photographic readers are all familiar with the general nature of the contents of recent issues, so that it is not necessary to recapitulate these. The epitome of progress, contributed by the editor, is a conspicuous feature as usual, and gives a very useful set of classified abstracts of papers, communications, and articles describing the progress made in technical photography, which have appeared in the British and foreign Press during the twelve months ending October 20, 1910. This alone occupies about 140 pages. Another subject treated, most helpful to those who cannot make themselves acquainted with it first hand, is that which deals with recent novel introductions in photographic apparatus; the eighty-six pages devoted to this are deserving of close attention. The formulæ for photographic processes, covering sixty-seven pages, and the instructions for the use of commercial photographic materials, occupying sixty-five pages, are valuable features to have brought together under one cover. The various tables—chemical, exposure, optical, &c.—and the directory of photographic bodies and societies, all of which are brought well up-to-date, seem to show the mass of useful material embodied in this almanac.

No mention has yet been made of the useful and well-indexed advertisements, which take up nearly two-thirds of the 1348 pages, that compose the volume. These in themselves are very handy for reference. The jubilee number is thus a fitting volume for the occasion, and should, as usual, be in every photographic studio or laboratory.

GEOLOGY AND LANDSCAPE.

Geologische Charakterbilder. Edited by Prof. Dr. H. Stille. Heft ii., Grosse erratische Blöcke im norddeutschen Flachlande. By F. Wahnschaffe. Pp. v+6 plates. Price 3.60 marks. Heft iii., Das Karstphänomen. By A. Grund. Pp. iii+6 plates. (Berlin: Gebrüder Borntraeger, 1910.) Price 4.80 marks.

THE object of these "Charakterbilder" is to provide geologists with a series of illustrations of natural phenomena, which shall be accurate and typical. The authors are selected for special knowledge, and supply several pages of text, printed on sheets of the same size as the plates. The plates, however, are loose, and can be used in the work of small classes, or can be framed for laboratories.

Herr A. Grund deals with the features of the karstlands, and surely a grey instead of a brown tint would have done more justice to the pictures that he has brought together. Except for welcome patches of *terra rossa* round the dolinas, sometimes perhaps turned up newly by the plough, the impression of the karst is eminently white or grey. A few dark trees, themselves almost colourless, break or serve to emphasise the monotony of the slopes. The author aptly compares the dolinas to the valleys of normal areas; they are the channels that lead off the water in a permeable land. The character of a plateau is, moreover, preserved without marked local dissection, in a district where there can be no considerable surface-streams. A peneplane, once established, long remains a peneplane. An interesting discussion is given in connection with plate ii., as to why the limestone or karst areas of higher latitudes, as in Moravia or Champagne, are covered with vegetation, in opposition to those of the Mediterranean region. The chief factor is held to be weathering by frost, which soon cumbers the surface with blocks that promote a soil. Signs of mechanical weathering are almost absent in the barren karstlands. A typical polje is shown from Herzegovina in plate vi., with its alluvial floor contrasting sharply with the desolate limestone hills. In this case the form of the basin is attributed, as in many Bosnian examples, to the deformation of a valley-floor by earth-movements.

Herr Wahnschaffe had a simpler task in describing, in the previous part, a number of large erratics found on the North German plain. The greatest of these, a mass of garnet-mica-gneiss, occurs in a churchyard at Gross-Tychow in Hinterpommern, and measures, above ground, 3·74 m. in height, 15·90 m. in length, and 11·25 m. in breadth. The thick-set fir-woods that surround most of these wanderers from Scandinavia form "Charakterbilder" in themselves. The author provides a clear, brief essay on the history of the theory of glacial transport, beginning with Playfair in 1802. G. A. J. C.

FOSSIL REMAINS OF MAN.

Der Stand unserer Kenntnisse vom fossilen Menschen. By Prof. W. Branca. Pp. viii+112. (Leipzig: Veit and Co., 1910.) Price 2.50 marks.

WITHIN the last few years there has been a marked recrudescence of interest in the study of the fossil remains of man, and the stream of literature relating to the subject has suddenly become so voluminous that the torrent threatens to overwhelm those readers who cannot devote their whole time to its perusal. In these circumstances any attempt to summarise and criticise this recent work is likely to meet with a hearty welcome, even though, as the author of this work frankly admits, it is far from complete.

Like the compiler of an analogous report on the same subject in this country (Sollas, presidential address to the Geological Society, 1910), the author of the book under review is a geologist, and as such he deals in a critical spirit with the determination of the age of the remains of diluvial man, insisting upon the need for placing chief reliance upon stratigraphic evidence, secondarily on that afforded by associated

animal remains, and least of all on the productions of man's industry.

He deals mainly with evidence which has come to light since 1901, when he discussed the whole subject at the International Zoological Congress.

After describing the distinctive features of the two main cranial types found in diluvial times—the higher or Cro-Magnon type, "which still persists in Europe," and the lower or Neanderthal type, "which still persists in Australia"—he describes specimens from Cheddar, Terra d'Otranto, Monteferrand-Périgord, Mentone, and Galley Hill as examples of the former, and those from Krapina, Vezere, Heidelberg, and Corrèze of the latter, but makes a third (intermediate) group to include some of the Mentone crania.

There is no reference to the Gibraltar skull or to any recent English writings, except those of Mr. Macnamara; but he quotes at length from Rutot's memoirs on the Galley Hill skull, which assign to it a singularly great importance as "the geologically oldest diluvial human remains," taking care to add "if M. Rutot is right."

After a destructive criticism of Ameghino's supposed Tertiary remains of man found in South America, he discusses the question whether the inferior type of diluvial European cranium is older than or ancestral to the higher type, and comes to the conclusion that there are many difficulties in the way, including the possibility that the higher type of skull may be older than the lower type.

He argues against the derivation of man from any such anthropomorpha as the existing man-like apes. There is an interesting chapter on fossil anthropoid apes, great stress being laid, and quite justly so, on Schlosser's recent discovery in Egypt of a diminutive Oligocene anthropoid—Propliopithecus Haeckeli.

Startling surprises await the reader as he approaches the close of this sober, critical, and characteristically thorough teutonic analysis of the state of our knowledge of fossil man, for he finds a chapter devoted to the serious discussion of whether Pithecanthropus may not be the bastard offspring of the union of a woman and a male Gibbon! And no sooner has he recovered from the effects of this speculation than the author launches into a polemic against what he calls "the fanatics of the Church and monism"—the chief "clerical fanatic" being the genial and popular entomologist, Father Wasmann, and the "monistic fanatic," Prof. Haeckel. He ends the work with a confession of his attitude towards the Christian religion!

G. ELLIOT SMITH.

OUR BOOK SHELF.

Schopenhauer-Darwin: Pessimismus oder Optimismus. By Gustav Weng. Pp. 189. (Berlin: Ernst Hofmann and Co., 1911.) Price 2 marks.

THE author describes the "struggle for existence" in somewhat lurid language, as a preparation for the introduction of the doctrine of his master, Schopenhauer. The weak go to the wall, the fit survive. In a few millenniums there will be nobody but the happy strong. Life is a game, a gladiator-fight, and the survivor is the best. The process is unmoral or immoral, but "the end justifies the means."

After some clever cut-and-thrust at the progress-enthusiast, in the style of Carlyle's remark that it may be progress backward, towards the devil and the pit, Herr Weng indicates his own opinion as follows:—"The exact sciences confirm Schopenhauer's Pessimism in every detail. Therefore can he alone of all philosophers satisfy our Reason and our indestructible metaphysical needs, without denying nature-knowledge, or forcing on us religious fairy-tales . . . this philosophy knows no continuance of individuality after death. For it, the individual is a form of objectification of the Will to Live." This will to live must be denied; thus only can the contradiction which has arisen between moral law and natural law (struggle for life, immoral survival of the strong) be resolved. The end of the scientific progress-philosophy—Darwinian evolution—is pessimism: the choice is between a scientific pessimism with no redemption, and a philosophic pessimism which does admit of putting things right.

The foregoing condensation will give an idea of this rather one-sided yet readable little book. Its criticism of the evolution theory is itself open to criticism, for though that theory issues in pessimism from the purely materialistic point of view ("nature red in tooth and claw with ravin," cruel, pitiless of suffering) it does not follow that the point of view is the right one. There may be meaning and purpose in all suffering, and an optimistic philosophy may be possible by extending the principle of development into a spiritual world. The assumption that the world exists for our education, says Emerson, is the only sane solution of the enigma. J. A. H.

Die experimentelle Grundlegung der Atomistik. By W. Mecklenberg. Pp. viii+143. (Jena: G. Fischer, 1910.) Price 2.50 marks.

THIS book is an extended reprint of articles which have recently appeared in *Die Naturwissenschaftliche Wochenschrift* and were written with the purpose of giving an account of the recent additions to our knowledge about molecules, their mean free path, radius, mass, &c., It is intended in the first place for chemists and physicists who have not time to consult original papers, but as the mathematics are exceedingly simple, the author hopes it may be suitable for a semi-popular audience.

There is first an account of the different means of obtaining molecular data from the kinetic theory of gases. Also, it is shown how the radius of the molecule may be calculated from the molecular refraction or from the constant of Van der Waals's equation. Then follows a section on the Brownian movement, in which the recent work of Perrin and Svedberg is described. There is also an account of the ultramicroscope and the continuity of suspensions and solutions. Finally, we have a section, which is fully up-to-date, on the more hackneyed subject of electrons and the atomic theory of electricity. At the end of the book there is a list of references and an index of names. The book is thus very complete, and gives a large amount of information for its size, and the style is clear and interesting.

According to the author, it has been the chief function of the recent physics and chemistry to prove the existence of atoms by direct experiment, the word atoms being used in the widest possible sense; before, it could only be inferred indirectly. Hence the title of the book, "The Experimental Founding of the Atomic Theory." In this his point of view appears to us somewhat artificial. While we have now no doubt a much stronger faith in atoms, yet that has come only in the train of other ideas, and does not accurately describe the change in our outlook.

The table mentioned on pp. 25 and 40 as being at the end of the book is really at p. 64.

Kant and His Philosophical Revolution. By Prof. R. M. Wenley. Pp. ix+302. (Edinburgh: T. and T. Clark, 1910.) Price 3*s*.

In a letter to Stägemann, in 1797, Kant made a seemingly arrogant remark. He said: "I have come with my writings a century too soon; after a hundred years people will begin to understand me rightly, and will then study my books anew, and appreciate them." And indeed the estimate and the prophecy were supported by the most brilliant historian of modern philosophy, and by the writer of the best book on Kant in our tongue—by Kuno Fischer and Edward Caird, namely.

The prophecy no doubt refers to the "Critiques," but Kant's contributions to science are important also. The "Cosmogony"—admirably translated by Hastie—is an astonishing book. It forecasts the conception of evolution, and its scheme is adjustable to all discoveries since made. "Law replaced Lucretian chance, simplicity expelled Cartesian involution, mechanism dispersed the clouds of mysticism raised by Malebranche." Herschel and Laplace were anticipated, and their very errors avoided with marvellous intuition. Where Kant made mistakes, it was inevitable, often owing to lack of mathematical resources, as in his calculation (for the first time) of Saturn's diurnal period.

In metaphysics, Kant's fame is, of course, that of a destroyer. He demolished the various famous "proofs" of God, freedom, and immortality. So far as reason goes, the analysis of the first and most famous "Critique" compels an agnostic attitude, and "man is thrust back powerless in face of his own most characteristic expressions and need." In the later works, they are justified as postulates or necessary hypotheses of the practical reason, giving occasion to Heine's famous sneer.

Prof. Wenley gives an excellent sketch of the condition of Germany in Kant's time, both intellectual and material, and his careful bibliography will be of use to many students. The style is popular and lucid—a difficult thing to manage in an exposition of a writer who uses such terrible terminology as we find in the "Critique of Pure Reason."

Plant Life in Alpine Switzerland, being an Account in Simple Language of the Natural History of Alpine Plants. By E. A. Newell Arber. Pp. xxiv+355+xlviii plates. (London: J. Murray, 1910.) Price 7*s*. 6*d*. net.

It is exceedingly true, as the author remarks, that a large number of visitors to Switzerland are aroused to great enthusiasm by the masses, brilliant colouring, and variety of the Alpine flowers. Whether their enthusiasm is sufficiently deep to induce biological inquiry and observation in many cases is doubtful, but the author is likely to be quite content if only a small proportion is led to take an intelligent interest in the information which he has set out with evident care and admirable clearness. Also, it may be expected that not a few botanists will be glad to avail themselves of the author's introduction to Schroeter's, Christ's, and Bonnier's studies.

The details are marshalled under genera, while the genera are arranged according to habitat, so that the chapters treat of alpine pastures, meadows, marshes, forests, and the high alpine region. Biological features provide the chief themes, among which may be noted pollination, structural modifications, colour and colour variation discussed in connection with the gentians, fruit of the anemones and Geum and contractile roots of Veratrum; cushion, carpet, and rosette plants are dealt with in the chapter devoted to the high alpines, although it is intimated that rosette plants are quite as numerous in lower alpine localities. A very large number of genera are included; of these, the willows, *Salix reticulata* and *Salix herbacea*, would generally escape notice, while the Papilionatæ and louseworts would attract more attention than they receive here. In the last chapter the author presents an interesting sketch of modern hypotheses regarding the origin of the Swiss alpine flora. A glossary and an introductory account of floral structure are supplied in the appendices; these should render the book intelligible to readers who have had no botanical training, as the author's style is simple and explicit. Finally, a word of commendation should be accorded to the excellent illustrations and the useful diagrams, the latter prepared by Mrs. Arber.

Index to Desor's Synopsis des Echinides Fossiles. By Dr. F. A. Bather, F.R.S. Pp. 46. (London: The Author, at "Fabo," Marryat Road, Wimbledon, 1910.)

By the publication of this index Dr. Bather has supplied a long-felt want and has done a valuable service to all students of living and fossil echinoids. Needless to say, he has carried out his important task with great care and thoroughness. The scheme adopted for the main part of the work is that which is employed by Mr. C. D. Sherborn in his well-known "Index Animalium"; that is to say, the first part of the index contains all generic and trivial names alphabetically arranged, while the second part sets forth the generic names, each one followed by an alphabetical list of all the trivial names which have been associated with it in the "Synopsis." Certain pages of Desor's work appeared in more than one issue and on varying dates, and due regard has been paid to these irregularities by a quotation of actual dates immediately following the page references in question in both parts of the index. Another important feature is the indexing of the plates, on which appeared some names that are not to be found in the text.

Systematic workers have always experienced much difficulty in ascertaining the dates of issue of the various fasciculi of the "Synopsis," and of the reissue of cancelled and revised pages, and it is therefore a matter for great satisfaction that the author has been able to include in this index a note on the dates of publication, contributed by such a high authority as Mr. Jules Lambert. It so often happens that nomenclatural accuracy is dependent on bibliographical precision that a special value attaches to Mr. Lambert's note and to an exhaustive collation, supplied by Dr. Bather, which immediately follows it.

Man's Redemption of Man. By Prof. W. Osler, F.R.S. Pp. 60. (London: Constable and Co., 1910.) Price 1*s*. net.

An address delivered by Prof. Osler to students of the University of Edinburgh in July last is here presented to a wider public. The message is that of the gospel of science. By observation and thinking, the Greek philosophers grasped great principles and arrived at brilliant generalisations, but not until the secrets of nature were searched out by experiment did the scientific redemption of man begin. The mastery "Of Earth and Water, Air and Fire," is to be obtained by following the experimental method; and through it the conquest of disease and suffering may be confidently anticipated. Unnecessary pain was banished by the introduction of anæsthetics, Listerian surgery has revolutionised the treatment of wounds, while cholera, yellow fever, malarial fevers, and other epidemic diseases have been brought under control. Tuberculosis has yet to be stamped out, and the campaign must be carried on until it is in the same category with typhus fever, typhoid, and smallpox.

The occasion on which Prof. Osler delivered his lay sermon was the Edinburgh meeting of the

National Association for the Prevention of Tuberculosis. The trumpet-call is short, but its clear notes should inspire confidence in the ranks of the small army now fighting against ignorance and disease.

G.

Weather Instruments and How to Use Them. By D. W. Horner. Pp. 48. (London: Witherby and Co., 1910.) Price 6*d.* net.

THIS handy little work is intended chiefly for amateurs, but it includes descriptions of instruments required for a "second-order" station, while difficulties which the author thinks are apt to "scare off" novices are avoided. It contains much that is interesting and useful, but its reading leaves us with the impression that persons wishing to take up the subject seriously might at once turn to the handbooks and instructions issued by recognised authorities. Some instruments and methods not suitable for second-order stations are also included, and, naturally in so small a work, no tables are given. Under air-pressure the necessity of using accurate barometers is pointed out. Reference is also made to the so-called Fitz-Roy barometer, which, like the Gladstone bag, is, we believe, only a trade name; as it is easily read, it may, however, be useful to the ordinary individual, who merely uses the barometer as a "weather glass."

Willing's Press Guide and Advertisers' Directory and Handbook, 1911. Pp. xiv+457. (London: James Willing, Jun., Ltd.) Price 1*s.*

THIS is the thirty-eighth year in which this concise and comprehensive index to the Press of the United Kingdom has appeared. The volume also contains a list of the principal colonial and foreign journals and a variety of general information.

Field and Colliery Surveying. A Primer Designed for the Use of Students of Surveying and Colliery Manager Aspirants. By T. A. O'Donahue. Pp. xii+263. (London: Macmillan and Co., Ltd., 1911.) Price 3*s.* 6*d.*

A REVISED and enlarged edition of this book was published in 1909, under the title, "Colliery Surveying." The opportunity has been taken with this new issue to make further additions and to change the title so as to direct attention to the prominence given in the work to field surveying.

Solutions of the Examples in an Elementary Treatise on Conic Sections by the Methods of Coordinate Geometry. By Charles Smith. Pp. iv+377. (London: Macmillan and Co., Ltd., 1910.) Price 10*s.* 6*d.*

THE master of Sidney Sussex College, Cambridge, here provides a "key" to the examples in the new edition of his "Treatise on Conic Sections by the Methods of Coordinate Geometry," published recently.

La Metallographie appliquée aux produits Siderurgiques. By U. Savoia. Pp. x+218. (Paris: Gauthier-Villars, 1911.) Price 3.50 francs.

THIS is a French translation from the Italian, and as the English equivalent has already been noticed in NATURE (December 15, 1910, p. 202) nothing further need be said, except that the work of rendering into French seems to have been carefully done, and that there are altogether ninety-four illustrations in the text.

Key to Hall and Stevens's School Arithmetic. Part II. By L. W. Grenville. Pp. 174. (London: Macmillan and Co., Ltd., 1910.) Price 6*s.*

BUSY teachers, and students working alone, will welcome these well-arranged solutions to the examples in the second part of Messrs. Hall and Stevens's "School Arithmetic."

LETTERS TO THE EDITOR.

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

The Inheritance of Acquired Characters.

IN his very friendly notice of my little book, Prof. Meldola has invited readers of NATURE to furnish an explanation of the source of a very "pregnant" passage —the only one dealing with the subject in question—in the "Origin of Species." Sir W. T. Thiselton-Dyer has clearly shown that the problem must certainly have been in Darwin's mind at least four years before the writing of the "Origin," when he was absorbed in the reading of the great work of Alph. de Candolle, and afterwards while writing the "Variations of Animals and Plants."

But, thanks to that important work, "The Foundations of the Origin of Species"—by the publication of which Dr. Francis Darwin has placed all students of the history of science under such deep obligations—I think it is possible to trace the actual "genealogy" of the passage, and to detect its origin, at a far earlier period.

In the pencil-written sketch of 1842 there occurs the following sentence in the equivalent position to the passage in question:—

"Most of these slight variations tend to become hereditary" ("Foundations," p. 1).

It is true that this sentence was erased by Darwin, but that this erasure was only due to the fact that he considered it unessential in the very brief outline of the theory of natural selection which he then "permitted" himself to make is, I think, proved by the circumstance that the statement appears in the enlarged and carefully written draft of 1844 in the following terms:—

"Most organic beings in a state of nature vary exceedingly little: I put out of the case variations (as stunted plants, &c., and sea-shells in brackish water) which are directly the effect of external agencies and which we do not *know are in the breed* or are *hereditary*" ("Foundations," p. 81).

The italics are Darwin's own. The context, I think, proves that "little" in this passage, like "slight" in the earlier one, refers to the *individual* variations, and not to their *accumulated result.*

In the first edition of the "Origin," and in all subsequent editions, as Sir W. T. Thiselton-Dyer points out, the statement runs:—

"Some authors use the term 'variation' in a technical sense, as implying a modification directly due to the physical conditions of life; and 'variations' in this sense are supposed not to be inherited"; he then goes on to refer to dwarfed shells, &c.

Now to realise what was at the back of Darwin's mind in writing these several passages, I think we must go back to the great controversy at the beginning of last century between Cuvier and his followers and the adherents of poor old Lamarck. The position taken up by the anti-evolutionists was that, while they admitted the transmission by inheritance of *small* variations, they stoutly denied that great changes in structure and habit, such as were required by Lamarck's theory, could be so transmitted.

Lyell, when he first read Lamarck's great work in 1827, was greatly fascinated by it, and down to 1830, and some time after that, became convinced (as his letters to Sedgwick, Whewell, and Herschel show) of the truth of the doctrine of organic evolution. But, as was the case with Darwin, a few years later, his ideas on the subject underwent many vacillations. He paid frequent, and sometimes prolonged, visits to Paris, where Cuvier showed him much kindness, inviting him to his receptions. Lyell, then still young and an ardent admirer of Cuvier's palæontological work, could not fail to be impressed by the arguments of the distinguished Paris circle, and we especially find that their studies of the Egyptian mummified animals and of the anatomy of the races of dogs had a very strong influence on his mind. Thus it came about that in 1832, when he wrote the second

volume of the "Principles," Lyell not only rejected the theory of Lamarck, but went far towards abandoning, for the time, any idea of "the transmutation of species."

It is scarcely necessary here to recall the fact that this second volume of the "Principles," so full of discussions bearing on the changes in organic life, reached Darwin in South America, just at the time when he was startled by discovering the relations between the living and recently extinct mammals of that continent. From that time forth Darwin no longer regarded the question of evolution with indifference. In the critical period between the return of the *Beagle*, in 1836, and the writing of the first sketch of the theory, in 1842, constant intercourse took place between the two friends: "I saw more of Lyell," says Darwin in his autobiography, "than of any other man, both before and after my marriage" (in 1839). In their frequent discussions, Darwin would become fully acquainted with the arguments of Cuvier and his school, which are, indeed, very clearly and trenchantly reproduced in the first three chapters of the second volume of the "Principles," which Darwin called his "own true love."

These facts borne in mind, I think we can have no difficulty in realising the source of the statements made by Darwin. I think the sentences may be paraphrased as follows:—

"Anti-evolutionists *admit* the inheritance of *small* variations. Well, the inheritance of such small variations is all I require for my theory of Natural Selection. I can afford to concede the non-inheritance of the greater variations."

But it is interesting to notice that in the sentence about plants and sea-shells following the passage in question, and in his discussion of the appearance and inheritance of a *sixth digit* in man, &c., Darwin was not satisfied that *only* small variations were transmitted.

It was the remembrance of facts like these that led me to suggest that the subject was "constantly present" in Darwin's mind. Prof. Meldola, thinking of the more acute discussion of the question aroused in 1885 by Weismann's declaration that *no* acquired characters are inherited, naturally expressed doubt on the subject, and I, of course, admit that this phase of the question, in all probability, never presented itself to Darwin, or at least never demanded his serious consideration.

Kew. JOHN W. JUDD.

The Transference of Names in Zoology.

As the preparation of an official list of *Nomina conservanda* is now under consideration by the International Commission on Zoological Nomenclature, it may not be out of place to direct attention to a point that seems to me of prime importance in this connection, although it has received little notice from recent writers on nomenclatural reform.

It is simply this—while the rejection and replacement of familiar names for well-known animals is, of course, an inconvenience to zoologists, it is a trivial matter in comparison with the grave possibility of confusion that arises when the names are used in an altered sense. In the former case we merely multiply synonyms, and, unfortunately, they are so numerous already that a few more hardly matter; in the latter case there is a real and serious danger of ambiguity. Thus, at present, a writer who mentions Trichechus may be referring either to the walrus or the manatee, Simia may mean either the orang or the chimpanzee, Cynocephalus may be either a "flying lemur" or a baboon, and so on through all the great groups of the animal kingdom until we come to Holothuria, which may refer either to a sea-cucumber or to a Portuguese man-of-war. Cases like these seem to me to be on an entirely different plane as regards practical importance, from those in which an old name is simply rejected; even if the shore-crab is to be called Carcinides for the future, we have only the additional burden of remembering that it was once called Carcinus.

A striking (if somewhat exceptional) instance of the pitfalls that are in preparation for future students is found in the section on Crustacea in Bronn's "Thierreich" (Bd. v., Abth. ii.). On p. 1056 there is an allusion to "Astacus," and on the following page to "Astacus (=Homarus)." In the bound volume (unless the part-wrappers have been kept in place) there is nothing to show that a change of authorship intervened between those two pages, and that, while the second "Astacus" refers to the lobster, the first indicates the crayfish.

If the International Commission could be persuaded to consider first those names that are threatened with *transference*, before proceeding to deal with those that are merely in danger of *replacement*, they would, I believe, secure the support and cooperation of many zoologists who have doubts as to the practicability of the schemes lately put forward. W. T. CALMAN.

British Museum (Nat. Hist.), Cromwell Road, London, S.W., January 23.

Sex Relationship.

IT seems a pity that writers should allow their political bias to influence their work, and especially that they should not at least ascertain the facts of a case before writing about it.

In his article on "Sex Relationship" in NATURE of January 5, Dr. R. J. Ewart said, in commenting on the present excess of females over males:—"The result of this is to produce in a community a section of women who cannot possibly perform that function for which they were fashioned. Their energies are naturally directed into other spheres, as evidence of which we see the revival of the movement for political recognition. The agitation is no new one, and apparently is dependent for its strength and virility on the position of the sex pendulum," &c.

Now, first, it may be observed that women are no more fashioned to perform a single function than men are; their natures are as complex, their brains as varied as men's—in fact, "God Almighty made 'em to match the men."

Secondly, the excess of females of all ages over males in this country is between one and two millions, while *five* million women earn their own livelihood. Thus a large number even of those who perform "the function for which they were fashioned" are obliged to "direct their energies to other spheres," quite irrespective of any excess of females.

Thirdly, there is no *revival* of the movement for political recognition—it has culminated. Since it first began with any vigour, in 1867, it has gone steadily on, and its greater activity during the last five years has been due to the genius and courage of two women, who had the political insight to realise that, by some curious quality in the psychology of men, the only tactics that are successful in obtaining a reform of the franchise are militant tactics.

Fourthly, the countries in which English-speaking women have already gained their political freedom are *not* those in which there is an excess of women over men, but are the comparatively new countries—New Zealand, Australia, and some of the western States of America.

Dr. Ewart errs in attributing to a purely physical cause a movement which really arises from a mental and moral awakening—and, indeed, his whole article is full of unsupported assertions and loose reasoning; but I should not have ventured to criticise it had he not so clearly allowed his judgment to be warped by his political bias.

HERTHA AYRTON.

41 Norfolk Square, Hyde Park, W., January 9.

I AM sorry that my little paper should have been taken as prompted by political bias. I am sure that its possible influence on the Suffragette question never entered my head. I should be quite willing to answer any question Mrs. Ayrton may care to put to me should she care to write me privately. I am not willing to enter upon a public correspondence. R. J. EWART.

The Health Department, Municipal Buildings, Middlesbrough, January 12.

The Origin of Man.

THE reference in "Dodsley's Annual Register for 1767," mentioned in NATURE of January 12 (p. 336), is to James Burnett, Lord Monboddo, whose speculations as to the simian origin of man excited so much ridicule amongst

his contemporaries. Boswell reports a saying of Johnson in 1773:—"Other people have strange notions, but they conceal them. If they have tails they hide them, but Monboddo is as jealous of his tail as a squirrel."

Burnett's work "On the Origin and Progress of Language," in which these speculations are put forward, only began to appear in 1773, but his views were evidently familiar at an earlier date. He became a Lord of Session in 1764. CECIL H. DESCH.

University of Glasgow, January 16.

[MR. F. GILLMAN, Brook House, Matlock, has sent a letter to the same effect.—ED. NATURE.]

POPULAR ORNITHOLOGY.[1]

IN producing yet another book on the birds of Great Britain [1] the editor points out that one result of the growing interest taken during recent years in the study of ornithology is a considerable addition to our knowledge of the habits of British birds; that as no comprehensive British work on the subject has appeared since those of Yarrell (revised by Newton and Saunders) and Seebohm, this knowledge is only available by searching through a large and scattered literature; that the new edition of the Naumanns' work leaves unrecorded many of the observations on the habits of our birds that have been made in our own and other countries, and that there is therefore place for a work that will bring together from every source, foreign and native, all the available information of any importance concerning the habits of British birds. To do this, and to do it in a form interesting alike to the student of animal life and the general reader, is the chief object of the present undertaking. This is to say the least an ambitious project. In carrying it out the editor will have the assistance of the following writers, J. L. Bonhote, William Farren, the Rev. F. C. R. Jourdain, W. P. Pycraft, Edmund Selous, A. Landsborough Thomson, and Miss Emma L. Turner, who have been left to arrange and treat the matter within each section of a chapter written by them "in the way best suited to his style and temperament, thus avoiding cut-and-dried uniformity with its resulting aridity."

The plan of the book differs in some important particulars from that generally adopted. Each chapter deals, not with a species, but a family, thus not only emphasising the relationship of the species, but facilitating comparative treatment and avoiding unnecessary repetition of statements that apply equally to the whole family or genus. In many cases it has been found advisable to divide the chapter into sections. In the present volumes all the finch genera are taken together "owing to the marked similarity in the general habits of the species," while the crow family has been divided into groups. But when we find the magpie and the jay grouped together for the same reason as the finches and the raven separated from the crows, and all three from the rook and the jackdaw (which are taken together), it is quite evident that "rigid uniformity in arrangement has not been attempted."

The information most often needed for reference is placed at the head of the chapter, under the title of "Preliminary Classified Notes," and refers to each species separately. These comprise (1) description of plumage; (2) distribution; (3) migration; (4) nest and eggs and information as to incubation, number of broods, &c.; (5) food; and (6) period of the year during which the species sings. So far as we can judge from the present instalment, these have been carefully prepared, and contain accurate and concise information, a detailed account, however, of the geographical distribution, as expressly stated in the preface, lying outside the scope of this work, which professes to deal comprehensively only with their habits. Those portions of the chapters treating of the habits generally, and forming the greater part of the volume, are somewhat gossipy and discursive in character, and even bordering in parts on the whimsical, while their popular character may be indicated by a reference to the devotion of two-thirds of a page to such matter as an account of Charles Dickins's ravens.

Mr. Selous makes the startling statement that young goldfinches are not fed apparently more than once in an hour. But in a footnote we are told that the observations (on which the statement is founded) were, it is true, made in the United States, and the Latin name of the goldfinch was not given in the original paper. "Still, it seems probable that what applies to the North American species of goldfinch would apply to our own." Wild speculations on probability of this kind seem to be a waste of space. The "American goldfinch," as a matter of fact, is quite a different bird from our goldfinch, and is closely allied to the siskin. It is a pity that the author of this section did not learn its Latin name. We do not think this portion of the work will supersede our old friend "Newton's Yarrell."

Photo by N. F. Ticehurst.

FIG. 1.—Blueheaded Wagtail's Nest and Young in Grass. From "The British Bird-Book."

The second volume treats of the buntings, larks, wagtails, pipits, the creeper and wren, in the order named, the treatment often inclining to the fanciful. In other places the grouping of the species, often diverse except in name, seems to have raised a slight difficulty, and some species—the shorlark, for instance—might well have received a fuller notice. Of

[1] "The British Bird-Book. An Account of all the Birds, Nests and Eggs found in the British Isles." Edited by F. B. Kirkman. Vol. i., pp. xviii+156; vol. ii., pp. 140. (London and Edinburgh: T. C. and E. C. Jack, 1910.) Price 10s. 6d. net.

its habits in winter, however, we are told "little is known." But further research into literature and inquiry among observers should surely have corrected this.

A smear on the general attractiveness and beauty of the second volume is unfortunately to be noticed in the shape of a footnote wherein one of the contributors indulges in a petulant attack on reviewers. As the editor expressly repudiates responsibility for the statements made in the note he is doubtless alive to their exceedingly bad taste; but why deface the pleasing pages of the book with an acrid expression of pique which can only be of interest to one person in the world?

At the end of the work there are to be chapters on rare British birds, classification of British birds, distribution and migration of British birds, bird watching and photography, and bibliography. With regard

Photo by E. L. Turner.

FIG. 2.—Tree-creeper's Nest tn a crevice in a Tree. From "The British Bird-Book."

to the illustrations, the artists include Winifred Austin, G. E. Lodge, H. Grönvold, G. E. Collins, and A. W. Seaby. The coloured plates in the present volumes are exceedingly pleasing and charming in every way, and they certainly do answer the purpose for which they have been designed. Their object is to supply something more than a portrait of each species for purposes of identification. Each picture is, with few exceptions, to offer a study of some habit of the bird or of one of its most characteristic and striking attitudes; it is to show the bird in its natural surroundings, and the thirty-four plates in these volumes are, on the whole, quite a success. In addition, we have a coloured plate of eggs, numerous photographs of nests and eggs and young, an outline map of the world, showing the six zoo-geographical regions, and a diagram explaining the names of the various external parts and portions of the plumage of a bird. An index is promised at the end of the book, which is to be completed in twelve of these sections or volumes.

The twenty plates of eggs which, with very short letterpress, are meant to supplement the "Sketch Book of British Birds," can hardly be said to be worth publication.[1]

The book is, in fact, too cheap. We cannot expect twenty coloured plates for five shillings, and the cheap reproduction has been a failure. Yet it was hoped that by having a faithful representation of one normal specimen of each species a key would be furnished by which identification might be made comparatively easy. This hope would have been better sustained, poor as the figures are, had they been correctly named. But, turning to plate iii., we find the egg of the black-throated thrush referred to the rock thrush and *vice versa*, that of the "American thrush" (*Turdus migratorius*) to the redwing, that of the redwing to the missel thrush, and that of the missel thrush to the American thrush; while on plate xv. the eggs of the purple sandpiper and little stint do duty for one another. We have not had patience to go through all of them. This deplorable confusion has been caused by the careless insertion of the reference numbers. But it is fatal to the key, and will prove fatal to the beginner's attempt to identify eggs. A few lines of letterpress are devoted to each species. Turning to that relating to this plate xv., we find the wood sandpiper called the wood "tattler," an American name not in use in England, and the information that the pectoral sandpiper is an American species the nest of which is built on high grassy slopes in Lapland! It is no longer correct to say that the eggs of the knot are still unauthenticated.

THE SEA-OTTER.[2]

SOME twenty years ago, in the days of the Bering Sea question, Captain Snow was well known as an authority on certain of the fur-seal fisheries of the North Pacific, and he was, and still is, known as one of the few authorities on the geography of the Kurile Islands. He has now written a pleasant book telling some of his manifold adventures in this region of the world, and, above all, relating his experiences in pursuit of sea-otter. There is an interest, which amounts to fascination in this singular animal. Fifty years ago it was comparatively plentiful all round the coast of the North Pacific, from California and Oregon to Kamtschatka and the Kuriles, though doubtless already much less abundant than in Steller's time, more than a hundred years before. But nowadays it has dwindled to very small numbers, here and there among the Aleutian and Kurile Islands, and these small numbers dwindle more and more every year. I know of no living naturalist who has seen the creature in its haunts, nor has any zoological garden ever possessed it. Once upon a time, by the way, I spent a fortnight on Copper Island, at the north end of which, five or six miles from my hut, was a large rookery of sea-otters; but while I was provided with passports giving me perfect freedom of access to the seal-rookeries, there was no word said about sea-otters; and day after day a polite functionary made excuses and apologies, a Cossack guard made

1 "British Birds' Eggs." By A. F. Lydon. Pp. 62+20 plates. (London: S.P.C.K., 1910.) Price 5s.

2 "In Forbidden Seas." Recollections of Sea-Otter Hunting in the Kurils. By H. J. Snow, F.R.G.S. Pp. xiv+303. (London: Edward Arnold, 1910.) Price 12s. 6d. net.

neither the one nor the other, and I came away without ever seeing the sea-otter.

While allied to the ordinary otters, the sea-otter has many peculiarities of structure which have scarcely yet been sufficiently weighed and discussed. Its small, but immensely powerful skull seems disproportionate to its big body; its forepaws are diminutive, while its hind ones are long and almost seal-like; its teeth are unique in their great smooth, rounded crowns, with which the animal crunches the crabs, sea-urchins, and shell-fish that make up most of its diet. Its fur is the finest and richest of all furs, soft, deep, and silky, uniform in colour save for the white or grey head, jet black in the finer skins, or interspersed with silvery hairs in the finest of all. A full-grown animal measures 4 to 4½ feet in length, but the skin of such an animal easily stretches out to 6 feet in length or more, and is worth nowadays something like £300 or £400.

The habits of the sea-otter are very singular. His natural home is on the great beds of "kelp" (Macrocystis), which fringe the rocky coast of the North Pacific, and these great kelp beds make calm water, though the surf be roaring and breaking just outside. The kelp beds are dense enough for the otters to lie upon, and here in old days they were so tame that they used to "stand with head and forepaws out of the water," staring at the hunter and his gun. The creature is handy with its forepaws, and has been again and again described ever since Steller's time as dandling and nursing its young in them; it holds its food almost as a squirrel does, and boxes its young or its companions, like a couple of cats at play. But its hind feet are for swimming only; it walks with difficulty, generally drawing up its hind feet both together and jumping forward, and, as Captain Snow assures us, when it attempts to walk the toes are doubled back under the sole (see illustration).

The mother otter swims upon her back, carrying her pup in her forepaws. When she dives for food she leaves the pup floating on its back, but when chased she dives with it, gripping it by the scruff of the neck, like a cat with its kitten, and she never deserts her pup until the poor little beast is perhaps drowned by her constant diving.

Captain Snow gives us some account of the number of otters killed in the Kuriles, which number between 1872 and 1881 varied from about 300 to 1500 a year. In the next decade (1882 to 1891) about 1200 were taken in all, by both foreign and Japanese schooners; between 1892 and 1901 about 800 were taken, and from 1902 to 1909 only about 350 in all. We may compare these figures with Captain Hooper's statistics for the Aleutian Islands, where more than 58,000 otters were taken in the twenty-four years from 1873 to 1896.

Sea Otter. From "In Forbidden Seas."

But for statistics and other technical details we must go to Hooper and Stejneger, Elliott and Allen, for statistics are not much in our good Captain's line. He is a sailor and an adventurer, and wherever otters were or seals, there was his Treasure Island. He has much to tell and very little to conceal. We hear of his love episodes with this or that young lady whose name ended in San ("it was always happening in those days"), and again of his raids, not bloodless, on Japanese or Russian "rookeries"; for he would seem to have been early aware that "there runs no law of God nor man to the north of *forty-three*." In short, our gallant Captain belongs to a very lovable and all but vanished type, rarer even and better than the sea-otter, the good old delightful breed of the pirate and the robber.

D. W. T.

THE MINNEAPOLIS MEETING OF THE AMERICAN ASSOCIATION.

THE sixty-second meeting of the American Association for the Advancement of Science was held on December 27–31, 1910, at Minneapolis, Minnesota, under the presidency of Dr. A. A. Michelson, of the University of Chicago.

The membership of the association lives for the most part in the large educational and scientific centres of the more eastern States, and, as a result, the large attendance always obtained at Boston, New York, Philadelphia, Baltimore, and Washington could not be expected during the Christmas holidays at a point so far removed as Minneapolis, which, by the way, is about thirty-six hours by rail from New York or Washington. There was, therefore, an attendance of approximately between seven and eight hundred. As often happens, however, with the smaller meetings the interest was quite as keen, if not keener, and the quality of papers presented reached the usual high standard.

At the opening session, held on Tuesday night, December 27, addresses of welcome were delivered by Dr. Cyrus C. Northrop, president of the University of Minnesota, and Mr. Wallace G. Nye, president of the local Chamber of Commerce. President Michelson made an address in reply, after which the retiring president, Dr. David Starr Jordan, president of the Leland Stanford Junior University, delivered his address on "The Making of a Darwin," published in NATURE on January 12. The people of Minneapolis were present in numbers and the audience at this session was very large.

All the meetings were held in the buildings of the University of Minnesota, one of the largest, most progressive and wealthiest of State universities. The handsome and admirably equipped buildings are concentrated in a reasonably compact campus, and no time was lost in going from one section to another. This was in striking relief from conditions existing in previous years. In Boston the meeting places were distributed through Harvard University, Massachusetts Institute of Technology, and Harvard Medical School, all very widely separated.

Apart from the opening meeting, there were only two other general sessions, one devoted to an address by Mr. A. B. Stickney, on the subject, "Should Practical Agriculture and the Physical Development of Childhood be Added to the Curriculum of the City Public Schools?" in the neighbouring city of Saint Paul, on Wednesday night; the other by Mr. William Alanson Bryan, on Thursday night, on the subject of "The Volcano Kilauea."

Probably on account of the distance involved, many of the affiliated societies which customarily meet with the American Association for the advancement of Science met at other cities, but the following were present and listened to excellent programmes :—

American Chemical Society, American Physical Society, American Psychological Association, Botanical Society of America, Botanists of the Central States, Entomological Society of America, American Association of Economic Entomologists, American Federation of Teachers of the Mathematical and Natural Sciences, Association of Horticultural Inspectors, American Mathematical Society (Chicago Section), American Microscopical Society, American Nature-study Society, American Phytopathological Society, Sullivant Moss Society, Western Philosophical Association, American Society of Zoologists (Central Branch).

Following the policy first formulated by the council three years ago, and reiterated by the council this year under formal resolution, the sections of the association, as a rule, did not present long programmes of shorter and more technical papers; but, aside from the addresses of the vice-presidents, devoted their time to the general discussion of topics of broad interest and conducted symposia on four subjects.

The addresses of the vice-presidents (presidents of sections) were as follows :—

A (Mathematics and Astronomy), Ernest W. Brown, Yale University, New Haven, Conn., "The Relations of Jupiter with the Asteroids." B (Physics), Louis A. Bauer, Carnegie Institution, Washington, D.C., "The Broader Aspects of Research in Terrestrial Magnetism." C (Chemistry), William McPherson, Ohio State University, Columbus, Ohio, "The Formation of Carbohydrates in the Vegetable Kingdom." D (Mechanical Science and Engineering), John F. Hayford, College of Engineering, Evanston, Illinois, "The Relations of Isostasy to Geodesy, Geology, and Geophysics." E (Geology and Geography), Reginald W. Brock, Geological Survey of Canada, Kingston, Canada, "Northern Canada." F (Zoology), William E. Ritter, Marine Biological Laboratory, San Diego, California, "The Controversy between Mechanism and Vitalism: Can it be Ended?" I (Social and Economic Science), Byron W. Holt, New York, N.Y., "Causes and Effects of High Land Values." K (Physiology and Experimental Medicine), Charles Sedgwick Minot, Harvard Medical School, Boston, Massachusetts, "The Method of Science."

The principal symposia were as follows :—Section K presented a series of excellent papers by well-known experts on "Disease Due to Filterable Organisms," including two papers on the mysterious Rocky Mountain spotted fever, another on "Acute Anterior Poliomyslitis," and another on "Yellow Fever, Dengue Fever, and Pappataci Fever." In the same symposium, general attention was given to animal diseases, plant diseases, and experimental diseases. The diseases of domestic animals considered were rabies and hog cholera.

Under the Section of Mechanical Science and Engineering, an important symposium was held on the subject of aëronautics, the papers for the most part being technical; but the list included an "Appreciation of Dr. Octave Chanute and His Work in Engineering and Aëronautics," an historical paper on the "Early Attempts to Navigate the Air," a suggested programme of aëronautical research at the colleges, and a paper on "Technical Education in Aëronautics."

Many joint programmes were held between the sections and the affiliated societies. An important conference on botany teaching was held by all of the botanists present, and the question of the water supply of Minnesota was discussed by the geologists. Questions of sewage pollution and the smoky atmosphere of western cities and many other practical topics were discussed in the Section of Chemistry. Section L (Education) joined with the American Psychological Association in discussing general questions relating to school children.

No actions of great importance were taken by the council aside from the resolution looking to the generalising and broadening of the sections and the restriction of purely technical programmes to the affiliated societies.

Two British subjects, and members of the British Association, were in attendance and were made honorary members for the meeting. They were Dr. Marie C. Stopes, of the University, Manchester, and Prof. A. H. R. Buller, of the University of Manitoba.

The general committee designated Washington as the place for the next meeting, with recommendations that Cleveland and Toronto be chosen in the succession indicated for following meetings.

The following officers were elected for the Washington meeting :—

President—Charles E. Bessey, University of Nebraska, Lincoln, Nebraska.

Vice-presidents.—A, Mathematics and Astronomy, Edwin B. Frost, Yerkes Observatory, Williams Bay, Wisconsin; B, Physics, Robert A. Millikan, University of Chicago, Chicago, Illinois; C, Chemistry, Frank K. Cameron, U.S. Department of Agriculture, Washington, D.C.; D, Mechanical Science and Engineering, Charles S. Howe, Case School of Applied Science, Cleveland, Ohio; E, Geology and Geography, Bohumil Shimek, State University of Iowa, Iowa City, Iowa; F, Zoology, Henry F. Nachtrieb, University of Minnesota, Minneapolis, Minnesota; G, Botany, Frederick C. Newcombe, University of Michigan, Ann Arbor, Michigan; H, Anthropology and Psychology, George T. Ladd, Yale University, New Haven, Conn.; I, Social and Economic Science (vacant); K, Physiology and Experimental Science, William T. Porter, Harvard Medical School, Boston, Mass.; L, Education, Edward L. Thorndike, Columbia University, New York, N.Y.

Permanent Secretary.—L. O. Howard, Smithsonian Institution, Washington, D.C.

General Secretary.—John Zeleny, University of Minnesota, Minneapolis, Minnesota.

Secretary of the Council.—Theodore S. Palmer, U.S. Department of Agriculture, Washington, D.C.

Secretaries of the Sections.—A, Mathematics and Astronomy, George A. Miller, University of Illinois, Urbana, Illinois; B, Physics, Alfred D. Cole, Ohio State University, Columbus, Ohio; C, Chemistry, Charles H. Herty, University of North Carolina, Chapel Hill, N.C.; D, Mechanical Science and Engineering, George W. Bissell, Michigan Agricultural College, East Lansing, Mich.; E, Geology and Geography, F. P. Gulliver, Norwich, Conn.; F, Zoology, Maurice A. Bigelow, Columbia University, New York, N.Y.; G, Botany, Henry C. Cowles, University of Chicago, Chicago, Illinois; H, Anthropology and Psychology, George Grant MacCurdy, Yale University Museum, New Haven, Conn.; I, Social and Economic Science, Fred C. Croxton, 1229 Girard Street, Washington, D.C.; K, Physiology and Experimental Medicine, George T. Kemp, 8 West 25th Street, Baltimore, Maryland; L, Education, Charles Riborg Mann, University of Chicago, Chicago, Illinois.

Treasurer.—R. S. Woodward, Carnegie Institution, Washington, D.C.

SCIENCE AND POTTERY.[1]

THE English Ceramic Society, founded about ten years ago, had its origin in a belated attempt, made by a few enlightened manufacturers, to introduce scientific method into the conduct of one of our most important industries. There is a proverbial connection between the potter and his thumb, and in no other leading manufacture in this country is the rule of thumb so dominant or so repressive as it is in that of pottery. The ceramic art as practised in England is for the most part empirical, and is therefore highly conservative; changes are few and progress is correspondingly slow. At the same time, in certain respects, the industry has reached a high degree of mechanical perfection. English china is a product *sui generis*, and its merits are widely recognised, even by those who decline to regard it as a variety of porcelain. In the manufacture of the highest qualities of earthenware no nation has hitherto surpassed us. But signs are not wanting that our supremacy is challenged, and each succeeding decade sees the struggle becoming more and more acute. The industry is, in fact, between the upper and the nether millstones of conflicting tariff systems. Industrial conditions in the Potteries are, in some respects, without parallel in any other manufacturing district. In no other staple trade of like magnitude is to be found so numerous a class of small manufacturers—persons of little or no capital and employing few hands—some of them no more than the members of their own families. These are for the most part ignorant of anything beyond the ordinary technique of their art. Even in the case of larger concerns, it was, until of late years, rare to meet with any evidence of practical recognition of the scientific principles underlying the industry. Such a condition of things cannot possibly tend to development in the art itself, or to improvement in the welfare of the workers engaged in it.

Ceramics is a branch of applied chemistry and physics, of chemical engineering in its most comprehensive sense. That this fact is beginning to be slowly appreciated may, we think, be inferred from the gradual increase in the number of the members of the English Ceramic Society. The society started in 1900–1 with 29 members; in 1909–10 its numbers were 261, but of these, it ought to be said, a certain fraction are engaged in American and Continental factories. But, after all, this growth in numerical strength is hardly commensurate with the value and importance of the society's objects, or with the influence it may be expected to exercise upon the development of the industry with which it is concerned. In the United Kingdom there are some 550 potteries; of these 329 are concentrated in the group of towns known as the North Staffordshire Potteries. It is not unreasonable to expect that in the case of an institution centrally situated and in close proximity to Burslem, Fenton, Hanley, Longton, and Tunstall, there would, after ten years of existence, be a membership equal at least to the number of factories in the neighbourhood. That such is not the case is only one more instance of the supineness and indifference of our manufacturers, as a class, to the bearing of physical science, its methods and its teaching, upon their industries.

Of the general character of the twenty-two contributions to the scientific work of the society contained in this volume we have nothing but commendation to offer. They all bear directly on problems of practical interest to the potter. The papers of Mr. Fowler on the control of kiln and oven gases; of Messrs. Cobb and King on the fluxing power of the common oxides; the papers by Dr. Mellor on cylinder grinding, vitrification of clays, surface factors, softening temperatures of lead silica glazes, and the two excellent papers by Mr. Thomason, on the toxic possibilities of fritted lead glazes and on white lead and plumbism are of permanent value as additions to ceramic literature. The latter papers are of special interest at the moment in relation to the question of lead-poisoning in pottery manufacture. Mr. Thomason points out that the official returns from such factories as are working under the 5 per cent. standard of solubility, as defined by the method prescribed by Sir Edward Thorpe, and adopted in the Home Office special rules, show no cases of plumbism amongst workers in the prepared glazes, and that the information available from the Continent is to a similar effect. It has been objected to this method that it bears no real analogy to what actually goes on in the human system. Mr. Thomason effectually meets this objection. After a careful experimental inquiry of which full details are given in the papers, and in which, so far as possible, all the conditions known to occur in the animal body were separately and collectively studied, Mr. Thomason concludes that the solubility of a glaze in the stomach is properly gauged by the official method, and that the figures so obtained are fair statements of its toxic possibilities.

These papers were evidently not very pleasant hear-

[1] Transactions of the English Ceramic Society. Vol. ix. Session 1909–10 (Stoke-on-Trent, Staffordshire: Published by the Society; Longton: Hughs and Harber, Ltd., 1910.)

ing to at least one member of the Ceramic Society, and were somewhat carpingly criticised by Mr. Bernard Moore, a representative of the manufacturers on the late Departmental Committee. How Mr. Thomason effectually disposed of Mr. Moore in the course of the subsequent discussion, will be evident to any unprejudiced reader.

It is not to be expected that in such a journal as we are noticing there would be much reading *pour rire*. But in the concluding paper, which tells of a visit paid by the society to a white-lead works, where the members seem to have been most hospitably entertained by the proprietors, there is a very distinct flavour of comedy. After the luncheon, one of the senior members of the party made an attempt to express the gratitude of the society to their quondam hosts. Unfortunately the speaker had evidently been much perturbed by the sight of a lavatory basin marked "leadless glaze," and this untoward circumstance, combined with the influence of "a sumptuous table" from which the party "had almost succeeded in abolishing that 'dangerous element,' water," led him to make an ill-mannered and vituperative attack upon what he was pleased to call "a band of faddists who had little better with which to occupy their meddlesome minds" than to bring down upon the trade "a perfect plague of inspections, committees, arbitrations, and commissions." But the orator took heart of grace. He did not despair "so long as they had such friends as *Mr. Bernard Shaw* on the Lead Commission." Mr. Shaw is as ubiquitous as King Charles's head, but it is a little hard on him to confound him with Mr. Bernard Moore, with whom he has little in common. The sorry thing is that the silly speech reflects the attitude of a not inconsiderable section of the manufacturers to what is a great and crying evil in their industry.

AN INSTITUTE OF HUMAN PALAEONTOLOGY.

THE Prince of Monaco, as is well known, is a scientific man of high attainments, more especially in the sphere of oceanography. His own researches and those conducted under his auspices have been of first importance. A short time ago an account was given in these columns of the beautiful and well-equipped Museum of Oceanography which he erected at Monaco, and in last week's NATURE (p. 379) mention was made of the Oceanographical Institute founded and endowed in Paris by the Prince. As stated in another column, the institute was inaugurated on Monday, January 23, and it is hoped to give an account next week of the opening.

In 1872 M. Émile Rivière discovered the first Palæolithic skeletons of the Baoussé-Roussé caves ("The Red Caves") or Grimaldi caves, as it was decided they should be called at the International Congress of Anthropology and Prehistoric Archæology at Monaco in 1906. Later investigations revealed fresh remains, and the Prince himself in 1907 discovered the fourth grave, that of the two famous "Negroids." The Prince took great interest in these important discoveries, and generously assisted in the work which was mainly conducted by the Canon de Villeneuve, Profs. Boule, Verneau, and Cartailhac. A great deal has been written on these finds in various journals, and the official reports have been published by the Prince in two volumes; he has also established a Museum of Archæology at Monaco. The Prince was so much impressed by the wonderful mural engravings and frescoes of Palæolithic age which adorn so many caves in central and south France and north Italy that he commissioned Dr. Émile Cartailhac and l'Abbé H. Breuil to make a thorough investigation of them, which, with his customary munificence, will be published in a series of sumptuous monographs, of which the first "La Caverne d'Altamira à Santillanc près Santander (Espagne)," has recently appeared. In the current number of *l'Anthropologie* (tome xxi., p. 725), it is stated that the Prince has decided to found in Paris an institute of human palæontology. In a letter to the Minister of Instruction announcing his decision he says that he has come to feel that greater prominence should be given to the study of the mystery which shrouds the origin of mankind, and that a methodical basis of archæological investigation is required. "Et je pensais que la philosophie et la morale des sociétés humaines seraient moins incertaines devant l'histoire des générations, écrite avec leur propre poussière." Having seen that oceanography was fittingly domiciled in Paris and Monaco, he gave some attention to the requirements of human palæontology.

The Prince goes on to state his intention of founding in Paris a centre for the pursuit of studies based on systematic excavation. The site for the institution has been selected, and the staff and a financial board of management appointed. The munificent founder adds that he has endowed the "Institut de Paléontologie humaine" with the sum of 1,600,000 francs, and proposes to make over his collections to it conditionally. The Prince, desirous of securing the most favourable terms of existence for this foundation, begs the Government to recognise its value and approve its statutes. A. C. H.

NOTES.

THE death of Sir Francis Galton at Grayshott House, near Haslemere, on January 17, marks another link broken with the greater leaders of nineteenth-century science. Sir Francis passed away quietly after only a few days' illness, clear in mind, and able within a few hours of his death to question his physician humorously as to the statistics available for the reputed action of strychnine as a drug. By his own desire his body was interred at Clavendon, near Warwick, a peaceful country churchyard, close to the house which had once been the home of his mother (Violetta Darwin), and still remains a spot with much of artistic interest to those who value the family history of a noteworthy scientific stock. The funeral took place an Saturday, January 21, the Master of Trinity College (representing the University of Cambridge and the college) and the vicar of Clavendon taking the service. Among the relatives and friends present were Miss E. Biggs, Mr. and Mrs. E. G. Wheler, Father Charles Galton, S.J., Major Hubert Galton, Miss Violet Galton, Mrs. Moilliet, Major Guy Lethbridge, Mr. Geoffrey Butler, Mr. A. F. G. Butler, Charles Galton Darwin, Miss A. Jones, and Prof. K. Pearson. The Royal Society was represented by Sir George Darwin and Mr. William Bateson, the former also representing the Royal Meteorological Society; Prof. A. Dendy represented the University of London and King's College; Major Leonard Darwin, the Royal Geographical Society; Dr. Charles Chree, the Kew Observatory; and Dr. David Heron, the Galton Eugenics Laboratory. We hope next week to publish some account of Sir Francis Galton's life and work.

THE two principal candidates for the vacant seat in the Paris Academy of Sciences caused by the death of M. Gernez were Mme. Curie and Prof. E. Branly. At the meeting of the academy on Monday, January 23, Prof. Branly was elected to the vacancy by the narrow majority of two votes. In the first ballot he received 29 votes against 28 given to Mme. Curie, and in the second 30

votes were given to him, while Mme. Curie received the same number as before. We congratulate Mme. Curie upon the substantial support she secured, and trust that before long her claims to a seat in the academy will receive their rightful recognition. The narrow margin by which she lost election on Monday may, we suppose, be taken to mean that the academy is about equally divided as to the eligibility of women for membership, and that Mme. Curie may expect to be elected on a future occasion. As scientific work must ultimately be judged by its merit, and not by the nationality or sex of its author, we believe that the opposition to the election of women into scientific societies will soon be seen to be unjust and detrimental to the progress of natural knowledge. By no pedantic reasoning can the rejection of a candidate for membership of a scientific society be justified if the work done places the candidate in the leading position among other competitors. Science knows no nationality, and should recognise no distinction of sex, colour, or creed among those who are contributing to its advancement. Believing that this is the conclusion to which consideration of the question must inevitably lead, we have confidence that the doors of all scientific societies will eventually be open to women on equal terms with men.

THE inauguration of L'Institut Océanographique de Paris took place on Monday evening, January 23, in the presence of the President of the Republic, M. Fallières, and a distinguished gathering, presided over by his Serene Highness the Prince of Monaco as president of the council of administration. Among those present were Prince and Princess George of Greece, Prince Louis of Monaco, Prince Roland Bonaparte, ex-President Loubet, the members of the Government, Ambassadors and Ministers Plenipotentiary of the foreign Powers, and the members of the Conseil d'Administration and Comité de Perfectionnement, including, among others, Dr. Paul Reynard, director of the institute; Dr. Jules Richard, director of the museum at Monaco; Prof. Chun, of Leipzig; Prof. Hergesell, of Strassburg; M. Thoulet, of Nancy; Sir John Murray, K.C.B., F.R.S.; Mr. J. Y. Buchanan, F.R.S.; and Dr. W. S. Bruce. Short addresses were delivered by the Prince of Monaco; M. Maurice Faure, Minister of Public Instruction and Fine Arts; M. Armand Gautier, president of, and in the name of, the Academy of Sciences; M. Liard, vice-rector of, and in the name of, the University of Paris; and M. Perrier, director of the Museum d'Histoire naturelle. M. Henri Bourée, *aide-de-camp* to the Prince of Monaco, also showed some excellent lantern illustrations and kinematograph views of the Prince's oceanographical investigations on board the *Princesse Alice*. After the formal proceedings, the assembled company proceeded to inspect the institute, an account of which, with its aims and object, will appear in a subsequent issue.

SIR JOSEPH LARMOR, F.R.S., Lucasian Professor of Mathematics at Cambridge and secretary of the Royal Society, has accepted the invitation of a meeting of the Unionist Party to become the Unionist candidate for the vacancy in the Parliamentary representation of Cambridge University. The prospect which this selection offers of including among the members of the House of Commons a man of distinguished eminence in the scientific world, is especially gratifying, in view of the necessity of keeping before the Government and the legislature the need for a general adoption of the methods of science in the affairs of the Empire. It is refreshing to find the value of scientific progress given prominence in an election address. Sir Joseph refers in his address to the progress of scientific knowledge during the last half-century, and to the part which Cambridge has played in promoting the advancement of this newer learning. He adds:—"But modern scientific discovery advances with accumulated force: better organisation and knowledge, in order to take full advantage of the resources that are available for this country, is still one of our foremost problems in the face of the competition of other nations; and our University is destined for an even wider sphere of work and influence than has fallen to us in the past. It should be our aim to supply leaders of industry who possess not only special attainments, but also that temperament of scientific inquiry which exalts industrial pursuits and is the most potent influence for their progress."

ACCORDING to a statement issued to the Press by Mr. William Willett, the originator of the so-called Daylight Saving Bill, the Home Secretary, Mr. Winston Churchill, "cannot conceive of any argument now which would cause him to doubt the wisdom of passing the Daylight Bill into law." Mr. Churchill is therefore prepared to make a speech in favour of the Bill when it comes again before the House of Commons. He considers that as agriculturists form only about eight per cent. of the population, their objections may be disregarded, "in order to bring within the reach of the other ninety per cent. of the population the blessings of sunlight and fresh air in their leisure hours." Mr. Churchill is, in fact, prepared to support a measure which will convert Greenwich time into German time at stated intervals, not because he has taken competent opinion as to the consequences of such an Act, but because he thinks a majority desires it. In the building and engineering trades, and in the Government's own dockyards, the working hours are already adjusted to the seasons, without legislative interference, so that the suggestion that agriculturists are the only people who do not want the Bill is altogether misleading. The daylight effects of the difference in latitude between London and Edinburgh are apparently not to be considered in these days of hasty and unnecessary legislation. Consideration of these effects would show at once that North Britain should be excluded from the provisions of the Bill. The promoters of the Bill refer to the advantages which would be obtained by altering the hours of work at different seasons of the year according to those of daylight. But it does not seem to occur to them that all the advantages could be secured in a much simpler way without the indescribable confusion and inconvenience which would be caused by frequent interference with clock-time. We believe that if the measure which Mr. Willett persistently puts forward is ever put upon the statute book, it will make us the laughing-stock of the civilised world. Unable to change our customs, we are to deceive ourselves into doing so by moving the hands of clocks in months prescribed by Act of Parliament. Such methods may be appropriate for lodging-house servants, but they are unworthy of the dignity of a great nation. It is peculiarly unfortunate that a Cabinet Minister should permit his name to be used in connection with such a proposal at the present time, seeing that a Bill to make Paris official time coincide with Greenwich time has been approved by the French Chamber of Deputies, the Senate Committee and the Cabinet, and will in all probability become law. We cannot believe, in the face of such facts, that Parliament will entertain seriously the proposed periodic change of our time-standard which Mr. Churchill is said to regard with favour.

THE concluding part (No. 10) of last year's volume of the *Kew Bulletin* contains identifications of new Lauraceæ

by Mr. J. S. Gamble, new orchids by Mr. R. A. Rolfe, and a new genus of Leguminosæ, Leptoderris, by Mr. S. T. Dunn. The new genus is practically a segregate from Derris, which it resembles in fruit, and comprises fourteen species, all derived from tropical Africa. An article by Mr. W. J. Bean provides a fourth set of garden notes on new trees and shrubs. An Alpine variety of *Erica arborea* is noted for its hardiness. Chinese introductions include *Acer griseum*, a striking trifoliate maple, *Berberis parvifolia*, a distinct species, and *Sarcococca ruscifolia*, a euphorbiaceous evergreen with habit recalling Butcher's broom. Two illustrations depict *Fothergilla major*, an American shrub highly decorative when in flower, and *Pistacia chinensis*.

THE starting of the Australian Antarctic Expedition seems now assured by the subsidies promised by the Australian Association for the Advancement of Science. The expedition will be under the command of Dr. Mawson, and it will enter the Antarctic field which now promises the most useful results. Many attempts have been made to discredit the existence of Wilkes Land, and it is obvious that Wilkes reported land farther to the north than it exists; nevertheless, his narrative offers convincing evidence that his expedition met land in that part of the Antarctic region. The Shackleton expedition has proved the extension of the land further west from Cape Adair than any other expedition, and Dr. Mawson proposes to follow this coast-line further to the west, which was one of the unfulfilled parts of the programme of the *Discovery* expedition. The German Antarctic Expedition, under Prof. von Drygalski, established the existence of continental land south of Kerguelen. No accessible part of Antarctica offers such promising results as that selected by Dr. Mawson. The development of wireless telegraphy has already led to the suggested establishment of an Australian meteorological station on that part of the Antarctic coast, and this observatory may be hoped for ultimately.

FOREIGN newspapers announce several losses that various scientific institutions have just sustained by the death of members on their respective staffs. Foremost among these is M. Gustave Leveau, by whose death the Paris Observatory loses its oldest official, who for more than half a century participated in its work and shared its renown. He had served under Le Verrier, Delaunay, Mouchez, Tisserand, Lœwy, and Baillaud, a long list recalling the various changes in the direction of activity pursued at the national observatory. M. Leveau, who rendered important services in various departments of celestial mechanics, will be best remembered for his researches into the motion of the comet of D'Arrest, the perturbations of which he regularly calculated, and at each return prepared an ephemeris. He belonged to the school of Le Verrier, and his tables of Vesta and other researches show the effect of his master's influence. Notwithstanding his mathematical work, he gave assiduous attention to the routine of the observatory, taking part mainly in the meridian observations. The director of the Leipzig Observatory announces the death of F. W. Hermann Leppig, who since 1867 has worked strenuously to forward the interests of that institution. The work of the deceased astronomer was mainly confined to meridian observations, time distribution, and in the meteorological service. The death of M. Rozé, astronomical lecturer at the Ecole Polytechnique and professor of mathematics in the Ecole de physique et chimie, is also announced. Since 1859 he had been attached to the Ecole Polytechnique, and for more than forty years had taken part in the tutorial work.

THE conference on sleeping sickness recently held at the Foreign Office was convened, Reuter's Agency learns, by the British Government as a result of representations made of the danger of the spread of sleeping sickness in consequence of the construction of the Rhodesia-Katanga Railway, which runs from the north of Broken Hill to the Congo frontier and beyond. The delegates to the conference were M. Melot, representing the Belgian Government, Dr. van Campenhout, of the Colonial Office in Brussels, Dr. Sheffield Neave, representing the Rhodesia-Katanga Railway, Dr. Aylmer May, representing the Chartered Company, Dr. Bagshawe, of the Sleeping Sickness Bureau, and representatives of the British Foreign and Colonial Offices. As the result of its deliberations, the conference concluded, with regard to the necessary precautions in the case of new railway extensions, that it is essential that the route of these lines should be inspected for *Glossina palpalis*, that maps of the fly areas be prepared, that railways should cross the fly belt at the narrowest points and not follow them, that there shall be no station, buildings, or stopping-places in the *G. palpalis* area, and that labourers on the railways should be recruited under such condition as to avoid infection. During the working of railways, it is recommended that there shall be constant supervision and inspection, that passenger carriages, trucks, &c., shall, so far as possible, have openings covered with fly-proof gauze, and that as *G. palpalis* probably does not exist south of the Congo-Zambezi watershed, the Rhodesia-Katanga Railway shall be worked in two sections with the view of avoiding the possibility of carrying the fly from one area to another.

MR. C. B. HOLMAN-HUNT, curator of the Selangor Museum, has been appointed assistant entomologist in the agricultural department of the Federated Malay States.

WE learn from the *Revue scientifique* that Baron Reinach has provided the Frankfort Physical Society with the funds necessary to establish a seismological observatory on the Feldberg, in the Taunus range. Dr. F. Linke will be the director of the observatory.

THE Belgian Royal Academy of Sciences, Letters, and Arts has awarded to Dr. L. A. Bauer the Charles Lagrange Prize for the period 1905–8, of 1200 francs, on account of his various researches in terrestrial magnetism. The academy has also awarded the decennial prize of 5000 francs for researches in physics and chemistry to M. Van der Mensbrugghe, for his work on the molecular physics of liquids.

ACCORDING to the *Revue scientifique*, the Krupp Society has given Prof. Emil Wiechert, of the University of Göttingen, 10,000 marks to enable him to conduct experiments in aërodynamics; and also 6000 marks to Prof. Leopold Ambronn, of the same university, for the construction of a new photographic apparatus.

THE Geological Society of London will this year award its medals and funds as follows:—Wollaston medal, Prof. Waldemar C. Brögger; Murchison medal, Mr. R. H. Tiddeman; Lyell medals, Dr. F. A. Bather and Dr. A. W. Rowe; Bigsby medal, Dr. O. Abel; Wollaston fund, Prof. O. T. Jones; Murchison fund, Mr. E. S. Cobbold; and the Lyell fund, Prof. C. G. Cullis and Mr. J. F. N. Green.

THE second annual Simple Life and Healthy Food Conference and Exhibition will be held in the Caxton Hall, Westminster, on March 21–24. The objects of the conference and exhibition are to simplify modern life, to introduce into homes healthy food and hygienic decorations, to teach rational physical culture, and to inculcate a love of simple and beautiful architecture.

ANNOUNCEMENT is made of another gift of 2,000,000*l.* presented by Mr. Carnegie to the Carnegie Institution at Washington. It is stated that Mr. Carnegie's total gifts to that foundation amount to 5,000,000*l.*, and his total benefactions to nearly 40,000,000*l.* The gift from him is also announced of a new telescope, with a 100-inch lens, for the observatory on Mount Wilson, California.

AT a meeting of the executive committee of the British Science Guild, the question of the annual dinner was considered in connection with the visit of the Colonial Premiers for the Imperial Conference of the Colonial Premiers. It was stated that the report on the synchronisation of clocks had given rise to a very wide discussion by the newspapers and Press. A committee was appointed to deal with the question of the prize essay upon the best way of carrying on the struggle for existence and securing the survival of the fittest in national affairs.

THE announcement has been made of the discovery of the ancient fossil Archæocyathus in material collected in Antarctica by the Shackleton expedition. The identification was made some months ago by Dr. Griffith Taylor, who is the author of a monograph on the Archæocyathineæ of South Australia, and is a member of the present British Antarctic Expedition. As Archæocyathus was a marine animal, it, of course, does not supply any evidence bearing on the presumed land connection between Australia and Antarctica. The evidence for that hypothesis is based on the distribution of land animals in the southern hemisphere and on tectonic evidence.

ACCORDING to a Reuter message from San Francisco, Mr. Eugene Ely succeeded, on January 18, in an attempt to fly in a Curtis biplane from Selfridge Field, twelve miles south of San Francisco, and to land on the deck of the cruiser *Pennsylvania*, lying twelve miles from the coast. Shortly afterwards he returned in his aëroplane to the starting point. The flight was made close to the water, and the aëroplane approached the cruiser's bows. Mr. Ely flew past the ship for a distance of about a hundred yards, and then circled back, rising slowly, and finally settled lightly. The flight occupied sixteen minutes going and fifteen minutes returning.

AT the Royal College of Surgeons on February 1 Dr. F. W. Edridge-Green will deliver the first of two lectures on "Colour-vision and Colour-blindness." The second lecture will be given on February 3. Two lectures will be delivered by Prof. W. d'Este Emery on "The Immunity of Reaction in Relation to Surgical Diagnosis" on February 6 and 8, and on February 10 Prof. Benjamin Moore will give one lecture on new views on the chemical composition and mode of formation of renal calculi, and the metabolism of calcium in gout. Prof. G. Elliot Smith, F.R.S., is to give three lectures on "The History of Mummification" on February 13, 15, and 17. The conservator of the college museum, Prof. Arthur Keith, will deliver lectures on "The Anthropology of Ancient British Races" on February 20, 22, 24, and March 1 and 3.

A CONTRACTOR employed by the Okehampton Rural District Council for the repair of roads recently removed stones from an ancient monument, known as King's Oven. Attention having been directed to this action, the Council, while admitting that the contractor should not have removed the stones, suggested that the Duchy of Cornwall should bear the cost of restoring the stones. The Secretary and Keeper of Records of the Duchy has informed the District Council that in future permission to take stone must be obtained before it is used for road mending, and that the Duchy counts upon the support and assistance of the local authorities in the protection and preservation of ancient remains. The District Council has, we are glad to know, decided to take steps to replace the stones.

THE annual general meeting of the Royal Meteorological Society was held on January 18. After the report of the council had been read, the president, Mr. H. Mellish, said that the completion of the third decade since the society undertook the collection of climatological observations suggested that the moment was opportune for taking stock of the data which had been collected in the British Isles, and of the progress which has been made in reducing and discussing them; he therefore devoted his address to a consideration of the present position of British climatology. The following officers were elected for the ensuing year:—*President*, Dr. H. N. Dickson; *vice-presidents*, F. Druce, H. Mellish, R. G. K. Lempfert, Colonel H. E. Rawson, C.B.; *treasurer*, Dr. C. Theodore Williams; *secretaries*, F. C. Bayard, Commander W. F. Caborne, C.B.; *foreign secretary*, Dr. R. H. Scott, F.R.S.

THE *Northern Whig* for January 19 contains a full report of a meeting held by the Belfast Naturalists' Field Club to commemorate the life-work of the late Samuel Alexander Stewart. The Rev. C. H. Waddell, Mr. R. Lloyd Praeger, and the president of the club, Mr. R. J. Welch, dwelt on various aspects of Stewart's career. Mr. Waddell and Mr. Praeger have also contributed sympathetic notices, accompanied by a bibliography and a charmingly characteristic portrait, to the *Irish Naturalist* for October, 1910. Belfast is justly proud of having numbered Stewart among her citizens for more than seventy years. It is one of the ironies of fate that his death, at the age of eighty-four, was caused by a street accident, but he had already retired from his post at the museum of the Belfast Natural History Society. His career was outlined in NATURE for June 30, 1910, and the recent meeting shows that the impression made by the energy and temperament of the man will not be lost among naturalists in Ireland. Those who knew his welcoming smile, and who discussed with him questions of botany or geology, felt that they were in the presence of a mind as beautiful as the open-air studies to which he pointed out the way.

PROCEEDING upon the reports of three committees and a Royal Commission, Mr. J. C. Medd presents in the *Quarterly Review* (January) a rational criticism of ways and means with reference to the extension of forestry areas and improved methods of cultivation in the British Isles. As examples of small beginnings, allusion is made to the purchase of the Inverliever estate in Argyllshire, of a forestry station at Avondale, and of estates at Aghrane, Dundrum, and other localities in Ireland. In common with most critics, Mr. Medd comments upon the failure of the commission to consider a scheme of cooperation between the State and private owners, and instances a number of advantages that would attend such an arrangement; in this connection he mentions approvingly the scheme of copartnership advocated by Lord Lovat. With regard to difficulties in the way of an extensive general scheme, it is pointed out that it would be unwise to dis-

place remunerative sheep farms and sporting estates by prospective forests of unknown value. The author touches on the need for information with respect to cost of plantations, facilities for training woodmen, and the possibilities of turning nature-study classes in the country schools to practical advantage. Cognate to the subject of the article is the announcement, last week, of the formation of an English Forestry Association, with Lord Clinton as the first chairman, for the purpose of organising the market for English timber, encouraging its use, and assisting in the establishment of local wood industries in suitable districts.

THE annual meeting of the Entomological Society of London was held on Wednesday, January 18, when the officers and council for the forthcoming session, 1911–2, were elected. Owing, however, to the death of Mr. J. W. Tutt, the president-nominate, no successor to the outgoing president, Dr. F. A. Dixey, F.R.S., was chosen, and a special general meeting will be held later in the year for that purpose. Meanwhile, the following fellows were elected to act as officers and members of the council:—*Treasurer*, Mr. A. H. Jones; *secretaries*, Commander J. J. Walker and (in place of Mr. H. Rowland-Brown, who resigns after eleven years' service) the Rev. G. Wheeler; *librarian*, Mr. G. C. Champion; *other members of the council*, Mr. R. Adkin, Mr. G. T. Bethune Baker, Prof. T. Hudson Beare, Dr. M. Burr, Dr. F. A. Dixey, F.R.S., Mr. H. St. J. Donisthorpe, Mr. J. H. Durrant, Prof. Selwyn Image, Dr. K. Jordan, Mr. A. Sich, Mr. J. R. le B. Tomlin, and Mr. H. J. Turner. The president, in the course of his address, dealt with certain problems of general biology on which special light had been thrown by entomological study, notably the demonstration that permanent races, differing from the parent stock, could be produced by artificial interference with the germ-plasm. This had been surmised from early experiments of Weismann, followed by Standfuss and Fischer, and had now been placed beyond doubt by the careful work of Tower in America, who had also shown that the new form might stand in Mendelian relation with the stock from which it sprang. Other topics touched upon in the address were the psychophysical character of the material presented to the operation of natural selection, a point particularly emphasised by Prof. Mark Baldwin, and, in connection with this, the special interest attaching to the communities of the social Hymenoptera, where the group rather than the individual appeared as the unit of selection.

A FORM of treatment of wasting diseases of young children has been recently introduced by M. Quinton. It consists in the injection every second day of 10–30 c.c. of pure fresh sea water, sufficiently diluted with distilled water so that the mixture is isotonic with human blood. Considerable success is claimed for this treatment, and, according to the *Morning Post* of January 16, M. Quinton lately visited London in order to arrange for the establishment of a dispensary for the trial of his method.

WITH the December (1910) number, the *Journal of Hygiene* completes its tenth volume, and contains indexes of authors and of subjects to the ten volumes issued, in addition to several important papers. Messrs. Glenny and Walpole find that vulcanised rubber has the power of absorbing mercury biniodide and mercuric chloride from weak solutions, in some cases almost completely. Dr. Peters in an elaborate paper discusses the natural history of epidemic diarrhœa, one of the most important conclusions being that the milk supply plays little or no part in its propagation, and that boiling the milk gives no protection.

ACCORDING to a note in the *Times* last week, plague-infected rats are still being met with in Suffolk and over an extended area, and for the purpose of aiding the Local Government Board in this connection, the Lister Institute has detailed two bacteriologists for work in the district. It would be well if the authorities followed the example of the United States Government in its campaign against the ground squirrels in California as described by Surgeon McCoy in the December (1910) number of the *Journal of Hygiene* (x., No. 4, p. 589). The squirrels are infected with plague, and during 1909–10 150,000 of the rodents were examined. The necessity for investigations on a large scale is apparent when it is stated that in one county more than 8000 squirrels were examined before any infection was discovered.

IN vol. xxiii., No. 4, of Notes from the Leyden Museum Dr. E. D. Van Oort describes, under the name of *Anurophasis monorthonyx*, a new genus and species of game-bird, obtained with other new birds, during the expedition of Mr. H. A. Lorentz to south-western New Guinea. The genus name relates to the apparent absence of tail feathers. It is not stated to what group the new bird is related. Dr. Horst's description in this issue of a new peripatus obtained during the same expedition has been noticed already in NATURE.

FROM a study of the local myriopods of the group Diplopoda (Chilognatha), Dr. K. W. Verhoeff, in a paper contributed to the *Abhandlungen der naturwiss. Ges. Isis* for the first half of 1910, considers himself justified in dividing Germany into three zoological provinces, from north to south, which he calls north, central, and south Germany. Central Germany is further split into two sub-provinces, from west to east, which are termed west central and east central. Details of the distributional grounds on which these divisions are based will be found in the paper, but it may be noted that the distribution of many groups of Diplopoda corresponds very closely with that of particular geological formations.

ACCORDING to an article contributed by Messrs. De Drorein de Bouville and Mercier to the *Revue générale des Sciences* for December 30, 1910, there has been a great recrudescence and expansion on the Continent during the past year of the salmon-disease known in France as furonculosis. The disease, which attacks both salmon and trout, together with a few other fishes, such as pike and carp, has been known on the Continent for about a quarter of a century, and was carefully studied at Munich in 1888 and the two following years. In June of last year the disease became more than usually prevalent, especially in Bavaria, where it made its appearance for the first time in 1909, and this recrudescence has given rise to much anxiety on the part of all connected with fresh-water fisheries. The disease, of which the symptoms are fully described in the article, is caused by the bacillus known as *Bacillus salmonicida*, but whether it was originally imported from America, or whether it be due to a pathogenetic development of a native organism, the authors leave an open question. It is noteworthy that rainbow-trout are particularly susceptible to furonculosis, which is fatal to a large percentage. This being so, the authors recommend that the practice of stocking European rivers with exotic salmonoids, which are generally in a low state of vitality, and therefore prone to take disease, should be discouraged. On the other hand, efforts should be made to restock salmon and trout streams with native stock, which is the most fitted to adapt itself to local conditions, and, further, that such fish should not be reintroduced into rivers from which they have completely dis-

appeared, as the causes which have led to the extinction are probably still active. Whether the continental *Bacillus salmonicida* is identical with the British *B. salmonis pestis*, Patterson, is not stated in the article.

THE annual volume for 1910 of the *Bulletin of Miscellaneous Information*, issued from the Royal Botanic Gardens, Kew, has now been published at the price of 4*s*. 6*d*. Attention has been directed already in these columns to the papers in separate numbers of the *Bulletin*, and it is sufficient to say here that the volume contains ten numbers, four appendices, and a complete index.

A LIST of Siamese plants compiled by Dr. C. C. Hosseus, and published in the *Beihefte zum Botanischen Centralblatt* (vol. xxvii., part ii.), represents, as the author points out, merely a contribution to the flora of Siam, inasmuch as some of the provinces are entirely unexplored. The author has received valuable help from many botanists in the identification of his specimens, and has furnished indications of the regions from which each species was obtained. The list shows a preponderance of Leguminosæ and Cyperaceæ.

THE latest part (vol. iv., No. 4) of the Records of the Botanical Survey of India is devoted to the notes contributed by Mr. I. K. Burkill with reference to a journey into Nepal. The author collected few novelties—three species of Impatiens and an Eriocaulon—which is explicable, as he traversed nearly the same route at the same season of the year that Wallich took eighty-seven years earlier. The notes relate chiefly to detailed features of the vegetation and a comparison of the sál, *Shorea robusta*, forests and flora of the hill tops in Nepal with those in Sikkim.

MR. ASKIN NICHOLAS, writing from 31 Queen Street, Melbourne, advances a curious explanation of Glacial periods of geology. He suggests that "the Glacial period corresponds with the period in which the moon lost its water. To me it seems feasible that this would be annexed by our planet by first forming a ring around it, under which *ring* would be a perpetual shadow of great width." But Mr. Nicholas's suggestion would not explain either the geographical distribution of areas of heavy glaciation or the recurrence of such glaciations. Mr. Nicholas refers in the course of his letter to the Glacial periods, and thus recognises that there have been more than one; and the last was geologically so recent that it would seem most improbable that there should have been any important change in the condition of the moon since that date. If the suggestion were valid, the moon should also have lost its water once during pre-Cambrian, in Cambrian, and Carboniferous times. Mr. Nicholas will find a discussion of the supposed causes of glaciation in Chamberlin and Salisbury's "Geology," vol. iii., 1906, pp. 424–46.

La Nature for December 17, 1910, contains a photograph of the "Spectre of the Brocken," taken some time ago by M. Th. Moureaux on the terrace of the observatory of the Pic du Midi. It shows in the centre of the corona the shadow of the operator holding up the photographic apparatus. On the summit of the peak and to the westward patches of cumulus cloud were scattered over the sky, and at times the sun shone out brightly on the rising mists. The author of the note (M. J. Loisel) states that, so far as he knows, this is the first time that the spectre has been photographed. He refers to M. Lancaster's experience at Uccle at the time of a thick fog in July, 1892, during which he saw his shadow projected by a lamp burning in a room on the second floor, and all his movements reproduced. M. Loisel remarks that it would be interesting to observe whether the phenomenon would be repeated in any thick fog, or only under special conditions.

WE have received a catalogue of physical apparatus and optical goods from Messrs. R. and J. Beck, which contains a longer list of parts of optical apparatus, *e.g.* lenses and prisms of glass or quartz, than we have seen previously in any English catalogue. It will prove of great help to those who are constructing apparatus for special purposes. The most noteworthy larger pieces of apparatus described are a lens-testing bench with all the fittings requisite for the rapid examination of spectacle lenses, and a large optic bench for interference and diffraction observations, which Messrs. Beck have made into a universal instrument by providing it with a spectrometer to fit on to one of the upright pillars, and with the lenses and polarising prisms necessary for the optical examination of crystals.

A COPY of the "Instructions of the Metropolitan Gas Referees" for the year 1911 has reached us. These instructions are practically identical with those issued last year, the only change being that the 10 cubic feet of gas burnt for the determination of the total sulphur is allowed to be burnt at a somewhat faster rate—0·62 foot per hour instead of 0·5. In the determination of the calorific value of the gas, the calorie used is now specially defined as "the amount of heat which will raise the temperature of a litre of water one degree centigrade," the temperature at which the water is measured not being stated.

MESSRS. D. APPLETON AND CO. will publish shortly a new work of travel entitled "The Big Game of Africa," by Mr. R. Tjader, who has studied very closely the characteristics of the big game which he has hunted, and paid attention to the scientific side of the subject.

OUR ASTRONOMICAL COLUMN.

METEORS IN FEBRUARY.—Mr. W. F. Denning writes:—"February is not a specially interesting one as regards meteors, but it has presented many brilliant fireballs in past years, and indications of several showers of somewhat important and active character.

"The writer has never made very extensive observations in this month, but from the data he has secured and from the paths of meteors observed by other persons he has long regarded a shower of Aurigids as the most prominent and richest stream of the period. The radiant is about at 75°+42°, and the time of visibility apparently extends from February 5 to 23, but this is uncertain. The meteors are slow and often bright.

"Observers would do useful work by watching the sky on clear February nights, when moonlight does not materially interfere. They might secure useful evidence as to the Aurigid shower, and would probably notice a few of the fireballs which commonly appear at this time of the year. The most remarkable fireball of modern times appeared on February 22, 1909.

"This year the moon will not interfere in the evening of February 22, and the paths of such meteors as are seen should be carefully registered and other details noted."

NOVA LACERTÆ.—Observations of Nova Lacertæ, made at Bergedorf on January 2, are reported by Dr. Graff in No. 4465 of the *Astronomische Nachrichten*. Two sets of comparisons with neighbouring B.D. stars gave, for the magnitude of the nova, 6·8, and its rose colour is compared with that of Nova Persei in May, 1901, being about 5·5° on Schmidt's scale of colour. Visual spectrum observations gave C and F, probably, and brightenings in the yellow and violet; strong absorptions in the orange and on the other side of F were also noted.

A NEW VARIABLE OR NOVA (134.1910 PISCIUM).—What may prove to be another nova is also reported in No. 4465 of the *Astronomische Nachrichten* by Herr E. Ernst. The discovery was made, whilst comparing some minor-planet photographs of the region near 42 Piscium, on a plate exposed on September 13, 1907, and the image appears to be that of a tenth-magnitude star, in the position $\alpha = 0h.\ 27{\cdot}3m.$, $\delta = +9^\circ\ 30'$ (1855·0).

Eighteen other plates, taken during the period October, 1894, to October, 1910, fail to show any image in this position, but one taken on the same evening shows the image to be undoubtedly stellar.

MASS-RATIOS OF THE COMPONENTS OF KRÜGER 60 AND CASTOR.—In No. 5, vol. xxxii., of the *Astrophysical Journal*, Dr. H. N. Russell discusses the mass-ratios in the multiple systems Krüger 60 and Castor.

In the case of the former system, Prof. Barnard has pointed out that the motion of the principal component A is distinctly curved with respect to the distant optical companion C, thus indicating that the faint component B has a mass comparable with that of A; from Prof. Barnard's measures Dr. Russell has calculated the relative masses. He finds that the mass of B is slightly greater than that of A, although the magnitude of A is 9·7, whilst that of B is 11·0; the ratio of the masses is $1{\cdot}14 \pm 0{\cdot}14$.

In the case of Castor, Dr. Russell finds that in all probability the "dark" companions in each of the two spectroscopic binaries are much less massive than their primaries, the ratio being greater than for any other system yet investigated. The mass of the whole system is $6{\cdot}5 \pm 1{\cdot}0$ that of the sun, whilst, if it is the same in each pair, the mass-ratio (primary/secondary) is about 6·5 in each case; the parallax of Castor is concluded to be approximately $0{\cdot}08'' \pm 0{\cdot}03''$.

DOUBLE STARS.—Lick Observatory Bulletin No. 188 contains a list of 100 new double stars discovered and measured by Dr. R. G. Aitken with the 36-inch refractor. This is the seventeenth list published by the same observer, and includes Nos. 2201 to 2300; the sixteenth list appears in No. 184 of the Bulletins.

Dr. Aitken makes some interesting remarks concerning the colours of the components in some 5000 close double-star systems he has examined with the large telescope. Generally, he finds that cases of striking contrast are comparatively rare, and he suggests that this may be due to the fact that the apparent brightness of even faint stars in the field of 36-inch telescopes is considerable, consequently the subjective phenomena recently discussed by Dr. Louis Bell are not so effective as in smaller instruments. Even in the case of A 2250, where the colour of the primary is a striking orange-red, the faint companion can only be described as a dull greyish-white, not blue. In most cases both components appear to be white, although the fainter one is perhaps more bluish than the primary.

No. 4464 of the *Astronomische Nachrichten* contains a long list of measures, made by Prof. Burnham with the 40-inch refractor at the Yerkes Observatory, of stars selected from the General Catalogue for remeasurement because some uncertainty or suspicion of change existed. Appended to the measures are many interesting notes concerning proper motions, existence of planetary and other faint nebulæ in the same region, or apparent discrepancies.

THE UNITED STATES NAVAL OBSERVATORY.—The report of the superintendent of the Washington Observatory for the year ending June 30, 1910, contains, in addition to the usual articles, several notes of special interest.

The observatory has decided to do what it can in the observation of fundamental stars in connection with the International Chart, but for the present cannot undertake more than the observation of the historic fundamental stars. A number of instruments no longer in actual use have been collected into one of the domes as a museum.

Observations of Halley's comet were made from November, 1909, to June, 1910, but during the time the comet was nearest the earth visitors to the observatory were so numerous that the 26-inch and 12-inch equatorials had to be given up to their use; three 5-inch equatorials were also mounted at the Capitol, and two assistants deputed to attend them.

STAR COLOURS.—In No. 4, vol. xxxii., of the *Astrophysical Journal* Mr. Innes has a note on Mr. Bell's paper regarding the physiological factor in the determination of the colours of stars in multiple systems.

Mr. Innes points out that modern observers do not record the fantastic colours recorded by earlier observers, but suggests that they should record colours on the modest "Chandler" scale. He also cites a celestial example, confirmatory of Mr. Bell's laboratory results, where the near approach of Mars—then 4 or 5 on Chandler's scale—gave the yellow binary γ Virginis a decidedly bluish appearance. Mr. Innes also gives examples, however, showing that in some cases the subjective effect apparently does not operate, whilst in others an objective difference almost certainly exists.

THE IMPERIAL DEPARTMENT OF AGRICULTURE IN THE WEST INDIES.[1]

IN recent years the productions of tropical countries have formed an appreciable proportion of the raw material for the manufacturing industries on which the prosperity of this country depends. It is admitted that the British are in possession of some of the richest portions of the tropics, and therefore their development is a matter of great imperial interest. Our responsibilities can hardly be realised; but if our commercial supremacy depends upon the control of the tropics, we cannot relieve ourselves of responsibility either in the interest of our possessions or in our own interests.

It is proposed here to confine attention more particularly to the West Indian colonies, consisting of a group of islands generally known as the British West Indies, Bahamas, and Bermuda, together with the two considerable colonies on the mainland, viz. British Honduras and British Guiana. By their situation in the western tropics and their entire dependence on agriculture, these possessions form a natural group having a common interest in the development of the products of the soil. The West Indies, in the larger sense suggested above, cover an area of 109,836 square miles, or a little less than the British Isles. The population is estimated at 2,300,000. The value of the total trade is about 22,000,000*l*. Of their imports of manufactured and other goods, they take 40 per cent. from the United Kingdom. An increase in the total trade from 15,647,816*l*. in 1903 to 21,429,301*l*. in 1909 is encouraging. It is anticipated that the twentieth century will witness the "regeneration of the West Indies" and a return to some of their former prosperity. Already this is becoming true. Lord Crewe, the late Secretary of State for the Colonies, was in a position to announce in February last "that no West Indian colony was now in want of grants-in-aid." Further, all the colonies have comparatively large sums in reserve to meet any ordinary emergency that may arise.

Briefly stated, the circumstances that have combined to bring about the new prosperity in the West Indies are as follows:—(1) the revival of confidence in the sugar industry as the result of the abolition of bounties, and improved trade relations with Canada; (2) the increase in the production of cacao in Trinidad, Grenada, and Jamaica; (3) the development of the American fruit trade in Jamaica; (4) the introduction of the Sea Island cotton into St. Vincent, Barbados, and the Leeward Islands; (5) the extension of the cultivation of limes in Dominica and rice in British Guiana.

The Imperial Department of Agriculture in the West Indies was created on the recommendation of a Royal Commission consisting of Sir Henry Norman (chairman), Sir Edward Grey, and Sir David Barbour. In 1897, when the commission visited the West Indies, many of the colonies were in a depressed condition and a source of anxiety to the Imperial Government and to those directly interested in them. The commission was charged, in the first place, to inquire into the condition and prospects of the sugar-growing colonies and "suggest such measures

[1] Abstract of a paper read before the Royal Colonial Institute on January 10, by Sir Daniel Morris, K.C.M.G., late Imperial Commissioner of Agriculture.

as would appear best calculated to restore and maintain the prosperity of those colonies and their inhabitants." A further subject of inquiry was: "Whether, in the event of the production of sugar being discontinued or considerably diminished, what other industries could replace it, and be carried on profitably and supply employment for the labouring population."

The commissioners recorded as their opinion that the depression in the sugar industry was due "to the competition of other sugar-producing countries, and in special degree to the competition of beet-sugar produced under a system of bounties." They submitted that "the best immediate remedy . . . would be the abandonment of the bounty system." In the meanwhile they recommended certain special remedies, such as an improved steam communication with outside markets and between the different islands, and the organisation of a scientific department to assist the sugar industry and encourage, where conditions were favourable, minor agricultural industries, together with a general improvement in the system of cultivation of the principal crops.

Most of the recommendations were sooner or later adopted by the Imperial Government, including the creation of an Imperial Department of Agriculture. For the latter, on the motion of Mr. Chamberlain, funds were voted by Parliament on August 2, 1898. The average amount that has been expended up to 1908 has been at the rate of 17,400*l.* per annum. Of this amount, some 5000*l.* represented the cost of the head office; the remainder was applied in grants-in-aid of botanical and experiment stations, agricultural schools, and other educational services in the individual colonies.

The duties entrusted to the department were of a varied and far-reaching character. Among them, the general improvement of the sugar industry and the encouragement of a system of subsidiary industries in localities where sugar could not be grown, or where the conditions were more favourable for the production of cacao, coffee, bananas, oranges, limes, cotton, rubber, cocoanuts, sisal-hemp, rice, nutmegs, pineapples, and other crops. In addition, it was proposed that it should devote attention to the improvement of the breed and condition of cattle, horses, and small stock, and to the extension of bee-keeping. Efforts were also made to bring the mass of the people into sympathy with agriculture and trained to regard the successful treatment of crops as the basis upon which to build, not only their own welfare, but the general prosperity of the colonies. With this view, a prominent position was given to teaching the principles of elementary science and agriculture, both in the primary and secondary schools. Associated with this policy was the increased attention devoted to object-lessons, the encouragement of growing specimen plants in pots and boxes, and the establishment of school gardens. Arbor days for the public planting of ornamental and other trees were also organised and assisted by the department.

The sugar investigations were mainly directed to raising improved varieties of canes capable of withstanding diseases that had rendered the continued cultivation of the Bourbon cane impossible and obtain a larger yield of sugar per acre. Valuable experiments have also been carried on over considerable areas in testing the relative value of pen and artificial manures, and in ascertaining, by a continuous series of trials under skilled supervision, in what quantities and at what stages of growth of the canes such manures could be applied to the best advantage. In addition, investigations have been carried on in the chemical selection of the sugar-cane, in the treatment of cane tops with germicides, and as to the effect of planting at different distances and of improved tillage operations.

A further improvement in the sugar industry has been the establishment of central factories at Antigua, Jamaica, and also at St. Kitts. In the case of the factory at Antigua, it was recently stated "that out of 6000 tons of crystals shipped from the factory, 2500 tons represented the gain due to improved methods of crushing the canes and manufacturing the sugar," that is, the production of sugar from a certain quantity of canes was increased by the factory, as compared with the system hitherto in use, by 40 per cent.

The annual production of sugar in the West Indies is about 240,000 tons, of the value of 3,000,000*l.* In recent years an increasing amount of sugar and molasses has been shipped at preferential rates to the Dominion of Canada. In 1897 Canada took only 11,000 tons of sugar; in 1909 it took 133,000 tons, or about 60 per cent. of the total production of the West Indies.

The result of the policy pursued during the last twelve years is shown in the fact that, while the total exports of produce and manufactures of the West Indian colonies have increased from 5,625,000*l.* to 7,195,360*l.*, the exports of the products of the sugar-cane (sugar, rum, and molasses) have declined from 3,243,000*l.* to 3,037,660*l.* On the other hand, the exports of other commodities, such as cacao, fruit, cotton, logwood extract, tobacco and cigars, rice, coconuts, and rubber, have increased from 1,382,000*l.* to 4,157,700*l.* The recent Royal Commission entirely concurs with the commission of 1897 as to the danger of dependence on a single industry, and they strongly support a continuance of the efforts that have been made with such signal success to develop other industries suitable to the soil and climate.

Several striking instances of the value of scientific investigation for practical purposes have been placed on record both as regards sugar, cacao, cotton, and other industries. The cultivation of Sea Island cotton was introduced in 1903. Since that time, 15,000,000 lb. of cotton lint have been exported, of the value of 800,000*l.* It is admitted that if fine Sea Island cotton had not been obtained from the West Indies, several cotton mills in Lancashire would have been compelled to work short time. The total number of valuable economic plants distributed from the botanic and experiment stations have reached 1,375,151, sufficient to establish about 10,000 acres in permanent crops.

Agricultural education has been extended during the last ten years, with the result that the West Indies are now fully provided with the means for extending agricultural knowledge amongst all classes of the community. Agricultural training schools and farm schools have been provided for boys of the agricultural classes, and the teaching of scientific agriculture has been making steady progress in the secondary schools and colleges. The department has also served a useful purpose as a leading school of tropical agriculture. It is acknowledged that there is no other organisation in any part of the tropics where such diversified work is carried on over so large an area and under such varying conditions of soil and climate. Hence it is possible to afford a sound scientific and practical training to students in the cultivation of crops suited to nearly all tropical conditions. A gratifying proof of the value of the work of the Imperial Department of Agriculture has been the formation of similar departments with well-equipped laboratories and experiment stations in other parts of the tropics; also in supplying trained officers to take charge of these departments.

The valuable services rendered to our tropical colonies by the Royal Gardens at Kew for more than half a century are deserving of special mention. The successful introduction of cinchona into India and Ceylon, and more recently of the rubber trees, which have made it possible to establish the important rubber industries now existing in India, Ceylon, and the Federated Malay States, are not the least of the achievements of Kew.

In a memorandum by Lord Islington, attached to the report of the Canada and West Indian Royal Commission, the following reference is made to the work of the Imperial Department of Agriculture:—

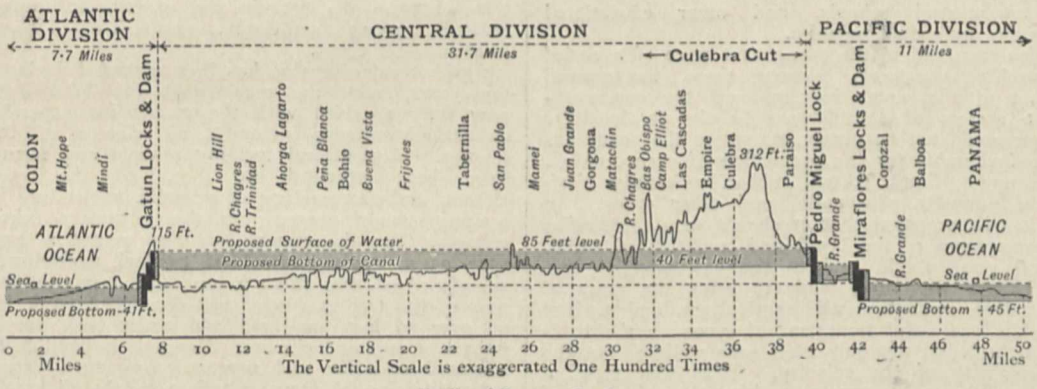
"I was deeply impressed by the value of the work done by the Imperial Department of Agriculture and by the greatness of the possibilities which still lay before it; the revival of the cotton industry, and consequent restoration of comparative prosperity to some of the small islands; experiments with the sugar-cane; the discovery and destruction of insect pests—these were in themselves great achievements. In my opinion, however, an even more valuable work has been done in diminishing the prejudices of agriculturists and inducing them to try new methods and in inculcating the value of science and cooperation. . . . The most successful fruit of the Report of the Commission of 1897 has been the work of the Imperial Department of Agriculture, which has beyond doubt saved the Home Government from appeals which could not wholly

be rejected, and would have cost more than the total outlay on the Department."

In response to the strong recommendations of the Royal Commission, the Imperial Government has recently agreed in principle to the continued maintenance of the central office of the department for a further period of ten years from April 1. This will enable the department under Dr. Watts (the present Commissioner) to continue to coordinate the work of scientific agriculture in the West Indies, to carry on research, and afford still further assistance in developing the resources of the colonies.

THE PANAMA CANAL IN 1910.[1]

THE canal now being constructed by the American Government in continuation of the work commenced by de Lesseps is 50½ miles long from deep water in the Caribbean to deep water in the Pacific. Of this distance 34 miles is high-level with 8 miles sea-level at each end, as shown on the accompanying profile. The water for lockage is supplied by blocking the lower valley of the Chagres River at Gatun with an earthen dam 7000 feet long, 115 feet high, and about 2000 feet broad. This consists of two heaps of broken rock enclosing the hydraulic fill, *i.e.* silt pumped in wet and allowed to drain. This packs tightly under the pressure of the atmosphere, and secures the impermeability of the dam. The heavy rock fills secure its stability against the lateral pressure of the 85 feet of water which will be behind the dam. The height now attained by the dam is 70 feet. The underlying ground is somewhat soft, but it has not been squeezed up owing to the way the load has been spread. The sides of the dam, in fact, hold down the ground so that the weight of the central portion cannot squeeze it up.



Profile of Panama Canal.

The elaborate investigations of the engineers on the spot have shown that the foundations are impervious, the earlier official reports to the contrary having been based upon a misinterpretation of the borings. The area of the lake which will be maintained between this dam and that at Pedro Miguel will be 164 square miles, or twice the size of the Lago Maggiore.

The dimensions of the locks are: length, 1000 feet; breadth, 110 feet. The minimum depths in canal and locks will be 41 feet. The minimum bottom width in the 8 miles of the Culebra cut, 300 feet. The rest of the canal will have a bottom width of from 500 to 1000 feet. The profile shows the greatest original elevation of the ground to be 312 feet, but this is on the central line. On the eastern side at the same place the escarpment began at 534 feet. The bottom will be at 40 feet above mean sea-level, so that the cutting here will be nearly 500 feet deep. The depth of water in this portion of the canal will be 45 feet, the surface being therefore 85 feet above mean sea-level.

The principal difficulty in construction is caused by landslides, brought about by the action of rain, of which 90 inches falls in the year at Culebra. The basalt rock is overlaid with disintegrated rock and with clay to an average thickness of 15 to 20 feet, and the rock itself in places has open joints or seams, either vertical or sloping towards the cut. Frequently the first sign of a landslide is the bulging up or humping of the basalt rock at the bottom of the cut, which sometimes rises 20 feet. Simultaneously a crack appears on the soil above, which is followed by foundering of the soil and clay, and very often of the rock. Obviously, so long as humping of the bottom occurs, it would be futile to let in water, as the canal might be at any moment so reduced in depth as to be unnavigable. It is proposed to deal with the difficulty by flattening the slopes until gravitational equilibrium is achieved, on the principle already referred to in the case of the Gatun dam.

The author points out the existence of a gravitative wave in landslides, and recommends the application of the principles and terminology of surface waves to their study.

In spite of the difficulty of the landslides, the opening of the canal may be expected on the promised date, viz. January 1, 1915.

[1] Abstract of a paper read before the Royal Society of Arts on December 9 by Dr. Vaughan Cornish.

APPLIED GEOLOGY IN THE UNITED STATES.[1]

HE eight bulletins referred to below cover a wide range of applied geology, and contain many valuable additions to academic geology. Thus the memoir by Messrs. Hillebrand and Schaller is a most important contribution to knowledge of the minerals containing mercury. It gives the result of a thorough research on kleinite, montroydite, terlinguaite, and eglestonite. The two last are proved to be oxychlorides, and montroydite to be an oxide of mercury, confirming the conclusions of Prof. Moses, the founder of these species. Kleinite was named in 1905 by Prof. Sachs, who described it as an oxychloride of mercury, but the day after his paper was

[1] F. C. Schrader: Mineral Deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohave County, Arizona. U.S. Geol. Survey, Bull. 397. Pp. 226+xvi plates+37 figs. (Washington, 1909.)

E. F. Burchard and C. Butts: Iron Ores, Fuels, and Flu xes of the Birmingham District, Alabama, with chapters on the Origin of the Ores, by Edwin C. Eckel. U.S. Geol. Survey, Bull. 400. Pp. 204++xvii plates, +19 figs. (Washington, 1910.)

W. F. Hillebrand and W. T. Schaller: The Mercury Minerals from Terlingua, Texas. U.S. Geol. Survey, Bull. 405. Pp. 174+vi plates+44 figs. (Washington, 1909.)

W. H. Emmons: A Reconnaissance of some Mining Camps in Elko, Lander, and Eureka Counties, Nevada. U.S. Geol. Survey, Bull. 408. Pp. 130+v plates+22 figs. (Washington, 1910.)

A. G. Maddren: The Innoko Gold-Placer District, Alaska, with Accounts of the Central Kuskokwim Valley and the Ruby Creek and Gold Hill Placers. U.S. Geol. Survey, Bull. 410. Pp. 87+v plates. (Washington, 1910.)

F. L. Hess: A Reconnaissance of the Gypsum Deposits of California, with a Note on Errors in the Chemical Analysis of Gypsum, by George Steiger. U.S. Geol. Survey, Bull. 413. Pp. 37+iv plates+2 figs. (Washington, 1910.)

F. L. Ransome: Notes on some Mining Districts in Humboldt County, Nevada. U.S. Geol. Survey, Bull. 414. Pp. 75+i plate+7 figs. (Washington, 1909.)

The Valuation of Public Coal Lands. G. H. Ashley: The Value of Coal Land. C. A. Fisher: Depth and Minimum Thickness of Beds as Limiting Factors in Valuation. U.S. Geol. Survey, Bull. 424. Pp. 75. (Washington, 1910.)

read, in Berlin Hillebrand announced that the mineral is a mercury-ammonium compound; it is a mixture of mercury ammonium chloride with some sulphate or oxysulphate. Some interesting photographs illustrate the optical heterogeneity of the mineral. Kleinite is hexagonal in symmetry, but basal sections are only singly refracting when heated above 130°; after cooling very slowly, in process of years, again become biaxial.

Three of these bulletins (Nos. 397, 408, and 414) state the results of inspections of western mineral fields where mining was once more active than it is now. Mr. F. C. Schrader describes the ore deposits of Mohave County, in north-western Arizona. The country consists of a plateau of pre-Cambrian gneisses covered in places by Cainozoic volcanic rocks, and flanked by Palæozoic sediments in the valley of the Colorado River. The climate is warm, and with a 5-inch rainfall and high evaporation there is little surface water, and the rocks are oxidised to the depth of usually from 200 to 600 feet. The mines are numerous, but they are all hampered by the difficulties of access and high costs, and so none have been worked very deeply. The outcrops were removed thirty years ago. The mines belong to two main types, one represented in the Cerbat Range, occurring in the pre-Cambrian rocks, and the other, as in the Black Mountain, found in the Cainozoic volcanic formation. The ores in the latter are found only in association with chloritic andesites. The field shows many points of interest, and the results will be watched with interest as the mines go deeper. The plans suggest that some of the ore shoots have been formed from ascending solutions. The evidence available is insufficient to throw much light on general problems, but Mr. Schrader's report will be indispensable in the future development of the field.

Mr. W. H. Emmons's reconnaissance on some mining camps in Nevada also deals with small scattered mines of which most of the direct evidence has been lost. Some of them were worked fifty years ago, and mining was most active during the silver boom of the 'eighties. The mines, unlike those in Mohave County, yield a large variety of minerals. The area consists of Palæozoic sediments, ranging from the Cambrian to the Carboniferous, which have been invaded by Cretaceous granodiorites, and covered in places by Miocene rhyolites, andesites, and basalts. One series of mines consists of replacements in what the author calls the "marbleised limestone" around the Cretaceous granodiorites, and a second series occurs with the Cainozoic eruptives, but only in association with the andesites; the basalts are always barren, and the rhyolites are only productive when near andesite. The chief metals in both series of mines are gold and silver. The gold is relatively more abundant in the older lodes, where it is associated with copper and lead. The mines only occur where the rocks have been leached by hot water, and thus prospectors recognise promising positions by the colour of the weathered rocks.

Mr. F. L. Ransome has examined Humboldt County, Nevada, of which the map prepared by the historic Survey of the Fortieth Parallel is still the best. Mining began in the district about 1860 on ores of antimonial silver with stibnite and cinnabar. In Copperwood Canyon small veins of nickel and cobalt ores occur in an altered andesite beside a diorite, probably of Cretaceous age. Mr. Ransome shows his characteristic insight in the classification of the ore bodies and in such illuminating diagrammatic sections as that of the Sheba mine (p. 42).

The gypsum deposits of California are described in a short memoir by Mr. F. L. Hess. The gypsum is mined for use as plaster and a fertiliser. Some of it occurs in "gypsite," a material containing grains of gypsum too small to be readily discernible to the eye. It is there an efflorescent product, due to the evaporation of water, which has percolated through underlying gypsiferous beds. Some massive deposits formed by the evaporation of shallow lakes and by precipitation in shallow sea water are also of local commercial value. The veins of gypsum, including both selenite and satinspar, have no intrinsic value, but are worked as the cheapest method of holding mineral leases on land which may yield oil. Sufficient work is done on the gypsum to maintain the lease without the expense of boring for oil, and thus dodging the law by using one mineral to maintain an unfair claim to another.

The valuation of coal lands is a problem which has long taxed the ingenuity of experts on mining law. In Bulletin 424 Mr. Fisher contributes to the discussion a summary of the depth and minimum thickness of coal seams worked in various countries. The deepest coal mining recorded is from 3937 feet, in Belgium; the deepest in Britain is at 3483 feet, in Rams Mine, Pendelton; and depths of more than 3000 feet have been reached in France and Germany. Forty years ago a British Coal Commission recognised that mining would reach a depth of 4000 feet, but such is the wealth in fuel of the United States that coal below 3000 feet is still disregarded in valuation. The United States, moreover, has not yet been driven to work such thin coals as are wrought in England and Belgium. The thinnest English seams worked at present independently are a cannel coal of 8 inches and ordinary coal 10 inches thick. Seams 12 inches thick are worked in Belgium and Scotland, where beds of less than 2 feet thick are worked extensively.

The red iron ores in the Silurian rocks of Alabama, described in Bulletin 400, are second in importance in the United States only to those of the Lake Superior district. They are low-grade ores, but being near fluxes and fuel are cheaply worked. The Clinton ores have generally been regarded as a residual deposit due to concentration of iron oxide by solution of a ferruginous limestone. This view has been based upon the belief, due to Porter and I. C. Russell, that the ironstones pass below into normal limestone. This view has been accepted by many later economic geologists, but is rejected by Eckel, as the ore is already being mined far from the outcrop, and has been found in New York in bores ten to fifteen miles from the outcrop, and nearly 1000 feet below the surface. The ore is often oolitic and contains many marine fossils which have been altered into iron oxide, but that this change happened during the deposition of the rock is indicated by several facts. Thus many of the oolitic grains contain a nucleus of quartz grains surrounded by concentric layers of iron ore, which is covered by carbonate of lime. A fuller account and figures of the microscopic structure of the ores would have been useful. As the oolitic grains have been cemented by iron oxide, some replacement appears to have taken place after the formation of the bed. Mr. Eckel, however, produces weighty evidence in support of his view that the ore is mainly of contemporary origin, though recent work shows that other American geologists reject this explanation, and regard the estimates based on it as exaggerated.

The brown ores of Alabama are admitted by Mr. Eckel to be epigenetic; they are interbedded with Cambro-Ordovician, Cretaceous, and Cainozoic rocks, but are all of Cainozoic formation.

Mr. Maddren's report on some Yukon placer deposits shows that the gold has been derived from lodes formed by the intrusions of acid rocks in Mesozoic or Lower Cainozoic times. The gold is usually coarse, but its concentration has been slow, because the cold acts as a cementing agent, and the erosion of the frozen ground is very slow. The report gives some interesting information as to the relative extent of Glacial and post-Glacial denudation in some Alaskan valleys.

J. W. G.

ON THE SENSIBILITY OF THE EYE TO VARIATIONS OF WAVE-LENGTH IN THE YELLOW REGION OF THE SPECTRUM.[1]

DR. EDRIDGE-GREEN[2] has introduced a method of classifying colour-vision by determining the number of separate parts or divisions in the spectrum within each of which the observer can perceive no colour difference. Movable screens are provided in the focal plane of the spectroscopic telescope, by which the part admitted to the eye is limited and the limits measured in terms of wave-length. Beginning at the extreme visible red, more and more of the spectrum is admitted until a change of colour (not merely of brightness) is just perceptible. This gives the first division. The second division starts from the place just determined, and is limited in the direction of

[1] Abstract of a paper read before the Royal Society on December 8, 1910, by Lord Rayleigh, O.M., F.R.S.

[2] Roy. Soc. Proc., B, 1910, vol. lxxxii., p. 458, and earlier writings.

shorter wave-length by the same condition. In this way the whole spectrum is divided into a number of contiguous divisions, or patches, which Dr. Green terms monochromatic.

"Tested with this instrument a normal individual will, as a rule, name six distinct colours (viz. red, orange, yellow, green, blue, violet), and will mark out by means of the shutters about 18 monochromatic patches. Occasionally we come across individuals with a greater power of differentiating hues, to whom, as to Newton, there is a distinct colour between the blue and violet, which Newton called indigo. Such individuals will mark out a greater number of monochromatic patches, from 22 up to 29. The limited number of monochromatic patches which can be marked out in this way is at first surprising when we consider how insensibly one part of the spectrum seems to shade into the next when the whole of the spectrum is looked at. The number and position of the patches present, however, great uniformity from one case to another."

Being curious to know into what class my own vision would fall on this system, I was glad to be tested by Dr. Green last July. The number of patches proved to be 17, a little short of what Dr. Green lays down in the passage above quoted as normal. The limits of the actual patches were as follows:—

780—635½—624—612—603—595—586—576—560—541—521—509—500—489½—477—462—443—426.

Thus in the region of the D lines a patch including wave-lengths between 595 and 586 did not manifest a difference of colour. The interval between the D lines on the above scale being 0·60, it appears that my "monochromatic patch" was 15 times this interval.

While it is undoubtedly true that in this way of working no colour-difference was perceptible as the eye travelled backwards and forwards over the patch, my experience with colour discs and other colour-mixing arrangements made me feel certain that under more favourable conditions I could discriminate much smaller differences of wave-length. Special experiments have since proved that I can, in fact, discriminate by colour between points in the spectrum so close together as the two D lines.

In order to compare two colours with advantage it is necessary that each should extend with uniformity over a considerable angular area, and that the two areas should be in close juxtaposition. The requirements of the case are sufficiently met by a colour-box (after Maxwell) such as I described nearly thirty years ago.[1] In this form of apparatus a second slit, placed at the focus, allows a narrow width of the spectrum to pass; but instead of regarding the transmitted portion with an eye-piece, the eye is brought close to the slit and focussed upon the prism, which thus appears uniformly lighted with such rays as the second slit allows to pass. The light thus presented is, of course, not absolutely homogeneous; it includes a mixture of neighbouring spectrum rays, the degree of purity augmenting as the slits are narrowed. With the aid of a refracting prism of small angle (set perpendicularly to the dispersing prisms) the field of view is divided into two parts, which correspond to any desired colours according to the situation of the two primary slits. For the present purpose these primary slits lie nearly in one straight line, inasmuch as the two spectrum colours to be compared are close together.

In making the observations on sensitiveness, one primary slit, as well as the eye-slit, remains fixed, the position being chosen so as to provide yellow light from the neighbourhood of D. The second slit can be moved as a whole while retaining its width.

The procedure is quite simple. If the colours seen are strongly contrasted, the movable slit is displaced until the difference is moderate. Marks may then be given: O, denoting that the difference is uncertain; R_1, that it is just distinct in the direction of making the second patch the redder; G_1, that it is just distinct in the opposite direction. Similarly, R_2, G_2, denote differences in the two directions which are more than distinct, and so on. After each observation worth recording, the position of the movable slit is measured.

[1] NATURE, 1881, vol. xxv., pp. 64-66; "Scientific Papers," vol. i., p. 543 See also NATURE, August 18, 1910.

In this manner, as the result of sets of observations made on several days, it was found that a movement of the second slit through 0·15 mm. was sufficient to carry the variable colour from being distinctly redder than the standard to distinctly greener. We may conclude that the eye is capable of appreciating without fail a difference of situation represented by 0·07 mm.

It remains to interpret the result in terms of wave-lengths. By allowing light to enter at the eye-slit, or rather at a narrower slit superposed upon it, a spectrum is formed at the other end the scale of which has to be determined. It appeared that the distance from D to E was 7 mm. The difference of wave-length between these lines is 62·3. The perceptible difference is 1/100 of this, corresponding nearly enough to the difference between the D lines. I think I am safe in saying that I could distinguish the colours of the two D lines if favourably presented to the eye.

This degree of sensitiveness, though not higher than I had expected, is a little difficult to reconcile with the monochromatic appearance of a portion of the spectrum fifteen times wider. I suppose that the gradual character of the transition is an obstacle to the recognition of differences. The question of angular magnitude may also enter. No doubt a very small apparent magnitude would be unfavourable. It is possible that in Dr. Green's apparatus an eye-piece of higher power, with a corresponding augmentation in the intrinsic brilliancy of the source of light, would allow of an increase in the number of distinguishable patches. The experiment would be worth a trial.

It will be seen that the existence of "monochromatic patches" in the spectrum is far from meaning that the eye is incapable of making chromatic distinctions within their range. I do not infer from this that the results of the method are without significance. Undoubtedly it is possible by means of it to classify colour-vision, and such a classification cannot be without interest, even if we fail as yet to understand exactly what it means.

THE PROGRESSIVE DISCLOSURE OF THE ENTIRE ATMOSPHERE OF THE SUN.[1]

LE soleil auquel est consacrée cette conférence est un magnifique sujet d'études. Tous les hommes sentent plus ou moins clairement que les destinées terrestres sont liées étroitement à celles du soleil, et qu'il est nécessaire de reconnaître sa nature intime, son rayonnement total, ses variations, en un mot son action précise et complète sur notre globe. Notre dépendance vis-à-vis du soleil est absolue, et récemment, elle a été résumée d'une manière simple par un homme politique français, maintenant ministre des finances, auquel je demandais un crédit spécial pour l'observatoire de Meudon que je dirige, et pour les recherches solaires. Il refusait d'abord, en alléguant l'acroissement continu des dépenses publiques. Puis, comme j'insistais, il s'écria: "Vous avez raison, le soleil est *notre maître* à tous; il est impossible que nous ne fassions pas quelque chose." C'est ainsi que l'observatoire de Meudon a pu joindre à son budget ordinaire une somme supplémentaire, certes peu élevée, mais qui est arrivée au moment opportun, et nous a beaucoup aidés dans les recherches que je vous présente aujourd'hui.

L'étude moderne du soleil exige en effet des installations coûteuses, des appareils compliqués et un personnel spécial apte aussi bien aux observations physiques qu'aux observations astronomiques. Or le soleil luit pour tout le monde, et mûrit toutes les moissons; et, à priori, il semble naturel que tous les hommes de la planète apportent leur concours aux recherches solaires. Partant de cette idée, j'ai proposé, il y a quelques années, à la Société astronomique de France une taxe spéciale et générale pour le soleil—et d'ailleurs très minime. Si chaque français, ai-je remarqué, donnait par an un sou, un simple sou pour le soleil, la somme totale serait encore élevée; elle permettrait d'assurer l'enregistrement continu du soleil et de ses variations, non encore réalisé, et donc une connaissance plus approfondie de l'astre. Mais les taxes nouvelles sont toujours plus nombreuses, et celle-là, bien que très faible et très légitime,

[1] Discourse delivered at the Royal Institution of Great Britain on Fri June 10, 1910, by Dr. H. Deslandres, Membre de l'Institut.

serait probablement écartée. D'ailleurs, il faut bien le dire, l'homme civilisé actuel, le citadin surtout, s'occupent peu du soleil; ils le regardent moins que l'homme primitif et le sauvage qui n'ont ni montre ni almanach. La réalisation de cette idée est réservée pour la cité future, et pour un état social plus parfait que le nôtre.

Le recours au gouvernement, à la collectivité, est une habitude française. Il vaut mieux comme en Angleterre, faire appel à l'initiative privée, à l'initiative d'hommes éclairés et généreux. C'est ainsi qu'a été fondée la Royal Institution, qui a vu éclore tant de belles découvertes et tant de savants illustres. Ce bel exemple doit être proposé à tous, et on sait qu'il a été largement suivi en Amérique où les plus grands observatoires, et surtout ceux consacrés au soleil, sont dus à de simples particuliers.

En fait, dans les cinquante dernières années, grâce à de grandes découvertes, grâce à l'appui des gouvernements et des Mécènes, l'étude du soleil a pris un développement considérable. Les astronomes ont pu lui donner peu à peu une organisation sérieuse et permanente et même l'étendre à l'atmosphère entière de l'astre, jusqu'alors inaccessible.

La découverte principale sur le soleil est la variation périodique de ses taches noires, variations que subissent aussi les facules brillantes de la surface et l'atmosphère entière très étendue. Le soleil entier a une grande oscillation générale; et, fait plus curieux encore, cette oscillation s'étend à la terre et, tout au moins, à ses éléments magnétiques.

L'extension du phénomène solaire à la terre a une importance capitale; elle implique presque nécessairement une action spéciale, nouvelle, exercée par le soleil sur notre globe; elle est la cause première de la grande faveur actuelle des recherches solaires. Après la découverte de Sabine et Lamont sur l'accord de nos variations magnétiques avec le soleil, la science anglaise a accordé la plus grande attention aux taches du soleil; et *la première* elle a organisé l'enregistrement photographique des taches et des éléments magnétiques sur plusieurs points du globe, et la concentration de tous ces documents dans un même observatoire qui les relève avec précision. Les travaux d'Ellis et de Maunder sur la question sont bien connus et il convient aussi de rappeler ceux de Lockyer et de Shuster, qui ont reconnu récemment dans les variations des taches des périodes plus grandes et plus petites que la période principale de 11 années.

L'action exercée par le soleil sur la terre est attribuée généralement aux taches; mais elle peut avoir son origine dans l'atmosphère solaire qui a les mêmes variations; d'où la nécessité d'étudier et de relever avec soin cette atmosphère. Or, depuis près de 20 ans, je me suis attaché à la reconnaissance de l'atmosphère entière du soleil, et je vous présente aujourd'hui les résultats les plus récents, qui ont mis au jour les couches supérieures de cette atmosphère jusqu'ici inexplorées.

Atmosphère des éclipses—au bord solaire extérieur.

L'atmosphère du soleil s'est montrée à l'homme pour la première fois dans les éclipses totales, au bord solaire extérieur. Elle forme alors l'anneau lumineux qui se détache sur le fond du ciel devenu noir, en entourant le disque lunaire, également noir. Elle comprend deux parties distinctes, à partir de la lune et du bord solaire: la *chromosphère* mince et brillante, de couleur rose, de laquelle se détachent les proéminences également roses, et *la couronne*, plus pâle mais très étendue. Dans ce qui va suivre, il sera question surtout de la chromosphère et des proéminences.

En temps ordinaire l'anneau lumineux des éclipses est caché par l'illumination beaucoup plus vive de notre ciel. L'écran qui le masque est lumineux; pour l'écarter, l'astronome anglais Sir Norman Lockyer, a en le premier, en 1866, l'idée de recourir au spectre, en admettant, ce qui était probable, que l'atmosphère solaire fût gazeuse. C'était *une idée de génie*, qui depuis a fait son chemin.

L'éclipse de 1868 montre en effet que les proéminences roses sont constituées en grande partie par l'hydrogène incandescent qui émet les radiations déjà reconnues dans le laboratoire sous l'influence de l'étincelle électrique, et en particulier une raie rouge intense appelée H_α. Et, après l'éclipse, Janssen aux Indes, Lockyer en Angleterre, avec le spectroscope et la raie rouge, retrouvent les proéminences et la chromosphère des éclipses. Ce résultat a excité un enthousiasme légitime; car la méthode, à la fois simple et féconde, est employée depuis 40 ans à la reconnaissance journalière de la chromosphère, des positions et des formes des proéminences. Cette étude est même plus captivante que celles des taches; car les proéminences ont les formes les plus variées et les changements les plus rapides. Elles apparaissent à toutes les latitudes, et suivent aussi la période undécennale des taches, la durée du maximum étant, il est vrai, plus longue.

L'étude spectrale du bord solaire, poursuivie en temps ordinaire, ou mieux pendant les éclipses, fait aussi connaître la composition chimique de la chromosphère, et aussi la hauteur minime de chaque vapeur, estimée par la longueur de la raie correspondante dans le spectre.

D'une manière générale, les vapeurs à faible poids atomique et les gaz légers s'élèvent le plus haut; tel est le cas de l'hydrogène et de l'hélium. La raie la plus haute dans ces deux gaz est la raie rouge $H\alpha$ de l'hydrogène, les autres raies de l'hydrogène ayant des hauteurs et des éclats qui diminuent du rouge à l'ultraviolet.

Mais les plus hautes de toutes sont les raies violettes H et K, très brillantes, qui sont émises par les composés du calcium. Comme le poids atomique et la densité de la vapeur de calcium sont relativement élevées, le fait paraît assez étrange; il est expliqué simplement, d'après les idées de Lockyer, par une dissociation du calcium dans le soleil et l'étincelle de nos laboratoires. Les raies H et K, à tous égards exceptionnelles, sont très brillantes au bord solaire, et assurent aisément la photographie des proéminences avec les plaques ordinaires.

D'autre part, les vapeurs lourdes, qui sont de beaucoup les plus nombreuses s'élèvent peu dans l'atmosphère, et ne sont aisément visibles que dans les éclipses. Elles forment la couche basse de la chromosphère, relativement fort brillante, appelée *couche renversante.*

Chromosphère projetée sur le disque, couche moyenne.

Tels sont les résultats principaux de la méthode Lockyer-Janssen. Ils sont assurément remarquables, mais, à certains égards, incomplets. Ils ne s'appliquent qu'à la partie de la chromosphère *extérieure* au bord solaire, et même aux vapeurs légères, et élevées de ce bord. La partie intérieure au bord, ou projetée sur le disque, en projection 50 *fois* plus étendue, lui échappe. Or cette lacune a été comblee de 1892 à 1894 par une méthode *absolument générale*, qui décèle toutes les vapeurs, lourdes ou légères, et leurs couches successives dans la demie-sphère entière tournée vers la terre.

Au bord solaire, les raies des vapeurs se détachent brillantes sur le spectre continu de notre ciel; mais, sur le disque, ces raies sont noires, comme on sait, et le spectre continu qui leur sert de fond est celui du soleil lui-même et est beaucoup plus intense. A priori la difficulté paraît beaucoup plus grande.

Or les raies H et K du calcium présentent une exception à cette règle, et le fait a été annoncé simultanément en février 1892 par Hale et Deslandres. Ces raies noires sont très larges et même les plus larges du spectre solaire; mais, aux points de la surface où *est une facule*, elles sont renversées, autrement dit elles offrent en leur centre une raie brillante qui même est double et se détache sur la large raie noire aussi bien que la raie des proéminences au bord extérieur. (Voir la Fig. 1, qui montre la raie K et ses composantes K_{1V}, K_{2V}, K_3, K_{2R}, K_{1R}.)

Le résultat a été obtenu par Hale avec un spectrohéliographe, appareil nouveau, assez complexe, qui isole une radiation avec une seconde fente, et, par le mouvement de cette fente lumineuse, fournit une image monochromatique de l'astre. De mon côté, j'ai employé le simple spectrographe ordinaire et des sections successives, mais en préconisant l'emploi du spectrohéliographe.

Cependant les deux observateurs étaient en désaccord sur un point capital. Hale plaçait les vapeurs ainsi décelées dans la facule même, sous la surface; je les plaçais au contraire au-dessus dans l'atmosphère même. Or le spectrographe ordinaire, qui réunit tous les éléments de la question, permet de la résoudre; il est, à ce point de vue, supérieur au spectrohéliographe.

La raie double K_2 est brillante non seulement sur les facules, mais sur tous les autres points du disque où elle est, il est vrai, plus faible et plus difficile à distinguer. De plus, au bord, la raie brillante double K_2, au bord intérieur, est toujours nette en ce point, et est prolongée à l'extérieur par une raie brillante double identique. (Voir la Fig. 2 ci-contre, figure schématique, qui montre bien l'aspect de la raie double K_2, au bord du soleil et aussi sur une tache.)

Comme la raie K_2 extérieure au bord représente par définition la chromosphère, la conclusion est la suivante : *L'image de la raie K_2 avec le spectrohéliographe représente la chromosphère entière de l'astre projetée sur le disque.*

D'ailleurs les images du calcium faites à Paris en 1894 et qui sont les premières images complètes, montrent des

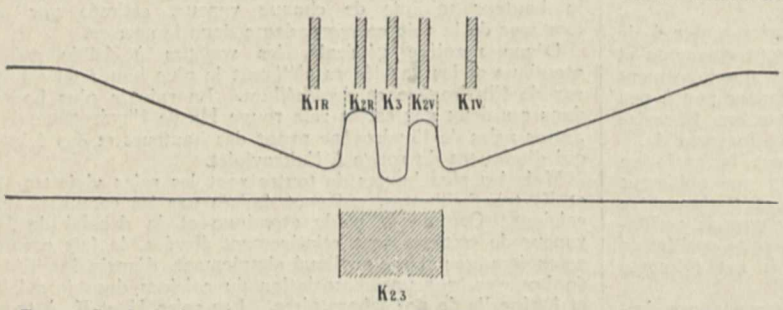


FIG. 1.—Courbe des intensités du spectre solaire à l'emplacement de la large raie noire K. On a représenté par des traits avec hachures les positions des fentes des spectrohéliographes.

plages faculaires brillantes plus larges que celles de la surface, et aussi les parties brillantes plus petites appelées maintenant *flocculi*, qui sont présentes aussi bien aux pôles qu'à la lignateur—j'ai vérifié la présence des flocculi aux pôles dans les années de minimum et pendant la période undécennale tout entière.

La raie brillante K_2 reste double au bord extérieur jusqu'à 4′ ou 5′ d'arc, et, comme la chromosphère au bord est haute de 10″, on peut dire que cette image représente la chromosphère moyenne.

En résumé, si le premier spectrohéliographe ayant donné des résultats a été réalisé en Amérique, c'est en France qu'on a reconnu pour la première fois la chromosphère entière du soleil.

Chromosphère basse.

Mais on peut aller plus loin. En 1893, j'ai annoncé que l'isolement d'une raie noire ordinaire avec le spectrohéliographe donnerait l'image même de la vapeur correspondante ; et, en 1894, j'ai isolé avec le petit spectrohéliographe de faible dispersion, organisé à Paris, les bords dégradés de la raie K, appelées K_{1R}, et K_{1V}, et les raies noires voisines les plus larges de l'aluminium, du fer et du carbone. L'image obtenue diffère de celle de K_2 ; les taches masquées par fois avec K_2 ont toujours leur ombre et pénombre bien nettes, et les plages faculaires sont brillantes au centre comme au bord, mais moins larges que dans l'image K_2. En fait, cette image nouvelle est intermédiaire entre l'image de la surface et celle de la couche moyenne chromosphérique K_2. Elle représente l'image de la couche renversante entière qui serait obtenue ainsi pour la première fois.

J'ai ajouté qu'une dispersion plus forte permettrait d'isoler les raies plus fines qui sont les plus nombreuses, et, en particulier, la petite raie noire centrale K_3, entre les deux composantes K_2. Cette raie K_3 correspond à la couche supérieure de la chromosphère. La méthode s'annonce ainsi comme absolument générale ; elle fournit l'image de toutes les vapeurs solaires, et *aussi* l'image de leurs couches successives superposées, au moins lorsque la raie est divisible en parties distinctes, ainsi que la large raie K.

Or le nombre des raies solaires s'élève à 20,000 ; et, d'après Jewell, toutes les raies solaires offrent plus ou moins la constitution spéciale de cette raie typique du calcium. Le champ nouveau offert à l'investigation s'annonce comme extrêmement étendu.

Recherches ultérieures. Grand Spectrohéliographe d'un type nouveau.

Le programme de recherches, indiqué en 1894, est donc extrêmement vaste. Il a été appliqué en partie dans les années suivantes, et les progrès ont été réels si non très rapides.

En 1903, Hale et Ellermann, à l'observatoire Yerkes, reprennent l'étude des raies noires, avec un spectrohéliographe plus dispersif, et la poursuivent à partir de 1906 au Mont Wilson avec des appareils encore plus puissants. Ils ont obtenu de magnifiques images et toute une série de faits nouveaux. Avec les raies de la couche renversante, les résultats sont à peu près les mêmes que ceux de 1894 ; mais les raies de l'hydrogène, et tout récemment la raie H_α ont montré des phénomènes nouveaux, très curieux, dont il sera question avec détails un peu plus loin.

Cependant la dispersion employée par eux est seulement moyenne ; s'ils ont isolé un nombre de raies bien plus grand qu'en 1894, ils n'ont pas isolé les raies fines ; et même dans chaque cas, ils ont isolé la raie entière, ils n'ont pas séparé les parties distinctes de la raie et donc les couches successives de la vapeur. Leur image est un mélange de plusieurs images distinctes et de plusieurs couches.

Je me suis proposé de combler cette lacune, et de poursuivre jusqu'au bout le programme de 1894, en isolant nettement les couches supérieures non encore décelées. Devenu directeur de l'observatoire de Meudon en 1907, j'ai pu diriger de ce côté les ressources de l'observatoire, et, d'autre part la crédit extraordinaire signalé plus haut, nous

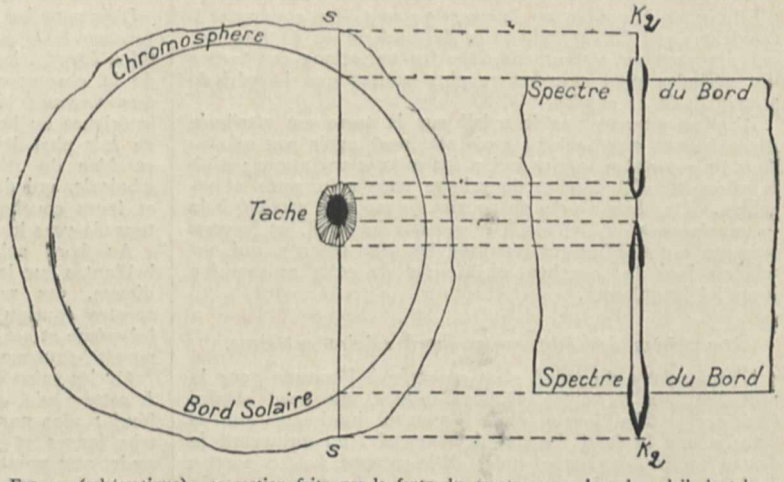


FIG. 2.—(schématique).—*ss*, section faite par la fente du spectroscope dans le soleil dont la chromosphère et la tache sont très agrandies ; K_2, raie brillante, attribuée aux vapeurs du calcium, qui apparaît au milieu de la large raie noire K du spectre normal ; elle est simple et fine au-dessus des taches et à la partie supérieure de la chromosphère, et double sur les autres points, étant alors divisée en deux par la raie noire centrale K_2.

a été fort utile. Bref il a été possible de construire un grand spectrohéliographe, aussi dispersif que le grand spectrographe de Rowland et un grand bâtiment spécial capable de le contenir.

Le bâtiment comprend une grande pièce de 22 m. sur 6 m. ; son toit est en pierre et terre, ce qui assure la constance de la température à l'intérieur. Il reçoit la lumière solaire d'un cœlostat placé au sud, constitué avec de vieux appareils du passage de Vénus, et d'un objectif ancien de 0·25 m. d'ouverture et 4 m. de distance focale. Ces pièces, qui sont médiocres, ont été utilisées par raison d'économie. Le spectrohéliographe, d'autre part, est d'un type nouveau, et offre plusieurs particularités intéressantes. Il est assez compliqué, au moins sur le dessin, car il comprend en

réalité quatre spectrohéliographes différents réunis autour d'un même collimateur. Le premier est à trois prismes et à deux fentes, avec une chambre de 3 m., et une image du soleil de 85 mm. : le second est à réseau et à deux fentes avec une chambre de même longueur. Le troisième est une disposition différente des deux précédents. Enfin le quatrième, le plus puissant, est à trois fentes, à prismes ou à réseau. Il comprend un premier spectrographe avec chambre de 7 m., ainsi que dans l'appareil classique de Rowland, ce qui permet d'isoler des raies très fines. Mais l'image solaire exigerait une pose trop longue ; on la reprend avec une second spectrographe qui le diminue au dégré voulu, et élimine la lumière diffuse intérieure. Le soleil final a un diamètre qui peut être quelconque, et, grâce à certaines dispositions spéciales, *il est entier*, ce qui n'est pas réalisé dans les autres spectrohéliographes de grande dispersion. Les diamètres habituels sont 6 cm. et 4 cm.

L'appareil, avec ses deux spectrographes, a une longueur totale de 14 m., et, dans ces conditions, reste immobile. Il est même le premier spectrohéliographe dont toutes les parties sont fixes, la plaque étant mise à part. Les pièces mobiles sont la plaque photographique et l'objectif astronomique, qui sont mis en mouvement à la vitesse voulue par des moteurs électriques synchrones et des transformateurs de vitesse spéciaux.

La concordance des mouvements est assurée par des moyens électriques, indépendants de la distance, et le dispositif est présenté comme une solution générale du spectrohéliographe. Chacun des quatre spectrohéliographes a ses avantages particuliers, et le passage de l'un à l'autre se fait en quelques minutes. L'observateur a ainsi à sa disposition des moyens d'investigation variés. D'une manière générale, les spectrohéliographes à deux fentes de 3 m. donnent une image plus grande et plus riche en détails. Le grand appareil de 14 m. à trois fentes, donne, avec une pose plus longue, une image plus petite, mais beaucoup plus pure ; il permet d'isoler des raies plus fines.

Les recherches avec cet appareil ont été poursuivies avec un jeune astronome de l'observatoire, M. d'Azambuja, dont le nom est associé au mien.

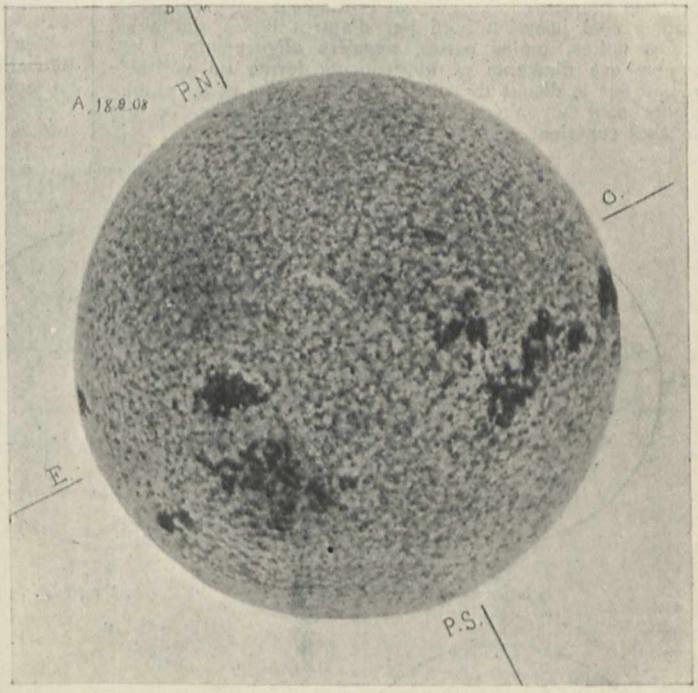
Révélation de la couche supérieure K_3 du Calcium.

En 1908 nous avons pu isoler la petite raie noire centrale K_3 du calcium, et donc la couche supérieure de la vapeur. La Fig. 1 qui montre la raie K et ses composantes permet de bien juger le progrès réalisé.

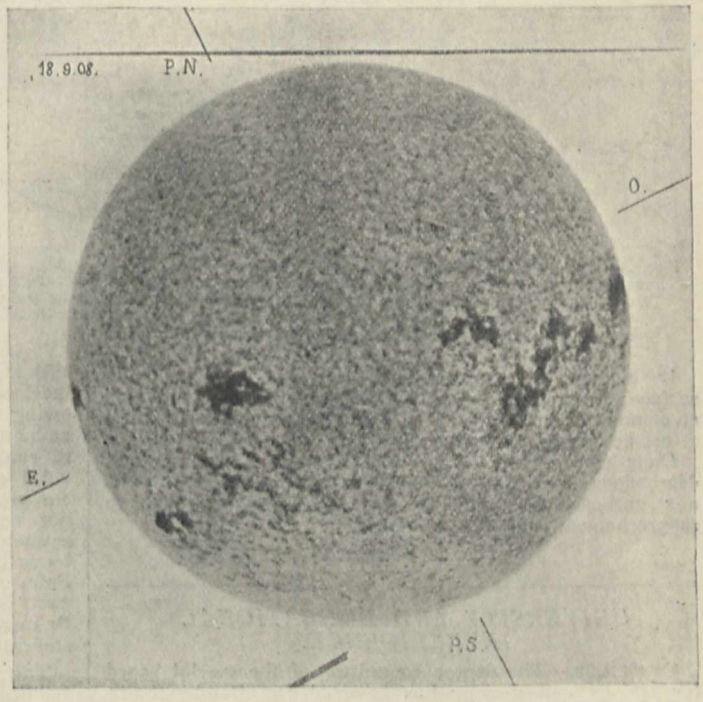
Jusqu'alors les spectrohéliographes employés isolaient en même temps l'ensemble des deux composantes brilliantes de K_3 qui comprennent la raie K_3, avec une fente de $\frac{2}{10}$ d'Angström. L'image, appelée par nous image K_{23}, était un mélange des couches K_2 et K_3 avec une prédominance de la couche K_2, beaucoup plus brillante ; la couche supérieure K_3 était masquée. Or, avec le grand spectrohéliographe, nous avons pu isoler facilement avec des fentes de $\frac{1}{10}$ d'Angström et plus, isoler soit la raie K_2, soit l'une des composantes de K_3, et avoir ainsi des images de chaque couche bien pures et exemptes de toute lumière étrangère. Les fentes correspondantes sont indiquées sur la Fig. 1 par des traits avec hachures.

La vapeur de calcium qui au bord extérieur, s'élève plus que toute les autres, présente ainsi dans l'atmosphère trois couches distinctes superposées. Si on ajoute la surface, on a quatre couches, qu'il est intéressant de comparer.

Lorsqu'on s'élève à partir de la surface, les facules ou plages brillantes de cette surface augmentent progressivement en étendue et en éclat relatif. Les flocculi moyens augmentent aussi, alorsque les petits disparaissent ou sont à peine visibles. Il en résulte un aspect particulier de la couche K_3 qui à première vue se distingue de la couche K_2, photographiée depuis 1892. (Voir les deux images K_3 et K_2, du 18 septembre 1908.) J'ajoute que le réseau spécial de flocculi, appelé par moi en 1894 *réseau chromosphérique*, et formé souvent, sur une étendue notable, de polygones juxtaposés par leurs côtés et leurs sommets, est en général plus net dans la couche supérieure.



Couche supérieure K_3 du calcium.



Couche moyenne K_2 du calcium.

PLATE I.—Images du 18 septembre, 1908.

D'autre part les taches noires, qui sont le caractère principal de la surface, diminuent progressivement, lorsqu'on s'élève et même disparaissent.

Par contre apparaissent des lignes noires, invisibles dans les couches basses, lignes souvent très longues et appelées par moi *filaments*. En général le filament est prolongé de chaque côté jusqu'au bord par d'autres lignes similaires, moins noires, moins nettes, appelées *alignements*. L'ensemble des filaments et alignements forme un véritable réseau sur le disque de soleil. Les filaments et les alignements sont un phénomène nouveau, caractéristique des couches supérieures.

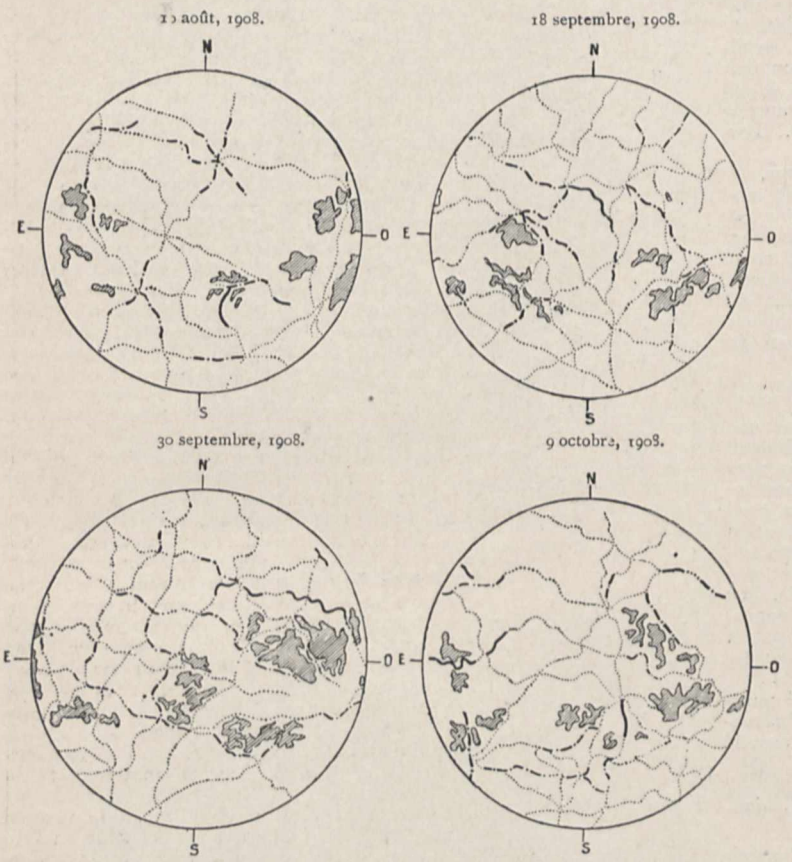


FIG. 3.—Réseau d'alignements relevé dans la couche supérieure de l'atmosphère solaire. Les traits noirs pleins correspondent aux alignements noirs, continues et très nets, appelés *filaments*; les traits discontinus aux alignements similaires moins nets, et les traits pointillés aux alignements encore moins visibles et parfois discontinus. Les parties hachées sont les plages brillantes faculaires les plus larges.

Le filament a la même importance que la tache de la surface; il persiste, comme elle, pendant plusieurs rotations et, comme elle aussi, il est le siége de perturbations spéciales, et est accompagné de proéminences.

Dans une première étude j'ai assimilé les taches aux dépressions ou cyclones de notre atmosphère, et les filaments aux anti-cyclones; mais je reviendrai plus loin sur ce rapprochement, qui sera developpé.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The degree committee of the special board for biology and geology has co-opted Dr. Barclay-Smith and Mr. R. H. Rastall as additional members of the committee.

The special board for physics and chemistry has appointed Mr. C. T. Heycock as assessor in chemistry to the examiners for the Mechanical Sciences Tripos in 1911.

Mr. George Winfield has been elected to the Benn W. Levy studentship.

The director of the observatory gives notice that on fine and clear Saturday evenings during the Lent full term celestial objects will be shown through the Northumberland equatorial to any members of the University and their friends who will come to the observatory between 8 and 10.30 p.m.

THE most important resolution of the last Muslim Education Conference, says the *Pioneer Mail*, related to an appeal to Muslims for a fund to raise the Aligarh College to the status of a Muslim university. The promoters of the scheme hope that if requisite funds are forthcoming a Muslim appeal for a charter from King George when he goes to India will not fail. His Highness the Aga Khan has given a lakh of rupees, and other important donations are promised.

A COPY of the report of the president of the Johns Hopkins University, Baltimore, U.S.A., for the year ending August 31, 1910, has reached us. It contains a brief summary of the principal events in the history of the University during the academic year under review, together with reports by professors and others having charge of the work in the various departments of the University. There seemed, at the date of the president's report, every probability that the University will benefit by the offer of the General Education Board to contribute towards the endowment fund the sum of 50,000*l*., "provided that on or before December 31, 1910, a supplementary sum of not less than 150,000*l*. shall be contributed to the University in cash or pledged to the same by good and responsible persons in legally valid subscriptions, payable in cash in not more than three equal annual instalments." At the conclusion of his report the president, Prof. Ira Remsen, writes:—"At the time of this printing the signs are most favourable."

THE annual report of University College, Reading, presented at the annual court of governors on January 21, pointed out that the number of students studying for university degrees shows an increase from 95 in the session 1908–9 to 117 in the session 1909–10. The other students number 1007. There is a deficit on the year's working of 2016*l*. The principal of the college, Mr. W. M. Childs, told the court that two years ago the college had a total indebtedness on the new buildings of nearly 30,000*l*., but owing to munificent anonymous donations last year, amounting to 16,500*l*., that debt has been brought almost to vanishing point. In addition, Lady Wantage has provided a permanent endowment for Wantage Hall, which she presented to the college some years ago, and that will not only help to defray the cost of maintenance and equipment, but will probably provide for scholarships and bursaries, tenable at the college and the hall. Mr. G. W. Palmer has granted the lease of a recreation ground for twenty-one years rent free, and, thanks to Mr. Alfred Palmer, a new hall will soon be opened for women students.

THE annual meeting of the Association of Technical Institutions will be held, by the courtesy of the Stationers' Company, at their hall on Friday and Saturday, February 10 and 11. The company are generously entertaining the members of the association and a few special guests to luncheon on the Friday. In the afternoon a vote of thanks will be accorded to Dr. R. T. Glazebrook, F.R.S., the retiring president, for his services during the year 1910, and Dr. Glazebrook will move "that Sir Henry F.

Hibbert be elected president for the year 1911." Sir Henry Hibbert will deliver his presidential address upon "The Duties and Difficulties of Education Authorities so far as Regards Evening Continuation Schools." The formal business of the association will then be transacted, including the election of the officers and council. On Saturday morning there will be two discussions, one upon the Board of Education's new regulations for the registration of evening and other students, to be opened by Messrs. Crowther, Graham, and Sumpner, and the other upon the course system, to be opened by Messrs. Coles, Duthie, and Graham.

In a message from Cape Town, a *Times* correspondent points out that the agenda paper for the forthcoming Imperial Education Conference includes a large number of questions particularly concerning South Africa. Dr. Muir, F.R.S., the superintendent-general of education in the Cape Province, has suggested the following subjects, which it is expected will be discussed:—school curricula; bilingualism in the case of white children; the boy-scout movement and its relation to nature-study; problems connected with the education of aborigines; the collection and dissemination of information regarding the cost of instruction and cost of living in connection with advanced technical colleges and post-graduate departments of universities; the desirability of the formation of a permanent imperial education bureau; and arrangements for the mutual recognition of teachers' certificates. The director of education for the Transvaal has proposed for discussion the problems arising from the use of two languages as media of instruction, and the organisation of education in sparsely populated districts. In addition, one suggestion each from Nova Scotia and Sierra Leone has been received, so that it would appear likely that great prominence will be given at the conference to South African educational needs.

Copies of the general and departmental reports for the session 1909–10 of the Bradford Technical College have been received. We notice that the total number of students in attendance during the session under review was slightly greater than in 1908–9, and that the college is in the front rank in the country as regards the number of day students in attendance. It is anticipated that the additional facilities provided in the new buildings, which are now approaching completion, will result in a decided increase in the number of such students. A gratifying feature of all the reports is the information provided showing the interest in the college of the various manufacturers in the district. Their gifts towards the equipment of the different departments and the other assistance given by them to the principal and his staff are evidences of their desire to make the college a centre for the technical education of their workmen. Though the regularity of attendance of evening students has been well maintained, there are, the principal points out, many causes of irregular attendance, the chief of which are overtime in the mills, changes of residence, and ill-health. It is not probable, he says, that a higher percentage attendance can be attained until the question of the overtime work of students is dealt with by legislation or in some other general manner. The large and increasing amount of testing and experimental investigation carried out in the engineering department for local firms and for trade purposes is further evidence of the close connection between the work of the college and the industries of the neighbourhood.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 19.—Sir Archibald Geikie, K.C.B., president, in the chair.—G. S. **Walpole**: The action of *B. lactis aerogenes* on glucose and mannitol. Part ii. The "crude glycol" obtained by the action of *B. lactis aerogenes* on glucose contains two optically inactive 2 : 3-butane diols, the diphenylurethanes of which melt at 199·5° and 157° respectively. The former constitutes well over 90 per cent. of the material. If fructose be substituted for glucose in one of the flasks, the yield of "crude butylene glycol" and acetylmethyl carbinol is of the same order as when glucose is employed. Acetylmethyl carbinol is formed abundantly when the bacillus is cultivated in a solution of butylene glycol in 1 per cent. peptone in a current of oxygen.—Dr. W. E. **Dixon**: The pharmacological action of *Gonioma Kamassi* (South African boxwood). South African boxwood, *Gonioma Kamassi*, has been employed occasionally in Lancashire as a substitute for common boxwood in the manufacture of shuttles; it is stated that symptoms of poisoning have occurred in a small proportion of the men engaged in sawing this wood or finishing the chiselled shuttles. From the wood an alkaloid can be obtained to about 0·07 per cent. This has a very characteristic physiological action, which places it in the curare group of drugs. The members of this group may be regarded as possessing three actions in common:—(1) paralysis of certain nerve cells; (2) increase of spinal and medullary reflexes; (3) paralysis of motor nerve endings. Boxwood exerts all these effects. It paralyses the nerve cells in the brain and medulla, as well as those on the course of the vagus and sympathetic nerves, and therefore after its exhibition to animals the stimulant action of nicotine cannot be obtained. In small doses the reflexes are increased, and if an injection be made into a vein going to the spinal cord of an animal, strychnine-like convulsions are produced. Boxwood causes death by paralysing the respiration; this is central in origin, but it occurs at a time when the phrenics and intercostals are depressed, though not paralysed. Boxwood has no direct action on the heart or on other form of muscle. Reasons are given for believing that the recorded cases of poisoning are not due to the specific action of the drug after absorption, but to the effect of the drug in facilitating certain local reflexes, principally of a respiratory nature, in the predisposed.—Dr. W. **Yorke**: Autoagglutination of red blood cells in trypanosomiasis. Autoagglutinin exists in small quantity in the blood of many normal animals. It is frequently present in much greater quantity in the blood of animals infected with trypanosomes. Reaction between autoagglutinin and erythrocytes takes place only at low temperatures. The strongest reactions are obtained when a suspension of washed erythrocytes in normal saline solution is treated at 0° C. with plasma, which has been prepared by defibrinating blood at 37° C. Autoagglutinin can be removed from plasma by absorption with the erythrocytes of the same animal. The reaction between autoagglutinin and red blood cells is reversible, the clumps disappearing on warming and reappearing on cooling. Iso- and hetero-agglutinin are also often present in much greater amount in the blood of infected animals than in that of normal animals of the same species. From the red blood cells of an infected animal, which have been agglutinated in the cold by the plasma of the same animal, an active substance can be extracted with normal saline solution at 37° C. This substance agglutinates, not only the red cells of the same animal and other members of the same species, but also those of many animals of different species. Observations of this kind indicate that auto-, iso-, and hetero-agglutinin are not different highly specific substances, but have closely related affinities. That a clumping together of the red blood cells is frequently observable in coverslip preparations of the fresh blood of animals and man infected with trypanosomiasis is due to the existence of an excess of autoagglutinin in the plasma, which reacts with the erythrocytes to a certain extent at the temperature (15°–20° C.) at which the preparations are usually made. It is to be inferred from the information at present available that a marked degree of autoagglutination of red blood cells is an extremely rare occurrence apart from an infection with trypanosomes. The phenomenon is therefore of some value as a diagnostic sign.—M. **Nierenstein**: The transformation of proteids into fats during the ripening of cheese (preliminary communication). Contrary to the accepted view, it was found that the so-called ripening of cheese is not accompanied by a transformation of proteids into fats, the increase of weight of the latter, as observed by other workers, being due to the presence of *free cholesterol, aminovaleric acid, putrescine, and cadaverine* in the etherial extract. This investigation disproves one of the frequently quoted evidences in favour of the theory that proteids serve as a source for the fat-formation in the animal body.—J. F.

Gaskell: The action of X-rays on the developing chick. No difference was observed in the action of X-rays upon any one tissue rather than another. The action is confined to the lowering of the mitotic activity of the growing tissues. If this diminution is not too great, complete recovery occurs, and the chicks hatch out at the usual time. If the diminution is above a certain degree, recovery does not take place, and further development is arrested forthwith. The critical dose, which just prevents recovery, varies with the stage of development of the embryo, decreasing as the mitotic index decreases. The "mitotic index" as defined by Minot represents the number of mitoses per 1000 cells in the various tissues of embryos of various ages, and he has shown that throughout embryonic life a rapid diminution of mitotic activity is going on. He calls the figures obtained the mitotic index for that particular tissue.—Colonel Sir David **Bruce** and Captains A. E. **Hamerton** and H. R. **Bateman.** (Sleeping Sickness Commission of the Royal Society, Uganda, 1908–10.) Experiments to ascertain if antelope may act as a reservoir of the virus of sleeping sickness (*Trypanosoma gambiense*). It is known that the tsetse-flies (*Glossina palpalis*) around the northern shores of the Victoria Nyanza still retain their infectivity for sleeping sickness, in spite of the fact that the native population was removed from the lake-shore some three years ago. A series of experiments was, therefore, carried out to ascertain if the antelope, which are fairly common along the uninhabited shores of the lake, were capable of acting as hosts of the parasite of sleeping sickness. Eleven antelope of the waterbuck, bushbuck, and reedbuck species were obtained from a district where tsetse-flies and sleeping sickness did not exist. Blood from these animals was first inoculated into monkeys to ascertain if they were already naturally infected with trypanosome disease. They proved to be healthy in this respect. Tsetse-flies (*Glossina palpalis*) that were known to be infected with the virus of sleeping sickness were then fed upon each of the eleven antelope. After about eight days the blood of these animals was again inoculated into susceptible animals, with the result that the latter became infected with *Trypanosoma gambiense* in every case. In eight out of the eleven buck under experiment *Trypanosoma gambiense* appeared in their blood for a few days only (some seven to twelve days) after they had been bitten by infected flies. Flies that were hatched out in the laboratory, and had never fed before, were now fed upon the infected antelope, and subsequently upon monkeys. After an interval of about thirty days, required for the development of trypanosomes within the fly, monkeys were infected with sleeping sickness from the antelope by the agency of *Glossina palpalis* in sixteen out of twenty-four experiments. On dissecting the flies which had been fed upon the infected antelope, it was found that 10·8 per cent. of them were infected with *Trypanosoma gambiense*. The highest percentage of infected flies in any one of the positive experiments was 21 per cent.; the lowest was 1·3 per cent. Nine of these antelope infected with *Trypanosoma gambiense* were under daily observation for more than four months. They remained in perfect health. Two of them (a waterbuck and a bushbuck) never showed trypanosomes in their blood, although examined every day. Both these antelope-infected flies fed upon them, one of them as long as fifty-five days after its infection. No wild antelope inhabiting the lake-shore has yet been found to be naturally infected with *Trypanosoma gambiense*.—Colonel Sir David **Bruce** and Captains A. E. **Hamerton** and H. R. **Bateman.** (Sleeping Sickness Commission of the Royal Society, Uganda, 1908–10.) Experiments to ascertain if the domestic fowl of Uganda may act as a reservoir of the virus of sleeping sickness (*Trypanosoma gambiense*). There is evidence that tsetse-flies (*Glossina palpalis*) feed on the blood of birds as well as that of mammals inhabiting the shores of Victoria Nyanza. Domestic fowls, as representing birds, were experimented with in the search for possible hosts or reservoirs of the virus of sleeping sickness. A series of twenty-one experiments was carried out to ascertain:—(1) if these birds can, like antelope, be infected with *Trypanosoma gambiense* by the bites of known infected flies; (2) if birds so infected can transmit the parasite to newly hatched *Glossina palpalis* which had not fed before they were allowed to bite the fowls; (3) if these flies can convey sleeping sickness to normal monkeys. About 2000 flies, many of which had been proved to be infected with virulent *Trypanosoma gambiense*, were fed upon twenty-one domestic fowls. The results were negative in every case, as ascertained by frequent microscopical examination of peripheral and centrifuged heart's blood, and inoculations of the fowls' blood into susceptible animals. Four hundred newly hatched flies were fed upon three of the fowls which had been bitten by infected flies. The former were subsequently fed upon monkeys, with the result that they failed to convey sleeping sickness from fowls to monkeys. Two hundred and eighty-three of these flies were dissected, and no flagellates could be found in them. *Conclusion.*—The Uganda fowl cannot act as a reservoir of the virus of sleeping sickness.

Institute of Metals, January 18.—G. D. **Bengough**: Report to the corrosion committee on the present state of our knowledge of the corrosion of non-ferrous metals and alloys, with suggestions for a research into the causes of the corrosion of brass condenser tubes by sea water. The report is intended to be a general review of present knowledge of the subject of the corrosion of non-ferrous metals, both in its practical and scientific aspects. The theory of corrosion is considered in some detail, and an attempt is made to lay a broader scientific foundation for the whole subject. Two series of experiments are proposed, which, in the author's opinion, should be taken in hand at once. One series is of an empirical nature, and is intended to test the validity of certain opinions held on the subject by practical men, and especially such opinions as are in dispute between different authorities. The other series of experiments is of a purely scientific nature, and is regarded as a means of elucidating certain causes of corrosion that have hitherto been obscure.—Engineer Rear-Admiral J. T. **Corner**: Some practical experience with corrosion of metals. Some of the causes of corrosion of metals on shipboard are so obscure, and the origin so difficult to trace, that a satisfactory explanation is seldom forthcoming. Corrosion of a minor character existed in the old wooden warships, but when iron was used for shipbuilding the conditions were different, and it was soon found that the ships' plates and angles suffered from contact with the copper pipes and bilge water, the *Megaera* being a case in point, where the copper so affected the ship as to necessitate beaching her to prevent her sinking. Trouble from corrosion largely increased about the time of the introduction of the electric light afloat. Suggested causes of corrosion were considered.—Prof. H. C. H. **Carpenter** and C. A. **Edwards**: A new critical point in copper-zinc alloys: its interpretation and influence on their properties, with an appendix, by C. A. **Edwards**, on the nature of solid solutions. A new critical point has been found in those alloys of copper-zinc which contain the β constituent. The temperature of this point is 470° C. The physical meaning of this change is that the β constituent decomposes at 470° C. into the α and γ constituents. In the appendix to the paper, Mr. C. A. Edwards concludes that a metallic crystalline mass, often described as a solid solution, is an intimate crystalline mixture, and whilst the primary crystals are so small that the mass appears quite homogeneous when viewed under the microscope, they are sufficiently large to retain their identity.—Prof. A. **McWilliam** and W. R. **Barclay**: The adhesion of electro-deposited silver in relation to the nature of the German silver basis metal. This paper gives details of researches undertaken with the view of determining the nature of the adhesion of electro-deposited silver to the German silver alloys generally used as a basis metal, and whether any differences exist between various grades of alloys as to their suitability for use in the manufacture of electro-plate which may be called upon to withstand rough usage. The authors find that under the severest conditions of wear there is a great tendency for thick electro-deposited silver coatings to strip from the alloys of high nickel contents known as firsts, that the plating adheres most firmly to the lowest grades known as fifths, but as these are generally too soft or too weak for the special purpose, the best medium is found somewhere in the region of the alloys known as thirds.—H. J.

Humphries and Prof. C. A. **Smith**: Some tests on white anti-friction bearing metals. The authors, being persuaded that friction tests on bearing metals as usually conducted are for many reasons inconclusive, have endeavoured to stimulate a search for a series of static tests which shall be conclusive.

MANCHESTER.

Literary and Philosophical Society, December 13, 1910.—Mr. Francis Jones, president, in the chair.—Miss Margaret C. **March**: Preliminary note on *Unio pictorum*, *U. tumidus*, and *Onodonta cygnea*. The form of the British Unionids can be shown to be dependent on current and soil, and is therefore useless for systematic purposes when taken alone. The umbonal markings of these animals, merge into one another, and are therefore useless specifically. Phylogenetically they show that *U. pictorum* is most archaic, Anodon least, Tumidus being intermediate. The edentulousness of American Anodons illustrates heterogeneric homæomorphy. The ornament and dentition of Unionoids show relationship to Trigonids, and a descent from a pre-trigonid ancestor.—D. M. S. **Watson**: Notes on some British Mesozoic crocodiles. The author discussed some systematic and nomenclatural difficulties, recording the occurrence of a new variety of *Metriorhynchus hastifer* in the Corallian of Headington, of *M. hastifer* itself in the Kimmeridge clay of Britain, and discussing *Petrosuchus laevidens* and *Steneosaurus Stephani*.—Prof. F. E. **Weiss**: Sigillaria and Stigmariopsis. The author exhibited some specimens of axes of Sigillaria associated with Stigmarian bark. From the repeated occurrence of these specimens it was suggested that they represented the base of the aërial or the subterranean axes of Sigillaria, probably of the Eusigillaria type. The secondary wood was more copiously developed than is general in the aërial axes. The primary wood was of Sigillarian type, so that these Stigmarian axes have centripetal primary wood, and their pithcasts would be striated like those described for Stigmariopsis. It was noticed that in some instances small axes were found in contiguity, and apparently in continuity, with the main axes. These smaller axes resemble the ordinary Stigmarian axes very nearly, and do not show the centripetal primary wood of the main axis, but only a few fine tracheids in the pith region.

January 10.—Mr. Francis Jones, president, in the chair.—H. S. **Holden**: An abnormal fertile spike of *Ophioglossum vulgatum*. The spike in question exhibited a branching structure comparable to a certain extent with the condition normally characterising *Oph. palmatum*. The various features of the vegetative anatomy all serve to demonstrate that the condition described has arisen by a process of chorisis or splitting, thus confirming the work of Prof. Bower on the group to which the genus belongs.—Dr. A. N. **Meldrum**: The development of the atomic theory: (4) Dalton's physical atomic theory. The physical atomic theory, otherwise the theory of "mixed gases," is specially interesting because it marks a stage in the development of Dalton's ideas. Both it and the experiments connected with it arose out of the meteorological observations and studies of his early life. It reveals him as a student of Newton, and as the upholder of a physical atomic theory years before he formed the chemical one. Dalton's theory of mixed gases was an attempt to explain the diffusion of gases, especially of the oxygen and nitrogen in the atmosphere. He ascribed diffusion to physical forces, and not to chemical union, then the accepted explanation in nearly all quarters. In the course of the mixed gases controversy, Dalton had the support of William Henry only, whilst his opponents, who held that the diffusion of gases was due to chemical affinity, included C. L. Berthollet, John Gough, Thomas Thomson, and Humphrey Davy. The water vapour in the atmosphere is a special case of the mixed gases question. Dalton made observations of the dew-point, and used them as a measure of the water vapour in the atmosphere. In this way he raised "hygrometry to the rank of an exact science." Dalton expressly alluded to the hypothesis now associated with the name of Avogadro as a possibility, but rejected it on the ground that, if it were true, the density of a compound gas must be greater than that of its constituent elements, which was not always the case. He knew that nitric oxide and water vapour are lighter than the oxygen they contain.

PARIS.

Academy of Sciences, January 16.—M. Armand Gautier in the chair.—C. **Guichard**: Surfaces the normals of which touch a quadric.—Gaston **Darboux**: Remarks on the preceding communication.—E. **Cahen**: Prime (*intégro-entières*) series.—M. **Girardville**: Increasing the stability of aëroplanes by means of gyroscopes. The gyroscope used in these experiments had a rotating mass of 5·8 kilograms, and a velocity of rotation of 6000 turns a minute. Model aëroplanes, used as gliders without motors, when fitted with the gyroscope governor were found to be free from periodic oscillations, and re-established equilibrium when disturbed.—J. A. **Le Bel**: A singular heating of thin patinum wires.—A. **Cotton**: The delicacy of intereference measurements and the means of increasing them. Shadow interference apparatus. The delicacy of the ordinary interference methods is much increased by the use of polarised light, and means are suggested for applying this to the determination of double refraction.—Jacques **Boselli**: The resistance to the movement of small non-spherical bodies in a fluid. Stoke's theorem has been successfully applied to the study of the movement of spherical bodies in a fluid; in the present paper the motion of red blood corpuscles has been studied. Using the corpuscles of different shapes derived from the blood of different animals, it has been found that, other conditions remaining the same, the velocity of fall is inversely proportional to the viscosity.—M. **de Broglie** and L. **Brizard**: The radiation of quinine sulphate. Ionisation and luminescence. As a working hypothesis it is suggested that the scintillations, and perhaps the continuous light, are due to small electric discharges produced at the moment of the sudden breaking of small crystals.—M. **Hanriot**: Brown gold. This name is applied to the product resulting from the action of acid upon a gold-silver alloy. A study of the changes in volume produced in this modification of gold by increase of temperature.—G. **Urbain**: A new element accompanying lutecium and scandium in the gadolinite earths. Celtium. From the rare earths obtained by treating xenotime on the large scale, impure ytterbium was extracted, and by the fractionation of this a new element, lutecium, was isolated. With the view of obtaining larger amounts of lutecium, large quantities of gadolinite have been worked up. The mother liquor resulting from a series of fractional crystallisations from nitric acid contains a metal the oxide of which is characterised by a very low coefficient of magnetisation. Spectrographic analysis revealed the presence of lutecium, scandium, and traces of neoytterbium, calcium and magnesium, and a large number of new lines due to a new element, for which the name of celtium is proposed.—R. **Fourtau**: The metalliferous layer of Gebel-Roussas (Egypt). A detailed description of the zinc and lead deposits.—MM. **Melchissédec** and **Frossard**: The buccal resonator.—M. **Doyon**, A. **Morel**, and A. **Policard**: The isolation of hepatic antithrombine, with a description of some of its properties.—Gabriel **Bertrand** and F. **Rogozinski**: Hæmoglobin as a peroxydase. The compounds of hæmoglobin with oxygen, carbon monoxide, and hydrocyanic acid, were compared as regards their action as oxydases; the catalytic power of each of these compounds was found to be exactly the same.—Aug. **Michel**: Autotomy and regeneration of the bodies and elytra in the Polynoïdians.—J. **Granier** and L. **Boule**: The somatic kineses in *Endymion nutans*.—L. **Spillman** and L. **Bruntz**: The eliminating *rôle* of the leucocytes. The elimination of liquid substances foreign to the organism is effected in three phases: fixation, during which the liquids are fixed mechanically by certain forms of leucocytes; transport, the white corpuscles carrying the fixed substances to the excretory organs; excretion, the excretory organs taking possession of the products fixed by the leucocytes by a glandular process.—H. **Coutière**: The Eucyphote shrimps collected in 1910 with the Bourée net by the *Princesse Alice*.—E. **Roubaud**: The biology and pæcilogonic viviparity of the cattle-fly in tropical Africa (*Musca corvina*).—Ph. **Glangeaud**: The volcanic region of Forez and its rocks. In the Forez region during the Miocene or early Pliocene period more than eighty volcanoes were active. The lavas from these show numerous points of similarity with those of Limogne, Mt. Dore, and Velay.

MELBOURNE.

Royal Society of Victoria, December 28, 1910.—Prof. E. W. Skeats in the chair.—Bertha **Rees**: The structure of the seed coats of hard seeds, and their longevity. The paper deals mainly with the investigation into the nature of the impermeable layer of hard seeds. The cuticularised layer may consist either of culticle alone or may extend to a varying depth in the wall of the superficial palisade cells. The cuticle is usually deposited on a basis of hemicellulose, but in *Acacia melanoxylon* the basis is pectose.—Janet W. **Raff**: Protozoa parasitic in the large intestine of Australian frogs, part i. *Hyla aurea, H. ewingii, H. peronii, Limnodynastes dorsalis,* and *L. tasmaniensis* were examined. The forms found most commonly were *Nyctotheus cordiformis, Opalina intestinalis,* two new species of Opalina, *Copromonas subtilis, Trichomonas batrachorum,* and *Trichomastix batrachorum.*—J. T. **Jutson**: The structure and general geology of the Warrandyte goldfield and adjacent country.—J. T. **Jutson**: A contribution to the physiography of the Yarra River and Dandenong Creek basins, Victoria. The Yarra Flats area and its extension south through Croydon and Port Phillip Bay is a Senkungsfeld. The Nillumbik peneplain was uplifted so gradually that the Yarra kept its old course to Templestowe, and is antecedent to the present topography.—A. C. **Stone**: The aborigines of Lake Boga, Victoria. The paper consists principally of vocabularies and folklore.—F. **Chapman**: Some supposed pyritised sponges from Queensland. Two melon-shaped masses are compared externally with Lithistid sponges. They are probably of Desert Sandstone (Upper Cretaceous age).—F. **Chapman**: A revision of the species of Limopsis in the Tertiary beds of southern Australia. Five species are recognised (*L. morningtonensis*, Pritchard; *L. maccoyi*, n.sp. = *L. belcheri*, M'Coy non Adams and Reeve; *L. multiradiata*, Tate; *L. beaumariensis*, n.sp. = ? *L. forskali*, Tate non Adams; and *L. insolita*, G. Sow). The latter also occurs in the Santa Cruz beds of Patagonia.—K. A. **Mickle**: The flotation of minerals. The metallurgical method of separation by flotation is due to an adherent gas film on the granules of ore. An account of a large series of experiments is given.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 26.

ROYAL SOCIETY, at 4.30.—Memoir on the Theory of the Partitions of Numbers. Part V.—Partitions in Two-dimensionals Space: Major P. A. MacMahon, F.R.S.—(1) The Origin of Magnetic Storms; (2) On the Periodicity of Sun-spots: Dr. A. Schuster, F.R.S.—Atmospheric Electricity over the Ocean: Dr. G. C. Simpson and C. S. Wright.—On the Fourier Constants of a Function: Dr. W. H. Young, F.R.S.—On the Energy and Distribution of Scattered Röntgen Radiation: J. A. Crowther.—On some new Facts connected with the Motion of Oscillating Water: Mrs. H. Ayrton.

ROYAL INSTITUTION, at 3.—Recent Progress in Astronomy: F. W. Dyson, F.R.S., Astronomer Royal.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Long Distance Transmission of Electrical Energy: W. T. Taylor.—Extra High Pressure Transmission Lines: R. Borlase Matthews and C. T. Wilkinson.

FRIDAY, JANUARY 27.

ROYAL INSTITUTION, at 9.—Radioactivity as a Kinetic Theory of a Fourth State of Matter: Prof. W. H. Bragg, F.R.S.

PHYSICAL SOCIETY, at 5 (at University College).—A Demonstration of Phase Difference between the Primary and Secondary Currents of a Transformer by means of a Simple Apparatus: Prof. F. T. Trouton, F.R.S.—A Note on the Experimental Measurement of the High Frequency Resistance of Wires: Prof. J. A. Fleming, F.R.S.—(1) The Measurement of Energy Losses in Condensers traversed by High Frequency Oscillations; (2) Some Resonance Curves taken with Impact and Spark Discharges: Prof. J. A. Fleming, F.R.S., and G. B. Dyke.—Council Meeting at 4.30 p.m.

SATURDAY, JANUARY 28.

ESSEX FIELD CLUB, at 6 (at Essex Museum of Natural History, Stratford).—Exhibition of Coloured Photographs of Alpine Flowering Plants: Somerville Hastings.—Note on the Occurrence of Stony Beds underlying Harwich Harbour: Percy Thompson.—On a Pre-historic Interment found near Walton-on-Naze: Hazzledine Warren.

MONDAY, JANUARY 30.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Recent Explorations in Dutch New Guinea: Dr. H. A. Lorentz.

INSTITUTE OF ACTUARIES, at 5.—On Staff Pension Funds: The Progress of the Accumulation of the Funds; The Identity of a Valuation with the Future Progress of a Fund; The Manner of Dealing with Funds which are Insolvent; and Sundry Observations: H. W. Manly.

TUESDAY, JANUARY 31.

ROYAL INSTITUTION, at 3.—Heredity: Prof. F. W. Mott, F.R.S.

ROYAL SOCIETY OF ARTS, at 4.30.—The Tin Resources of the Empire: F. Douglas Osborne.

ILLUMINATING ENGINEERING SOCIETY, at 8.—*Dicussion* on Library Lighting opened by J. Duff Brown and S. L. Jast.

INSTITUTION OF CIVIL ENGINEERS, at 8.—*Further discussion*: Sand movements at Newcastle Entrance, N.S.W.: C. W. King.—Fremantle Harbour-works, Western Australia: C. S. R. Palmer.—The Bar Harbours of New South Wales: G. H. Halligan.

WEDNESDAY, FEBRUARY 1.

ROYAL SOCIETY OF ARTS, at 8.—Examinations and their Bearing on National Efficiency: P. J. Hartog.

SOCIETY OF PUBLIC ANALYSTS, at 8.—President's Annual Address.—Note on the Detection and Estimation of Small Quantities of Antimony: Dr. P. Schidrowitz and H. A. Goldsbrough.—The Analytical and Microscopical Examination of Compound Liquorice Powder: G. E. Scott-Smith and John Evans.—Commercial Analysis and Arithmetic: C. A. Seyler.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, FEBRUARY 2.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: (1) Experiments to investigate the Infectivity of *Glossina palpalis* Fed on Sleeping Sickness Patients under Treatment; (2) Experiments to Ascertain if *Trypanosoma gambiense* during its Development within *Glossina palpalis* is infective: Col. Sir D. Bruce, F.R.S., and others.—Further Experimental Researches on the Etiology of Endemic Goitre: Captain R. McCarrison.—On the Leaves of Calamites (*Calamocladus Section*): H. H. Thomas.—Complement Deviation in Mouse Carcinoma: Dr. J. O. W. Barratt.

ROYAL INSTITUTION, at 3.—Recent Progress in Astronomy: F. W. Dyson, F.R.S., Astronomer Royal.

LINNEAN SOCIETY, at 8.

RÖNTGEN SOCIETY, at 8.15.—The Work of Action of an Induction Coil: Prof. Salomonson.

FRIDAY, FEBRUARY 3.

ROYAL INSTITUTION, at 9.—Grouse Disease: A. E. Shipley, F.R.S.

GEOLOGISTS' ASSOCIATION, at 7.30.—Annual General Meeting.—President's Address: Flint and Chart: W. Hill.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Rivers and Estuaries: W. H. Hunter, M.Inst.C.E.

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