THURSDAY, JUNE 14, 1917.

PSYCHOLOGICAL MEDICINE.

Manual of Psychiatry. By Dr. J. Rogues de Fursac and Dr. A. J. Rosanoff. Fourth edition. Pp. xi+522. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1916.) Price 10*s.* 6*d.* net.

WAR has always been the most potent cause of mental and physical suffering among a people; apart from the many direct injuries such as wounds, sickness, and fever which are inflicted upon the fighting forces. In war, military necessities must precede any consideration for the civil population, which experiences "stress and strain," two factors that contribute more than any other to the causation of insanity. For this reason we should expect a greater incidence of insanity during war than in peace-time; yet, although this war has lasted nearly three years, and much pain, great sorrow, and almost unendurable grief have been borne, there has been less registered insanity than occurred before the war, and on January 1, 1916, there were 3278 fewer cases than the year before. The causes for this diminished incidence are many. In the first place, it is a fact of experience that one great emotion is less frequently the cause of insanity than are the many small, but continuing, marginal, sub-conscious worries, which are always just within the limits of consciousness. It is also common knowledge that the working classes as a whole have been better off financially than in peace-time: the enormous demands of the world-war have created work on a colossal scale; the great industries of the country have been transformed into factories for the output of munitions and into workshops for the production of material for military requirements, and every responsible civilian capable of useful work has had his or her attention fixed, his or her interests maintained, and his or her domestic anxieties relieved. In spite of the greatly enhanced cost of living, difficulties connected with ways and means have even been less felt than in normal times, so that this diminution may be only temporary and due to social and economic conditions.

Other reasons for the diminished incidence of insanity are, first, the fact that the Liquor Traffic Control Board, exercising its powers under the Defence of the Realm Act, has curtailed the opportunities for drink—as alcohol accounts for 20 per cent. of all insanity among men, and 10 per cent. among women—and secondly, and probably the main reason, insanity occurring among the five millions of our troops is now unrecorded. This latter fact is of the utmost importance, because in all previous wars the soldier disabled through a mental illness was certified under the Lunacy Act, registered, and removed for treatment into the asylum in which he had a territorial settlement, whilst in the present war no insane soldier has been certified to be insane until he was deemed to be incurable. When insane, he is now detained under Military Law and maintained in a "military hospital," the latter in many instances a county asylum taken over by the War Office exclusively for the treatment of the soldier. This procedure has been adopted in order to avoid the possible stigma of having suffered from an attack of insanity should the soldier recover and desire to re-enter civil life. In giving sanction to this policy the Director-General of the Army Medical Department has acted wisely and considerately towards the insane soldier, and up to the present the experiment has worked satisfactorily, and it is because of this separate management of the mentally disabled soldier that a review of a text-book upon insanity is both appropriate and opportune.

This text-book by Dr. de Fursac is well known in this country, and its popularity is confirmed by the fact that this is its fourth edition; but it is in the main an American revision, and out of more than 350 references to authors in the text-book not above a dozen refer to English contributors. As in most American works upon mental diseases, the classification of insanity comes from Germany: the scheme is confused; it classifies insanity partly upon the basis of factors of causation, *e.g.* alcoholic insanity, syphilitic insanity, thyrogenic insanity, and partly upon the form of the mental disorder, so that a case may be in more than one group at the same time, and the groups are, therefore, not mutually exclusive. Moreover, the terms "manic-depressive insanity" and "dementia precox" find a prominent place. They refer, of course, to the varieties "alternating insanity" and "primary dementia" of our English classification. In regard to the technicalities of certification—a matter of vital importance to the family physician and to the general practitioner—the text-book is useless. It refers to "commitment" as the equivalent of certification, and upon this point of procedure it affords no guide according to English, Scottish, or Irish law. Nevertheless, the work is a helpful and instructive manual to the student of psychiatry.

Under ætiology, a section is introduced upon the Mendelian theory, which is not yet perfect enough to deal with the complex mental characters of human beings. In the mental constitution of human beings it is certain that "the segregation of unit-characters" does not occur, because the mind of each person is a hybrid blend, and the blended conditions appear in succeeding generations. The so-called law of dominance is quite an irregular phenomenon in Mendelism, as we know from the crossing of the "Chinese" with the "star" variety of primula, the cross between these two types being intermediate in form and easily distinguishable from either of the pure types, the characteristics having become blended. In human beings mental characteristics are complex states and not segregated units. There is no "purity" in the reproductive cells with regard to these characters, *i.e.* the hybrid condition that results as a blend

is not represented in a single reproductive cell, for the organism is always a double structure. On the other hand, we know that certain physical characters are definitely inherited upon Mendelian lines; for instance, colour in plants and animals, certain hair and feather characters, leaf forms, the presence or absence of horns in cattle, the shape of potato-tubers, are thus inherited; as are also brachy-dactyly, nyctalopia, and other conditions in man.

Although certain abnormal characters in individuals may be conveniently described as dominant or recessive, this is far from being a full explanation of neuropathic inheritance. The "coupling" and "repulsion" known to exist between different factors, the explanation of "sex-limited" diseases, and even the causation of sex itself, fail to be explained upon evidence which is founded upon Mendelian lines alone. In regard to Mendelism we think there is too much stress laid in the text-book upon the statement that "actual findings in mental disorders are alongside of theoretical expectations." As yet we know too little to be able to state that Mendel's law applies to all characters of all living organisms. Mental disorders in themselves are too vague as well as too subtle and complicated to be classified into definite heritable unit-characters. All we can say is that we must not expect simple Mendelian results from the study of insane inheritance, which is a product of many factors, each of which may possibly be independently heritable, but all of which have certain definite effects that must necessarily interfere with the practical application of Mendelism. The irregular dominance of some abnormal mental states shows that there is no definite segregation of mental characters.

The references to cerebral syphilis in the manual are the only long quotations from any English authority, and these do not point out that mental symptoms, such as cerebral irritation, restlessness, excitement, anxiety, and depression, occur in no fewer than 80 per cent. of all cases of syphilis, and mostly during the secondary stage! It is agreed by English authorities that these mental symptoms occur within six months from the date of primary infection. The author is too optimistic about the Wassermann reaction remaining negative after one or two injections of salvarsan. Exceptionally this may be so, but the present treatment of syphilis extends to more than one hundred days, and consists in the intravenous or intramuscular injection of salvarsan, neo-salvarsan, gallyl, luargol, or kharsivan, combined with mercury; and cerebral syphilis receives identical treatment. No reference is made to the numerous experiments made with salvarsanised serum, and we share the author's doubt as to the permanent arrest of general paralysis or of locomotor ataxia.

The Binet-Simon tests of mental deficiency are introduced and occupy about twenty pages, but it would have been more helpful if the author had added fuller comments upon their interpretation and practical utility. No mention is made of the Montessori method of treating mental deficiency, for this would have been appropriate in a work purporting to cover all inherent mental weakness. A useful sub-section is given to the technique of the Wassermann reaction, but, although the hæmolytic system is used to explain the bacteriolytic, the description needs simplifying for the general practitioner, in spite of the fact that this reaction is in essence only a quantitative chemical test for the presence of "complement." Psycho-analysis finds a short place in the text-book; it is described as a "time-robbing task," and the author shows a dignified reserve in its discussion, merely indicating briefly the methods employed to carry it out. Figures of the dead neuron (Betz cells) are introduced from the drawings of Adolf Meyer, but no reference is made to the altogether different structure of the living neuron. On the whole, the manual is a trustworthy text-book for the psychiatric clinic, and the new edition brings the work fairly up to date, although there is no mention of "shell-shock" or the mental effects of the war. Probably the recent development in American politics will soon remedy this defect.

ROBERT ARMSTRONG-JONES.

PHILOSOPHY AND PARADOX.

(1) *Fermat's Last Theorem.* By M. Cashmore. Pp. 63. (London: G. Bell and Sons, Ltd., 1916.) Price 2*s.* net.

(2) *The Elements of Non-Euclidean Plane Geometry and Trigonometry.* By Prof. H. S. Carslaw. Pp. xii+179. (London: Longmans, Green and Co., 1916.) Price 5*s.* net.

(3) *The Algebraic Theory of Modular Systems.* By F. S. Macaulay. Pp. xiv+112. (London: At the Cambridge University Press, 1916.) Price 4*s.* 6*d.* net.

(1) THE main fallacy of Mr. Cashmore's paradoxical tract is this:—"Let f, ϕ be polynomials in x, and λ a constant different from zero; then, if f, ϕ have a common factor $(x-\alpha)$, $x=\alpha$ may be regarded as a solution of $f/\phi=\lambda$. *Conversely,* if $f/\phi=\lambda$ has a root α, then $(x-\alpha)$ must be a common factor of f and ϕ." (See p. 18.)

(2) By this time it is fairly well known among mathematicians that ordinary geometry is a sort of border-line between two equally consistent theories, in each of which Euclid's axiom of parallels is false. In one of these the sum of the angles of a "rectilinear" triangle exceeds two "right" angles; in the other it falls short of it, and may even converge to zero. If "similar" triangles are defined by parallelism of sides, we have the sums of their angles differing according to a fixed law; and, similarly, if we define them by proportion of sides (generally according to a different law). These non-Euclidean geometries apply to three-dimensional space as well as to the plane, and the question for teachers is to make them intelligible to the student by intuitional methods. As regards the case when the sum of the angles of a triangle is less than two right angles, nothing can be better than to take as

"straight lines" circles which cut a fixed ordinary sphere orthogonally, and to regard all points outside this sphere either as non-existent or as "images." of accessible points within the sphere. The *plane* version of this is given by Prof. Carslaw (pp. 153–75) in the clearest manner conceivable; but he does not seem (in this book) to have considered the analogous theory *in solido*. There is no satisfactory theory of three-dimensional non-Euclidean geometry, *from an intuitional point of view*, unless it gives us a clear three-dimensional image in our ordinary space, assuming, of course, that our powers of "intuition" are confined to ordinary space.

One of the great merits of Prof. Carslaw's book is that he gives a good account of the history of the subject. In a certain sense Saccheri is the great pioneer, and as much justice seems to be done to him as the scope of the work permits. The next is presumably Gauss, but, as usual, he lost his claim by delay in publication.

It should be noticed that theories of parallels and theories of distance are, or may be made, essentially distinct. Thus, if we define *parallel* lines as those which cut the fundamental sphere orthogonally in the same point, they may or may not be continually at the same *distance* from each other, according as we define the measure of the distance of two parallel lines.

Altogether, we think Prof. Carslaw's book is one of the best introductions to the subject that we have seen. He ought to have given a reference to Mr. Somerville's bibliography.

(3) Let $F_1, F_2, \ldots F_n$ be n assigned polynomials in m variables; then $[F_1, F_2, \ldots F_n]$ is defined to be the set of polynomials $X_1F_1+X_2F_2+\ldots+X_nF_n$, where $X_1, X_2, \ldots X_n$ are arbitrary polynomials in the same variables. We also speak of $[F_1, F_2, \ldots F_n]$ as a "modulus" or "module," this term being due to Kronecker, who first emphasised the importance of *algebraical* moduli. The importance of *arithmetical* moduli, in the wider sense, was discovered by Dedekind, and the whole theory of algebraic integers in a given field may be reduced to that of moduli *contained in that field*. The algebraic theory is analogous, but much more difficult, and Dr. Macaulay has done a real service to mathematics by his original and critical tract. Even men such as Kronecker and Lasker seem to have made mistakes (in detail) in this peculiarly difficult field of research.

The originality and conscientiousness of this tract are so great that the reader must forgive the author for occasional obscurities. For instance, the "array" on p. 7 is fundamental, but we fear that many readers may fail to see precisely what it means, and the "reverse" notation (p. 4) for F_1, F_2 is not justified by any remark in the text.

The main result, illustrated by well-chosen examples, is that whereas, in the arithmetical theory, a modulus is uniquely expressible as a product of prime moduli, and all moduli are, so to speak, homogeneous in the sense that numbers of the natural scale are homogeneous, the same is *not* true of algebraic moduli in general, and we have to introduce technical epithets to distinguish one kind of modulus from another. In fact, it seems clear that the problem of classifying algebraic moduli according to their essential properties is at least as complicated as the corresponding problem in group-theory; and if we attend to the arithmetical nature of the coefficients (*e.g.* if, instead of taking them as *umbrae*, we take them as integers in a given finite field), additional difficulties present themselves. We hope that Dr. Macaulay will continue his researches; meanwhile this tract ought to be welcomed as one of the most valuable in the series to which it belongs. G. B. M.

SOME ASPECTS OF TEXTILE MANUFACTURE.

Dyeing in Germany and America, with Notes on Colour Production. By S. H. Higgins. Second edition, rewritten and enlarged. Pp. viii+143. (Manchester: At the University Press; London: Longmans, Green, and Co., 1916.) Price 5*s*. net.

THE first edition of this book was reviewed in NATURE for November 7, 1907. Since the completion of his work as a Travelling Scholar under the Gartside Foundation scheme, the author has gained much practical experience in dye and bleach works, the results of which are embodied in the new volume. This has added considerably to its value, particularly in the sections dealing with mercerisation and bleaching.

In a new chapter the German and English methods of manufacturing flannelettes are contrasted. This is of interest as raising the general question of the relative efficiency of the British and German methods of textile manufacture. Generalisation on such a topic is, of course, open to many pitfalls, and an adequate discussion of the matter would be impossible in this review; but, broadly speaking, the British textile industry has developed along the lines of specialisation of *processes*, whilst the German specialises in *products*. This contrast is seen very acutely in the worsted industry, in which it is quite usual here for at least five distinct firms to be concerned in the production of a piece of cloth—the comber, the spinner, the weaver, the dyer and finisher, and the merchant. Each of these carries out its section of the work with the maximum amount of skill and at the minimum cost, but there is an obvious, and very real, danger that the various processes are not sufficiently co-ordinated. On the other hand, the usual German practice is to carry out all processes in one works and under one general control, when it is much easier to correlate the various stages of manufacture and subordinate each process to the final result desired. The ultimate aim should be to combine the advantages of both systems.

The author of the book has also added a new chapter on "Instruction in Dyeing," and gives it

as his opinion, after inspecting the dyeing schools in Germany, Austria, and the United States, that they are not to be compared, as regards equipment or efficiency, with the schools at Manchester, Bradford, and Leeds. This is true enough, but is not generally recognised.

With regard to trade research, it is pointed out that the amount actually carried on must not be gauged by publications in technical journals. The most valuable results obtained are, of course, used by individual firms, and it is only gradually that they become known and find a place in the literature. This is no argument against the many schemes of research initiated by industries as a whole. It is often stated that information which is the common property of an industry is of no special value to an individual firm; but this is a fallacy, as it is in *applying* new information in particular directions that individual enterprise, skill, or special facilities have full scope.

The new edition of the book has been largely rewritten throughout, with great advantage. The concluding section deals with the future prospects of the dye-manufacturing industries in Britain, France, and the United States. W. M. G.

OUR BOOKSHELF.

An Introduction to a Biology, and Other Papers. By A. D. Darbishire. Pp. xviii+291. (London: Cassell and Co., Ltd., 1917.) Price 7*s.* 6*d.* net.

SINCE the advent of natural selection the mechanistic interpretation of Nature has on the whole steadily gained ground among biologists. The trend has been more and more towards the translation of vital phenomena in terms of physics and chemistry. Much of modern investigation, such as the discovery of artificial parthenogenesis or the establishing of the Mendelian principles among the phenomena of heredity, has undoubtedly strengthened the mechanistic position. Yet to all action succeeds reaction. To-day there is an evident tendency in many quarters to cast on one side the mechanistic interpreter and seek out other prophets. The note sounded thirty years ago by the acute and critical intellect of Samuel Butler is finding echoes among biological workers. Such a one was the author of this book. The "Introduction to a Biology" was designed, we are told, to direct attention to the failure of modern interpretative biology and to suggest the direction in which an understanding of life may be sought. Unhappily the work is but a fragment cut short by the author's premature death.

The principal theme is that the intelligence of man is of utilitarian origin, developing gradually as he gradually acquired more and more control over his material surroundings. Hence the circumstances of its development have led to man's welcoming a mechanistic theory of the organism and a materialistic theory of evolution to the neglect of other points of view. The influence of Bergson is clearly marked not only in the thesis, but in the generous use of entertaining analogy.

The essay, however unconvincing, is brightly written, for the author had a style of candid freshness and a gift of investing even trivial things with humorous interest. The charm of his personality is well brought out in the brief biographical sketch by his sister, upon whom fell the labour of piecing together what he left behind. It should be added that the greater part of the book consists of Darbishire's papers reprinted from various sources.

The Secretion of the Urine. By Prof. A. R. Cushny. ("Monographs on Physiology.") Pp. xi+241. (London: Longmans, Green, and Co., 1917.) Price 9*s.* net.

IN this extremely valuable monograph Prof. Cushny gives an admirable account of the kidney, and discusses the various views held as to its functions. Many other matters, such as the action of drugs upon it and the changes that occur in disease, are included, and the bibliography appended is of a most complete kind. The centre of interest in the book, however, is the presentation of the author's own views on the theory of kidney activity. The main theories discussed are naturally those associated with the historic names of Bowman and Ludwig. Bowman's view, with modifications introduced by Heidenhain and others, is at the present time the one most favoured by the majority of physiologists; Prof. Cushny's view, which he terms the "modern view," is a modified Ludwig hypothesis: secretion (a pure filtration) occurs at the glomerulus, and this fluid is converted into more concentrated urine by reabsorption which takes place in the tubules.

The author criticises the Bowman-Heidenhain theory that secretion of urea, etc., occurs in the tubules, partly because he interprets Heidenhain's celebrated pigment experiments in a new way, but mainly because it is vitalistic. His own theory reduces the "kidney to a machine," instead of postulating for it the capacity of a trained analytical chemist. It is a little difficult to follow the author here, for in some pages the reabsorption which he supposes to occur is spoken of as being indiscriminate and mechanical, while in other places he speaks of the kidney-cells as rejecting the urea instead of reabsorbing it, and in one place at least (p. 44) he says that reabsorption depends on the *vital activity* of the epithelium, and in so doing drops into an expression which is anathema to him as a rule. It really does not matter what word we employ—secretory, selective, or vital; but by whichever name we call it, selective action is undoubted in the case of other secretions, and in the kidney, whether the substances pass through its cells in one direction or the other, the cells do exercise discrimination. Prof. Cushny argues that discrimination implies intelligence; he might just as well urge that the amœba is intelligent because it rejects non-nutritious particles.

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.]*

A Letter of Ch. Darwin in Argentina.

ON the occasion of the first national meeting of the Sociedad Argentina de Ciencias Naturales, held towards the end of last year in the city of Tucuman, Señor Juan W. Gez presented the archive of Dr. F. J. Muñiz, together with a biographical narrative. To that archive belongs the subjoined letter from Darwin which I have transcribed. That letter, as can be seen, has not been included in the "Life and Letters of Ch. Darwin," but a Spanish version of it was published by the first biographer and editor of the papers of Dr. Muñiz—Don Domingo F. Sarmiento,[1] ex-President of this Republic (1868–74).

I would first, in a few words, say something concerning the man himself, who is probably little known to the English public. Dr. Francisco Javier Muñiz is considered to be the first Argentine naturalist. He was born in San Isidro in the year 1795. In 1821 he had already graduated in medicine, and was located for four years in Carmen-de-Patagones as a military doctor, at a time when those regions were still inhabited by Indians. From that period dated his inclination and fondness for natural sciences. From the year 1825 he resided in the province of Buenos Aires, where he rendered medical services, eventually coming to be professor, and later dean, of the faculty of medicine of the city of Buenos Aires. At the age of seventy years he continued to serve in his professional capacity as military physician, through the long war which Argentina, together with Brazil and Uruguay, waged against the tyrant Lopez, of Paraguay. In 1871, when the terrible epidemic of yellow fever scourged the city of Buenos Aires, he wished even at his advanced age to lend his professional services, but himself succumbed a victim to the disease on October 8 of the same year, at seventy-six years of age. The city of Buenos Aires has raised a monument to his memory.

The scientific works carried out by Muñiz treated of medicine and natural sciences, as may be seen by Darwin's letter. He was the first one in the Argentine to devote effort to collecting and studying the remains of the fossil mammals, which have since made famous the Pampa regions. As a physician he knew anatomy well, but his attainments in comparative osteology were less solid, because of the lack of works of study, which were exceedingly difficult to obtain at that time in this country.

Dr. Muñiz discovered numerous fossil mammals, and described some of them. Among these was the great fossil tiger of the Pampas, which he called *Felis bonaërensis* (see *La Gaceta Mercantil,* Buenos Aires, October 9, 1845). Not being familiar with the usages of nomenclature, he thought the suggestion of some friends acceptable, and that he should call the fossil Muñi-felis, but he only used this name once in the title, while in the description he simply calls it *Felis bonaërensis,* this being a less objectionable denomination. Notwithstanding, had the species been really new, his name should have continued, but it turned out to be, not a Machærodus, as Darwin suggested, but a Smilodon, distinct from the *S. neogaeus,* Lund, and which should bear the name *S. bonaërensis,* Muñiz, Amegh. With reference to the purpose declared by Darwin of having Dr. Muñiz's description translated and published (a description which was very prolix and detailed), it would seem that this was never carried out.

The reports on the *ñata* cow (a type of short-faced, wide-nostriled cow), to which Darwin refers, are those which are mentioned in his "Journal of Researches" (p. 146, second edition, 1845); but the series of questions to which Muñiz replied, and a copy of which I now find in the above-mentioned archive, contains many other details of interest which Darwin did not utilise, and Sarmiento did not publish save in very fragmentary form. These data have therefore undoubted interest, now that, as one may say, the peculiar *ñata* cow belongs to history.

The collection of fossil bones from the Pampa of which Darwin speaks from references by Owen is probably that which Muñiz gave to General Rosas in 1842, and Rosas gave to some French personage who resided in Buenos Aires, who in his turn presented it to the Paris Museum.

In conclusion, I may say that the projected sale of the rest of his collections, of which Muñiz spoke to Darwin, had not, as some might think, any commercial end in view. Muñiz proposed by this sale to obtain some resources for the sole purpose of being thus able to prosecute his explorations in the search for fossils, as appears from copies of letters preserved in his archive. The last specimens of his collection were presented by him to the Museum of Buenos Aires.

Subjoined is the text of Darwin's letter.

M. DOELLO-JURADO.

Museo Nacional, Buenos Aires, April, 1917.

Down, Farnborough, Kent,
February 26, 1847.

Dr. F. J. MUNIZ, Buenos Aires.

RESPECTED SIR,

Your letter of August 30, with the papers which you were so good as to send me, reached me only a short time since, owing to the protracted illness and absence from London of Mr. Morris, through whom they were sent. I have lately heard from Mr. Morris that you wish to dispose of your fossil remains on some pecuniary arrangement, which I did not fully understand from your own letter to me. I have given Mr. Morris my opinion on this head, so will not here repeat it; but will only say that I conceive the only feasible plan would be to send your fossils here to some agent to dispose of them. No society will purchase anything of the kind without having them inspected, and most societies only receive presents. Your specimen of the Muñi-felis must be a noble one; I suspect it will turn out to be a Machairodus, of which there are some fragments in the British Museum from the Pampas. I will endeavour to get your paper translated and inserted in some scientific periodical. Your account of the earthquake in the Pampas has surprised me; I never heard of one in any part further east of the Cordillera than at Cordoba. If you will inform me whether you read English I shall be happy to send you a copy (if you will point out some channel) of my "Geological Observations on South America," lately published; I do not think it worth sending them without knowing whether you read English, which I fear is not probable. Your pamphlet on the scarlet fever I will present to the Royal College of Surgeons.

I cannot adequately say how much I admire your continued zeal, situated as you are without means of pursuing your scientific studies and without people to sympathise with you, for the advancement of natural

[1] "Life and Writings of Col. Francisco Javier Muñiz," p. 280 (Spanish) (Buenos Aires, 1885.)

history; I trust that the pleasure of your pursuits affords you some reward for your exertions. Some time since you were so kind as to send me through Mr. E. Lumb some *most curious*, and to me *most valuable*, information regarding the Niata oxen. I should be deeply obliged by any further facts about any of the *domestic* animals of La Plata; on the origin of any "breed" of poultry, pigs, dogs, cattle, etc. I should be much interested by a brief description of the habits and appearance of the pigs, dogs, etc., which have *run wild*, and especially on the habits of these wild breeds, when their young are caught and reared. Will a puppy of one of the run-wild dogs, if brought up carefully, be as tame as a common dog? *Any* information on *all* such points would be of *real service* to me; and my address, should you find time to write to me, will always be that at the head of this letter. I most sincerely wish you all success in your admirable labours, and if at any time I can be of any service, I shall be happy to be so; but I am sorry to say I am not connected with any mercantile establishment and cannot recommend agents, etc., etc.

With much respect, I beg to remain, Sir,

Your obliged and obedient servant,

CHARLES DARWIN.

P.S.—I omitted to state that Prof. Owen has heard that a collection of bones from Buenos Aires some time since arrived at Paris.

Plated Teeth of Sheep.

PLATING of the teeth of sheep with "gold" can scarcely have been a common phenomenon, in Scotland at any rate, for in the few cases mentioned by the older writers it is recorded as something of a marvel.

In 1536 Hector Boece, Bishop of Aberdeen, thus described the sheep of Doundore (Bellenden's translation):—"In Gareoth [Garioch, a district of central Aberdeenshire] is ane hill namit Doundore, that is to say, the Goldin Montane. The scheip that gangis on this montane ar yallo; thair teeth are hewit like gold; thair flesche reid, as it wer littit with safron; thair woll is on the same maner." This locality remained for a couple of hundred years the typical Scottish locality, if one may so call it, for golden-toothed sheep, for it is mentioned by many writers, whose accounts vary mainly in the spelling of the hill-name —Dundore, Dunedere, Dinnedure, etc. It is the prominent conical, ruin-capped hill, still known as Dunnideer, near the railway station of Insch, in central Aberdeenshire.

Martin, in his "Description of the Western Islands of Scotland" (1703), almost suggests that the colouring of the teeth in the Outer Hebrides is due to native gold in the soil:—"The Natives affirm that Gold Dust has been found at *Griminis* on the Western Coast of the Isle of *North Uist*, and at *Copveaul* in *Harries*; in which, as in other parts of the Isles, the teeth of the Sheep which feed there are died yellow."

In these cases it is likely that iron in fair quantity was present in solution in the bogs and streams, for Dunnideer is formed of a cap of coarsely grained syenite lying upon the basic intrusive mass of the district, which possesses a moderate ferro-magnesian content, while the peat-bogs characteristic of the Outer Hebrides rest upon Lewesian gneiss, the ferruginous tendency of which in the area is indicated by the presence of patches of hornblende and garnet. In the Aberdeenshire area, iron pyrites, also, is disseminated throughout the intrusive mass in microscopic crystals.

JAMES RITCHIE.

Edinburgh, June 7.

The Organisation of Scientific Literature.

IN the current number (June, 1917) of *Scientia* (pp. 530–32) there is a somewhat full account of discussions that took place at the meeting of the Italian Society for the Advancement of Sciences at Milan in April last, which are of great interest to us, particularly at the present time. Prof. Gino Loria spoke about national and international collaboration in publications on science and culture, and Prof. Eugenio Rignano spoke on projected scientific periodicals of the Entente. The praiseworthy scheme of Prof. Rignano was fully described by him in a letter printed in NATURE of January 25 of this year, and I may also refer here to an article by myself on the organisation of scientific literature in *Science Progress* for last April. It is necessary that the nations of the Entente should take immediate steps to make themselves less dependent on Germany for the results of organisation of scientific and philosophical literature, if for no other reason than that Germany's powers of production are very much lessened at present, and probably will be even more so in future. Science is, of course, not an affair merely of particular nations or groups of nations; all nations should combine to make the work of advance in science rather easier by organising its literary aids. It seems that we, in particular of all nations, ought not to remain content with the position into which we have fallen in this possibly humble organising duty of science. I may remark that I have been in correspondence with the Government with respect to plans for Government action in this direction, and that, though some outcome of the correspondence does not seem impossible, it is to be feared that the curse of delay will act as a clog on the wheels of progress. One would have thought that by now the evils of inefficiency, slackness, and neglect of science had been sufficiently forced upon us. In France, Italy, and America there have been public expressions of a wish to help in this need for the organisation of the literature of scientific research.

PHILIP E. B. JOURDAIN.

The Bourne, Basingbourne Road,
Fleet, Hants, June 2.

The Origin of Flint.

SIR E. RAY LANKESTER (NATURE, June 7, p. 283) attributes the black colour of flint to carbon, but has he considered whether ferrosoferric oxide may be the cause of the colour?

I have recently observed a similar, almost black colour in specimens of hydrated, colloidal sodium silicate, which contained small quantities of oxide of iron, originally in the ferrous state, but partly oxidised.

It has been pointed out by Hofmann and Resenscheck (*Annalen*, 1905, vol. cccxlii., p. 364) that depth of colour in various chemical compounds is connected with the presence within the same molecule of atoms of an element exercising two different valencies. The deep colours of sulphur sesquioxide and uranouranic oxide are examples of this phenomenon, and especially the deep blue colour of ferric ferrocyanide. The dark colour of hydrated, ferrosoferric oxide is well seen when white, ferrous hydroxide, precipitated by alkali from ferrous sulphate solution, undergoes atmospheric oxidation, or when a mixed solution of ferrous and ferric salts is similarly precipitated. The greenish-black colour, which cannot possibly be due to a mixture of white, ferrous hydroxide and reddish-brown, ferric hydroxide, is to be attributed to a compound of the two hydrated oxides.

R. M. CAVEN.

University College, Nottingham, June 11.

THE SOCIETY OF CHEMICAL INDUSTRY AND THE PROGRESS OF THE CHEMICAL ARTS.

THE Society of Chemical Industry has done wisely in following the example of the Chemical Society in initiating the compilation and issue of annual reports on the progress of the various sections of applied chemistry dealt with in its journal. Its action is most opportune, for there can be no question that such a publication, if well and judiciously carried out, will have a profound effect on the development of that branch of technology which it is the special function of the society to foster. Valuable as the present volume undoubtedly is, we venture to think it furnishes only a partial indication of what such a work, if loyally supported, is destined to become. It would not be fair to its projectors to infer its ultimate character from the issue before us. It is confessedly incomplete, and covers only a portion of the sections of the classification followed in the society's journal. This has, no doubt, arisen from the circumstance that many of those best qualified to report on the missing sections have, owing to the special conditions of the time, been wholly engaged upon more pressing occupations. Indeed, this circumstance has probably reacted upon the production of the work generally, and is a sufficient explanation of its somewhat belated appearance. It was a bold venture to carry out such an undertaking in circumstances so unpropitious, and the editor and the Publication Committee are to be congratulated on the measure of success that has attended their efforts under such untoward conditions.

In addition to the missing reports on fibres, dyeing, metallurgy, electro-chemistry, and sugar, to which the preface refers, and to that on explosives, which for obvious reasons it is undesirable to include at the present time, no action has been taken in respect to agricultural chemistry, the chemistry of foods, and analysis, ostensibly on the ground that these subjects are dealt with in the annual reports issued by the Chemical Society. This appears to us no valid reason for their future exclusion. As these sections are part of the fortnightly issue of the society's journal, they presumably meet a want, and are acceptable to a more or less considerable fraction of its readers. If so, these readers are equally entitled, and may fairly look forward, to the annual summaries of progress and development in these sections as well as in the others. Moreover, it must not be forgotten that the compilers and readers of each of the two annual reports look at the subjects from somewhat different points of view. One set is primarily concerned with abstract and theoretical principles, the other with practical application. Of course, it is not possible to draw any hard-and-fast line between them, as each is intimately related to the other. But as the angle of view is certainly different, there is surely room for both, and it would unquestionably tend to efficiency and comprehensiveness if the council of the society decides that in future its annual reports of progress should include every department of applied chemistry with which its journal is concerned.

The present volume is made up of reports on fifteen out of the twenty-three sections of the classification adopted in the society's journal, and thirteen contributors, together with the editor, Mr. Burton, have been engaged in its production. Each author is well qualified to treat of the section which has been entrusted to him. Thus Prof. Cobb, the Livesey professor of fuel and gas industries of Leeds University, deals with "Fuel and Heating" and with "Mineral Oils"; Mr. E. V. Evans, the chief chemist of the South Metropolitan Gas Company, reports on "Gas: Destructive Distillation: Tar Products"; Prof. Gilbert Morgan writes on "Colouring Matters and Dyes"; Dr. Auden, of the United Alkali Company, on "Acids, Alkalis, Salt, etc."; Mr. Audley on "Glass and Ceramics" and "Building Materials"; Mr. Warburton, who was associated with the late Dr. Lewkowitsch, on "Oils, Fats, and Waxes"; Dr. Morrell, of Messrs. Mander Bros., on "Paints, Pigments, Varnishes, and Resins"; Dr. Stevens on "India-rubber"; Mr. Joseph T. Wood, of Messrs. Turner Bros., Ltd., on "Leather and Glue"; Mr. Arthur Ling, the chairman of the London section of the society and the editor of the Journal of the Institute of Brewing, reports on the "Fermentation Industries"; Mr. O'Shaughnessy on "Water Purification and Sanitation"; Dr. Pyman, director of the Wellcome Research Laboratories, on "Fine Chemicals, Medicinal Substances, and Essential Oils"; and Mr. B. V. Storr, of the Ilford Company, on "Photographic Materials and Processes." Such names, with such connections, are well calculated to inspire confidence in the judgment, knowledge, and critical ability with which the reports have been compiled.

Of course, it would be impossible in the space at our disposal to enter into any detailed analysis of these several communications, or to show at any length in what respects they fulfil, or fail in, their purpose of being "the abstracts and brief chronicles of the time." As is to be expected, much of the subject-matter is too technical to be of general interest. But in certain of their aspects these reports are highly significant, and the story they tell is of national importance. As might have been anticipated, the authors have not been able, however much they might have wished, to get away from the war. That stupendous event is profoundly influencing the position of chemical industry in this country, and anyone who deals with its present condition and prospective development cannot possibly ignore that fact if he rightly interprets his duty as a chronicler.

It is therefore of interest to ascertain what, in the judgment of experts, has been the effect of the war on the several branches of applied chemistry in this country, and how far that effect is likely to result in a general and permanent improvement in their character. It may be thought too soon to pronounce any definite

opinion on this matter, and this may have led certain of the contributors to hesitate in giving it. Others, however, have been able to read more clearly the signs and portents of the times, and, on the whole, their testimony is reassuring and full of hope. There can be no doubt whatever that the general body of chemical manufacturers in this country, as well as of the manufacturers dependent on chemical industry, have had a rude awakening. The war has completely upset commercial conditions, and many generations must come and go and a long period of peace ensue before pre-war relations are resumed. Public sentiment will force this country to depend more and more upon its own efforts, and to develop to a far greater extent its own internal resources. There is a general recognition that at the base of this problem is our educational system, and we see the evidence of this fact in the appointment of a professed educationist as director of a new policy. It is being realised that science and the methods of science must enter more largely into the curriculum of our secondary schools, and that colleges of science must be multiplied and strengthened. It is now everywhere perceived that the future of all industries depends upon science and upon the application of scientific principles. The bread that has been cast upon the waters is now being found after many days.

Many proofs of this fact are to be met with in the volume before us, accompanied, we regret to add, with certain disquieting features. There are those who aim at ends which are not those of their country, and too many new activities are secret. Perhaps in the circumstances this is unavoidable; but, as the example of our enemies has shown us, those industries flourish best and develop most rapidly where their leaders co-operate for their common good, even though they may themselves combine *contra mundum*.

Progress in applied chemistry may be measured by different standards. From an economic point of view it may be estimated by the wealth it brings to a community. This aspect of the matter finds practically no mention in the compilation before us. It is probably difficult to get together the requisite information, but if the Society of Chemical Industry could be induced to add a statistical department to its staff and publish the results of its labours each year as a supplement to these annual reports, we should obtain a real and valuable measure of the progress of the chemical arts in this country. As it is, the present work is too obviously based upon the pattern of the annual reports published by the Chemical Society, and is too exclusively a *catalogue raisonné* of the yearly output of the literature of applied chemistry. We would by no means undervalue the worth of such a compilation, but we venture to believe a fuller measure of its usefulness might be secured by a further extension of its scope.

These observations are offered in no spirit of carping criticism. We welcome with sincere pleasure the advent of an enterprise which is bound to have a far-reaching influence on the development of chemical industry in all English-speaking countries. Its inception at the present juncture is most timely, and we heartily wish it success. Thanks to the energy, skill, and perspicacity with which it is conducted, the journal of the society has become its most valuable asset. We are confident that these annual reports are destined to be a no less valuable feature of its work, provided that those who control its affairs are determined to rise to the full extent of their opportunity.

THE RADIATION OF THE STARS.

SINCE the publication of Homer Lane's paper "On the Theoretical Temperature of the Sun" in 1870, many writers have discussed the internal state of a star, considered as a globe of gas in equilibrium under its own gravitation. Recent observational work gives encouragement to these investigations, for it is now known that numerous stars are in a truly gaseous condition with mean densities similar to that of our atmosphere. To such stars the results for a perfect gas may fairly be applied, whereas stars, such as the sun, with densities greater than water must necessarily deviate widely from the theoretical conditions. The stars which are in a perfectly gaseous state correspond to the "giants" on H. N. Russell's theory,[1] or to the stars of rising temperature on Lockyer's principle of classification; the denser "dwarfs" are outside the scope of this discussion. The two series coalesce for spectral type B, which marks the highest temperature attained.

The internal temperatures which have been calculated are so far beyond practical experience that we may well hesitate to apply the familiar laws of physics to such conditions. But in so far as the investigation can be based on the second law of thermodynamics, the conservation of momentum, or laws which are directly deduced from these, there can be little doubt of the validity of the treatment. We cannot altogether avoid assumptions of a speculative or approximate character, and no doubt some of the results described in this article are open to serious criticism on that account; but to a considerable extent the discussion can be made to rest on laws which are held to be of universal application. Moreover, natural phenomena usually become simpler at high temperatures; gases become more "perfect"; the absorption of X-rays follows simpler laws than the absorption of light; the heat-energy comes to be located in greater proportion in the ether, so that the precise nature of the material atoms is less important.

Most investigators have assumed that the stars are in convective equilibrium.[2] In that case, when

[1] NATURE, vol. xciii., pp. 227, 252, and 281.

[2] There are strong reasons for believing that the interior of a star must be in radiative equilibrium, not convective equilibrium. The internal distribution of temperature and density is, however, of the same character in either case; if the coefficient of absorption is independent of the temperature, then the distribution corresponding to radiative equilibrium is the same as that of material for which $\gamma = \frac{4}{3}$ in convective equilibrium. See *Monthly Notices, R.A.S.*, vol. lxxvii., p. 16.

the mass and mean density are given, and also the molecular weight and ratio of specific heats (γ) of the material, we can find at once the temperature at any internal point. Let us take a star of mass $1\frac{1}{2}$ times that of the sun and of mean density 0·002 gm./cm.^{3}; for illustration, the average molecular weight will be taken as 54 (*e.g.* iron vapour dissociated into atoms at the high temperature). For γ we shall take $\frac{4}{3}$, but any possible change in γ makes comparatively little difference in the results, so far as we require them. For this star the calculated temperature at the centre is 150,000,000°; half-way from the centre to the boundary it is 42,000,000°. But the temperature of which we have some observational knowledge is not given immediately by these calculations; according to observation, the "effective temperature" of a star of this density would probably be about 6500°. This term does not refer to the temperature at any particular point, but measures the total outflow of heat per unit surface. Now, the outflow of heat evidently depends on two conditions—the temperature gradient (more strictly the gradient of T^4), and the transparency of the material; therefore, the temperature-distribution being calculated as already explained, we can deduce the transparency necessary to give the observed effective temperature of 6500°. The result is startling. We find the material must be so absorbent that a thickness of one-hundredth of a millimetre (at atmospheric density) would be almost perfectly opaque. There is little doubt that such opacity is impossible. Conversely, if we adopt any reasonable absorption coefficient, the effective temperature would have to be above 100,000°, which is decisively contradicted by observation.

A way out of this discrepancy is found if we take into account the effect of the pressure of radiation. Fortunately, this effect can be calculated rigorously without introducing any additional assumption or hypothesis. Suppose that a beam of radiation carrying energy E falls on a sheet of material which absorbs kE and transmits $(1-k)$E. It is known from the theory of electromagnetic waves that radiant energy E carries a forward-momentum E/c, where c is the velocity of light; similarly, the emergent beam carries momentum $(1-k)$E/c. The difference kE/c cannot be lost, and must evidently remain in the absorbing material. The material thus gains momentum, or, in other words, experiences a pressure. The amount of the pressure kE/c involves the coefficient of absorption k, of which we have no immediate observational knowledge; but it is the *same* coefficient which has already entered into the calculations of the opacity of the material, so that the introduction of radiation-pressure into the theory brings in no additional unknowns or arbitrary quantities.

The radiation-pressure is thus proportional to k, and to the approximately known outflow of energy. The preposterous value of k already found would, if adopted, lead to a pressure far exceeding gravity, so that the star would be blown to pieces. But the radiation-pressure modifies the internal distribution of pressure and temperature; it supports some of the weight of the outer layers of the star, and consequently a lower temperature will suffice to maintain the given density. The smaller temperature-gradient causes less tendency to outflow of heat, and there is accordingly no need for so high an opacity to oppose it. By calculation we find that for a star of mass 1·5 times the sun, and molecular weight 54, radiation-pressure will counterbalance 19/20ths of gravity; somewhat unexpectedly, this fraction depends neither on the density of the star (so long as it is a perfect gas) nor on the effective temperature, but it alters a little with the mass of the star. The pressures and temperatures are then reduced throughout in the ratio 1/20; for the star already considered, the corrected value of the central temperature is 7,000,000°. Assuming an effective temperature of 6500°, we can now calculate the new value of k; it amounts to 30 C.G.S. units, *i.e.* 1/30 gm. per sq. cm. section will reduce the radiation passing through it in the ratio 1/e. It is of considerable interest to note that this is of the same order of magnitude as the absorption of X-rays by solid material; for at the high temperatures here concerned the radiation would be of very short wave-length and of the nature of soft X-rays.

The approximate balance between radiation-pressure and gravity leads to an important relation between stellar temperatures and densities. It is easy to put this relation in a more rigorous form; but it will suffice here to express the condition as radiation-pressure = gravity. If T is the effective temperature of the star, and g the value of gravity at the surface, the outflow of radiation (per unit area) varies as T^4, and the condition is

$$k\mathrm{T}^4 \propto g.$$

We shall assume that k is the same for all stars. Now g depends on the mass and mean density in the ratio $\mathrm{M}\,\rho^{\frac{2}{3}}$. Hence

$$\mathrm{T} \propto \mathrm{M}^{\frac{1}{12}}\rho^{\frac{1}{6}}.$$

The range of mass in different stars is trifling compared with the great range of density. Thus the leading result is that *the effective temperature of a giant star is proportional to the sixth-root of the density*. To test this, we take the densities given by Russell[3] for the different types, and, assuming that stars of the solar type (G) have the sun's effective temperature (6000°), we calculate by the sixth-root law the temperatures of the other types.

Type		Density (⊙=1)		Effective temperature
A	...	$\frac{1}{10}$	...	10,800°
G	...	$\frac{1}{350}$	...	6,000°
K	...	$\frac{1}{2800}$	...	4,250°
M	...	$\frac{1}{25000}$	...	2,950°

The calculated numbers in the last column agree almost exactly with the temperatures usually

[3] *Loc. cit.*, pp. 282–83.

assigned to these types, and it is clear that if Russell's densities are correct the sixth-root law must be close to the truth.

If a is the radius of a star the total radiation will be proportional to a^2T^4, which varies as ga^2, *i.e.* as M. The total radiation thus depends only on the mass, and not on the density or stage of evolution. The absolute luminosity is a fairly good measure of the total radiation for the range of temperature here considered, though, of course, the visibility of the radiation changes a little with the temperature. We shall thus have the total radiation constant as we pass through the series of spectral types, and the luminosity roughly constant (with deviations amounting to about $1\frac{1}{2}$ magnitudes). This is just the feature which Russell has pointed out in the luminosities of the giant stars; they are practically the same whatever the type of spectrum.[4]

It may be remarked that this theory avoids a difficulty noticed by J. Perry[5], that when γ is less than $\frac{4}{3}$, the heat within the contracting star is greater than the energy set free by contraction, leaving less than nothing for radiation into space; the difficulty is even more serious than Perry considered, for he did not make any allowance for the enormous store of ethereal energy necessary for equilibrium with matter at high temperatures. But we have seen that by taking account of radiation-pressure the interior temperature is much reduced; less internal heat is therefore needed; and there is, in fact, an ample balance of energy left for dissipation even when γ is considerably below $\frac{4}{3}$.

With a molecular weight smaller than 54 the importance of radiation-pressure is reduced; for example, with molecular weight 18 radiation-pressure is 6/7 of gravity, instead of 19/20. But it still plays a predominant part until we come down to molecular weight 2. Reasons have been urged in favour of a low average molecular weight—perhaps as low as 2. It is probable that the atoms are highly ionised by the radiation of short wave-length within the star; and if most of the electrons outside the nucleus are split off from each atom we shall actually have an average weight for the ultimate independent particles nearly equal to 2, whatever the material (excluding hydrogen). Radiation-pressure is then less than half gravity; but the two principal laws, which seem to be verified by observation, are arrived at as before. Moreover, the order of magnitude of k is scarcely altered; it is now 5 instead of 30 C.G.S. units. Nor is the internal temperature much changed. In fact, the effect of ionising the atoms is that the pressure of the superincumbent layers is supported by a mixture of cathode rays and X-rays, instead of by X-rays alone; our doubt as to the proportions in which these occur and as to which will predominate is no serious hindrance, because the main results are nearly the same in any case.

A. S. EDDINGTON.

[4] *Loc. cit.*, p. 252, Figs. 1, 2, and 3.
[5] NATURE, vol. lx., p. 350.

DR. W. H. BESANT, F.R.S.

THE death of William Henry Besant on June 2, in his eighty-ninth year, will be mourned, in all sincerity, by a far greater number than he would have anticipated, supposing that he ever wasted a thought on the subject. Among these will be a legion of his old pupils, who had the opportunity of learning to know him in a peculiarly intimate way. Until 1880 or so Besant and Routh had almost a monopoly, for many years, in coaching pupils for the Mathematical Tripos. Besant's method was rather odd, but very effective with the right sort of man. At the cost of immense labour he had written out, with his own hand, a set of "book-work and rider" papers covering the whole range of the examination. The pupil, on each of his three weekly visits, found one of these papers awaiting him in the outside room, and proceeded to answer it as well as he could on the backs of old examination scripts. If he had not brought a pen of his own, he had to search among a lot of ancient quills until he could find one that was not hopelessly spoiled. Presently, Mr. X would be politely summoned to an inner parlour, where his last exercise would be returned to him corrected and annotated, and if he had failed to answer any question he would be either shown a solution or given a hint how to proceed.

Of course, it was not every pupil that was taken separately like this; some of them were taken in small batches (not exceeding five or six), but the general method was the same. It should be added that once every week each pupil took away with him a printed problem paper to be done at leisure in his own rooms. The results were marked, and the list was available for inspection.

As a member of St. John's College staff Besant used to give "lectures" of a sort; but (unlike Routh) he eschewed formal lectures on bookwork. His solutions of problems were always original and elegant, and he had the great advantage (for a coach) of being equally good in geometry, analysis, and dynamics.

Besides being one of the *par nobile fratrum* of coaches, Besant was a busy and trusted examiner, and in this connection it may be recorded that he used to say that ten minutes of oral examination were worth any amount of written *ditto*.

Besant was too much engrossed by his proper work to add much to mathematical literature. His text-books on conics, dynamics, hydrostatics, and hydrodynamics deserved their popularity, and are still worth consulting, though their point of view is now rather antiquated. His one thoroughly original printed work, the tract on roulettes and glissettes (first edition, 1869; second edition, enlarged, 1890), shows all his qualifications at their best. Besant had really studied Newton, and had an exceptional power of estimating different orders of infinitesimals from a figure. His invention of the term

"glissette" is a reminder to those who knew him that he preferred the works of the great French mathematicians to all others, and would rather read a good text-book in French than one in English.

It used to be a commonplace among Cambridge undergraduates that Besant was the handsomest Senior Wrangler that ever was. Anyhow, he was a very handsome man; so far as his head and face were concerned, he resembled the photographs of Russell Lowell. The left eye and eyebrow were damaged by a mountaineering accident. Above all, his manners were perfect—or as near perfection as human manners can be (curiously enough, his gyp Scott, when I knew them both, was the most gentlemanly gyp in college); no one who had much to do with Besant could help trying to be polite.

Besant was Senior in 1850 (four years before Routh), F.R.S. in 1871, and Sc.D. (Cant.) when that degree was first instituted. He and Routh were the first two to receive it, and he really enjoyed the distinction, though he used to pretend that he accepted it only to please his "womenfolk,"[1] and had to take a cab to the Senate House, lest ribald boys should jeer at his salmon and geranium gown. G. B. M.

NOTES.

WE notice with much regret the announcement of the death on June 9 of Prof. T. McKenny Hughes, F.R.S., Woodwardian professor of geology in the University of Cambridge, at eighty-five years of age.

IN the list of birthday honours last week we ought to have included the names of Lieut.-Col. A. W. Crossley, F.R.S., and Lieut.-Col. E. F. Harrison, two chemists who have received the distinction of C.M.G. in recognition of valuable services in connection with the war.

SIR WILLIAM D. NIVEN, whose death was announced in last week's NATURE, was born at Peterhead in 1842. After attending the Grammar School there, he entered King's College, Aberdeen, and graduated in 1861, obtaining the Simpson prize in mathematics. He afterwards entered the University of Cambridge, where he graduated in 1866 Elected to a fellowship in Trinity College, he for some years acted as assistant tutor. For a time he held an appointment at the Royal Military Academy, Woolwich, but he was back again in Cambridge by 1873. In 1883 he succeeded Dr. Hirst as Director of Studies at the Royal Naval College, Greenwich, a post which he held until his retirement in 1903, when he was created K.C.B., having been made C.B in 1897. He was elected a fellow of the Royal Society in 1882, and served for several years on the council of the society, and for a period of two years was vice-president. He was president of the London Mathematical Society in 1908 and 1909. Sir William was the author of numerous papers in mathematics and mathematical physics. He was virtually Clerk Maxwell's literary executor, and prepared and edited his collected works. His services as Director of Naval Education won the high regard of the Service and the attachment of the chiefs of its scientific branches. In recognition of his work, a group of scientific friends presented him with his portrait in 1911, and it is preserved in the collection of the University of Aberdeen.

THE death is announced, on June 11, at eighty-six years of age, of Sir W. C. Macdonald, the Chancellor and President of McGill University, and a generous benefactor to education and science in Canada. A list of his chief donations given in the *Times* of June 12 is here summarised. The gifts to McGill University included a fully equipped engineering building, which cost more than 70,000*l.*, besides endowment; a physics building, costing 60,000*l.*; a building for the departments of chemistry, mining, and architecture, costing 100,000*l.*; 30,000*l.* to endow the faculty of law; 18,000*l.* for two chairs of physics; at least 42,000*l.* for the endowment of engineering; 10,000*l.* for a pension fund, and other endowments; also a large area of land close to McGill, and bought for 200,000*l.* for the University. To promote rural education, Sir William Macdonald established four "consolidated schools," one each in Ontario, New Brunswick, Nova Scotia, and Prince Edward Island, all equipped for manual training, household science, and nature-study in practical gardening, as well as for the more conventional subjects, spending about 36,000*l.* on this experiment; and the sequel was the establishment of the Macdonald College at St. Ann's for teachers, farmers, and farmers' wives at a cost of about 600,000*l.* When the college was complete the founder presented it to McGill, along with 400,000*l.* as endowment.

THE interim and final reports of the Halakite inquiry have been issued by H.M. Stationery Office (Cd. 8446, price 1*d.*). The general findings of Mr. Justice Shearman, with whom Prof. W. J. Pope sat as assessor, have been widely read, but particular interest attaches to Prof. Pope's report. The original specification refers to an explosive having as a basis an admixture of lead nitrate with glycerine, and prescribes hydrocarbons, nitro-compounds, such as collodion or nitrobenzene, and barium and potassium chlorates and nitrates as possible constituents. It is stated that under the working conditions employed the glycerine reacts with the metallic nitrates to form a nitrocompound. Such a claim "is untrue, and the specification is the production of charlatans who seek to conceal the worthless nature of their invention by the use of a scientific terminology." The earlier samples submitted did consist largely of metallic nitrates, the proportions of which varied considerably, but the nitrocompounds were found to be short lengths of Mark I. cordite. Indeed, all samples presented to the court contained manufactured cordite as the common ingredient. Halakite was recommended by its proprietors for use as a smokeless powder for propellent purposes and as a bursting charge for shells. The report points out that explosives of such composition are so sensitive to shock that they cannot be used as high explosive for shell with any reasonable degree of safety, whilst the considerable proportion of metallic nitrates renders them unsuitable for propellent purposes because of low explosive power and dense smoke. A later sample submitted to the French Government in April, 1916, proved to consist of about 98 per cent. of Mark I. cordite, the balance being mainly lead chromate. Prof. Pope says that the clumsy nature of the fraud was obvious to the British and French authorities concerned The whole case is an illustration of the stupidity of otherwise astute business men accepting statements of self-styled "inventors," and failing to avail themselves of the advice of an independent expert chemist, which action certainly would have saved large sums of money and the waste of much valuable public time, as well as avoided a depressing public inquiry.

[1] Perhaps, like the Antiquary, he said "womankind"; I forget.

A JOINT meeting of the Society of Glass Technology with the Faraday Society will be held at the Applied Science Department, the University, Sheffield, on Wednesday, June 20, at 3.30 p.m., when a discussion will take place on "The Choice of Refractory Materials for Use in the Glass Industry." The discussion will be opened by Prof. W. G. Fearnsides, with a paper on "Supplies of Refractory Materials for Use in the Glass Industry."

THE council of the Royal Society of Edinburgh has made the following awards of prizes:—(1) The Makdougall-Brisbane prize to Dr. R. A. Houstoun, for his series of papers on "The Absorption of Light by Inorganic Salts," published in the Proceedings of the society; (2) the Gunning Victoria prize to Sir Thomas Muir, for his series of memoirs upon "The Theory and History of Determinants and Allied Forms," published in the Transactions and Proceedings of the society between the years 1872 and 1915.

THE second annual meeting of the Geological Physics Society was held at the rooms of the Geological Society on May 25, with the president, Prof. Benjamin Moore, in the chair. The following were elected members of the council:—Prof. B. Moore (president), Dr. G. Abbott, Dr. V. Elsden, Dr. Dawson Williams, Messrs. G. W. Bulman, C. H. Grinling, W. F. Gwinnell, E. Haviland, W. H. Richardson, E. K. Robinson, and A. C. Young. Mr. H. Davey was appointed hon. secretary *pro tem.* A discussion on "The Origin of Flints" was opened by the president.

THE battle of Messines opened on June 7 at 3.10 a.m. with the simultaneous explosion of nineteen large mines along a front ten miles in length. The total amount of explosives fired is estimated at about 450 tons, and one of the largest craters was afterwards found to be about one hundred yards in diameter and seventy feet in depth. Several people in and near London, including the Prime Minister, are said to have heard the sound, and a small movement recorded by a seismograph at Shide may have been a result of the explosion. The distance of London from Messines is about 145 miles, and that of Shide about 185 miles.

DR. F. O'B. ELLISON sends us a description of a curious meteorological phenomenon observed by him on June 1 at about 5.45 p.m. G.M.T., on leaving St. Mary's Hospital Medical School. He writes:—"The western sky was covered with a sheet of cirrus of a somewhat patchy appearance. The sun was shining through it strongly, about 20° above the horizon. There was no halo round the sun. About 20° from the zenith, and with its centre apparently at the zenith, was what appeared exactly like a very bright rainbow, in length a quarter of a circle, with the red on its convex border towards the sun. It was brightest when I first saw it, and gradually faded, having disappeared in about fifteen minutes. The bow was of uniform brilliance, with no 'mock sun' upon it, and was of sufficiently striking aspect to attract the attention of some railwaymen working near."

A TELEGRAM from the President of the Republic of Salvador to the Legation in London announces that an earthquake produced by the San Salvador volcano has destroyed a great part of various places in the Department of La Libertad and some in the Department of San Salvador. The capital has suffered considerably. It is estimated that there were forty killed and 100 injured in Armenia and Quezaltepeque, but none at San Salvador. The telegram does not give the date of the disaster, but it was known on June 7 that the volcano of San Salvador was in eruption. The city of San Salvador was founded in 1528, close to the great volcano of the same name. In less than four centuries it has been ruined eleven times by earthquakes, four times in the last century, namely, in 1806, 1815, 1854, and 1873. This recurrence of disastrous earthquakes in the same limited region seems to point to their volcanic origin, for great tectonic earthquakes are subject to constant focal migrations.

THE death is announced, in his seventy-seventh year, of Dr. Arnold Hague, who had been one of the geologists of the U.S. Survey since 1879. He had previously been connected with Clarence King's exploration of the 40th parallel, and with the official survey of the Cordilleras of North America from the Great Plains to the Sierra Nevada. In 1877–78 he was Government geologist of Guatemala, and travelled extensively over that country, especially in the mining and volcanic districts. In 1878 he was engaged by the Chinese Government to examine the gold, silver, and lead mines in northern China. He was best known by his work in the Yellowstone District, and most notably by his investigations of the geysers in connection with the extinct volcanoes. He was a member of the commission appointed by the National Academy of Sciences at the request of the U.S. Government in 1896 to prepare a plan of the national forest reserves. He received honorary doctorates from Aberdeen and Columbia Universities, was a vice-president of several international geological congresses, and in 1910 was president of the Geological Society of America.

LIEUT. ALAN GORDON HARPER, whose death is announced at twenty-eight years of age, was educated at Dulwich and at Magdalen College, Oxford, of which he was a demy. In 1912 he took the honours school in botany, and afterwards the diploma in rural economy. For work on the effects on the timber of defoliation by the caterpillar of the large larch sawfly, *Namatus Erichsoni*, he secured the degree of B.Sc. A preliminary report on this research was made to the British Association at Dundee in 1912, the full work being published in the *Annals of Botany* in 1913. After acting for a year as assistant in the Botanical Department of the University College of North Wales, Lieut. Harper returned to Oxford as demonstrator in the School of Rural Economy, where he carried out a research on the structure of timber as influenced by pressure stimuli (*Quarterly Journal of Forestry*, July, 1914). He also worked on the protomorphic shoots of Pinus, publishing a paper in the same journal in April, 1914. The acceptance of the post of deputy professor of botany in the Presidency College of Madras gave him the attractive opportunity of first-hand acquaintance with Indian vegetation. At the outbreak of war he secured a commission in the R.F.A., and on June 1 of this year he met an instantaneous death on the Western front.

THAT Italy realises the necessity of founding scientific laboratories is evident from a paragraph in a recent number of *L'Economista d'Italia*. So far as can be gathered, the scheme would appear to have been inaugurated by the "National Scientific and Technical Committee," which was formed last year in Milan. At a recent meeting of the industrial section of this committee (on which the leading Italian manufacturers are represented) it was stated that the desire of the committee was to "raise scientific laboratories to the level of similar institutions abroad." Signor Ruffini has already promised one million lire (40,000*l.*), together with an annual donation, and the warm support of the Government and of leading manu-

facturers is assured. The selection and training of the staffs are to be left to the committee already mentioned. The laboratories will apparently be established at the technical colleges, and will be devoted especially to physical and chemical research. The need for such laboratories is pressing, the committee being firmly convinced that "their efficiency will also depend on the rapidity with which the plan is put into execution, as Italy has every need to have available as soon after the war as possible all the scientific, technical, and industrial resources she can muster with the view of increasing production in the most favourable economic conditions and of improving the quality of her products." The scheme for the creation of the laboratories has formed the subject of a special memorandum, which is not reproduced in the journal mentioned above.

IN Memoir No. 91 of the Canadian Department of Mines Mr. E. W. Hawkes publishes an exhaustive monograph on the Labrador Eskimo. The author had already lived three years among the tribe in Alaska, and his previous knowledge of the race was useful, because the ethnological divisions of the Eskimo are geographical rather than cultural. The most interesting point in the inquiry is the proof that these were the people known as the Skraelings mentioned in the Saga of Eric the Red, who describes how the Vikings "saw a great number of skin canoes, and staves were brandished from their boats with a noise like flails, and they were revolved in the same direction in which the sun moves." This is obviously an attempt of the Norse singer to describe the Eskimo kayaks or skin boats. The noise of the double-bladed paddles might well be likened to that of flails. Elsewhere the bard speaks of the Skraeling boats approaching from the south, when "all their staves waved in a direction contrary to that of the sun." This is explained by the fact that in the former case the boats were coming from the north, in the second from the south, when the apparent motion of the paddles would necessarily be reversed. The monograph is a valuable addition to the accounts of the Eskimo by E. W. Nelson in the eighteenth annual report of the Bureau of American Ethnology, and by F. Boas in the sixth annual report in the same series.

THE April number of the Journal of the Royal Microscopical Society (No. 237) contains an article by Drs. Drew and Griffin on the parasitology of pyorrhœa alveolaris. At least six species of spirochætes, together with numbers of bacteria, were detected. Two species of amœbæ also seem invariably to be present, and their life-cycles were worked out. The authors suggest that mechanical injury seems to play an important part in initiating the condition; once the injury has occurred, the spirochætes probably play the chief part in the disease, causing tissue destruction and the formation of pockets, which then become infected by bacteria. The paper is illustrated with four plates. Two interesting letters written in 1877 by Prof. Abbe to the English microscopist, John Ware Stephenson, relating to the design and production of the first homogeneous immersion microscope objectives, are communicated by Mr. Cheshire to this number.

IN the *Psychological Review* (vol. xxiv., No. 3) Mr. Daniel Starch gives the results of his experiments on the similarity of brothers and sisters in mental traits. He wished to find out to what extent children of the same parents are alike in mental characteristics, and to determine whether the similarity, if any, was greater in those mental traits which are directly affected by training in school work than it is in those traits which are not so directly affected. He therefore chose tests of both types, *e.g.* speed and comprehension of reading ability, size of vocabulary, speed and quality of hand-writing, and ability in spelling for one group, and tests of perception, memory, and motor capacity for the other. He found that the resemblance of such children is approximately as great in mental traits as in physical, as found by Prof. Karl Pearson, and that the resemblance was greater in those tests which were less affected by school work. The article seems to corroborate the view that the mental make-up of human beings is as much a matter of heredity as their physical make-up, and that environment plays a relatively small part in producing the resemblance of closely related individuals.

AN important memoir on the baboons of Celebes, by Dr. J. Buttikofer, forms part i. of vol. iii. of *Zoologische Mededeelingen*. Of these animals the author recognises eight species, which he relegates to the genus Cynopithecus, dividing them into two groups, mainly on cranial characters. Specific characters are based on the general coloration and the shape and coloration of the gluteal callosities. The very complete survey of the literature of this theme, and the numerous coloured plates and text-figures, make this a most welcome contribution.

MR. ERIC B. DUNLOP, in *British Birds* for May, records some remarkable instances of polygamy among rooks. In one case he describes two females sharing one nest, incubating side by side in perfect harmony. Both sitting birds were fed in turn by one male, who was welcomed on his approach with food by much wing-shaking, after the fashion of young birds. Later, when the young appeared, this dutiful husband fed both his wives and the youngsters. The writer records two other cases of a like kind. But in these each female had a separate nest. In the same issue Mr. H. F. Witherby gives a further instalment of his valuable notes on moulting. He deals now with the flycatchers and the warblers, giving a very complete history, probably the most complete yet written, of this very interesting and important phase in their life-history, which has hitherto been strangely neglected. As might be supposed, a number of new facts are now placed on record.

PROF. C. CHILTON has examined some terrestrial Isopoda from the shore of the Chilka Lake, and his report upon them appears in the Memoirs of the Indian Museum (vol. v.). The name Isopoda, implying resemblance throughout the sevenfold series of legs, suited many, though far from all, of the groups to which Latreille applied it a century ago. It fits the terrestrial and semi-terrestrial, or "maritime," genera. Belonging to the latter set is a species described in 1828, the *Ligia exotica*, Roux, which, in its vast distribution, has not neglected Lake Chilka. "On Barkula I. it is enormously abundant. Though individuals may be found running on the shore at all times of the day and night, even on rocks heated by the midday sun, the species is most active in the morning and evening. It may then be seen in great droves, numbering sometimes hundreds of individuals, all of which move in the same direction." Though usually avoiding water, whether fresh or brackish, a drove meeting a pool will not hesitate to swim across it. Of this species Prof. Chilton says:—"Though it is so common and has been known for many years, it has received only scanty attention at the hands of those who have recorded it, most observers having merely mentioned its occurrence without adding to previous descriptions." No such reproach will be likely to assail the detailed account and illustrations which

Prof. Chilton now supplies. Only one small oversight may be noted. While the text duly explains that in the young the seventh peræon-segment bears no appendages, such appendages are nevertheless displayed in the adjoining figure.

BULLETIN No. 4 of the Department of Chemistry, South Australia, contains an interesting account of the marine fibre industry of Spencer's and St. Vincent's Gulfs, near Adelaide. The fibre is derived from *Posidonia australis*, a marine plant of the family Naiadaceæ, to which our familiar pond-weeds (Potamogeton) belong. The fibre consists of the remains of the plant which have been accumulating for centuries, and have become naturally retted through the decay of the soft parts. It is estimated that the workable deposits cover some 240 square miles, and at a yield of 6 lb. of fibre per cubic yard, and an average depth of deposit of 7 ft., this means a yield of 19,200 tons of air-dried fibre per square mile. Attention was first directed to the possibilities of an industry in the fibre in 1902, and now three large companies are at work. The fibre is useful for insulating purposes, the manufacture of bedding, etc. The paper gives an illustrated account of the methods employed for raising the material from the sea, and general details as to the methods of cleaning and preparing the fibre for the market.

ATTENTION is very properly directed in the *Agricultural News* of March 10 to the remarkable progress made in recent years in the agricultural departments of the Windward and Leeward Islands, which progress, it should be pointed out, is largely due to the fostering care and advice of the Imperial Department of Agriculture under the Commissioner, Sir Francis Watts. Starting from small botanic stations, each island has now a well-organised agricultural department, and the various islands are devoting their energies to the economic products most suitable for their particular conditions. The cotton industry in St. Vincent, Montserrat, St. Kitts, and Nevis; the onion-growing activity in Antigua, Montserrat, and the Virgin Islands; limes in Dominica, Grenada, and St. Lucia, are all thriving industries. Mention should also be made of the land settlement and peasant instruction work of the departments in St. Vincent and St. Lucia, which has been attended with great success. Further, in Dominica, in addition to its beautiful botanic garden, there is an excellent system of agricultural education in operation, and the science of horticulture is maintained at a very high level in the island.

WE learn from *La Géographie* (vol. xxxi., No. 4) that a small Swedish expedition has left for Juan Fernandez and the Galapagos Islands. The expedition, which is for botanical and zoological work, is under the leadership of Dr. Carl Skottsberg, who was a member of the Swedish Antarctic Expedition of 1901–3. Dr. Skottsberg in 1907–8 led an expedition to Patagonia, the Falkland Islands, South Georgia, and Juan Fernandez. The last scientific expedition to the Galapagos Islands was that of the California Academy of Sciences in 1905–6, when Mr. Alban Stewart made a thorough botanical exploration of the group and a great deal of zoological work was done.

THE want of coal which is seriously affecting Norway has already made her turn to the valuable Spitsbergen deposits. According to *La Géographie* (vol. xxxi., No. 4) Bear Island, another unclaimed Arctic land, is now attracting her attention. During last summer a party of Norwegian miners was at work on a coal-seam there which has been known for many years, and several wintered on the island in the hope of having a cargo ready for shipment to Norway this summer. Previous reports on the coal of Bear Island have not indicated very extensive deposits, but the great drawback to mining is the absence of safe anchorage. The Norwegian syndicate appears to consider the construction of a port. A meteorological observatory and wireless station are also proposed. A further discovery of coal in Spitsbergen is reported by a Russian expedition. According to the *Bolletino* of the Royal Italian Geographical Society (vol. vi., Nos. 4–5), the highest seam is near the surface and extends over an area of 450 square kilometres. It is estimated that this coalfield could produce 200,000 tons a year.

IN our issue of May 17 we quoted, without comment, from the *National Geographic Magazine*, published by the National Geographic Society of Washington, a forecast that, assuming that there is no immigration, and that the United States will grow as fast during the three centuries ahead of us as Europe grew from 1812 to 1912, the population will amount to nearly 500,000,000 in 2217, or approximately 166 to the square mile. A correspondent writing under the name of "A London Statistician" questions the accuracy of this estimate, mainly on the ground that in certain States the former rate of increase has not been maintained among the American-born population. This fact has been admitted and explained by General Walker (see "Encyclopædia Britannica," eleventh edition, xxvii., 635) on the grounds of a rise in the standard of living, the multiplication of artificial necessities, the extension of a paid domestic service, and the introduction of women into factory labour. Our correspondent shows good reasons for confirming these views, and, in any case, a forecast of this kind is liable to modification by recent events—the probable loss of life in war, a change in the conditions of production and domestic life, and the amount of emigration from European countries—resulting from the world-wide conflict which is now in progress.

THE papers, verbal discussion, and written communications contributed to the symposium on refractory materials held at the Faraday Society on November 8, 1916, have now been reprinted from the Transactions in a brochure of 189 pages. A brief account of the meeting was published in these columns on December 7, 1916. The principal additions to the symposium are the following:—(1) A note on the composition of clay and on silica bricks, by Prof. H. Le Chatelier, containing some striking photomicrographs of quartzite and cristobalite; (2) two short papers by Prof. H. B. Cronshaw, one on "The Deterioration of Refractory Materials in the Iron and Steel Industries," the other on "The Standardisation of Refractory Materials used in the Iron and Steel Industries"; and (3) a paper by Mr. R. B. Sosman, of the Geophysical Laboratory, Washington, on the common refractory oxides. The Faraday Society is to be especially congratulated on having obtained Mr. Sosman's contribution, which gives considerable information about the results of experimental inquiry obtained in the Geophysical Laboratory. It deals with the common rock-forming oxides—silica, alumina, lime, magnesia, and the oxides of iron. The last-named offer a research problem quite different in character from that of the other oxides by reason of the fact that their compositions and properties at high temperatures depend upon the pressure of the oxygen in contact with them. Ferric oxide, Fe_2O_3, begins to dissociate as the temperature rises into oxygen and a solid solution containing ferrous iron. At a given temperature the initial dissociation pressure is high, but it drops rapidly as the percentage of FeO in the solid increases,

passing through a range in which the pressure falls rather slowly with change of composition, and finally falling rapidly to the dissociation pressure of Fe_3O_4, which is very low. This in turn dissociates into oxygen and a mixture of oxides the character of which has not yet been determined. The properties of FeO are still practically unknown.

IN the March–April number of the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale* Prof. Ch. Féry gives some particulars of the work of the optical laboratory of the Ecole de Physique et de Chimie Industrielles at Paris. The present laboratory has been available for students for four years. Before and since its erection many important researches have been carried out, and, more particularly, the experiments undertaken so successfully of recent years by Prof. Féry on optical pyrometry. Prof. Féry is probably the most competent authority on this subject, and his methods may be said to be of almost universal application in works practice. Among other recent investigations may be mentioned the following:—Research on the calorific emission of the sun; note on the solar constant and apparent temperature of the sun; researches on radiation; an absorption spectrophotometer; an electric chronometer; a new thermo-electric calorimeter; the principle of a new method of measuring the velocity of light; and the chemical theory of lead-plate accumulators. The laboratory was the birthplace of the Grassot fluxmeter and the now world-famed Méker burner. This list shows that the laboratory has been keenly alive to industrial and scientific research, as well as to instruction. Special dark-rooms are provided in the laboratory for photometric and other optical experiments, while a balcony allows of experiments being conducted in the open air. Further rooms are provided for work on the optical bench, for the metallography of steel and alloys, and for chemical experiments. Special rooms are provided in the basement, built on masonry foundations, for work where absence of vibration is required. All rooms are carefully heated, lighted, and ventilated. The new electrochemical and physical laboratories and that devoted to the investigation of dyes, the mineralogical collections, the central library, and the lecture-rooms, are all built on modern principles, and directed, like the optics laboratory, with due regard to modern teaching and research requirements.

MESSRS. A. AND C. BLACK, LTD., announce for immediate publication "An Introduction to the Physiology and Psychology of Sex," by Dr. S. Herbert. The work will direct attention to the important facts respecting sex, mating, and reproduction, from the physiological and psychological points of view.

OUR ASTRONOMICAL COLUMN.

COMET 1917*b* (SCHAUMASSE).—The following continuation of the ephemeris for Greenwich midnight given in NATURE of May 31 has been received from Copenhagen:—

1917	R.A. h. m. s.	Decl. ° ′	Log r	Log Δ	Mag.
June 15	9 25 28	+18 24·8			
17	28 2	17 12·3	9·9829	0·0550	10·6
21	32 8	15 12·5	0·0033	0·1071	10·9
25	35 20	13 36·7	0·0238	0·1528	11·3
29	37 59	12 17·5	0·0442	0·1925	11·6
July 3	40 17	11 10·3	0·0642	0·2276	11·8
7	42 21	10 11·9	0·0837	0·2587	12·1

THE SPECTRUM OF COMET 1917*a* (MELLISH).—Prof. Frost reports that the spectrum of Mellish's comet, as observed at the Yerkes Observatory on March 21, showed a close resemblance to that of Morehouse's comet (Journ. R.A.S. Canada, vol. xi., p. 196). The cyanogen band 3883 and the blue carbon band, with its red edge at 4741, were strong, and there were other bands at 3914, 4017, and 5075. It may be remarked that the band 3914 was probably the negative band of nitrogen at that wave-length, while 4017 and 5075 would appear to be two of the bands of the low-pressure spectrum of carbon monoxide, these being especially characteristic of the tails of comets.

EFFECTIVE TEMPERATURES OF STARS.—The values of stellar temperatures derived by Rosenberg from comparisons of the intensity at different wave-lengths in photographic spectra have been discussed by Dr. Wilsing (*Astronomische Nachrichten*, No. 4881). A new reduction of Rosenberg's observations has brought the results for stars of early type into much closer accordance with the Potsdam values, as will appear from the examples included in the following table:—

	Type	Rosenberg	Rosenberg corrected	Scheiner and Wilsing
		°	°	°
a Andromedæ ...	I.*a* 2	33,000	13,500	8,800
a Pegasi	I.*a* 2	27,500	12,200	13,600
γ Geminorum ...	I.*a* 2	16,000	10,000	11,800
a Aquilæ	I.*a* 3	10,500	7,700	7,700
η Bootis	II.*a*	5,500	4,700	5,200
γ Cygni	II.*a*	5,100	4,400	6,000
ϵ Bootis	II.*a*–III.*a*	5,300	4,500	4,200
a Bootis	II.*a*–III.*a*	3,100	2,800	3,600
β Andromedæ ...	II.*a*–III.*a*	2,650	2,400	3,000
a Orionis	III.*a*	2,200	2,000	3,000

Scheiner and Wilsing's values were based upon visual observations with a spectrophotometer.

THE FELLOWSHIP OF THE ROYAL SOCIETY.

IN the annual report of the council of the Royal Society, adopted at a special general meeting in November last, certain changes in one of the statutes relating to the election of fellows were submitted. These changes were put forward after detailed deliberation by the council, and were based upon a report prepared by a committee appointed to consider the subject. Statute XII. of the society provides for the special election of persons who "either have rendered conspicuous service to the cause of science, or are such that their election would be of signal benefit to the society, provided that not more than two persons shall be so recommended in any one calendar year, and if two persons be elected in any one year there shall be no election in the following year."

By the new statute proposed by the council and adopted at the special meeting on November 2, 1916, the council could recommend to the society for election "(A) Privy Councillors whose election would assist the society; (B) men distinguished in the scientific or educational service of the State, or by their services to science and its applications, provided that (1) the number of fellows in Class A shall not exceed twenty-five at any time, including the fellows elected as Privy Councillors under the statutes in force before 1903; (2) the number of fellows in Class B shall not exceed twenty-five at any time, not more than five being elected in any one year." As in the original statute, any person so recommended for election had to receive the votes of two-thirds of the members of council present, and the number of votes in his favour had to be not fewer than eleven.

In February last a memorial signed by a large number of fellows of the society was presented to the council asking that steps should be taken to consult

the general body of fellows as to the introduction of the amended statute, and not to proceed with any recommendation for election under it before thorough reconsideration of the whole question. Fear was expressed that the amended statute might result in the election under (A) of "a politician, not at all necessarily of high distinction, who may be engaged in particular legislative or other public activity, on the ground only that his election would assist the work of the society," and under (B) of generous donors to the society or other scientific institutions, and the chief permanent officials of all departments of State concerned with scientific matters.

At the request of the memorialists, a special general meeting was held on June 7 to reconsider the amended statute, and the following resolution, moved by Sir David Bruce and seconded by Sir E. Ray Lankester, was carried after a long discussion :—"That this meeting is of opinion that the council will serve the best interests of the society by restoring Statute XII. to the form it had before the change made in it by the council on November 2, 1916, and by postponing further consideration of the statute relating to the election of fellows until after the termination of the war."

The action of the council in endeavouring to provide for the election of a few fellows on a broader basis than at present exists is thus practically undone. It was thought by some fellows that opposition to the new statute might have been met by a resolution to suspend elections under it during the war, and to leave any question of rescinding it until after the war; but the meeting decided to refer back to the council the whole question of amendment. A new council is, however, now in office, and the considerations which led to the recommendation of the amended statute will have to be gone over again in detail for the benefit of the new members when the resolution comes before the council.

THE ANIMAL SYMBOL OF THE EGYPTIAN DEITY, SET.

M. G. DARESSY has been writing [1] concerning the long-disputed question as to the identity of one of the animals which the old Egyptians selected as the symbol of their malevolent deity, Set, or Seth. Among creatures suggested as intended by the Egyptian artists have been the jackal, hare, oryx, and okapi, but all these assignments have been abandoned.

Two years ago Dr. Schweinfurth decided upon the orycterope, or anteater, the Erdferkel of the Sudan and Aardvaark of the Boers, because of the almost absolute resemblance of its head and snout to the Set quadrupeds.

The long legs and tail shown in Egyptian drawings, the tail often depicted vertically erect, and with double tufted end, render this attribution difficult, so M. Daressy has reviewed the question from the archæological side, summarising important Egyptian writings, and citing the delineations of the Set animal by their draughtsmen. From the literary side he illustrates the question from myth and stories of Set, of whom the creature was the crest, totem, and symbolic hieroglyph.

In the myths, when Set, with his name changed to Souti, became ally, instead of foe, of Horus, he was deemed lord of Upper Egypt, as Horus was of Lower Egypt and the Delta. This suggests that Set may have been a ruler of Upper Egypt, who warred with Osiris, King of Lower Egypt, and later also with Horus.

Although the myths speak of Set as god of evil, darkness, and the sterile deserts, the fact of his in some cases being said to have been reconciled to Horus, though he had assassinated Horus's father, Osiris, caused Set to be semi-deified, and a few shrines for his worship have been found as Souti. At Edfu he was a crocodile, though never worshipped under that type, crocodile deities such as Sobk and Pnepheros being different concepts. Set took other evil animal forms, such as the boar and swine, creatures abhorred in many religions. M. Daressy argues that the Set animal is really a creation of the imagination, the object of the design being to depict a creature so constructed as to be impotent to destroy Horus. If this was so, it is futile to search for the creature in either the existing or fossil fauna of Africa.

Egyptian drawing of head of Set animal. *Orycterope aethiopicus.* Set Pharaonic crest.

M. Daressy thinks the design embodies all the most opposite characters to those of a boar. If so, the animal is merely a fantastic design to symbolise the evil aspect of the deity.

But once in Egyptian history a Pharaoh, instead of using the falcon, which was their solar Horus dynastic crest, for his totem, in the Second or Third Dynasty employed for his honour the Set animal. This king was probably ruler of Upper Egypt solely, but his successor, to assure his subjects that he was under the tutelary protection of all Egypt's deities, used the double crests of the Set animal and Horus falcon, and the Set one was never used again for a royal symbol. It is very improbable this would have been done if the Set figure was a sort of serio-comic invention.

Head of Set in Spink collection.

It should be borne in mind that the ancient Egyptian animal-gods were (unless Set is an exception) real existing creatures. The Sphinx was not a god, or even totem of any particular deity. In the tombs at Beni Hassan various fantastic animals are depicted as denizens of the desert, and real ones also. The Set creature is there placed between a real and an imaginary one. An interesting fact is that the greater the antiquity of the figure, the less abnormal are its features from those of a dog, or jackal, or some allied species. Thus on some of the Serekh figures containing the name of the early dynasty Pharaoh, Perabsen, the Set quadruped is identical with old Egyptian drawings of jackals, which were sacred to Anubis excepting for its long erect tail, which has not the forked ending introduced later.

This Pharaoh only bore the Upper Egypt crown, so the creature, if a real one, may not have existed in Lower Egypt, and Set himself, as noted, seems to have ruled in Upper Egypt only.

It is just possible that remains of a member of the

[1] M. Daressy's article may be found in the Bulletin de l'Institut Français d'Archéologie Orientale, tome xiii., pp. 77–92.

Canidæ family now extinct may be found that will explain the anomaly.

Unfortunately, the prehensile lips and snout, so well indicated by the unique and very ancient bronze head which Messrs. Spink, of St. James's, have kindly permitted us to publish, would not be indicated by any of the bones.

It may be that the animal was very scarce, and that after its association with the detested deity it was exterminated by the Horus - following, orthodox Egyptians. JOSEPH OFFORD.

TECHNICAL OPTICS.

THE establishment of a Department of Technical Optics at the Imperial College of Science and Technology, and the appointment of Mr. F. J. Cheshire as the director of the department, were announced in NATURE of May 24 (p. 257). The report of the Board of Education for the year 1915–16 just issued (Cd. 8594, price 6*d*.) includes the following reference to this subject:—

After many years of discussion the establishment of a Department of Technical Optics is at last assured, and the Board desires in this connection to express its appreciation of the action of the London County Council, to whom the realisation of the scheme is largely due. The scheme involves the co-operation of the Imperial College of Science and Technology at South Kensington and the Northampton Polytechnic Institute in Clerkenwell. The more elementary instruction will be given at the Northampton Polytechnic Institute; the advanced full-time courses, and most of the research work, will be centred at the Imperial College. The work in technical optics at both institutions will be under the control of a director, who will be a professor of the Imperial College, and will be given the position of honorary head of a department in the Northampton Institute.

The governors of the Imperial College have appointed a Technical Optics Committee to manage under them the work for which they are responsible; and the London County Council has appointed the same committee to advise it as to the work to be done at the Northampton Institute. The Right Hon. A. H. D. Acland, who is chairman of the Executive Committee of the Imperial College and a member of the Committee of His Majesty's Privy Council on Scientific and Industrial Research, has consented to act as chairman of the Technical Optics Committee. This committee will contain representatives of the Admiralty, the War Office, and the Ministry of Munitions, and also of employers and workers in the trade.

At the outset the annual cost of maintaining the new scheme is estimated to be not less than 5000*l*., while 5500*l*. is needed for alterations and equipment. Of these sums the London County Council is prepared to find 2000*l*. a year (including 1000*l*. for the work at the Imperial College, and an increase of not more than 1000*l*. in its maintenance grant to the Northampton Institute), together with 750*l*. towards the necessary equipment at South Kensington and 250*l*. for alterations and new equipment at Clerkenwell. The Board of Education will make an additional annual grant of 2000*l*. to the Imperial College as from April 1, 1917, and a capital grant of 1500*l*. for equipment, while the extended provision for technical optics at the Northampton Institute will be taken into account in fixing the amount of the Board's block grant to that institution under the Regulations for Technical Schools. The Department of Scientific and Industrial Research is prepared to make a grant of 1000*l*. a year for five years to the Imperial College and an equipment grant of 750*l*. in respect of the research work which will be undertaken by the new Institute of Technical Optics.

Mr. Frederic J. Cheshire has been appointed head of the new department at the Imperial College for a period of five years, with the title Director of Technical Optics and Professor of Technical Optics at the Imperial College. Mr. Cheshire's long experience and great ability in optical matters practically ensure a successful beginning. He has been associated with optical instruments for many years at the Patent Office, and since the formation of the Ministry of Munitions has been Deputy Director-General of the Ministry and Technical Director of the Optical Department of the Ministry. He is the present president of the Optical Society. It is expected that, subject to the conclusion of certain arrangements with the Treasury, Mr. Cheshire will accept the directorship, and it is anticipated that the organisation of the department will be rapidly completed, and that training will begin at an early date.

THE CONFIGURATIONS OF ASTRONOMICAL MASSES AND THE FIGURE OF THE EARTH.[1]

A STUDY of the forms which can be assumed by masses of actual compressible matter under their own gravitation is of obvious importance for cosmogony and astronomy. A theorem of fundamental importance is that for a given mass, acted on by given forces and rotating at a given speed, there is only one equilibrium arrangement of the internal strata when the boundary is fixed. Thus possible figures of equilibrium can be classified by their boundaries; the interior matter will arrange itself.

A simple application is to the figure of the earth. Regarding the earth's surface as roughly spherical, the internal layers of equal density must be concentric spheres. The view that the internal strata may be, or in some past age may have been, excentric, is found to be illusory, and an attempted explanation of the major inequalities of the earth's surface in terms of this idea fails.

A more complex application is to the figures of compressible masses, such as gases, in rotation. It is found that a shrinking compressible mass will, in general, assume in turn figures which may be described as pseudo-spheroids and pseudo-ellipsoids, these being derived by continuous distortion from the spheroids and ellipsoids which form the only stable figures of equilibrium for incompressible masses. The pseudo-spheroids are more lens-shaped than a spheroid, and the pseudo-ellipsoids are more spindle-shaped than an ellipsoid. A sharp periphery may develop on the pseudo-spheroid or a sharp point on the pseudo-ellipsoid, in which case streams of matter are ejected through centrifugal force outbalancing gravity.

Considering in detail the figures appropriate to the law $p=\kappa\rho^{\gamma}$, it is found that a sharp periphery will develop on the pseudo-spheroids before the series of pseudo-ellipsoids is reached, if $\gamma<3$ (approximately). Thus a mass of ideal gas for which $\gamma<1\frac{2}{3}$ can never attain the pseudo-ellipsoidal form and so can never divide into two detached masses. But as the density of an actual gas increases with shrinkage, the ideal laws are departed from. The value $\gamma=3$ is reached, perhaps, at a density of $\frac{1}{4}$ to $\frac{1}{2}$, roughly that of a B-type star. So far, then, a "giant" star can lose matter equatorially, but cannot divide by fission. The

[1] Abstract of the Bakerian Lecture delivered before the Royal Society on May 17 by Mr. J. H. Jeans, F.R.S.

latter process can only begin at about type B. This agrees exactly with Campbell's discussion of spectroscopic binaries.

In an actual star internal ionisation and pressure of radiation must be considered, so that a star of sufficient mass can break up before B-type is reached, and there can be "giant" double stars.

The results obtained fit in well with observation and suggest a simple view of stellar cosmogony.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—Mr. G. H. Holcroft has presented to the University a valuable collection of fossils and recent shells which belonged to the late Sir Charles Holcroft.

Dr. J. W. Russell has been elected joint professor of medicine, to succeed Prof. Saundby, whose resignation takes effect on September 30 next. The council has resolved to recommend the court of governors at its next meeting to confer the title of "Emeritus Professor" on Prof. Saundby, "in recognition of his conspicuous services to the University and his eminence in the general field of medicine."

Messrs. A. W. Nuthall and J. T. Hewetson have been reappointed honorary curators of the Pathological Museum, in the sections of surgery and gynæcology respectively, for a term of three years from October next.

OXFORD.—On June 12 the honorary degree of D.Sc. was conferred on Prof. Arthur Schuster, who afterwards delivered the Halley lecture. In presenting Prof. Schuster, the Public Orator (Mr. A. D. Godley) spoke of his eminence in various departments of physical research, deploring the inadequacy of the Latin language for dealing with the technical details of the professor's work in the subjects of electricity and magnetism. He alluded also to Prof. Schuster's services as secretary of the Royal Society, and to the value of his labours to the nation at large.

THE Gilchrist Studentship for Women, of the University of London, has been awarded to Miss B. J. Schlumberger, an internal student, of University College.

PROF. J. G. ADAMI'S course of Croonian lectures at the Royal College of Physicians of London begins to-day, and will be continued on June 19, 21, and 26, at 5 o'clock. The subject of the course is "Adaptation and Disease."

A FUND of the value of 2000*l.*, to be known as the Osler Testimonial Fund, has been raised by the medical and chirurgical faculty of Maryland; the income will be devoted to the purchase of books for the library of the faculty and for the upkeep of the Sir William Osler Hall.

THE Prime Minister has informed Mr. Fisher that the urgent demand for further accommodation for war staff which must be housed in the immediate vicinity of the War Office and Admiralty necessitates the removal of the offices of the Board of Education. The new quarters of the Board are to be at the Victoria and Albert Museum, South Kensington. A sufficient number of rooms in Whitehall will, however, be retained for the use of the President, Parliamentary Secretary, and Permanent Secretary of the Board and for conferences, deputations, and interviews.

DR. T. BRAILSFORD ROBERTSON, professor of biochemistry and pharmacology in the University of California, has given to the regents of the University of California his patents for the growth-controlling substance tethelin, isolated by him from the anterior lobe of the pituitary body and used to accelerate repair in slowly healing wounds. The proceeds which may accrue from the sale or lease of these patents are to constitute a fund which will be entitled "The University of California Foundation for International Medical Research," and will be expended in the furtherance of medical research, preferably research in the physiology, chemistry, and pathology of growth.

WE have received a letter from the Rev. A. J. Ashley, hon. secretary of the Church Esperantist League, in reference to the paragraph which appeared in this column in our issue of May 31. Mr. Ashley writes:—"Ido stands now about where Esperanto stood in the eighties of last century; it has no literature worth mentioning, while many of the finest works of every great literature can now be obtained in Esperanto." Mr. Ashley is of opinion that Esperanto, having thousands of societies and being used daily by tens of thousands of people, is continually spreading, and that such popular acceptance should be a preliminary condition of any Government support. As regards the teaching of a universal language in schools, Mr. Ashley says that in the Patricroft Council School in Eccles Esperanto is being taught as a regular school subject with great success. An account of this experiment will be found in the June–July issue of the *Esperanto Monthly*, which may be obtained from the secretary of the B.E.A., 17 Hart Street, London, W.C.1.

THE new chemical laboratories at University College, London, have been planned and designed so as to meet the requirements of modern chemical teaching and research, including provision for physical chemistry, in which branch immediate and rapid progress is urgent. The funds for these laboratories have been raised by a committee, of which H.R.H. Prince Arthur of Connaught is the president, and Capt. the Hon. Rupert Guinness the chairman and treasurer. The total cost of the site, building, and equipment will be 120,000*l.* One hundred thousand pounds has already been raised, leaving 20,000*l.* still to be found. In order to facilitate the immediate provision of this 20,000*l.*, Sir Ralph C. Forster, Bt., who has already subscribed generously to the cost of these laboratories, has promised 5000*l.* on condition that the remaining 15,000*l.* is raised speedily. Upwards of 700*l.* has already been raised towards the 15,000*l.* required. Those who are anxious to see chemical science in London adequately equipped are invited to assist in completing the sum needed. An appeal has been issued by a sub-committee formed by Lord Glenconner and Capt. the Hon. Rupert Guinness for this purpose. Further particulars may be obtained at the college. Subscriptions should be addressed to Lord Glenconner at the college.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 24.—Sir J. J. Thomson, president, in the chair.—Prof. A. **Dendy** and Prof. J. W. **Nicholson**: The influence of vibrations upon the form of certain sponge-spicules. It has been suggested recently by one of the authors that the positions of the whorls which appear on certain siliceous spicules in the genus Latrunculia may be determined by vibrations to which the spicule is subjected at a certain stage of its development, corresponding, in fact, with the nodal points of a vibrating rod. The object of the present communication is to describe a similar case in a closely allied, but hitherto undescribed, genus, and to subject it to mathematical analysis with the view of testing this vibratory theory. The problem was to determine the

degree of coincidence between the actual positions of the whorls on the spicule and the positions which would be occupied by the nodes in a vibrating free-free rod of shape similar to that of the shaft of the spicule at the moment when the nodes are beginning to develop (*i.e.* at the critical stage). The general problem is that of the nodes in a rod composed of two equal portions, each formed by the rotation of the curve $y \propto x^n$ between $x=o$ and $x=l$ about its axis, and the positions of the nodes are expressed as functions of the index n by the interpolation formula. All the spicules examined correspond very closely with this law of shape for values of n between $\frac{1}{2}$ and 1. Details of ten cases at or near the critical stage are given in the paper, and the conclusion is arrived at that the positions of the whorls, although subject to slight individual variations due to various disturbing factors, agree so accurately with the theoretical positions of the nodes as to leave little doubt as to the influence of transverse vibrations in determining them. An efficient cause of such vibrations may be found in the water currents which circulate with considerable force through the canal system of the sponge.—Prof. J. W. **Nicholson**: The lateral vibrations of bars of variable section. The paper contains a discussion of the lateral vibrations of a bar composed of two equal halves and free at each end. Each half consists of a portion of the solid generated by the revolution of the curve $y=Ax^n$ about its axis, and the fundamental frequencies and positions of the corresponding nodes are investigated for various values of n between 0 and 1.

Physical Society, May 25.—Mr. W. R. Cooper, vice-president, in the chair.—C. C. **Paterson**, J. W. T. **Walsh**, and W. F. **Higgins**: An investigation of radium luminous compound. The paper contains the results of measurements made on various samples of radium luminous compound during the last two years. Determinations of the brightness of the compound in powder form and when made up into paint, and also after the application of the paint to instrument dials, were carried out; and curves are given showing the rates of decay of luminosity. The radium contents of the compounds were determined by comparison of their γ-ray activities with that of a preparation of pure radium bromide, which is periodically compared with the British radium standard. The various precautions which have to be observed and the corrections which have to be applied in making the various determinations are explained, and the considerations which should govern the proportion of radium employed for practical purposes are discussed.—F. J. W. **Whipple**: The resistance to the motion of a lamina, cylinder, or sphere in a rarefied gas. The investigation is carried out on the assumptions that the free-paths of the particles of the gas are long compared with the dimensions of the moving body, and that the motion, relative to the body, of the particles which rebound from it depends only on its temperature. It is shown that if v, w be the components of velocity perpendicular to the surface of a lamina and parallel thereto, the corresponding components of the resistance are

$$(4+\pi)\sqrt{\frac{3}{2\pi}}\frac{v}{V}p \quad \text{an} \quad \sqrt{\frac{3}{2\pi}}\frac{w}{V}p,$$

where V is the standard (root-mean-square) speed of the gas-particles and p is the gas-pressure. The resistance to the motion of a cylinder or a sphere is found to differ very slightly from the resistance to a lamina occupying the central section. The formulæ are applicable to the problem of the damping of the oscillations of a system suspended in a rarefied gas.—Prof. C. H. **Lees**: The effect of stretching on the thermal conductivity of wires.

PARIS.

Academy of Sciences, May 21.—M. A. d'Arsonval in the chair.—G. A. **Boulenger**: Batrachians belonging to the genus Euproctus, their ethological and phylogenic relations.—M. P. A. Dangeard was elected a member in the section of botany in the place of the late R. Zeiller.—P. **Fatou**: Rational substitutions.—L. **Décombe**: The influence of temperature on electrocapillary phenomena. An application of the second law of thermodynamics to electrocapillary phenomena, utilising the numerical results obtained by W. A. Vining and by M. Gouy.—M. and Mme. A. **Laborde**: Remarks on a note of MM. Debierne and Regaud on the use of the radium emanation condensed in sealed tubes. For clinical work MM. Debierne and Regaud have proposed to express the energy given out in terms of the quantity of emanation destroyed during the application. The authors suggest that the mean quantity of emanation present in the sealed tube during the time of application gives an equally exact measure of comparison between the two methods of utilising the energy of radium. Actual cases are worked out according to both modes of expression.—MM. **Massol** and **Faucon**: The absorption of the ultra-violet radiations by the iodine derivatives of methane. Details of the absorption bands produced by tetraiodomethane, iodoform, methylene iodide, and methyl iodide.—Ed. **Chauvenet**: The zirconyl bromides. The only definite compounds isolated were $ZrBr_4.ZrOBr_2.8H_2O$ and $ZrOBr_2.3.5H_2O$.—A. **Valeur**: An anomaly in the solubility of sparteine. An aqueous solution of sparteine becomes turbid when the temperature is slightly raised, and this effect is still more marked in dilute solutions of sodium carbonate. In the latter case the relation between the concentrations in sparteine and the temperature of turbidity formation has been determined, and between certain limits of concentration the curve expressing the results is a straight line. A method for determining this alkaloid can be based on these experiments.—J. **Bougault**: Acidylsemicarbazides and acidylsemicarbazic acids. The author attributes the constitution, $C_6H_5.CO.NH.NH.CO.NH_2$, to the product obtained by the action of sodium carbonate and iodine on the semicarbazone of phenylglyoxylic acid, whilst for the isomer produced by the action of benzoic anhydride upon semicarbazide chlorohydrate the formula $C_6H_5.C(OH):N.NH.CO.NH_2$ is suggested as most probable.—G. **Mouret**: The existence of a zone of crushed rocks, about 200 kilometres long, in the western region of Central French massif.—Ph. **Glangeaud**: The elements of the relief of the volcanic massif of the Monts-Dore.—L. **Ballif**: The determination of the density of air as a function of the altitude. The method is based on the measurement of the rate of ascent of a free balloon, which need not be recovered. The heights are estimated by simultaneous observations by two observers on the ground.—C. **Sauvageau**: A new type of alternation of generations in the brown algæ (*Dictyosiphon foeniculaceus*).—Em. **Bourquelot**, M. **Bridel**, and A. **Aubry**: The crystallisation and properties of a β-monoglucoside of glycerol obtained by biochemical synthesis. The synthesis of this glucoside has been described in an earlier paper (1915). By solution in absolute alcohol, and partially precipitating with ether and then allowing to stand at a temperature below 6° C. for twenty-one months, the substance has been obtained in the crystalline state. Details are given of its rotatory power and chemical and biochemical hydrolysis. This is the first glucoside of glycerol to be obtained in a crystallised state.—M. **Lièvre**: Stereoradioscopy. The apparatus described has been used with success in the Army Medical Service.—J. **Amar**: The origin and prophylaxy of heat stroke. Heat stroke

is regarded as an intoxication caused by fatigue and favoured by bad oxygenation of the blood.—R. **Dalimier**: Chemical vaccination of arsenical reactions.

May 29.—M. A. d'Arsonval in the chair.—H. **Douvillé**: The Orbitoids of Trinity Island.—J. **Bergonié**: The advantages from the hygienic, economic, and social points of view of a change in the number, time, and importance of meals. It is argued that the main meal of the day should be taken at 7.30 a.m., and a second and smaller meal at 6 p.m. The advantages of such a reduction of meals are set out.—S. **Lefschetz**: The multiple integrals of algebraic varieties.—N. **Kryloff**: Generalisations of the method of Walter Ritz.—J. K. de **Fériet**: The formation of integral equations admitting hyperspherical functions as fundamental solutions.—F. **Schrader**: A map of the massif of Gavarnie and of Mont-Perdu.—G. **Sizes**: The intervals in Hindu and Arabian music.—Ed. **Chauvenet**: The combinations of zirconium with sulphuric acid. Twelve compounds of zirconium with sulphuric acid have been described; the author has only obtained evidence of six of these.—G. **Bourguignon**: Normal chronaxy of the muscles of the lower limb in man. Functional and radicular classification by chronaxy.—Ch. **Dhéré** and G. **Vegezzi**: Helicorubin. This red pigment is found in the bile of the snail. Details of the changes in the absorption spectrum under the influence of various chemical reagents. In slightly acid media it is easily oxidised and reduced, and in the intestine of the snail behaves as a respiratory pigment.—H. **Vincent** and G. **Stodel**: The influence of traumatism on experimental gas gangrene and on the recrudescence of this infection. *B. perfringens* may be injected into healthy tissue without visible effect, but it does not immediately disappear; it is latent for a certain period, and may reappear as the result of a contusion.

June 4.—M. A. d'Arsonval in the chair.—J. **Boussinesq**: The equilibrium of a given homogeneous sandy mass under certain conditions.—P. **Montel**: Conformal representation.—W. **Sierpinski**: Some problems which imply non-measurable functions.—G. **Fayet** and A. **Schaumasse**: Elements of the comet 1917*b* (Schaumasse). The elements are calculated from observations made on April 25 and May 8, 14, and 22.—MM. **Portevin** and **Garvin**: The influence of the velocity of cooling on the transformation temperature and structure of carbon steels.—G. **Arnaud**: Some Microthyriaceæ.—M. **Amar**: Remarks on meal times. A destructive criticism of the proposals of M. Bergonié (see above), the main point of which is that food is not necessarily utilised immediately after it has been eaten. Two main meals at noon and 8 p.m. are regarded as justified from the point of view of experimental hygiene and the laws of human energetics.—L. **Camus**: The time necessary for the appearance of the anti-virulent property of serum is a function of the quantity of vaccine inoculated.

BOOKS RECEIVED.

A Psychic Vigil in Three Watches. Second edition. Pp. xi+233. (London: Methuen and Co., Ltd.) 5*s.* net.

The Mothercraft Manual. By M. L. Read. Pp. xviii+440. (London: G. G. Harrap and Co.) 5*s.* net.

A Pocket Book for Chemists, Chemical Manufacturers, etc. By T. Bayley. Eighth edition. Edited by R. Ensoll. Pp. xvi+425. (London: E. and F. N. Spon, Ltd.) 7*s.* 6*d.* net.

Cotton Spinning. By W. Scott Taggart. Vol. ii. Fourth edition. Pp. xxviii+462+illustrations. (London: Macmillan and Co., Ltd.) 10*s.* net.

DIARY OF SOCIETIES.

THURSDAY, JUNE 14.

ROYAL SOCIETY, at 4.30.—Some Cases of Wave Motion due to a Submerged Obstacle: Prof. T. H. Havelock.—The Propagation of Sound in the Free Atmosphere and the Acoustic Efficiency of Fog Signal Machinery: Prof. L. V. King.—The Behaviour of Scattering Media in Fully Diffused Light: H. J. Shannon, F. F. Renwick, and B. V. Storr.—The Theory of Decay in Radio-active Luminous Compounds: J. W. T. Walsh.

MATHEMATICAL SOCIETY, at 5.30.—Some Theorems on the Multiplication of Series: A. E. Jolliffe.—Certain Trigonometrical Series and their Applications to the Theory of Numbers: S. Ramanujan.

OPTICAL SOCIETY, at 8.—Aeroplane Compasses: S. G. Starling.—An Optical Method for Accurately Dividing a Circle into Degrees: Dr. R. S. Clay.

FRIDAY, JUNE 15.

INSTITUTION OF MINING ENGINEERS, at 11 a.m.—The Spontaneous Firing of Coal: Dr. J. S. Haldane.—The By-product Coking Process, its History, Development, and Application: E. Bury.—Acetylene Mine Lamps: W. Maurice.

MONDAY, JUNE 18.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Zambezi-Congo Watershed: Major E. A. Steel.

VICTORIA INSTITUTE, at 4.30.—Annual Address: The Distances of the Stars: Sir F. W. Dyson.

TUESDAY, JUNE 19.

ROYAL STATISTICAL SOCIETY, at 5.15.—Statistical Aspects of Inflation of the Currency: Prof. J. Shield Nicholson.

MINERALOGICAL SOCIETY, at 5.30.—The Problem of Sartorite: Dr. G. F. Herbert Smith.—Note on a Curious Case of Devitrification: Dr. A. Scott.—The Meteorites of Simondium, Eagle Station and Amana: Dr. G. T. Prior.

WEDNESDAY, JUNE 20.

ROYAL METEOROLOGICAL SOCIETY, at 5.—The Reduction of Temperature Observations to Mean of 24 Hours, and the Elucidation of the Diurnal Variation, in the Continent of Africa: C. E. P. Brooks.—Autographic Records of the Air-wave from the East London Explosion, January 19, 1917: F. J. W. Whipple.—Some Aspects of the Cold Period, December, 1916, to April, 1917: R. C. Mossman.

GEOLOGICAL SOCIETY, at 5.30.—The Inferior Oolite and Contiguous Deposits of the Crewkerne District (Somerset): L. Richardson.—The Pre-Cambrian and Associated Rocks of the District of Mozambique: A. Holmes.

ROYAL MICROSCOPICAL SOCIETY, at 8.—*Nouria rugosa*, a New Species of Foraminifera from the Faröe Channel: E. Heron-Allen and A. Earland.

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