THURSDAY, MAY 10, 1917.

EDUCATIONAL IDEALS.

(1) *German and English Education: A Comparative Study.* By Dr. Fr. De Hovre. Pp. 108. (London: Constable and Co., Ltd., 1917.) Price 2*s.* 6*d.* net.

(2) *The Permanent Values in Education.* By Kenneth Richmond, with an Introduction by A. Clutton Brock. Pp. xxiii+136. (London: Constable and Co., Ltd., 1917.) Price 2*s.* 6*d.* net.

(1) THE first of the above volumes, by Dr. De Hovre, of the Higher Institute of Philosophy of the University of Louvain, is a lucid statement of what he believes to be the fundamental differences between the essential aims of German and of English education, and includes a particularly interesting discussion as to the genesis and real significance of the much debated term "Kultur." He finds its basis in nationalism—upon it, as the foundation-stone, the German Empire has been built—in an ultra-devotion to intellectualism divorced from morals, and in the adoption of the formula "Education to the State, for the State, by the State." "Kultur," he says, is the soul of Germany, "civilisation" the soul of England, and he seeks to establish his thesis by reference to the fruits of the respective policies and measures of the rival nations in the sphere of colonial enterprise, in trade, and in social and political life, to the great disadvantage of Germany. "Humanism," he declares, is the vital element in English education, whilst nationalism, intellectualism, militarism, are the three fundamental principles of German life and education, summed up in the comprehensive term "Kultur." In short, the aim of English education is to make "men" through the development of character, whilst that of German education is to make "Germans" subservient to the State in all the varied activities of life, with a view to the aggrandisement of Germany and the imposition of her learning, her discipline, and her organisation upon the rest of the world.

It is admitted that the English nation has not a strong belief in education, that what her education lacks is a wider horizon, a deepening of intellectual culture, and a more efficient organisation, though it is firmly rooted on the solid basis of the freedom of the individual soul and on the development of character as its chief purpose. To bring about these reforms constitutes a formidable task, but their accomplishment is essential to the well-being of the nation, and, if realised, will place England in the forefront of the civilised nations of the world.

The author expresses the opinion that the strength of English education lies in its fundamental principles, and its weakness in its superstructure, whereas the opposite is the case with Germany. It will be felt by many readers that a too favourable view is taken of the actual state of English education, and that German education has scarcely met with the full appreciation which its great achievements deserve.

(2) Mr. Richmond's book is devoted to a consideration of the ideals which have inspired the minds of some of the world's greatest educators, and is an eloquent exhortation to all those engaged in the work of education to seek refreshment in the thoughts and aspirations of the prophets and teachers of past times, in "the wide universalism of Comenius, the devoted humanitarianism of Pestalozzi, and in the practical idealism of Froebel," in the sure hope that they will not be disappointed. It is the aim of the author to consider these ideals in the light of present-day conditions and needs, and to recast them for its service. The Jewish and Greek ideals, the Roman and Medieval, and the Renaissance, together with the teachings of Milton, of Locke, of Rousseau, and of Herbart, are discussed with the view of bringing to light those elements which appear to be of permanent value. Referring to the controversy now recrudescent between the advocates of scientific and literary training, the author suggests a synthesis such as Bacon, or Comenius, or Herbart would have desired. Science is to-day an activity of far wider and more complex significance than ever it has been before, and, in view of the inevitable struggle that lies before us, must be accorded its rightful place throughout the entire sphere of educational organisation, nor must the teachings of a true patriotism be neglected, so as to bring about harmony not only between class and class, but between nation and nation.

GEOMETRY AND ANALYTICAL MECHANICS.

(1) *A Treatise on the Circle and the Sphere.* By Dr. J. L. Coolidge. Pp. 602. (Oxford: At the Clarendon Press, 1916.) Price 21*s.* net.

(2) *Exercices et Leçons de Mécanique Analytique.* By Prof. R. de Montessus. Pp. ii+334. (Paris: Gauthier-Villars et Cie, 1915.) Price 12 francs.

THE first of these is a work of great significance, by the author of the well-known "Non-Euclidean Geometry," for which English readers will be very grateful. Its title may perhaps mislead, for it is by no means an elementary book; indeed, anyone who reads it conscientiously and follows out its manifold implications will have traversed wide fields of modern geometry, dealing not only with circles and spheres, but with line geometry, with hypergeometry, with non-Euclidean geometry, and with the theory of continuous groups. The specifically English reader will probably find it a most interesting and stimulating exercise to translate many of the results of the latter portion of the book into the language of projective geometry, with which his training may have made him more familiar; and if he thinks that this is the form in which the theorems should be summarised, he will be no less grateful to the author for his presentment. The first three chapters (pp. 19–188) deal with the elementary plane geometry of the circle. Apparently every-

thing to which we are accustomed in this respect receives masterly treatment here; even the so-called modern geometry of the triangle is handled with a detail which to many readers will seem excessive. The author's notation for angles and segments is, however, in the reviewer's opinion, needlessly tiresome.

The sphere receives a similar elementary treatment of less extent in chaps. v. and vi. (pp. 226–82). Chap. iv., with the title, "On the Tetracyclic Plane," introduces a method of presentment, followed also from chap. vii. to the end, about which opinions may well differ. The book on the whole has such value that criticism is a form of praise, and we shall express our opinion freely. We think the author might have introduced his chapter on the tetracyclic plane, say, by a brief account of Clifford's projection of the plane sections of an ellipsoid from an umbilicus: when the plane of projection is the tangent plane at the opposite umbilicus, actual circles are obtained, and two of these cut at right angles when the corresponding plane sections of the ellipsoid are in conjugate planes. If this were too elementary, he could, even then without introducing the co-ordinates in the first paragraph have defined quasi-circles as projections on to an arbitrary plane of plane sections of a quadric taken from an arbitrary point of the quadric. This would give at once the geometrical meaning of the tetracyclic co-ordinates. The projection of the intersection of the fundamental quadric with another quadric is then obviously a quartic curve with two nodes; there seems no great gain in calling such a curve a cyclic. The tangent planes of the cones containing the curve of intersection of the two quadrics intersect the fundamental quadric in curves projecting into the four systems of generating circles of the cyclic, and it is easily seen that the centres of the circles of one generation lie on a conic. All this seems clearer without the co-ordinates. And it is curious that a writer on non-Euclidean geometry should not recognise that the admirable theorem quoted from Jessop (p. 212), in regard to the angles between generating circles of different generations, is a generalisation of an old friend, relating to the difference of the distances of a variable point of the focal hyperbola of a system of confocal quadrics from two fixed points of the focal ellipse, the absolute being one of the confocal quadrics.

Similar remarks apply to chap. vii., on pentaspherical space, and chap. xiii., on circles in space; we think the projective geometry, of which these are translations, should be brought forward first and made more fundamental. The reader, after he has had the pleasure of turning the author's theorems back into projective geometry, will, we think, summarise them as such. The author recognises that the famous pentacycle of Stephanos is no more than a nearly obvious theorem for lines in four dimensions; he refers to Segre's cubic variety in four dimensions (p. 506), and there may be a real gain in calling it a cubic complex of spheres. It certainly is very interesting to have the theorems for spheres which he states; but we think a greater insistence on the projective geometry should have preceded his treatment, especially as a large part of the theory can be obtained without the explicit use of co-ordinates.

Some minor remarks may be added. There are occasional misprints; on p. 284 there are three (lines 1, 5, and 15 from the bottom.) The definitions of the many technical terms are not given sufficient prominence; if one forgets the meaning of such a term, it is in some cases a matter of hunting to find it again. On p. 351 the author refers to his impression that Cayley spoke of the sign of the radius of a circle; one place where this is so at least is in the "Collected Papers," vol. ii., p. 140. The reference to Weitzenböck in the footnote on p. 485 is obscure; the p. 2574 refers to the *Wiener Sitzungsberichte* referred to in the footnote on p. 484.

To use a phrase often employed by the author, these minute criticisms, it is seen, are not transfinite in number. Copying again the concluding phrase of what is a very gracious preface, which all Englishmen will be glad to read, the reviewer would like his last word, as was his first, to be one of gratitude to the author. His book is a noble addition to the geometrical literature in the English language, and must have a great influence on the prosecution of the study in all countries where English is read.

(2) This is a collection of elementary examples, in which the details of calculation are given at length, for the most part solved by Lagrange's equations. Pp. 1–109 are occupied with computations of centres of gravity, attractions and potential, and moments of inertia. Then one page is given to expounding the principle of virtual work, and one to D'Alembert's principle; after this the equations of Lagrange are briefly obtained. Chap. v. (p. 121) begins with an example discussing the motion of a sphere on the surface of a smooth cylinder (not in two dimensions), in which it is assumed, without previous discussion, that the motion of the centre is independent of rotation. Pp. 262–323 are occupied with an arithmetical discussion of the introductory formulæ of the theory of elliptic functions, but without any application to statical or dynamical problems. Throughout the volume the computations are arranged in a brief, businesslike way, and the diagrams are clear and numerous. As a working class-book, in the hands of a competent teacher concerned mainly in teaching the art of solving concrete examples, the book might be of great use.

A TEXT-BOOK OF GENETICS.

Genetics and Eugenics: A Text-book for Students of Biology and a Reference Book for Animal and Plant Breeders. By Prof. W. E. Castle. Pp. vi+353. (Cambridge, Mass.: Harvard University Press; London: Oxford University Press, 1916.) Price 2 dollars net.

SINCE the beginning of the present century, when genetic research passed from the province of the amateur to that of the professional,

Prof. Castle has been recognised as one of the most active workers on these lines. A book embodying his outlook after years of teaching and research is sure of a welcome from all who are interested in these matters. The volume is evidently designed more especially for the university student. It falls roughly into three sections: an introductory portion dealing with theories of evolution and what may be termed pre-Mendelian genetics, a main part treating of contemporary genetic work, and a final section on human heredity and eugenics. The amount of ground covered involves a condensed treatment of many important questions, and though this need not be a drawback to the student whose reading is supplemented by lectures, it makes it rather a difficult book for the average reader.

The author has approached the subject almost entirely from the zoological side, and, for a book of the sort, devotes an unusual amount of space to the inheritance of characters in domesticated animals. This part of the work is freely illustrated by photographs which have generally been well reproduced. But in some cases, as in Fig. 53, an attempt has been made to indicate colour differences in black and white, and the result is not happy.

Though the space devoted to plants is avowedly brief, the omission of any adequate account of the remarkable phenomena exhibited by plant chimæras must be regarded as a shortcoming, for it may well be that the principles here involved will turn out eventually to be of much wider application than appears at present. Some of the statements in this section are open to criticism by the botanist, as, for example, that which records doubling in the poppy as recessive to single. The reverse is true of Meconopsis.

In connection with sex-determination more attention might have been paid to the phenomena associated with gynandromorphs. The extraordinarily interesting and suggestive work of Goldschmidt is not even mentioned.

The best part of the book is that dealing with the effect of selection and the constancy of hereditary factors. From extensive experiments on the inheritance of white markings in rats, Prof. Castle has come to the conclusion that the hereditary factors upon which pattern depends may undergo alteration on crossing, thereby becoming either more or less potent in bringing about their peculiar reaction. *Plus* and *minus* variants are thus produced which may be isolated by selection. He speaks of the process as one of "contamination," though it is not altogether clear how he supposes it to be brought about. His ideas have been subjected to severe criticism in America, where many geneticists prefer to explain these phenomena on the hypothesis of multiple factors or of specific modifiers. It is clear that we do not yet understand this type of inheritance, and Prof. Castle's presentation of his case deserves most careful consideration.

The treatment of eugenics is eminently sane, and most people will probably agree with the conclusion that "we should extend our knowledge as rapidly as possible, but not legislate until we are very sure of our ground."

An excellent feature is an appendix containing a translation of Mendel's paper, which ought to be carefully digested by every student. A fairly full bibliography concludes the work. This might well be revised in a later edition to include all references to papers mentioned in the text. On p. 208 alone, for example, there are three such references which are not to be found in the bibliography.

OUR BOOKSHELF.

Life and Habit. By Samuel Butler. New edition, with author's addenda. Pp. x+310. (London: A. C. Fifield, 1917.) Price 5*s.* net.

WE were a little afraid to read "Life and Habit" again after a quarter of a century, lest all the magic might have gone. Perhaps some of it has, for we found tediousness in the criticisms of Darwin—*e.g.* in that culminating on p. 260 with the conclusion that a certain sentence from the "Origin of Species" "does not contain, or at any rate convey, any clear or definite idea at all." Butler was sometimes too much preoccupied with his own views; in this case the meaning of Darwin's sentence seems no conundrum. But the old charm is still in the book—the good humour, the epigrams, the dividing sword, the sincerity, the insight. The new edition seems to differ from that of 1877 only in including four short addenda found among the author's papers. The first and second are biologically interesting; the fourth strikes one as a lapse of good taste which should have been left to blush unseen.

That Butler's genius gave him insight into evolution problems has been generally, though tardily, recognised. What were the convictions that led him to react so violently from Darwinism? The first was that "there is in every impregnate ovum a *bonâ-fide* memory," more than a system of characteristic chemical processes occurring in a characteristic colloidal substratum. By memory he did not mean necessarily conscious memory. The second was that he could not bring himself to believe that the raw materials of evolution, variations to wit, arose by chance, "blind" and "unintelligent." The third was that when a living creature does something often, the frequently repeated experience must affect the germ-cells and have results enregistered in them. It is strange that so ingenious a mind never really understood the subtlety of natural selection, the way in which it sifts directively, not randomly, its consistent reference to the established web of life, and its progressive character. J. A. T.

Compressed Air Practice in Mining. By David Penman. Pp. vii+221. (London: Charles Griffin and Co., Ltd., 1916.) Price 5*s.* net.

THE first two chapters of this book, dealing with the theory of air compression and subsequent ex-

pansion, together with the efficiencies of each conversion of energy, are very good, as is also the short third chapter on indicator diagrams. In the fourth chapter, on air-compressors, exception may perhaps be taken that reciprocating air-compressors have been described under the names of firms which make them, rather than under headings derived from differences of design, though, otherwise, the description of these compressors is good, as is also that of the turbo-compressors in chap. v. In the sixth chapter, devoted to the transmission of compressed air, there is but little discussion of the principles of loss of pressure by friction, the author in this matter relying on Peele's well-known book. Coming, in the eighth chapter, to the machines making use of compressed air, coal-cutting machines first receive attention, and the principal machines employed in Great Britain are described. The description of rock-drills in chap. x. is accomplished chiefly under the names of firms making these drills, which is not an interesting procedure from a technical point of view. Mention is made of the use of compressed air in haulage and conveying, while in the twelfth and final chapter the transmission of power by compressed air is compared with that by electricity. In this it is stated that the cost of generating compressed air compares favourably with that of generating electricity, a statement with which few will agree.

The book in its later parts is disappointing and does not bear out the promise of its early chapters, so that, altogether, it does not do justice to its title. Within these limitations, it is, however, clearly written, while the assistance in elucidation which a number of worked problems give is a commendable feature.

Bill's School and Mine. A Collection of Essays on Education. By W. S. Franklin. Second edition. Pp. 102. (South Bethlehem, Pennsylvania: Franklin, MacNutt, and Charles, 1917.) Price 1 dollar.

THE new edition of Prof. Franklin's brightly written essays, with their advocacy of education in the "Land of Out-of-Doors" and of the claims of sensible science to a prominent place in school curricula, is enriched by a new essay on "Education after the War." In this paper he deals effectively with the unfriendliness towards science teaching prevalent in certain influential circles. Science, he urges, is finding out and learning how, whereas most people think of it only in terms of its material results. To quote Prof. Franklin: "It is now as much a mistake to oppose the fullest and widest possible development of Finding Out and Learning How as it was years ago to oppose labour-saving machinery; only it is quite necessary to make readjustments for the conservation of character and morals—and physique! Indeed, this necessity has shown itself most distinctly in our reluctance to make just such readjustments among those whose labour has been so wonderfully 'saved' by machinery!"

LETTERS TO THE EDITOR.

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Flat-foot in Young Women.

THIS deformity is exceedingly common among the young women of our nation, and it is not for lack of opportunity that it is studied so little. The present fashion of short skirts presents to us now an exceptional chance of finding out the extent of this evil. If the short skirt be destined to be permanent, it will be unique among the numerous fashions of women. The chance is here and now, and may not return.

Among certain negro races flat-foot appears to be normal, and in them perhaps it is an adaptation and a feature of their evolution. It is not so among us, and cannot be classed among the variations which are studied by biometricians.

Impressed by the sight of so many flat feet which young women are exhibiting below their short skirts, I made an observation of 355 persons of about the age of fifteen to forty-five, and noted the proportion of flat feet to normal ankles and feet, and I found 251 with definite signs of this defect. This represents a serious disability in this group for active life in the strenuous days to come, all the more because the persons noted belonged to the more favoured classes, living in a large and prosperous town. In addition to these, I noted about 200 more cases, which can only be classed as "borderland cases," and further investigation convinces me that there are more than 70 per cent. of our younger women and girls thus hindered from full locomotive and mental activity.

There are two main reasons why this deformity is important—first, that it is ugly and produces an ungainly gait; secondly, that walking and standing are rendered painful by it, and therefore unduly exhausting to the nervous system. I venture to say that if the attention of Mr. Fisher and the Board of Education were directed to Prof. Keith's valuable booklet, "The Human Body," they would not be long in doubt that flat-foot in girls is a pressing matter for them to consider, while they can. Prof. Keith points out that in all joints, except the knee-joint, the bones are kept in apposition by muscles and not by ligaments, that the arch of the foot is maintained by the steady and continuous reflex action of muscles, that the act of standing is an extremely complex act involving many muscles, and that all the time messages are passing from these to the centres in the spinal cord, from which other messages are being issued to co-ordinate the muscles in their action—a state of things well calculated to add much to the exhaustion of nervous centres when carried on with broken-down arches of the feet.

The series of cases I have described here is too small for any generalisation, but it is worthy of the notice of education authorities and their expert advisers. It is not a matter for investigation only by medical men. They are chiefly called upon to treat the deformity when it has come to a painful and gross form, and the clinical method of examination, with the foot raised, or even observation of the bare foot in standing, is not enough for the discovery of the slighter degrees of it. It needs to be observed from behind when the person is walking, so that the full degree of *working defect* may be known.

I submit that this is a matter for early attention, and for a system of remedial foot-drill in schools for our growing children. M.D., F.R.S.E.

May 1.

Classical Education and Modern Needs.

A REVIEW by Mr. H. G. Wells in NATURE of April 19 contains the following words: "This claim is pressed even more impudently by Mr. Livingstone in his recent 'Defence of Classical Education.' He insists that all our sons are to be muddled about with by the teachers of Greek up to at least the opening of the university stage."

This is a complete misrepresentation of my views, the more gratuitous because in several passages I insist on the importance of *not* teaching Greek and Latin to those boys who are unsuited for them—*e.g.* on p. 241: "It ought to be a first aim . . . to avoid diverting boys with mechanical or scientific tastes, who have no aptitude for linguistics, into studies that will be barren for them." (The context shows that the studies referred to are Latin and Greek.)

With regard to the present system of "compulsory Greek," after pointing out that it was an undesirable system, maintained on the ground that without it Greek teaching would, in present circumstances, disappear in many important educational areas, I remarked that "it would be possible, almost without opposition," to abolish it if such facilities were provided for the study of Greek as would put it within the reach of all boys in secondary schools *who wished to learn it*. This does not seem to me an impudent claim; it would be easy to satisfy; and I imagine that no one would take exception to it.

R. W. LIVINGSTONE.

Corpus Christi College, Oxford,
April 23.

MR. LIVINGSTONE'S letter is satisfactory, so far as it goes, in promising to spare such boys as are unworthy of classical blessings, but I think many of the readers of NATURE will see in its phrasing just that implicit claim to monopolise the best of the boys for the classical side of which I complain. We do not want the imbeciles, the calculating boys, the creatures all hands and no head, and so forth, for the modern side. We want boys for scientific work who may be not "unsuited," but eminently suited for Greek and Latin, in order that they may do something better and more important. I write with some personal experience in this matter. I am very much concerned in the welfare of two boys who have a great "aptitude for linguistics," and would make excellent classical scholars. I think I can do better with them than that, and that they can serve the world better with a different education. In each case I have had to interfere because they were being "muddled about with" by the classical side masters, and have got Russian substituted for the futile beginnings of Greek. The fact remains that Mr. Livingstone does, under existing conditions, wish to retain compulsory Greek.

H. G. WELLS.

The Frequency of Snow in London.

IN NATURE of May 3 Mr. L. C. W. Bonacina directs attention to the number of days on which snow was observed respectively at Wandsworth Common and in the neighbourhood of Hampstead during the early months of 1917. Incidentally he expresses some doubt as to the accuracy of the Wandsworth Common observations.

That it is possible for considerable variations in weather to exist over the hundred square miles or so of territory comprised within the metropolitan area is a fact I had hitherto regarded as within the limits of common knowledge. The variations observed during the recent winter months are clearly indicated in the following table, which has been compiled mainly from information given in the Monthly Weather Report of the Meteorological Office. The table shows for eight stations situated in and around London the number of days upon which snow or sleet was observed during each of the five months November, 1916, to March, 1917. The results for April are not yet available. For purposes of comparison I have also inserted in the table the records made at Wandsworth Common and at Mr. Bonacina's station, which may, I suppose, be assumed to be at Parliament Hill. Mean results for the whole of the ten stations are given at the foot of the table.

Days with Snow or Sleet, November, 1916–March, 1917.

Station	Nov.	Dec.	Jan.	Feb.	March	Total for the 5 months
Camden Square ...	1	3	7	3	13	27
Enfield	1	3	10	3	8	25
Greenwich (Royal Observatory) ...	1	5	16	5	12	39
Hampstead (Parliament Hill) ...	1	3	20	4	11	39
Hampstead (Reservoir)	3	7	19	6	13	48
Richmond (Kew Observatory) ...	2	3	15	4	10	34
South Kensington (Meteorological Office)	1	2	10	5	5	23
Tottenham	1	1	7	3	7	19
Wandsworth Common	2	3	11	3	10	29
Westminster ...	2	2	14	3	14	35
Mean of the ten stations	1·5	3·2	12·9	3·9	10·3	31·8

The table shows, in the first place, that the number of days upon which snow was observed at Wandsworth Common was in fair accordance with the mean results for the whole of the ten London stations. The total number in the five months was, it is true, somewhat smaller, but was at the same time in excess of that recorded at four of the ten stations, viz. Camden Square, Enfield, South Kensington, and Tottenham. The greatest divergence between the Wandsworth Common and the mean results was in January. The number of days with snow was then much smaller than at the two Hampstead stations, and was appreciably smaller than at Greenwich, Richmond, or Westminster. It was, however, larger than at the other four stations already quoted, so that if we begin to doubt the accuracy of the Wandsworth Common observations we must not stop there. We must question also the records made at important official stations, such as Camden Square and South Kensington.

The local variations which may exist in regard to such an element as snow (much of which came last winter in the form of fleeting showers) is clearly shown by the fact that while the total number of falls at Parliament Hill in the five months agreed precisely with the Greenwich record, it was appreciably smaller than at Hampstead Reservoir, little more than a stone's-throw away.

FREDK. J. BRODIE.

30 Loxley Road, Wandsworth Common, S.W.

WITH reference to the recent correspondence in the columns of NATURE upon the frequency of snowfall in London during the past winter, it may be of interest to state that at the Hampstead Scientific Society's observatory at the extreme summit of Hampstead Heath (453 ft.) some form of snow or sleet was recorded on as many as sixty-one days, nineteen of these being in January, and thirteen both in March and in April.

In this country most of our snow comes with winds from N. and N.E., and hence it need scarcely seem a matter for wonder that a place, such as Hampstead, situated to the north of the artificially heated metropolitan zone, should sometimes receive in the form of snow or sleet precipitation which reaches the southern suburbs as rain. Apart from the difference in height, the heating of the north or north-east current in its traverse over the city would account for the discrepancy mentioned by Mr. Bonacina.

This is, to my mind, a more probable explanation than that the observer at Wandsworth Common, who has assisted with distinction in the upbringing of modern meteorology almost since its birth, could fail to recognise snow or sleet, in whatever form it may have fallen. E. L. HAWKE.

May 5.

A Canvas-attacking Fungus.

So many inquiries have been made from strangely diverse sources, especially since the outbreak of war, concerning black spots which appear on bell-tents, sails, aeroplane and airship fabrics, etc., that it seemed desirable to write the present note principally to direct attention to a paper by F. Guéguen in *Comptes rendus*, vol. clix. (1914), p. 781, "Sur l'altération dite 'piqûre' des toiles de tente et des toiles à voile." The spots are caused by fungi which damage the fabric, so that after some months it is easily torn. The fungus hyphæ grow on the surface of the fabric, between the fibres and within the lumen of the fibres. Guéguen found that the fungi principally concerned were the Pyrenomycetes, *Pleospora infectoria* and *P. herbarum*, especially the former. These Ascomycetes are also found in their conidial states, *Alternaria tenuis* and *Macrosporium commune*, and other Mucedineæ, Rhinocladium, Helminthosporium, etc., are often associated with them. According to Guéguen, the malady is scarcely ever due to accidental contamination, but is caused by the development, in moist warmth, of moulds already present in the newly manufactured fabric, commercial patterns of the most diverse origin being found almost all to contain fungus spores. Practically all unbleached canvas is affected, but that bleached with hypochlorites, etc., remains free—the glaucous colonies which are sometimes seen are due to Penicillium or Aspergillus derived from the air, and almost invariably non-injurious to the fabric. Guéguen holds that the fungi causing the spots are those which grow on the dead stems of the textile plant, which are introduced amongst the fibres at the time of retting. The thick-walled hyphæ remain in a resting state in the dry canvas, and resume vegetative growth when external conditions become again favourable (humidity, warm confined air). He considers that the best method of prevention would be to sterilise the tow after retting, by heat—steam under pressure, and then dry heat. Boiling solutions of salts of chromium or copper would also serve, applied either to the tow or the fabric. A suitable method of rendering awnings, etc., impermeable would be to immerse the fabric first in a 20 per cent. solution of soap, and then in 8 per cent. copper sulphate, each at boiling point.

Similar black spots are very common on paper, and are most commonly due to Alternaria, Stachybotrys, and Chætomium. Sée ("Sur les moisissures causant l'altération du papier," *Comptes rendus*, vol. clxiv. [1917], p. 230) has investigated the variously coloured spots damaging paper, and believes that the causative fungi are already present in the paper-pulp, and probably come from the straw, fibre, etc., from which the pulp is made.

In the damaged fabrics examined by the writer the perfect Pleospora stage has rarely been found, though the Alternaria and Macrosporium conditions have been frequent. Other Mucedineæ, Cladosporium spp., Stachybotrys, Helminthosporium. etc., were also common. In certain cases fungi were found, however, which seem to be identical with species which are known to occur in the soil. A large number of fungi are active cellulose destroyers; many of these occur only in the soil, and it seems probable that a large proportion, if not most, of the cellulose destruction which goes on there is brought about by their agency. Canvas left lying about on broken ground would be almost certainly attacked by these cellulose fermenters, given the suitable conditions for growth—a very small portion of soil scattered over moistened sterilised filter-paper gives rise to an amazing number of fungus colonies. Although no experiments have yet been undertaken in connection with this suggestion, it is put forward for certain more or less obvious reasons. J. RAMSBOTTOM.

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Diffraction Phenomena in the Testing of Optical Surfaces.

IN the *Philosophical Magazine* for February, 1917, Lord Rayleigh has published an investigation of the phenomena to be expected according to the wave theory when an optical surface is tested at the focal plane by the well-known method due to Foucault, and has shown that, even when nearly the whole of the light is cut off by the advancing edge in the focal plane, the boundaries of the aperture retain a very marked brilliancy *which is symmetrical about the centre*.

An interesting question arises as to the manner in which this effect (which has been shown by Lord Rayleigh to be due to diffraction) would be modified if the light is screened, not exactly at the focal plane, but a little in front of, or behind, the focus. On testing this at this laboratory it has been found that the Rayleigh effect is still observed, but *the edges of the aperture on either side differ very markedly in their brilliancy*, one of the edges becoming several times brighter than the other as the screen is removed further and further from the focus. The explanation of this asymmetry is apparently the fact that, as we move away from the focus, the diffraction-pattern which is screened gradually passes from the Fraunhofer to the Fresnel class. Several series of photometric comparisons of the brightness of the two edges have been made at this laboratory, using a special type of rotating sector photometer devised by C. V. Raman (*Phil. Mag.*, May, 1911) and constructed by Hilger.

The full mathematical treatment of the subject and the detailed comparisons with the experimental results will be published in due course.

S. K. BANERJI.

Indian Association for the Cultivation
of Science, Calcutta, March 15.

THE RAMSAY MEMORIAL FUND.

AT the request of numerous friends and admirers of the late Sir William Ramsay a public meeting was held last October at University College, London, to consider the best means of establishing a memorial to him. The meeting was attended by representatives of H.M. Government, of the Allied and neutral Powers, and of the principal scientific societies of the United Kingdom. It was resolved, on the motion of the Rt. Hon. Lord Gainford, with the support of Sir J. J. Thomson, his Excellency the Belgian Minister, and Mr. W. H. Buckler, of the American Embassy, that a fund should be raised as a memorial to Sir William Ramsay, and that such a fund should be utilised for promoting chemical teaching and research under a scheme to be approved by the subscribers.

Since then the organisation of the appeal has been set up and is now complete. The Rt. Hon. H. H. Asquith has consented to act as president of the fund, whilst the vice-presidents include the Ambassadors and Ministers of Allied and neutral Powers, the Rt. Hon. D. Lloyd George, the President of the Board of Education, the President of the Royal Society, the Chancellors of the Universities of Cambridge, Glasgow, and London; the Rt. Hon. Lord Gainford of Headlam, and the chairman of University College Committee. The general committee, consisting of the subscribers, is under the chairmanship of the Rt. Hon. Lord Rayleigh. The Rt. Hon. Lord Glenconner and Prof. J. N. Collie share the office of honorary treasurer, and Dr. Smiles is acting as honorary secretary.

An executive committee, formed under the chairmanship of Sir Hugh Bell, has drawn up an appeal, which is at present only privately issued, but will shortly be circulated publicly. The committee aims at obtaining a sum of 100,000*l.*, and whilst the final form to be taken by the memorial will be submitted to the subscribers, and will necessarily depend on the amount obtained, the objects recommended are: (1) The provision of Ramsay Research Fellowships, tenable wherever the necessary equipment may be found; and (2) the establishment of a Ramsay Memorial Laboratory of Engineering Chemistry in connection with University College, London, where Sir William Ramsay's most important discoveries were made during his twenty-six years' tenure of the chair of chemistry. The committee has also in mind the inclusion of other forms of memorial, such as the institution of a Ramsay Medal for Chemical Research.

The committee considers that the conditions governing the award and tenure of the fellowships should be as elastic as possible. It is proposed that fellows should devote their time to investigating either chemical or chemico-technological problems, and, since it is further suggested that the fellowships should be tenable in any suitable place possessed of adequate equipment, it is evident that the scheme would permit fellows to carry out their researches in the laboratories of works. Also, in the second proposal the committee shows its sense of the necessity of meeting the demands of chemical industry. Being deeply impressed with the importance of providing for further teaching in relation to chemical and metallurgical industry, it proposes to provide for young chemists who intend to enter an industrial career a means of obtaining adequate training in the application of engineering principles to chemistry on a commercial scale. It is hoped that the establishment of a school of engineering chemistry in connection with a university will not only be to the mutual benefit of chemical industry and the chemists in its service, but will also promote the closer relations between industry and the schools of chemistry. In view of the importance of these objects, the committee is confident that the amount necessary to carry its proposals into effect will be obtained.

The sum already obtained by the private efforts of Sir William Ramsay's friends and from their own generosity amounts to about 13,500*l.* This includes the munificent donation of 5000*l.* from Messrs. Brunner, Mond, Ltd.; 1000*l.* each from the Rt. Hon. Lord Glenconner, Sir Hugh Bell, Sir Ralph C. Forster, Sir Robert Hadfield, Mr. Robert Mond, and Mr. Hugh Brunel Noble; and 500*l.* each from the president of the British Science Guild and Miss Lilias Noble.

INDUSTRIAL RESEARCH IN CANADA.

THE subject of industrial research in Canada is discussed in an interesting manner by Prof. J. C. McLennan, of Toronto University, in a presidential address to the members of the Royal Canadian Institute. In the address, publicity is given to several striking examples of the general indifference to scientific research, and among them is one which shows that Canada has not been in advance of the Mother Country in this respect. A department of the Government got interested in some way in the possible discovery of radium-bearing minerals in Canada, but the steps these officials took to find them showed that they were in complete ignorance of the work that had been done in their own universities in connection with radio-activity, although this work had gained for its authors a world-wide reputation in scientific circles.

Prof. McLennan makes a strong plea for the conservation and development of the natural resources of Canada. He tells us that a large percentage of the electrical power produced on the Canadian side of the Niagara River is being used to further the industries of their neighbours on the south, and he pleads for more energy and enterprise in the use of electrical power on the Canadian side. It is gratifying to learn that he is pleased with the work of Government departments in promoting the agricultural prosperity of Canada, but he thinks that much remains to be done in applying electrical power to agriculture, in the more extensive use of fertilisers, in ameli-

orating the conditions of farm life, improving roads, and increasing the facilities for education. Prof. McLennan discusses at length the methods that may be used to apply scientific research to Canadian industries. We gather from his remarks that the difficulties which have to be overcome in Canada are to a large extent the same as in the United Kingdom. It will be necessary for the firms in each industry to combine for purposes of research, and Prof. McLennan thinks that this will lead to the creation of great trusts, as in the United States, a result which, in his opinion, need not be an economic evil if due precautions are taken for the protection of the interests of labour and of the consumer. It scarcely follows, we think, that co-operation in research need lead to the formation of trusts. If the research work undertaken in common does not deal with matters of detail, the firms can surely retain their individuality and supplement the State-aided research by good scientific organisation of their own.

An important point discussed in the address is the part that the universities can take in industrial research. Prof. McLennan is anxious to see the universities take a prominent place in the work, but he expresses a strong opinion that research work of a secret nature or for the advantage of individual firms should not be encouraged in university laboratories. Nothing must be allowed to interfere with the training of the research worker in the university.

In addition to the university laboratories and those established for research in connection with special industries, the author points out the need for others in which work of a testing and standardising type would be done. He also thinks that the Royal Canadian Institute might find a special field of useful work if it aimed at providing laboratories of the type found at the Mellon Institute at Pittsburgh, where individual manufacturers could have problems of a private and exclusive nature dealt with at their own cost.

Prof. McLennan touches on such subjects as banking, protection, and housing problems. He tells us that it is comparatively easy in Canada for railroads, electric development companies, steel corporations, milling and other large and politically powerful interests to have very large advances made to them by the banks under legislative or Governmental guarantees, but it is not easy for certain vital or "key" industries to get the support they need. He agrees that the policy of Protection is both desirable and necessary, but he wishes to see it applied first of all to those industries which are basic and of vital importance to the community rather than to those, for example, which have to do with the preparation of foodstuffs and clothing. He thinks the time has come for a scientific revision of Canadian tariffs. He looks forward to the development of western Ontario, and especially the Niagara peninsula, into a region of great industrial activity, and he pleads that care be taken in advance to avoid in this district the wretched housing conditions which prevail in some manufacturing centres in the Old Country.

The June, 1916, issue of the Journal of the British Science Guild contains a report by Prof. Barnes, of McGill University, on the work of the Canadian Branch of the Guild. It is clear from this report that the Guild has taken a leading part in Canada, as at home, in concentrating attention on the necessity of organising scientific and industrial research, and the Canadian Government has now taken up the work on lines somewhat similar to those adopted by the Home Government.

Among the subjects considered by the Canadian Branch of the British Science Guild is that of science teaching in schools, and opinion appears to be divided on the relative values of physics, chemistry, and botany as school subjects. The present writer has long held the opinion that we should not teach in our schools courses of physics, chemistry, and so on, but that we should endeavour to frame a single course in science suitable for school work. The course should be selected so as to provide a due amount of experimental work and theoretical reasoning, and should include fundamental principles required for the further study of any branch of science. When we try to teach separate sciences in schools the result invariably is that the courses deal with subjects which do not interest schoolboys and are not of fundamental importance.

THE CULTIVATION OF MEDICINAL HERBS.

THE National Herb Federation, which has taken an active part in stimulating the collection and cultivation of medicinal herbs in this country, has issued a review of an article that recently appeared in the *Journal of the Board of Agriculture* under the above title. From this review it appears that the Board of Agriculture, which, in its leaflet published in October, 1914, and in a revised form in June, 1916, encouraged the production of a number of medicinal herbs, now makes the statement, based apparently on a communication from the National Health Insurance Commission (England), that the home demand for "drug-yielding herbs," with the exception of four essential species (belladonna, henbane, digitalis, and colchicum), is now met, and that the four essentials are likely to be put upon the market in sufficient quantity to meet all home demands.

The National Herb Federation very pertinently points out that, in addition to the home consumption of the medical profession, the home consumption of the drug factories, where preparations of the herbs are made in large quantities for exportation, has to be considered, and that the Imperial aspect of the question has apparently been jettisoned. The origin of the movement for the cultivation of medicinal herbs in this country was twofold, viz. (1) an attempt to meet the serious shortage due to the cessation of importation, and (2) an attempt to wrest from Central Europe an industry which we are capable of conducting. The general position appears to

be (*a*) that certain drugs must be considered as of primary importance and be cultivated irrespective of market conditions; (*b*) that with adequate encouragement a herb industry could be created that would exclude the importation of many foreign medicinal herbs; and (*c*) that, with the exception possibly of digitalis and male fern, cultivation is the only method by which this can be ensured.

There is much to be said for the patriotic attitude of the National Herb Federation and for the efforts it is making to establish a home industry on a sound basis.

PROF. H. F. E. JUNGERSEN.

BY the death of Prof. Jungersen, Copenhagen has lost an outstanding citizen—both physically and mentally. Of a commanding figure and fine presence, he was a marked man at scientific gatherings at home and abroad; whilst his genial and courteous bearing, as well as his knowledge of English, made him especially welcome on this side of the North Sea.

Born in 1854, at Dejbjerg, in Jutland, son of Dean Jungersen, Prof. Jungersen received his early education at Odense, thence proceeding to the University of Copenhagen, where he graduated as M.Sc. in 1877, Ph.D. in 1889, and afterwards D.Sc. Throughout his career he was deeply interested in the fauna of Greenland, and he utilised his experiences in drawing up (1886, 1898, and 1904) accounts of the Danish expeditions. Though not a voluminous author, his researches on the Alcyonaria, Antipatharia, and Madreporaria of Greenland and the northern regions are important, and show scrupulous care in references to the literature as well as the synonymy of the subject. His memoir on the structure and evolution of *Pennatula phosphorea* in the *Zeitschrift f. wiss. Zool.* is also a noteworthy contribution; and still more his fascicle on the Pennatulidæ brought home by the *Ingolf* expedition, that of the *Diana* in Iceland and the Faröe Islands, the Norwegian expeditions, and the productive voyages of Dr. Joh. Schmidt in the *Thor*. His wide grasp of the subject and his sound judgment are conspicuous in this careful memoir, which is finely illustrated, and it is of special importance from the extensive sea-territory it comprehended, viz. the polar sea between Europe and Iceland, the sea to the west of Greenland, the northern part of the Atlantic down to 55° lat. N., and to the meridian off Cape Farewell. Another interesting contribution was that on the development of the sexual organs in the Teleosteans, and others on Ichthyotomy.

Prof. Jungersen visited this country several times, and on the occasion of the meeting of the British Association in Dundee in September, 1912, the University of St. Andrews conferred on him the honorary degree of LL.D. He was also a fellow of the Danish Royal Academy, president of the Natural History Society of Copenhagen, professor of zoology and director of the Zoological Museum in the University of Copenhagen, and a member of other Danish and foreign societies. His latest work was connected with the publication of the results of the *Ingolf* expedition, and his death at the comparatively early age of sixty-three will be regretted by all interested in this task, as well as for the loss to zoology in general.

In conclusion, if one observation of Prof. Jungersen is more important than another, it is his pointing out the difference between the deep-sea faunas north and south of the submarine ridges between Greenland, Iceland, the Faröes, and the Hebrides, a result due to the Danish *Ingolf* expedition. W. C. M.

SIR ARMAND RUFFER, C.M.G.

THE tragic death of Sir Marc Armand Ruffer will awaken, in the minds of many of his contemporaries, memories of the early struggles for the establishment of an Institute of Preventive Medicine in this country. It was largely due to Sir Armand Ruffer's efforts that the British Institute of Preventive Medicine, which has now grown into the Lister Institute, was founded and started in a small way in Great Russell Street in 1893. As its first director, he gave all his energy to its proper establishment on the lines of the Pasteur Institute, where he had previously worked with Pasteur and Metchnikoff, both of whom valued him very highly. In carrying out the first important work done at the new institute, namely, the production of diphtheria antitoxin, he contracted diphtheria and nearly lost his life. His health was so shattered by this very severe attack that he had eventually to relinquish the post of director, and went for a change to Egypt. After a rest he decided to settle in Egypt, and became professor of pathology in the Cairo Medical School. He gathered men around him and reorganised this post, which he gave up in about two years upon being offered the important position of president of the Sanitary, Maritime, and Quarantine Council of Egypt. His knowledge of both the sciences and languages concerned, his tact, and his firmness enabled him to fill this very difficult international post with great distinction up to the time of his death. He again reorganised the whole work of the department; he did himself, and superintended others in doing, a great deal of research work connected with the various diseases which the council had to guard against; he built special pilgrim stations, which are models of what such things should be, at Tor and elsewhere on the pilgrim routes, and with infinite skill managed to bring the difficult and mixed groups of pilgrims under the conditions of proper quarantine, thereby keeping deadly diseases not only out of Egypt, but also out of Europe. At the outbreak of war he became head of the Red Cross in Egypt, and he met his death in returning from Greece, whither he had gone in order to help and advance the Red Cross and sanitary organisation there.

Most of Sir Armand Ruffer's active life was spent in reorganising, making efficient, and putting on a proper scientific basis the various bodies mentioned above, in which he was the ruling spirit; but in addition to this he carried out researches on, and extending over, a number of subjects. As a pupil of Metchnikoff, it was fitting that his earliest research work should have been on phagocytosis, on which he published, in 1890, a paper which is still valuable. He then turned his attention to the still baffling subject of cancer and set himself to try to solve the vexed question of the various cell-inclusions found in the lesions of this disease, which he considered to be of parasitic origin. As a member of the Indian Plague Commission, he did work on plague which was of great use to him later in his administrative and preventive work in Egypt. Besides the bacteriological and serological research, in connection with the quarantine work, which was done in his laboratory, and of which a good deal was new, he published several papers on the pathological lesions found in mummies, of considerable importance with regard to the history and distribution of diseases; and he collected a large quantity of material on this subject which is not yet published.

As a colleague he was ideal, ever ready to help and to advise, and never thinking of himself; and he was one who had the truest, kindliest, and most appreciative affection for his many friends.

H. G. P.

NOTES.

THE long-deferred Arctic expedition of Mr. Roald Amundsen seems at last to be taking definite shape. This is the expedition which Amundsen abandoned in 1910, when he sailed instead for the Antarctic on his successful conquest of the South Pole. The plans have been modified in detail, and no longer include the use of Nansen's *Fram*, which has been condemned, but the general scheme probably remains the same. Amundsen's original intention was to enter the Arctic Ocean by Bering Strait, to traverse the unknown Beaufort Sea and force his vessel into the polar pack. He intended to allow his vessel to be frozen in and to drift with the ice across the polar basin, eventually reaching the open sea, in four or five years, between Greenland and Spitsbergen. In this respect the expedition is to be on the lines of Nansen's successful drift in the *Fram*, but by entering the ice further east than Nansen, Amundsen hopes to drift across the middle of the polar basin through quite unknown regions. Research in meteorology, oceanography, and biology will be pursued all the time, and the expedition will be accompanied by several aeroplanes for reconnaissance work. Amundsen has recently returned to Norway from America, where he has been arranging about these machines and receiving instruction in flying. It is announced that the Norwegian Storthing has voted 11,000*l.* towards the cost of the expedition. In 1914 a grant of 4000*l.* was promised by the National Geographic Society of Washington.

THE recent debate in the House of Commons on the Air Board vote has done much to explain the precise functions of the Board, and its relation to the aeronautical industry. Major Baird pointed out to those who were dissatisfied with the results of the work of the Board that it was necessary to proceed cautiously and to avoid rash experiments which might seriously affect the supply of machines to meet the demand at the front. In the debate which followed Major Baird's statement the usual criticisms were levelled at the Government machines which are being supplied to the Services, and it was asked whether more efficient machines could not be obtained in large numbers. The prevailing impression as to the inefficiency of these Government machines is entirely unfounded, and a statement made to the effect that the Air Board will consider the Royal Aircraft Factory and private firms on equal terms as regards the development of new types of machine should satisfy anyone that a firm claiming to produce a better machine than the official type will have a fair hearing before the Board. The formation of a new committee, under Lord Northcliffe, to investigate the possibility of using surplus machines and pilots for commercial purposes after the war should produce some interesting results. It is certainly high time that the possible uses of aircraft when peace returns should be seriously considered. At the conclusion of the war there will be many aircraft factories possessing expensive plant for the production of machines, and this plant may easily be wasted when the demand for military and naval machines becomes smaller. The work of the Air Board has already proved of great value in centralising and controlling the production of war machines, and there seems no reason why equally good work should not be done in peace time to advance the commercial side of aeronautics.

UNDER the title of "Science in Russia" a new reference-book will be published in the present year, composed of two parts: (*a*) an index of all scientific institutions, societies, and higher schools in Russia; (*b*) an index of all persons working in these institutions and of private scientific workers. It will thus include in the first part the particulars hitherto supplied (but very incompletely as to Russia) by the "Minerva Jahrbuch"; while the second part will be similar to "Who's Who in Science," but will give, at least for 1916, not so much information about each individual. The difficult task of collecting the necessary material is already well in hand. The undertaking has been brought, through the Russian newspapers, to the knowledge of all those interested, and special forms are being supplied to the institutions and societies, many of which have already been returned with the necessary particulars. The work has been taken in hand by the Academy of Sciences of Petrograd and the scientific periodical *Priroda* (Nature) of Moscow. "Science in Russia" for 1916 will be edited by Prof. V. N. Beneševič, and published conjointly by the Academy and the journal *Priroda* in the latter part of this year. It will be issued annually. This publication will supply a long-felt need, as up to the present the only work of reference containing any information about the scientific institutions of Russia as a whole has been "Minerva." "Science in Russia" will help towards an exact evaluation of Russian scientific forces and activity, and will constitute an important step towards the promotion of closer scientific relations with the Allied countries.

IN London, and probably at many other places in England, April was colder than any corresponding month for the last sixty years or more. Dr. H. R. Mill contributed some details of the exceptional cold weather to the *Times* of May 3. The mean temperature at Camden Square is given as 43·1°, or 5° below the average; the mean maximum was 52·6°, and the mean minimum 34·6°. The arithmetical mean of

maximum and minimum values is 43·6°. At Camden Square, April, 1860, was almost equally cold; the mean temperature was 43·9°, and the mean minimum 35·3°. In 1888 the mean maximum temperature in April was 52·4°, which was equally cold for the daytime. The Greenwich records for the last seventy-six years do not show a lower April mean, from maximum and minimum temperatures, than 44·3°, which occurred in 1887 and 1908, so that April this year was lower than previous records by 1°. The lowest April mean temperature from the hourly observations is 43·3° in 1860, and in 1879 and 1888 the mean was 43·5°. At Camden Square the mean deficiency of temperature for the five months December, 1916, to April, 1917, was 3·6°, each month being colder than the normal. The same series of observations shows 1878–79 to be correspondingly cold, whilst for 1890–91 the mean temperature for the five months was lower, and 4° less than the average. At Greenwich the coldest corresponding five months also occurred in 1890–91, when the mean was 37·6°, and 4° below the average. Other low mean temperatures for corresponding periods were 37·9° in 1878–79; 38·0° in 1844–45; 38·5° in 1846–47; 38·6° in 1854–55; 38·7° in 1887–88; 39·2° in 1885–86; and 39·5° in 1894–95.

THE Ontario Nickel Commission, appointed by the Ontario Government on September 9, 1915, to investigate the resources of the province in connection with nickel and its ores, has recently presented its report, of which a summary has reached this country. The Commissioners are the chairman, Mr. G. T. Holloway, an English metallurgist; Dr. W. G. Miller, the provincial geologist of Ontario; Mr. McGregor Young, a Toronto barrister; and Mr. T. W. Gibson, Deputy Minister of Mines, who acted as secretary In order that the report might be placed before the Legislature at the earliest possible date, 150 advance copies were struck off without the last chapter, which is a bibliography of nickel, and the index. The report proper contains more than 600 pages, and is well illustrated with cuts, diagrams, and maps. The Commissioners print a summary of the report and their conclusions on the main points of the investigation at the forefront of the volume. After references to the various countries they visited, including the United States of America, Great Britain, France, Norway, Cuba, Australia, and New Caledonia, and to numerous mines, works, plants, smelters, etc., on both sides of the Atlantic, and also to their interviews with Mr. Bonar Law, then Secretary of State for the Colonies, they address themselves to the two questions which have been uppermost in the various discussions concerning Ontario's nickel industry during the last twenty-five years, viz.:—(1) Can nickel be economically refined in Ontario? and (2) are the nickel deposits of Ontario of such a character that this province can compete successfully as a nickel producer with any other country? The Commissioners without hesitation answer both these questions in the affirmative. The full report will be studied with much interest by metallurgists in this country.

THROUGH the death of Major P. G. Bailey in action on April 26 another scientific career of promise has been cut short. Educated at Dulwich, he entered Clare College as an exhibitioner in 1905. Three years later he graduated with first class honours in the Natural Sciences Tripos. Though he passed an examination for the Eastern Civil Service, he felt that he had a bent towards research work, and instead of taking up the appointment offered he went through the agricultural course at Cambridge. Genetics attracted him; he became a Development Research scholar, and was soon immersed in animal breeding. One of the investigations on which he was engaged was that of the inheritance of wool characters in sheep, a preliminary account of which (with F. L. Engledow) appeared in the *Journal of Agric. Science* for September, 1914. It was with the idea of gaining further experience that he accompanied the British Association to Australia in 1914. He was also busy with investigations on poultry and rabbits, the first-fruits of which appeared in a paper (with R. C. Punnett) "On the Inheritance of Size in Poultry" (*Journ. Genetics*, vol. iv., 1914). The outbreak of war found him in Australia. On his return he obtained a commission in the Royal Field Artillery, and had been at the front for more than two years before his death. Bailey was a careful and conscientious worker, with a great reserve of quiet enthusiasm. He brought to his work the straightforward honesty which characterised him in the affairs of life. He had the intellectual strength to recognise facts and the courage to face them, endowments which would have carried him far in the line of his choice. Though rather shy and diffident, he had a great charm of manner, and for those who knew him well his going has made a grievous gap.

AT the Royal Society on Thursday last the fifteen selected candidates, whose names were given in NATURE of March 1, were elected by ballot fellows of the society.

THE Bakerian lecture of the Royal Society will be delivered by Mr. J. H. Jeans on May 17 upon the subject of the configuration of astronomical masses and the figure of the earth.

PROF. VICTOR GRÉGOIRE (Louvain), Prof. T. H. Morgan (New York), and Prof. Hans Schinz (Zürich) have been elected foreign members of the Linnean Society.

THE Pereira prize of the Pharmaceutical Society has been awarded to Miss Ivy Roberts, and the silver and bronze medals of the society have been awarded respectively to Mr. H. Jephson and Miss Doris Gregory.

SIR WILLIAM OSLER will deliver the annual oration of the Medical Society of London in the rooms of the society, 11 Chandos Street, Cavendish Square, W.1, on Monday next, May 14. His subject will be "The Anti-Venereal Campaign."

GENERAL G. W. GOETHALS has, we learn from *Science*, notified Governor Edge, of New Jersey, that he will accept the position of State engineer, created under a special Act during the present session of the Legislature. General Goethals will have supervision over the projected system of highways, which will cost about 3,000,000*l*.

DURING the evening of May 1 a great earthquake was registered in European observatories. In Italy seismographs continued in motion for three and a half hours. Father Alfani estimates the distance of the origin from Florence at about 7000 miles, and suggests the Pacific coast of South America as the seat of the disturbance.

THE second Sydney Ringer memorial lecture, which is delivered biennially, will be given by Prof. A. R. Cushny at University College Hospital Medical School on Friday, May 25. The subject will be "Digitalis and Auricular Fibrillation." The lecture will be open to all qualified medical practitioners and medical students.

THE Angrand prize of the Bibliothèque Nationale of Paris, of the value of 5000 francs, is to be awarded in 1918 for the best work published during 1913–17 on the pre-Columbian history, ethnography, archæology,

or linguistics of the American aborigines. Ten copies of each of the competing essays should be sent to the Secrétariat of the Bibliothèque Nationale, Paris, before January 1 next.

FOR the third year in succession, the war conditions make it impossible for the British Medical Association to hold the usual annual scientific meeting. The council announces, therefore, that arrangements have been made to hold the annual representative meeting in London on Thursday, July 26, and the annual general meeting on Friday, July 27. It is recommended that Sir T. Clifford Allbutt be re-elected president of the association for 1917-18.

THE subject of the next triennial prize of the Royal College of Surgeons of England (consisting of the John Hunter medal in gold, or a medal in bronze and the sum of 50*l*.) will be "The Development of the Hip-joint and the Knee-joint of Man." The subjects of the Jacksonian prize for 1917 and 1918 are respectively "The Causation, Diagnosis, and Treatment of Traumatic Aneurysm, including Arterio-venous Aneurysm," and "Injuries and Diseases of the Pancreas and their Surgical Treatment."

AT the meeting of the Zoological Society on May 1 the secretary, Dr. Chalmers Mitchell, announced with the deepest regret that Mr. Henry Peavot, the society's librarian and clerk of publications, had been killed in action. Mr. Peavot entered the service of the society in 1896, and, after passing through various departments, was appointed assistant librarian and clerk of publications in 1908, and was promoted to the post of librarian and clerk of publications in 1912. In every way he had gained the esteem and regard of the scientific fellows of the society, and was one of the most valuable and competent members of the society's staff.

THE death is announced, in his fifty-ninth year, of Dr. H. W. Conn, professor of biology at Wesleyan University, Middletown, Connecticut, since 1889. He was for several years bacteriologist to the Storrs Experimental Station, and director of the Cold Spring Harbour Biological Laboratory and the Connecticut State Board of Health Laboratory. In 1902 Dr. Conn was president of the American Society of Bacteriologists. He was a specialist in the bacteriology of dairy products, and the author of more than 150 scientific memoirs

HAVING in mind the remarks made in the article on the position and prospects of professional chemists (NATURE, March 29) with regard to the conditions of service offered to qualified temporary assistants in the inspection department at Woolwich, we are glad to learn that such appointments are now being made on a definite salary basis, commencing with a minimum of 175*l*. per annum. We feel that in this there is some justification for our hope that under the Ministry of Munitions the services of scientific men will meet with more enlightened appreciation.

AT the annual banquet of the U.S. National Academy of Sciences held on April 17 the Henry Draper gold medal was presented to Prof. A. A. Michelson, of the University of Chicago, for his numerous and important researches and contributions to physics. Prof. Michelson's major work includes the precise determination of the velocity of light; the study of ether drift; the determination of the length of the international standard meter in terms of light waves; the measurement of tides in the body of the earth, and the invention of several very delicate and exact scientific instruments of prime importance in the study of light. Dr. S. W. Stratton, director of the U.S. Bureau of Standards, was awarded the academy medal for eminence in the application of science to the public welfare, for his services in introducing standards into the practice of technologists in the United States.

THE American Museum of Natural History has sent Dr. H. J. Spinden, of its department of anthropology, on a three months' tour in Central America for the purpose of making researches in the interests of the textile industry. He will start in Guatemala and extend his investigations to Western Honduras, Salvador, and Nicaragua. In these countries are many groups of Indians whose costumes are not only picturesque, but have many details of construction which, it is thought, might be successfully adapted in the United States. Dr. Spinden, in addition to obtaining examples of designs, will learn the details of the art of weaving as there practised, and will study the dyestuffs used by the native artisans. He will also obtain information concerning the native food products, and will collect specimens of them for display in the "preparedness" exhibit which the museum now has under way.

THE *American Museum Journal* for February contains a preliminary report by Mr. N. C. Nelson on the excavation of one of the finest and best preserved examples of prehistoric Pueblo architecture in the south-west. The ruin is situated in Animas Valley, in north-western New Mexico, a few miles below the Colorado boundary, and directly across the river from the town of Aztec. It was at once a great house and a great village, its inhabitants forming a closely organised community. This co-operation of work seems to have resulted from the need of providing works of irrigation, or, perhaps, also from the necessity of defence against encroaching nomads. The report is illustrated by good plans and photographs, and the account of the further progress of this important excavation will be awaited with interest.

A VALUABLE report on child mortality at ages 0-5 years has been issued by the Local Government Board (Cd. 8496, 1916). During the four years 1911-14, 575,078 deaths occurred in England and Wales under five, or more than a quarter (28·2 per cent.) of the total deaths at all ages during these years. In some of the 274 urban areas specially considered in this report the death-rate was three times as high as in some others. While it is true that even in the most backward of the towns and boroughs much saving of child-life has already been secured, there is evidently still a large mass of preventable mortality. The centres of excessive child mortality are those in which the chief industries of the country are carried on. In degree of ignorance there is little, if any, difference between the wives of wage-earners and the wives of men belonging to other classes. The important conclusion is formulated that the difference between these two classes, apart from the handicap of the former in respect of housing, food supply, and sanitation, in the main is one of ability to secure the assistance required in the various contingencies of maternity and early childhood.

A WELL-ILLUSTRATED account of the cane-borer beetle in Hawaii by F. Muir and O. H. Swezey comes from the Experiment Station of the Hawaian Sugar-planters' Association (Entom. Bulletin 13). The life-history is described in detail, and much stress is laid on the importance of natural enemies in controlling the pest.

A. L. QUAINTANCE and A. C. Baker continue their studies of "white flies" (Aleyrodinæ) in a long paper in the Proceedings of the U.S. National Museum (vol. li., pp. 335–445). Many genera and species from all parts of the world are described, their structure being excellently illustrated in forty-six plates and several text figures.

WE have received the twenty-eighth and twenty-ninth reports of the State entomologist (Dr. S. A. Forbes) on the "Noxious and Beneficial Insects of Illinois" (1915–16). The former of these is devoted chiefly to the San Jose scale, and to a description of the result of extensive experiments towards the destruction of the corn-root aphis, an insect very harmful to maize. The latter contains a valuable paper on the life-history of the codling moth (*Carpocapsa pomonella*) in Illinois; from the diagrams given it appears that the larvæ of the autumn generation are far more abundant in the locality studied than those of the spring brood.

MR. J. ARTHUR HUTTON has published a report of a lecture delivered to the Manchester Anglers' Association dealing with proposals for the nationalisation of the salmon fisheries. He suggests, as remedial measures counteracting the deterioration that is in progress, the total abolition of unrestricted fishing; the control of the rivers, preferably by a separate Ministry of Fisheries; a thorough topographical and statistical survey; and strict control of the sources and means of pollution wherever these can be avoided or minimised. Artificial culture he regards as, at least, a very promising method of largely increasing the yield of the rivers, and an expensive and large-scale system of hatching and distribution of larvæ is earnestly recommended.

THE snares and pitfalls which beset those who venture to "restore" extinct animals, even where the remains are fairly complete, form the theme of an extremely interesting article by Prof. Henry Fairfield Osborn in the *Museum Journal* for January, which has just reached us. The spirited picture, with which we have now become familiar, of that very agile dinosaur, Ornitholeistes, seizing an Archæopteryx in mid-air is now, in the light of further discoveries, regarded as improbable. And we venture to predict a like fate for the restoration of the yet more remarkable dinosaur described under the name Struthiomimus. The restorations given here certainly do not carry conviction. This issue also contains an article on the autumn migrations of butterflies, which demands careful study from all who are interested in the phenomena of migration.

THE secretary to the International Commission on Zoological Nomenclature has recently issued, as Circular Letter No. 35, a list of generic names, chiefly Linnean, proposed for inclusion in the "Official List of Zoological Names." These names are those in general use, and each has been checked to see that it conforms with the rules of nomenclature. The names are: One of Protozoa, one of Cœlentera, two of Trematoda, five of Cestoda, one of Cirripedia, one of Tunicata, and twenty-eight of Pisces. The genotype of each is quoted. Anyone interested who has not received a copy of the list may obtain one from the secretary, 25th and East Streets, N.W., Washington, D.C., or from the British Commissioners, Dr. E. Hartert, Tring; Dr. W. E. Hoyle, National Museum of Wales, Cardiff; and Dr. F. A. Bather, British Museum (Natural History).

THE deplorable neglect among us of all forms of scientific investigation which do not promise immediate "economic" results formed the subject of an admirable presidential address by Prof. G. H. Carpenter to the Dublin Naturalists' Field Club in December last. In the course of this address, which appears in the *Irish Naturalist* for April, Prof. Carpenter reminded his audience of the lasting benefits to the human race which have resulted from what is, so mistakenly, called "pure science." In this connection, he proceeded to show how the study of the lower forms of life, pursued solely for the sake of knowledge, may unexpectedly prove of immense practical importance. By way of illustration, he cited some recently discovered changes of habit in certain collembola, wire-worms, and other insect pests which had adversely affected the newly introduced tobacco crop in Ireland.

La Nature for April 21 contains an article on "L'hiver 1917 dans la Scandinavie," by M. Charles Rabot. The author points out that it is not only in France that the winter has been of unusual severity; it has been equally cold in Norway and in the south of Sweden as well as in Denmark, where it has not been so severe for twenty years. At Christianja the period of cold lasted about three months, commencing December 23 and continuing to the middle of March. From December 23 to February 9 the thermometer remained below zero Centigrade, and since the establishment of the Norwegian Meteorological Service in 1861, so long a period of low temperatures has not been previously observed. The mean temperature for January was −10·9° C., which is 6·9° below the normal, and is the coldest January for fifty-six years. The absolute minimum temperature has not been excessive. February was also very cold. The cold was accompanied by copious falls of snow, occurring at times over the whole of Norway. At Vuonatjviken, a meteorological station situated 500 m. above sea-level, in the most northern part of Sweden, the thermometer registered 55° C. below zero. Much ice obstructed navigation on the coasts and in the fjords, and the ice paralysed the operations of the submarines in these parts throughout the winter, whilst drifting mines were exploded by coming into contact with the large masses of ice. For twenty-two years the sea in southern Scandinavia has never been so full of ice.

THE December, 1916, issue of *Terrestrial Magnetism and Atmospheric Electricity* contains a report by Drs. W. Knoche and J. Laub on the electrical measurements made at Boa Vista, Brazil, during the total eclipse of the sun on October 10, 1912. The eclipse had no effect on the radio-activity of the air, or on the fall of potential upwards, or on the propagation of electric waves. The number of ions per c.c. was considerably diminished, the negative ions more seriously than the positive. The mobilities of the ions showed sharp maxima about the middle and the end of the eclipse, the ratio of the mobility of the negative to that of the positive ion having a sharp maximum about half-way between totality and end. The conductivity due to both ions was a minimum near totality and a maximum near the end. Curves are given showing the variation of each element observed during the whole eclipse.

AT a recent meeting of the Institution of Petroleum Technologists an interesting paper on the little-known oilfields of Assam was read by Mr. H. S. Maclean Jack. These oilfields are being worked by the Assam Oil Company, which, after eighteen years of strenuous labours, has at last reached the stage of active production. The paper describes the great diffi-

culties met with, first in locating, and afterwards in drilling, oil-wells, the latter having been to some extent overcome by the use of the American rotary drill. The petroleum occurs in Assam in intermittent deposits, situated in loose sands; the gas pressure is very high, and the oil when first struck gushes out with much violence; the wells do not produce any very great quantities, but keep up a reasonably steady flow for considerable periods. The crude oil is very dark, and has a density of 0·856; it is distilled in the ordinary way in continuous boiler stills, the products being crude benzene, intermediate kerosene, ordinary kerosene, and a residue which is distilled to dryness in pot-stills. These latter produce "batching" oil, used for softening jute fibre; some lubricating and other heavy oils; a large proportion of paraffin wax, this being a hard wax with a melting point of 135° to 140° F.; and a coke, which is nearly pure carbon. The kerosenes supply the local demand, and are shipped also to Bengal, whilst the paraffin wax finds a market in all parts of the world.

Engineering for April 27 contains an interesting account, with illustrations, of a new machine-gun shop belonging to Messrs. Vickers. This shop had to be erected, equipped, and started up with great rapidity in order to meet the demands of our forces at the front. The floor area is nearly 2·5 acres, accommodating more than 1000 machines of specialised type, driven by electric power transmitted through 6000 ft. of line shafting and 40,000 ft. of machine belting, and yet actual manufacturing work was started within three calendar months of the date when the ground —a potato field—was first taken possession of, while in two months more the factory was in complete working order, and a steady supply of machine-guns was being dispatched to the front. More satisfactory still, the whole of the machining work in the manufacture of these machine-guns—one of the most intricate units of mechanical production—is carried out by women workers. In connection with this, it is of interest to note that many of our women workers have now got beyond the mere operation of automatic and semi-automatic machine tools, and are being trusted with work and machines formerly operated by skilled machine hands.

OUR ASTRONOMICAL COLUMN.

A NEW COMET (SCHAUMASSE).—The second new comet of this year was discovered at the Nice Observatory on April 25 by M. Schaumasse. The magnitude at the time of discovery was 9·5, and the comet is said to be increasing in brightness. A Copenhagen telegram announces that on April 27 the comet was observed at the Lick Observatory by Mr. Shane, its position at 16h. 1m. 3s., Lick Mean Time, being R.A. 23h. 7m. 40s., decl. +11° 36′ 57″. According to the *Times* of May 9, the following positions for Greenwich midnight have been calculated by J. Braae and J. Fischer-Petersen, Copenhagen :—

1917	R.A. h. m. s.	Decl. ° ′
May 9 ...	23 32 0 ...	+23 14
16 ...	0 21 0 ...	38 46
20 ...	1 54 0 ...	52 36
22 ...	3 25 55 ...	58 36
24 ...	5 16 30 ...	58 41
26 ...	6 44 42 ...	53 52
28 ...	7 39 49 ...	47 19

COMET 1917*a* (MELLISH).—The following continued ephemeris for Greenwich midnight has been received from J. Fischer-Petersen, Copenhagen :—

1917	R.A. h. m. s.	Decl ° ′	Log *r*	Log Δ	Brightness.
May 11	1 26 3	−10 31·0	9·9677	0·1661	6·2
13	29 45	10 54·6			
15	33 20	11 17·0	0·0072	0·1825	6·5
17	36 48	11 38·5			
19	40 9	11 59·3	0·0422	0·1968	6·7
21	43 23	12 19·6			
23	46 30	12 39·6	0·0738	0·2093	7·0
25	49 31	12 59·4			
27	52 26	13 19·2	0·1024	0·2204	7·2
29	55 15	13 39·0			
31	1 57 57	13 58·9	0·1286	0·2300	7·3
June 2	2 0 33	14 19·0			
4	2 3 4	−14 39·3	0·1527	0·2386	7·5

COMET 1916*b* (WOLF).—The following is a continuation of Prof. Crawford's ephemeris for Greenwich midnight, as given in the Lick Observatory Bulletin No. 289 :—

1917	R.A. h. m. s.	Decl. ° ′	Log Δ	Brightness
May 10 ...	20 55 38	+15 5·7	0·1646	
11 ...	20 58 4	21·9		
12 ...	21 0 29	38·1	0·1599	3·63
13 ...	2 54	15 54·2		
14 ...	5 19	16 10·1	0·1553	
15 ...	7 43	25·9		
16 ...	10 7	41·6	0·1507	3·85
17 ...	12 31	16 57·2		
18 ...	14 54	17 12·6	0·1462	
19 ...	17 17	27·9		
20 ...	19 39	43·1	0·1418	4·06
21 ...	22 1	17 58·1		
22 ...	24 23	18 12·9	0·1374	
23 ...	26 44	27·5		
24 ...	29 5	41·9	0·1330	4·28
25 ...	31 26	18 56·1		
26 ...	33 46	19 10·2	0·1287	
27 ...	36 5	24·1		
28 ...	38 24	37·7	0·1245	4·49
29 ...	40 42	19 51·1		
30 ...	43 0	20 4·3	0·1203	
31 ...	45 17	17·3		
June 1 ...	21 47 34	+20 30·0	0·1162	4·71

THE AQUARIDS OF HALLEY'S COMET.—These meteors were perseveringly awaited on the mornings between about April 28 and May 7 by a number of observers, including Miss A. G. Cook, Mrs. F. Wilson, the Rev. J. C. W. Herschel, Mr. T. Hargreaves, Miss T. E. Gall, Mr. W. F. Denning, and others. The results were somewhat disappointing, though the weather proved favourable on the whole. Very few meteors of the Aquarid shower were seen. On May 1, at 14h., a fireball directed from a radiant at 50°+71° was recorded by Mrs. Wilson and Miss Gall, at Totteridge, and Miss Cook, at Stowmarket. It fell from a height of sixty-three to thirty-eight miles over the Channel, between Boulogne and Sussex. Another fireball was seen on the morning of May 7 from Totteridge, and this proved an Aquarid. From the collected observations it appears that the shower, though unusually scanty in numbers, was visible over the nine mornings from April 28 to May 7.

OSMOTIC PRESSURE.

THE theory that osmotic pressure is due to bombardment of the walls of the containing vessel by the particles of solute has met with considerable criticism, both from the chemical and physical sides (compare, *e.g.*, van Laar, Proc. Amsterdam Academy, vol. xvii., p. 1241; vol. xviii., p. 184; abstracted in NATURE, March 16, 1916). However, at the discussion on osmotic pressure before the Faraday Society on May 1, with Sir Oliver Lodge in the chair, the kinetic

theory more than held its own. It was claimed by Prof. A. W. Porter that this theory is the only one which gives directly the experimentally obtained values for dilute solutions; that it has now been placed on a sound experimental basis as a result of Perrin's investigations, which show that particles suspended in a liquid, and therefore also the molecules of the solute, are in rapid motion to the precise amount required by the theory; and that any other theory of osmotic pressure must not only be competent to account for the observed facts, but must explain the absence of the effects that we have a right to expect from the molecular agitation of the solute. These claims were not seriously shaken by the criticisms of subsequent speakers, and towards the close of the meeting the chairman expressed his general agreement with the arguments put forward in favour of the kinetic theory.

Mr. W. R. Bousfield's contention that it is the solvent and not the solute which is active in osmotic pressure may be met, as Sir Oliver Lodge pointed out, in a simple and therefore necessarily incomplete way as follows. Imagine a closed vessel full (or practically full) of water, and divided into two compartments by a semipermeable membrane. The pressures on the two sides of the membrane compensate each other, but if a little sugar is dissolved in one compartment an *additional* pressure, due to the presence of the solute, is set up on that side. The contention that it is necessary to look to the solvent, and the solvent only, as the source of the pressure is therefore not established, but Bousfield's view that osmotic pressure is connected with the presence of solvent vapour (approximately obeying the gas laws) in the molecular interspaces deserves consideration on its merits.

It will not be denied that there are difficulties in applying the kinetic theory to relatively concentrated solutions (more particularly as regards the correction for the volume of the solute), just as there are difficulties in the application of the kinetic theory to compressed gases. It is remarkable that the deviations from the simple gas laws are smaller for solutions than for gases, and in one case at least (compare Sackur and Stern, *Zeitsch. physikal. Chem.*, 1912, vol. lxxxi., p. 441) this has been shown to be in accordance with the kinetic theory of osmotic pressure.

Both Prof. Porter and Mr. Bousfield ascribe the deviation of osmotic pressure from simple laws solely to hydration of the solute, and proceed to calculate the degree of hydration of the solute particles on this assumption. As, however, such simple laws do not hold for the gaseous state, in which hydration is necessarily absent, these "hydration numbers" do not inspire much confidence, more particularly as the variation of some of them with concentration in relatively dilute solution appears difficult to reconcile with the law of mass action. Unfortunately they cannot be independently tested, as no satisfactory method of measuring hydration in solution has yet been discovered.

Although the magnitude of the osmotic pressure, as equilibrium pressure, is independent of the nature of the membrane provided the latter is truly semipermeable, the mechanism of osmosis, including the part played by the membrane, is of great interest and importance. The very suggestive investigations of Adrian Brown and Tinker on the permeability and other properties of membranes have already added substantially to our knowledge of these questions. As regards the bearing of theories of osmotic pressure on osmosis, the suggestion of van Laar that the pressure of the sugar molecules as postulated by the kinetic theory would prevent water flowing inwards does not appear well founded. The most satisfactory picture of the process is probably obtained by analogy with Ramsay's well-known experiment with a cell provided with a palladium membrane permeable for hydrogen, but not for nitrogen. Although the cell contained nitrogen at half an atmosphere pressure, when it was surrounded by hydrogen the latter entered until its partial pressure inside was practically equal to its pressure outside. G. S.

ECONOMICS OF LIFE INSURANCE.

SIX papers relating to problems of life insurance, read to the Economic Section of the American Association for the Advancement of Science last December, are printed in the *Scientific Monthly* for April. Of these, the most important, in view of what has happened since it was read, is that by Prof. Huebner, of the University of Pennsylvania, on "Life Insurance and the War." For all the belligerents he finds that the financial effects of the war on the companies by depreciation of investments have been serious. For England and Canada the war claims have been between 11 and 12 per cent. of the total claims, which is a favourable experience; for the enemy countries little information is to be had. The same observation applies to the terms upon which companies undertake war risks. The after-effects of the war on the health of survivors must not be overlooked. The author urges that the companies should have latitude to charge such extra premiums as may be necessary, but that the burden should to some extent be borne by the community as a whole.

Prof. Huebner submits for consideration by the companies proposals for refunding any excess extra premium at the close of the war, and for reinstatement of the policy where the insured, owing to the war, is unable to produce evidence of good health. These proposals will no doubt be attractive, but they are open to the objection that contracts based on a calculation of averages cannot be modified by after-results in individual cases.

A paper by Mr. E. E. Rittenhouse shows that the life insurance companies of New York State have increased their new insurances in the thirty years 1885–1915 from 65,000,000*l.* to 385,000,000*l.*, and that the proportion of insurances lost by lapse and surrender during that period is a little more than 40 per cent., and tends to diminish.

Three of the papers relate to a recent development of the functions of life insurance companies in the United States. Dr. Fisk, as medical director of the Life Extension Institute, a body organised in 1914, urges health conservation as a duty incumbent upon these companies. Mr. Cox, who represents an influential association of life insurance presidents, asserts that nearly every large company in the United States is doing something intended either to prolong the lives of its policy-holders or of the people generally. Mr. Haley Fiske gives particulars of the work of a life extension bureau for medical examination of insured persons and of other comprehensive measures adopted by the companies for the preservation of the health of the insured.

Dr. Hoffman, statistician to the Prudential Insurance Company of America, improves the occasion offered by these recent developments to expose some fallacies of compulsory health insurance. He considers that voluntary effort can be relied upon to bring about all the benefits that could be expected from compulsory measures. He meets the argument that compulsory insurance has had good effect in Germany and in England in the fight against tuberculosis by statistics showing that Massachusetts has reduced its mortality from that cause by 23·8 in 10,000, while the corresponding reduction in Germany has

been only 17·6 in 10,000, and in England even less. He contends that compulsory health insurance is primarily a question of taxation, as 20 per cent. of the cost is to be paid out of general revenues for the specific benefit of a selected group, which is merely poor relief under another name, and is indirect taxation in its most pernicious form, and contrary to the fundamental principles of republican government.

THE UNITED STATES NATIONAL RESEARCH COUNCIL.

AN important feature associated with the April sessions of the National Academy of Sciences at Washington, D.C., was the meeting of the National Research Council. The Research Council is made up of eminent men of science who are members of the academy, and of representatives of the military bureaux of the Government, and it co-operates with the United States Government in the solution of scientific problems.

Dr. G. E. Hale, of the Mount Wilson Solar Observatory, chairman of the council, presided at the meeting, and reports were presented by Dr. C. D. Walcott, secretary of the Smithsonian Institution, for the Military Committee; Dr. R. A. Millikan, of the University of Chicago, for the Physics Committee; Dr. M. T. Bogert, of Columbia, for the Chemistry Committee; and Dr. V. C. Vaughan, director, Medical Research Laboratory, University of Michigan, for the Medicine and Hygiene Committee.

In connection with the work accomplished by the Military Committee, Dr. Walcott, who is also a member of the National Advisory Committee for Aeronautics, stated that investigations had been conducted with noxious gases as employed for military purposes; problems connected with all forms of signalling had been studied; the utilisation of opium for obtaining a supply of morphine for medical purposes had been considered; and improvements had been suggested in the service Army blanket, which is not thought to be warm enough. Other work for military establishments of the Government is confidential. The Army was represented by Maj.-Gen. W. C. Gorgas, Brig.-Gen. William Crozier, and Brig.-Gen. George O. Squier, the chiefs of the medical, ordnance, and aviation divisions of the Army. Representatives of the Navy are:—Rear-Admiral D. W. Taylor, chief constructor; Rear-Admiral R. S. Griffin, engineer-in-chief; and Dr. J. Gatewood, medical director, Navy Medical School. The other members of the committee are:—Dr. S. W. Stratton, director of the Bureau of Standards; Mr. Van H. Manning, director of the Bureau of Mines; Prof. C. F. Marvin, chief of the Weather Bureau; and Mr. H. E. Coffin, Council of National Defence, Naval Board, and Research Council.

In reporting for the Committee on Physics, Dr. R. A. Millikan stated that they were co-operating with the National Society and the American Association for the Advancement of Science in an effort to find the men and the means for attacking certain physical problems which are now confronting the National Government. While no information as to the exact nature of these researches was announced, the chairman stated that four or five of them were submarine problems, several pertained to aeronautics, and some were optical, having to do with range-finding devices and the production and use of optical glass. Experiments with X-rays are being conducted for the Government, as are studies in thermal conductivity, atmospheric electricity, as encountered by airships, and even the manufacture of guns.

The study of these problems has brought to life the vital need for a central co-ordinating body, such as the National Research Council. For example, certain questions concerning the submarine were being considered separately by a naval investigating board, three of the industrial research laboratories, and a number of universities before the solution of its various phases was undertaken and distributed by the council. Encouraging results have been secured as the committee has become familiar with the general lines of attack of each investigation An important problem, which on April 1 was in a discouraging condition, is now well under way towards solution. The members of the committee include: Dr. F. P. Jewett, Western Electric Company; Prof. T Lyman, Harvard; Dr. I. Langmuir, General Electric Company; Prof. C. E. Mendenhall, University of Wisconsin; Prof. E. Merritt, Cornell; Dr. P. N. Pupin, Columbia; Dr. S. W. Stratton, Bureau of Standards; Brig.-Gen. George O. Squier, U.S.A.; Prof. A. G. Webster, Clark University; and Prof. R. W. Wood, Johns Hopkins.

Other committees of the council are on educational institutions, nitrate supply, census of research, astronomy, botany, zoology, agriculture, physiology, geography, geology, and anthropology. Another special co-operating body, the Engineering Foundation, established to promote scientific and engineering research, and representing several American engineering organisations, is giving the entire available income from its endowment to the work of the National Research Council.

The purpose of the Research Council is to pursue organised investigation for the Government when such investigation is needed, in co-operation with the department desiring the experiments or data. It brings into co-operation existing governmental, educational, industrial, and other research organisations.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The executors of the late Sir Charles Holcroft, Bart., have informed the University Council that the deceased baronet bequeathed to the University the sum of 5000*l.* upon trust, to apply the income thereof to the promotion and encouragement of research work in connection with any of the following subjects, viz. physics, chemistry, zoology, botany, geology, engineering, mining and metallurgy. Sir Charles Holcroft contributed, during his lifetime, about 100,000*l.* to the University.

The Rev. John Howell has presented to the Odontological Museum a further collection of skulls and teeth from the Congo region.

PROF. W. R. SCOTT, of the University of Glasgow, will deliver the Jevons Memorial Lectures on "Economic Problems of Peace after War" at University College, Gower Street, on Tuesdays and Fridays, beginning on Tuesday, May 15. The subject of the first lecture will be "The Economic Man and a World at War." The lectures will be free to the public.

DR. WILLIAM PRICE, of Southerndown, Glamorgan, at one time an active member of the council and court of governors of the University College of South Wales and Monmouthshire, died at Southerndown on January 11 last. By his will, of which the principal of the college is one of the executors and trustees, it is provided that the residue of his trust estate, after payment of certain legacies, annuities, gifts, and devises, shall be bequeathed to the council of the college to be devoted to the medical department of the college

according to the directions and discretions of the council. The residue of the estate will probably amount to something approaching the sum of 20,000*l*.

AN exhibition of official photographs illustrating various types of work on which women are employed in engineering and other industries on munitions of war is to be held at the South-Western Polytechnic Institute, Manresa Road, Chelsea, S.W.3, from Monday, May 14, until Saturday, May 26, between the hours of 10 a.m. and 7 p.m. The photographs, which have been lent by the Ministry of Munitions, illustrate the employment of women, and include work in general engineering, foundry, machine tools, optical munitions, aircraft, aeroplane engines, woodwork, shells, guns and gun components, machine-guns, fuses, and cartridges. All who are interested to see these photographs are invited. Admission is free. The Ministry of Munitions has recently held a similar exhibition at the Royal Colonial Institute, and also at one or two towns in England.

MOST of the museums in this country have long recognised the desirability of interesting school children, and have had various schemes of lectures and demonstrations for the pupils. Owing to exigencies of the curricula of elementary schools, however, it has not often been possible to arrange for an extended course of museum lectures for any particular school or schools. At Liverpool, where many schools have been taken over for other purposes, an opportunity has recently occurred of giving systematic lectures on an extended scale, and a report by Dr. J. A. Clubb, Prof. W. A. Herdman, and Mr. E. B. Turner (the Senior Inspector of Schools) has been published. From this it seems that the lecturers and inspectors alike are astonished at the way in which the children can sketch and describe what they have seen, and in the opinion of the inspectors the experiment has proved "an unqualified success." The Liverpool pupils were fortunate in having lessons from Prof. Herdman, Prof. Newstead, Mr. R. D. Laurie, and Miss Bamber.

A NATIONAL conference on the subject of educational reconstruction was held on Thursday, May 3, at the Central Hall, Westminster, under the chairmanship of the Rev. W. Temple, president of the Workers' Educational Association. The resolutions submitted to the conference, and carried with some amendments, covered the whole educational ground from the provision of nursery schools for children between the ages of two and six up to entrance to the university, for it was unanimously affirmed that the object of educational reform will not be attained until a broad highway is established from the elementary school to the university. One of the most pressing and important series of resolutions agreed to was that dealing with the educational needs of boys and girls who at present enter on some form of occupation on leaving the elementary school, and it was emphatically laid down that this education should not be confined to the development of the minds, but must be also directed towards that of the bodies and characters of such pupils. As passed by the conference the resolutions in this connection read as follows:—1. (*b*) All forms of exemption under the age of fourteen to be abolished; the leaving age to be raised to fifteen (without exemption) within a period of five years, and to sixteen within a further period of three years; maintenance allowances to be provided to children above the age of fourteen; and child labour for profit or wages to be abolished during the period of compulsory full-time attendance at school. 2. (i) Compulsory part-time education of not fewer than twenty hours per week (including time spent in organised games and school meals) to be provided free for all such young persons, up to eighteen years of age, as are not receiving full-time education; such education to be given in the daytime. 2. (ii) The hours of labour for all young persons under the age of eighteen to be limited to a maximum of twenty-five per week. If, moreover, statutory approval be given to the demand of the conference that "the size of all classes in elementary schools be immediately reduced to forty as a maximum with a view to a further reduction to thirty," not only will a better foundation be laid for the further education of part-time artisan pupils, but the superstructure in the secondary schools will be considerably strengthened. The conference resolved that its resolutions shall be pressed forward in every possible direction without delay.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 26.—Sir J. J. Thomson, president, in the chair.—G. W. **Walker**: The effective inertia of electrified systems moving with high speed. If it is assumed that an electron moving with speed KC (where C is velocity of light) becomes deformed so that the surface is of the form $(1-k^2)^{-1}x^2+y^2+z^2=a^2$, Lorentz has shown by the "quasi-stationary" assumption that the inertia for longitudinal inertia is $m_0(1-k^2)^{-\frac{3}{2}}$, and for transverse inertia $m_0(1-k^2)^{-\frac{1}{2}}$. The same results follow from Einstein's "relativity" theory. In the paper the inertia is determined by a method developed in a former paper (*Phil. Trans.*, A, vol. ccx., p. 145), which depends directly on the primary equations, and is free from the error that the quasi-stationary method may introduce. The results are that for a "contracted" electron the longitudinal inertia is—

$$m_0(1-\tfrac{1}{5}k^2)\,(1-k^2)^{-\frac{3}{2}},$$

and the transverse inertia is—

$$m_0(1+\tfrac{11}{60}k^2)\,(1-k^2)^{-\frac{1}{2}}.$$

—Dr. G. W. C. **Kaye**: The composition of the X-rays from various metals. The X-rays from a bulb excited by low voltages (10,000 to 50,000 volts) are rich in the characteristic radiation of the anticathode. In the case of iron, nickel, and copper the amount of K-radiation lies between 80 and 90 per cent. In the case of platinum the proportion of L-radiation is from 40 to 60 per cent. Evidence of characteristic radiations softer than the K- and L-radiations has been obtained.—Dr. C. H. **Browning** and Dr. S. **Russ**: The germicidal action of ultra-violet radiation and its correlation with selective absorption. (1) A new method is described which renders it possible to determine what portion of the ultra-violet spectrum is most effective in germicidal action, and, further, to specify the wave-length of the radiation at which such action practically ceases. (2) The method has been applied to test the range of susceptibility of a number of different pathogenic organisms. By the process described it is possible to expose cultures of two different organisms simultaneously to the same intensity and character of radiation. The ranges of susceptibility of *B. typhosus* and *B. coli* are closely similar and practically the same as those of organisms such as staphylococcus pyogenes aureus and the meningococcus. (3) A striking feature of the germicidal action of the radiation in question is its abrupt termination at a wave-length of about 2960 Å.U. (4) It has been

possible to correlate this feature with "selective absorption," for it is found that the organisms exhibit marked absorptive power for just those rays which have germicidal action.—E. C. **Hort**: Morphological studies in the life-histories of bacteria. According to current theory the life-history of the "lower" bacteria is one of great simplicity, reproduction taking place—apart from endosporulation, in certain cases, of a special type—solely by transverse binary fission. This theory is mainly based on the unquestioned fact that transverse binary fission is the rule in standardised laboratory cultures. In the present communication evidence is produced to show that the life-cycle of the "lower" bacteria, as illustrated by the members of the enteric group, so far from being solely represented by perpetual binary fission, is one of great complexity, and includes an invisible, or almost invisible, stage. The nature of the evidence presented excludes the presence of contaminants, or of "involution" forms, as reasonable explanations of the recorded observations, and throws grave doubt on the adequacy of the mutation theory to explain morphological aberrancy from type—laboratory type—amongst the bacteria.

Geological Society, April 18.—Dr. Alfred Harker, president, in the chair.—Prof. H. H. **Swinnerton** and A. E. **Trueman**: The development and morphology of the ammonite septum. Two methods of studying the septum (not merely the suture) were used:—(1) Cleaning the face of the septum completely; (2) filing away the surface of the whorl in successive layers, and thus making a series of sections—called septal sections—of the septum parallel to its periphery. An instrument was designed for measuring accurately the variations in level of the face of the septum in relation to a definite datum-plane; and also the thickness of the layers filed off from the whorl. *Dactylioceras commune, Sphaeroceras brongniarti*, and *Tragophylloceras loscombi* were chosen as types with normally shaped, greatly depressed, and greatly elevated whorls respectively. A contoured plan of the adult septum of Dactylioceras shows that half the septum lies approximately in one plane and that the posterior folds or lobes occupy a greater area than the anterior folds or saddles. It also confirms the view that the septum is, on the whole, convex forwards. In all three types the axes of the folds remain approximately at right angles to the periphery through all the changes in shape of the whorl. Incompletely formed septa indicate that secretion commences at the umbilical angle and at a definite distance from the preceding septum. Asymmetry of the septum, and of the suture-line, in ammonites is more common than is usually supposed. It may arise in one of two ways, namely, (1) by the different development of the elements of opposite sides; (2) in association with the lateral displacement of the siphuncle. Asymmetry of the latter type has been considered as of systematic importance. Nevertheless, while it does arise more frequently in certain genera, as, for instance, in Psiloceras and Hoplites, it occurs not uncommonly in many other unkeeled ammonites.

Mathematical Society, April 19.—Prof. H. M. Macdonald, president, in the chair.—Prof. W. **Burnside**: A liquid gyrostat.—G. N. **Watson**: The integral formula for generalised Legendre functions.—Prof. H. **Hilton**: A substitution permutable with the transposed substitution.

May 3.—Sir J. Larmor, vice-president, in the chair.—G. H. **Hardy**: Sir George Stokes and the theory of uniform convergence.—Prof. E. W. **Hobson**: Hellinger's integral.—Dr. W. P. **Milne**: A symmetrical condition for co-apolar triads on a cubic curve.

Challenger Society, April 25.—Capt. Alfred Carpenter in the chair.—Dr. S. F. **Harmer**: (1) A submarine cable damaged by the bite of a shark; the injured portion, brought up from a depth of 252 fathoms off the west coast of South Africa, was pierced by the tooth of a shark (*Oxyrhina spallanzii*). (2) Cetacea stranded on the British coasts during 1915 and 1916; of special interest were examples of Cuvier's whale, a very young sperm whale, a white-sided dolphin, and a killer of very large dimensions.—E. **Heron-Allen** and A. **Earland**: (1) A new type of Arenaceous Foraminifera; this showed a remarkably selective use of entire sponge spicules of a single species. (2) An unidentified enemy attacking Foraminifera; the enemy organism sought to bore through the test of Biloculina.

Royal Anthropological Institute, May 1.—Mr. A. L. Lewis in the chair.—J. Reid **Moir**: Some human and animal bones, flint implements, etc., discovered in two ancient occupation-levels in a small valley near Ipswich. The excavations, carried out over two years, have shown that two well-marked occupation-levels occur in the deposits covering the sides of the valley. Since these floors were occupied by man the valley has suffered denudation and erosion. The lowermost floor has yielded animal bones, including elephant and ancient types of horses, and three portions of the human skeleton, viz., a skull fragment and part of the shafts of a humerus and femur. These are not referable to the same individual, but probably two or three persons are represented. The associated flints are of Upper Le Moustier type, and were associated with fragments of primitive pottery. The upper floor contains implements of the Aurignac culture, while in the hill-wash overlying this floor two specimens of Early Solutré implements have been found. The surface soil above the hill-wash has yielded a tanged and barbed Neolithic arrow-head. Thus an orderly sequence of industries has been established such as occurs in Continental caverns. The implements have been examined by Prof. v. Commont, who agrees with the description of them given above. It would appear that the hill-wash covering the upper floor was deposited during a period of low temperature occurring at the close of Upper Palæolithic times.

MANCHESTER.

Literary and Philosophical Society, April 3.—Prof. S. J. Hickson, president, in the chair.—R. B. **Fishenden**: Illustration processes used in scientific publications. In the case of diagrams and other drawings in pure line the most satisfactory results are obtained by the use of a waterproof Indian or Chinese ink upon a smooth hard-surfaced paper, or Bristol board. All the lines must be equally black and firm; if they are broken, or have serrated edges, the defects generally become more pronounced in the reproduction. Unless it is impracticable for other reasons, the original drawings should be made to be reproduced to half or two-thirds their lineal dimensions. Photographs may conveniently be converted into line drawings by drawing over the outlines with waterproof ink and then bleaching out the original print. Photographs for reproduction by collotype or by the half-tone process are preferably black, glossy "bromide" prints, or "gelatino-chloride" prints of a purple-brown tone. Sepia wash drawings are more satisfactory for photographic reproduction than those made in pure black and grey.

PARIS.

Academy of Sciences, April 25.—M. A. d'Arsonval in the chair.—H. **Deslandres**: The influence of intense and prolonged gunfire on the fall of rain. Heavy rainfall

has been generally regarded as a consequence of prolonged cannonades, although the scientific evidence is not conclusive on the point. From a theoretical point of view this effect may be regarded as probable, as ionisation of the air is produced in several ways during the discharge of artillery, and this might provoke precipitation in the case of air charged with moisture. Experimental work on the degree of ionisation of the air and the intensity and sign of the electric field is suggested.—G. **Lemoine**: Observations on the preceding communication. If the frequent and prolonged discharge of artillery has any influence on rainfall this can only be the case for small falls; heavy and prolonged rain can only be explained by the action of large atmospheric currents.—M. **Tisserand**: Agricultural teaching in France. Improvements of which it appears susceptible. Comparisons with results obtained in Belgium, Denmark, and Germany show that much increased yields of agricultural produce and animals might be expected as a result of improved agricultural education. France has always applied without delay the results of scientific research to the culture of the vine and with great practical success, and the proposals put forward should lead to similar improvements in other fields of agriculture.—M. Quénu was elected a member of the section of medicine and surgery in the place of the late Ch. Bouchard.—G. **Julia**: The reduction of non-quadratic indeterminate conjugated forms.—W. H. **Young**: The differentiation of functions with limited variation.—E. **Kogbetliantz**: The summation of ultra-spherical series.—P. **Pascal**: The neutral and acid sulphates of sodium. Studies of the equilibrium of the ternary system H_2SO_4—Na_2SO_4—H_2O between wide limits of temperature ($-45°$ C. to $+210°$ C.), the results being shown on a diagram in trilinear projection.—Ed. **Chauvenet**: The zirconyl radical, ZrO. Conductivity, cryoscopic, and thermochemical experiments are cited proving the existence of this radical in zirconium compounds.—J. **Bougault**: Isomerisation in the ethylenic acids by migration of the double bond. $\alpha\beta$-Phenylcrotonic acid, $C_6H_5.CH_2.CH=CH.CO_2H$. The action of boiling alkalies on these acids is usually represented as producing a transformation of the $\beta\gamma$ into the $\alpha\beta$ acids. In reality the reaction is a reversible one, but the point of equilibrium in the majority of cases is very near the total transformation into $\alpha\beta$ acids. Some experimental proofs of the existence of this equilibrium are given.—F. **Grandjean**: An attempt at orientation of the salts of cholesterol and anisotropic liquid oleates on crystals.—P. **Lesage**: The germination of seeds in saline solutions.—H. **Coupin**: The influence of calcium salts on the absorbent root hairs. Calcium as carbonate, chloride, and nitrate may prevent the proper development of the root hairs of a plant. Calcium sulphate appears to be without effect.—A. **Guilliermond**: Contribution to the study of the fixation of the cytoplasm.—J. **Amar**: The price of movement in invalids and persons who have recently lost the right arm. The use of a limb or a portion of a mutilated limb by mutilated soldiers produces a fatigue in excess of that produced by the same movements in normal persons.—H. **Bordier** and G. **Roy**: The colloidal state of camphor in water in presence of camphorated oil. Biological and therapeutical consequences. Camphor in solution in water is in the colloidal state, and this accounts for the discrepancies between the solubility coefficients for camphor in water given by different authors.—M. **Fonzes-Diacon**: The white turbidity in wines (*casse*). The modern treatment of wine by sulphurous solutions of ammonium phosphate predisposes the wine to the white *casse*. This defect may be reduced or prevented by citric acid, although in some cases the legal limit is too small, and by oxalic acid or oxalates, toxic products the use of which is forbidden by law.—A. **Chantemesse**, L. **Matruchot**, and A. **Grimberg**: A new micro-organism, *Mycobacillus synovialis*, causing in man a disease developing like articular rheumatism.

WASHINGTON, D.C.

National Academy of Sciences, Proceedings No. 3, vol. iii. (March).—I. **Langmuir**: The condensation and evaporation of gas molecules. A discussion of the evaporation *versus* the reflection theory, with conclusions favouring the former.—S. B. **Nicholson**: The ninth satellite of Jupiter. Comparison of the orbits of the eighth and ninth satellites. The mean period of the ninth is 745 days, and its diameter is probably about fifteen miles.—H. E. **Jordan**: Aortic cell clusters in vertebrate embryos. The hæmogenic activity of embryonic endothelium is a normal function at a certain stage of embryonic development.—H. **Jordan**: Rheotropism of *Epinephelus striatus*, Bloch. The lip region is the most sensitive part of the body surface. The end organs of tactile sensitivity serve also as organs of rheotropic sensitivity.—J. **Rosenbaum**: Studies of the genus Phytophthora. A search for determining characters of diagnostic values in testing the different species.—E. H. **Hall**: A possible function of the ions in the electric conductivity of metals. A discussion of the number of ions necessary to maintain currents of great density, and of the temperature relations of conductivity if due to ions.—W. **Bowie**: The gravimetric survey of the United States. A summary of the present position of the subject.—S. J. **Barnett**: The magnetisation of iron, nickel, and cobalt by rotation, and the nature of the magnetic molecule. A confirmation of the assumption that only electrons are in orbital revolution in all the substances investigated.—D. L. **Webster** and H. **Clark**: The intensities of X-rays of the L series. A discussion of the intensities in the case of platinum as functions of the potentials producing them.—C. C. **Little**: The use of vasectomised male mice as indicators.—F. H. **Seares**: Photographic magnitudes of stars in the selected areas of Kapteyn.—N. C. **Nelson**: Archæology of mammoth cave and vicinity: A preliminary report. Two isolated horizons of culture have been found, one indicating an agricultural people, the other a hunting people.—R. H. **Chittenden** and F. P. **Underhill**: The abnormal state is due to a deficiency in some essential dietary constituent or constituents presumably belonging to hitherto unrecognised but essential components of an adequate diet.—F. N. **Cole**, Louise D. **Cummings**, and H. S. **White**: The complete enumeration of triad systems in fifteen elements. There are eighty types.—E. L. **Nichols**: New data on the phosphorescence of certain sulphides.—A. C. **Redfield**: (1) The reactions of the melanophores of the horned toad. (2) The co-ordination of the melanophore reactions of the horned toad.—E. C. **Jeffrey**: Petrified coals and their bearing on the problem of the origin of coals. Coals containing "coal balls" are abnormal, but there is no good evidence that "coal balls" are organised from material accumulated *in situ*.—C. **Zeleny**: The effect of degree of injury, level of cut and time within the regenerative cycle upon the rate of regeneration.—F. H. **Seares**: Preliminary note on the distribution of stars with respect to the galactic plane. A comparison of Mount Wilson counts with Kapteyn's, in which good agreement is found; as compared with both, the results of Chapman and Melotte are not homogeneous.

PETROGRAD.

Imperial Academy of Sciences (Physico-Mathematical Section), January 18.—A. A. **Markov**: Some limiting formulæ of the calculus of probabilities.—V. V. **Zalenskij**: The structure of the female sexual organs and the ripening of the egg of *Salpa bicaudata*.—A. S. **Vasiljev**: The transit instrument and the zenith telescope in latitude observations.—O. I. **Kuzeneva**: Plants collected by V. Č. Dorogostajskij in the Jablonovoj range (East Siberia).—K. A. **Nenadkevič**: The bismuth minerals of Transbaikalia.—O. V. **Rosen**: The malacological fauna of the province of Terek. Description of two new species of the genus Buliminus from Transcaucasia.—A. **Šestakov**: Materials for the fauna of the Vespidæ of the genus Cerceris, Latr. (Hymenoptera, Crabronidæ), of Turkestan.—V. **Soldatov**: Notes on two new species of Lycodes from the Okhotsk Sea.—V. A. **Steklov**: The approximation of functions by means of Čebyšev's polynomials, and on quadratures.—A. A. **Borisiak**: The osteology of the genus Indricotherium.

BOOKS RECEIVED.

Rivers as Sources of Water Supply. By Dr. A. C. Houston. Pp. vi+96. (London: John Bale, Sons, and Danielsson, Ltd.) 5*s*. net.

The Origin of the World. By R. McMillan. Cheaper edition. Pp. xv+139. (London: Watts and Co.) 1*s*.

The Carnegie United Kingdom Trust. Report on the Physical Welfare of Mothers and Children. England and Wales. Vol. i., pp. xvi+434; vol. ii., pp. viii+190. (Dunfermline: Carnegie United Kingdom Trust.)

Text Book on Motor Car Engineering. By A. Graham Clark. Two vols. Vol. i., Construction. Pp. xix+437. Vol. ii., Design. Pp. xvi+368+21. (London: Constable and Co., Ltd.) Each 8*s*. 6*d*. net.

The Range of Electric Searchlight Projectors. By J. Rey. Translated by J. H. Johnson. Pp. xiv+152. (London: Constable and Co., Ltd.) 12*s*. 6*d*. net.

Contributions to Embryology. Vol. vi. Nos. 15–19. (Washington: Carnegie Institution.)

The Mosquitoes of North and Central America and the West Indies. By L. O. Howard, H. G. Dyar, and F. Knal. Vol. iv., Systematic Description. (In two parts.) Part ii. (Washington: Carnegie Institution.)

Lezioni di Antropologia. By Prof. F. F. Frassetto. Vol. iii. Pp. xiii+422. (Bologna: Libraria Mareggani.)

Ozone: Its Manufacture, Properties, and Uses. By Dr. A. Vosmaer. Pp. xii+197. (London: Constable and Co., Ltd.) 10*s*. 6*d*. net.

The Aviator and the Weather Bureau. By Dr. F. A. Carpenter. Pp. 54. (San Diego: San Diego Chamber of Commerce.)

The Aviation Pocket-Book for 1917. By R. B. Matthews. Pp. xix+300. (London: Crosby Lockwood and Son.) 4*s*. 6*d*. net.

Higher Education and the War. By Prof. J. Burnet. Pp. x+238. (London: Macmillan and Co., Ltd.) 4*s*. 6*d*. net.

DIARY OF SOCIETIES.

THURSDAY, MAY 10.

ROYAL SOCIETY, at 4.30.—Permanent Periodicity in Sunspots: Sir Joseph Larmor and N. Yamaga.—The High-frequency Resistance of Multiple-stranded Insulated Wire: Prof. G. W. O. Howe.

ROYAL INSTITUTION, at 3.—Pagan Religion at the Time of the Coming of Christianity: Prof. Gilbert Murray.

FRIDAY, MAY 11.

ROYAL INSTITUTION, at 5.30.—Radioactive Haloes: Prof. J. Joly.

ROYAL ASTRONOMICAL SOCIETY, at 5.—(1) Convection and Diffusion within Giant Stars. (2) Thermal Diffusion and the Stars: S. Chapman.—Observations of Ch. 7085 R.T. Cygni in 1912–17: A. N. Brown.—Solar Prominences, 1916: G. J. Newbegin.—Baxendell's Observations of Variable Stars, Ninth Instalment: H. H. Turner and Miss M. A. Blagg.

PHYSICAL SOCIETY.—Meeting postponed until May 25.

SATURDAY, MAY 12.

ROYAL INSTITUTION, at 3.—The Electrical Properties of Gases: Sir J. J. Thomson.

TUESDAY, MAY 15.

ROYAL INSTITUTION, at 3.—Architectural Design in Organisms—The Laws of Growth and Form: Prof. D'Arcy Thompson.

ZOOLOGICAL SOCIETY, at 5.30.—Demonstration of the Behaviour of Living Birds and Mammals in the Presence of Snakes: Dr. P. Chalmers Mitchell.—Lantern Exhibition of Birds Now or Recently Living in the Society's Collection: D. Seth-Smith.

ROYAL STATISTICAL SOCIETY, at 5.15.

ILLUMINATING ENGINEERING SOCIETY, at 5.—Annual Meeting.—*Discussion*: Economies in Lighting in Relation to Fuel Saving.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 8.—The Estimation of Toluene in Crude Petroleum: S. E. Bowrey.

WEDNESDAY, MAY 16.

ROYAL SOCIETY OF ARTS, at 4.30.—The Blind Sufferers from the War, and their Future Employment: Sir C. Arthur Pearson, Bart.

GEOLOGICAL SOCIETY, at 5.30.

ROYAL METEOROLOGICAL SOCIETY, at 5.—Report on the Phenological Observations for 1916: J. E. Clark and H. B. Adames.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Annual Exhibition of Microscopic Aquatic Life.

THURSDAY, MAY 17.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture: The Configuration of Astronomical Masses and the Figure of the Earth.—J. H. Jeans.

ROYAL INSTITUTION, at 3.—The Chromosome Theory of Heredity and the Alternatives: Prof. W. Bateson.

ROYAL SOCIETY OF ARTS, at 4.30.—The Future of Indian Trade with Russia: D. T. Chadwick.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Annual general meeting.

FRIDAY, MAY 18.

ROYAL INSTITUTION, at 5.30.—The Complexity of the Chemical Elements: Prof. F. Soddy.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—The Construction of Turbine-Pumps: A. E. L. Chorlton.

SATURDAY, MAY 19.

ROYAL INSTITUTION, at 3.—The Electrical Properties of Gases: Sir J. J. Thomson.

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MACMILLAN AND CO., LTD.,
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Editorial Communications to the Editor.
Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.