THURSDAY, AUGUST 10, 1916.

THE HISTORY OF THE FAMILY.

The History of the Family as a Social and Educational Institution. By Prof. W. Goodsell. Pp. xiv+588 pp. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1915.) Price 8*s*. 6*d*. net.

IN what sense is it right to speak of the history of the family? As an institution it occupies so central a position in the social structure that it may well seem fundamental. Should we write a history of stellar motion so long as the component forces determining it are constant? Are the forces which find expression in the family constant? Can it be said to have a history? The institutions surrounding the family vary from one age to another, and from people to people. Marriage ceremonials, customs in such matters as dowries, settlements, and other marriage contracts, are not uniform. The rights of parents over their children, of husbands over their wives, differ in a similar way. But can these differences be brought into any general historical scheme, or are they local variations brought about by economic and ideal forces acting upon an institution the essential nature of which has never altered?

Some such questions as these arise in one's mind as one takes up Prof. Goodsell's book, which is, however, rather descriptive in its treatment than historical. True, he has adopted a chronological order. After a very brief discussion of the primitive family he describes the matrimonial institution and family life of Hebrews, Greeks, and Romans, and the changes brought about by Christianity. Thus we proceed through the Middle Ages and the Renaissance to the modern period, in which attention is confined to England and America. In this section there is a chapter describing the influence of the industrial revolution on the family, and elsewhere the influence of chivalry is discussed, but, broadly speaking, as we pass from chapter to chapter we feel ourselves in a different atmosphere without knowing exactly what it is that has brought the change about. In consequence, the book is more like a selected series of panoramic views than a history in the strict sense. It may be that the author's treatment is the only possible one, but in that case why has so much been omitted? Except for the Hebrew, the Asiatic civilisations are entirely omitted; Egypt is not mentioned, and an important institution like the "Conseil de Famille" escapes notice.

Obviously, the subject so interpreted is one of vast range; indeed, we have only to interpret widely enough to make it include the greater part of the history of civilisation. Prof. Goodsell himself takes a wide view and includes much of that side of human conduct which springs directly from the sex-impulse. Modes of courtship, prostitution, education in matters of sex, household furniture, clandestine marriages, Platonic love are examples. The odd way in which they occur in the various sections helps to destroy the unity of the book and to confirm the "panoramic feeling" previously mentioned. Accessibility of material rather than a philosophic plan seems at times to have led the author into side-tracks, attractive and interesting enough in themselves, but *culs-de-sac* in spite of that, from the point of view of the subject as a whole.

A short notice of this kind cannot cover the ground of such a book, though even a casual reader will be struck by a want of precise references in certain of the chapters, particularly, perhaps, in that dealing with the primitive family. Where is the "weight of evidence" which shows that polygamy is unpopular among savage women? The author gives several reasons why *we* condemn it, but there is surely room for doubt whether deprivation of the father's care in the rearing of children or any other of the alleged reasons for this feeling could have operated—indeed, Prof. Goodsell himself suggests this, for he says on the preceding page that primitive man could not be aware of the physical and moral advantages which monogamy brings. How much attention could the politically occupied citizen of Athens give to the care of his children? And what of men in the modern industrial State? What proportion of men in our day feel this particular disability? In the same chapter the author has clearly confused the household and the village community as it still exists in Russia. It is the whole community which owns the land, not the related families living under one roof, and communal authority, not patriarchal, which allots the land to the householder.

His account of Greek family life omits all reference to the Spartan system of common meals, so much admired by Plato and Aristotle. It does little justice to Plato's high-minded, if mistaken, attack upon the family, and still less to Aristotle's defence of it. Both these philosophers raised moral and educational issues in this connection which should have found a place in a book which gives considerable space to Edward Carpenter and Ellen Key amongst the moderns.

From the particular point of view of education the book is perhaps least satisfying, but the task which Prof. Goodsell undertook was one of extraordinary difficulty. It called for scholarship of a high order, and, above all, for a philosophical outlook which would help to preserve unity of aim and balance of treatment. Although defective in these respects, the book is full of human interest. The pictures of home life in the old colonial days are especially so. As a collection of facts connected more or less closely with the family, many readers will find pleasure in its perusal, and as each chapter closes with a long list of references it may serve as a very useful introduction to a subject of vast interest and importance.

J. A. GREEN.

FORECAST BY MR. WELLS.

What is Coming? A Forecast of Things after the War. By H. G. Wells. Pp. 295. (London: Cassell and Co., Ltd., 1916.) Price 6*s*. net.

WHEN Mr. Wells writes upon social and political questions he is a prophet whom it is a pleasure to follow, even when we feel that time will prove his extrapolation careless. What mistakes he may have made in this book will declare themselves in a year or two, so that he has placed his reputation in more jeopardy than usual. He believes that Germany will be beaten, but not completely crushed by this war; "she is going to be left militarist and united with Austria and Hungary, and unchanged in her essential nature; and out of that state of affairs comes, I believe, the hope for an ultimate confederation of the nations of the earth." The Central Powers remaining a menace, the Allies and America will reform all their methods. It is in discussing these reforms that Mr. Wells is at his best; he is on his own familiar ground, and he excites the admiration and sympathy of his most exacting critics. The chapter, "Nations in Liquidation," contains in one sentence his great idea: "The landlord who squeezes, the workman who strikes and shirks, the lawyer who fogs and obstructs, will know, and will know that most people know, that what he does is done, not under an empty, regardless heaven, but in the face of an unsleeping enemy and in disregard of a continuous urgent necessity for unity."

Thus we shall have a millennium induced by the German menace: we wish we could believe in it. In the chapter, "The Outlook for the Germans," we find that he relies upon the great middle class to save Germany from Junkerdom. He does not take into account the fact that the German nation must get tired of being intense and perhaps may even get disgusted with "Kultur." Readers know his views on Socialism, and they can imagine how he mocks at our present want of organisation, our rottenness and dishonesty, and how in particular he makes war against the lawyers and schoolmasters. There is a good chapter on "What the War is doing for Women."

Mr. Wells's whole scheme is based on his belief that the Central Powers will continue to menace the world, and this belief is itself based upon a certain hypothesis which might almost have been called an axiom five months ago, when Mr. Wells wrote. This hypothesis is that in entrenched warfare the defensive has an advantage over the most brilliant strategy and over considerably superior numbers, and that there must be a deadlock, followed by the complete exhaustion of both sides. If Mr. Wells had waited only a few months he would have seen that the great wealth and patriotism of England and the enormous population of Russia and the intense feeling of France now enable the Allies to break through the long German fortifications at all points with advantages in power which get greater and greater every day, so that the deadlock is already at an end. Exhaustion in men is possible, and as there are more than twice as many available soldiers with the Allies as with the Central Powers, the speedier exhaustion of Germany in men is quite certain. As for exhaustion in wealth: in two years of the Napoleonic war we spent one-third of a million pounds per day. In a week we spent as much as Charles II. spent in a year. Now we have reached an expenditure of six millions per day, and yet unscientific persons refuse to recognise that the wealth of England is unimaginably great, and that the steam-engine has given us the whole earth in fee.[1] Germany in 1871 thought, and everybody thought, that she had ruined France financially. We know now that if she had enforced an indemnity ten times as great France would have paid it easily. We talk of the cost of the war to Germany spelling her financial ruin, whereas those scientific persons who have studied Germany know that at the end of this war, if we compel Germany to pay the total expenditure of the Allies (we do not recommend this), she will still be in a flourishing condition. Mr. Wells thinks that the world peace is coming soon through universal self-sacrifice; it is a guileless notion. Peace will come to the world by such a loss of its wealth as people do not think about—by the exhaustion of its coal. The man in the street who reads scraps of scientific literature believes, like the spendthrift, in a miracle—namely, that unknown stores of wealth will be opened up when our coal fails. Before the war we recognised with sorrow that he was wrong, but we have less sorrow now when we know that our greatest blessing has become a curse.

J. P.

[1] It has been proved that the steam-engine has multiplied the wealth of the world by some number between 200 and 1000.

OUR BOOKSHELF.

The Cruise of the "Tomas Barrera": The Narrative of a Scientific Expedition to Western Cuba and the Colorados Reefs, with Observations on the Geology, Fauna, and Flora of the Region. By John B. Henderson. Pp. ix+320. (New York and London: G. P. Putnam's Sons, 1916.) Price 12*s*. 6*d*. net.

THIS book is the narrative of a "delightful outing and a most successful collecting expedition" to the north-west end of Cuba. The account throughout is essentially domestic, the doings of each day are recorded, and there are the usual more or less informed pages on mosquitoes, snakes, and sharks. It was a scramble of nine "naturalists" for six weeks to secure specimens of as many different animals as possible, rather than to study scientific problems or living beasts. The collectors secured a well-found fishing schooner of 65 ft. length, with a launch, and dodged in and out of the barrier reefs of the Colorados, wherever possible securing specimens by shallow dredging, the use of copper sulphate for doping rock pools, and the attraction of the electric bulb at night. It is a slightly known area, but reefs, lagoons, and mangrove swamps seem to be little different from others in the same region. No fresh light is thrown on their origin. They differ mainly from Indo-Pacific reefs in the shallowness of the lagoons—seldom more than ten fathoms—within the barrier reefs, but, unfortunately, in an otherwise well-got-up book, the chart given is totally inadequate.

Some of the party were more interested in the land than in the sea, and much of their time was spent in hunting for land-shells. It is upon the great limestone ridges (sierras) which stretch through Cuba from east to west that that island's astounding wealth of land mollusca is found. In addition, there are isolated mounds of limestone (mogotes), rich in peculiar genera and species. The author is an authority on these, and we are sorry not to hear much more of them. Clearly he considers that the land mollusca reached their climax after the elevation of the limestones, apart from which they cannot maintain themselves. Later, abrasion has been at work, and their original range has dwindled as continuous limestone areas were replaced by broken sierras and isolated mogotes. Isolation in plastic genera gave rise to the formation of new species. The widely distributed families, genera, and species are hence the ancient forms, the isolated genera and species their modern descendants.

The Statesman's Year-Book. Statistical and Historical Annual of the States of the World for the year 1916. Edited by Dr. J. Scott Keltie, assisted by Dr. M. Epstein. Pp. xliv+1560+maps 4. (London: Macmillan and Co., Ltd.) Price 10*s*. 6*d*. net.

THE "Statesman's Year-Book" makes its ever-welcome appearance. The editors, Dr. Scott Keltie and Dr. Epstein, have been able to obtain much statistical information regarding the belligerent countries, and, in the case of Germany, to include facts and figures based upon the latest officially published information. Maps show the railway schemes in Asiatic Turkey and in Africa respectively, and the distribution of Germans both in the world as a whole and, in greater detail, in the United States. The introductory tables provide a world review of the production of wheat, sugar, ships, etc., and usually include the year under review. There is an illuminating summary which deals with the Great War in regard to population, books, loans, and war finance. The Allies outnumber the Central Empire Alliance by 5 to 1; the war has cost already more than 10,000,000,000*l*., of which a quarter has been spent by Britain, nearly a quarter by Germany, and a fifth by Russia. Mr. John Leyland has revised the information concerning the navies of the world in succession to the late Mr. Fred T. Jane. We cull a few facts at random: There is a volunteer corps among the 2328 males in the Falkland Islands; Oregon University, organised in 1876, has 108 professors; the Free City of Bremen in 1913 exported goods valued at 10,110,000*l*. to Great Britain, about 9 per cent. of the total exports of the port.

LETTERS TO THE EDITOR.

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

Is Proto-Oxygen the Principal Constituent of the Atoms?

As from Moseley's experiments we know the number of rare-earth elements between La and Ta to be 15, the mean difference between atomic weights is, from Mg on, for 6 atomic numbers, 16 exactly. So for Mg (Atw. 24, N 12) and Th (Atw. 232, N 90) we get $(232-24)/16=(90-12)/6=13$. Between U and Nt this difference of $238-222=16$ is known to be a difference of $4\alpha+2\beta$ particles. But if the α particle is the real constituent of the atoms, $4\alpha+2\beta$ is the inner part of the oxygen atom (the additional 6 β particles being electrons of valency). That atomic weights are not twice the atomic numbers would be due thus to the formation of $\alpha_4\beta_2=\theta$ particles, or proto-oxygen, within the nucleus, and radio-activity should be the disintegration of these θ particles into their constituents. It may be remarked that $\alpha_4\beta_2=\theta$ is similar to $H_4^+\beta_2=\alpha$ (which might be the formula for the α particle). A. VAN DEN BROEK.

Gorsel, Holland, July 17.

International Commission on Zoological Nomenclature.

OPINIONS on the following subjects are before the International Commission on Zoological Nomenclature for final vote:—

Opinion 70.—The case of *Libellula americana*, L., 1758, vs. *Libellula americanum*, Drury, 1773.

Opinion 71.—Interpretation of the expression "typical species" in Westwood's (1840) synopsis.

Opinion 72.—Herrera's zoological formulæ.

Opinion 73.—Five generic names in Crinoidea, ninety-two generic names in Crustacea, and eight generic names in Acarina, placed in the official list of generic names.

If anyone is interested in these opinions and has not already been reached by the Commission, and therefore has not had an opportunity of being heard upon them, he is cordially invited to send his views to the Secretary of the Commission, and if any new point is raised that is likely to alter the opinion of the Commission, the data will be forwarded to the Commissioners for consideration.

C. W. STILES,
Secretary to the Commission.

Office of Secretary to International Commission on Zoological Nomenclature, Smithsonian Institution, Washington, D.C., July 13.

The Magnitude of θ Eridani.

THE arguments of Mr. E. J. Webb (NATURE, vol. xcvii., p. 341) seem conclusive as to this star having been of the first magnitude at the epoch of Ptolemy's catalogue, but are perhaps less conclusive as to its magnitude at any other time, though the reviewer of Peters's and Knobel's work is surely wrong in assuming that Al Sûfi would find any difficulty in judging between a first and a third magnitude star at an altitude of 10°. Have astronomers considered the possibility of θ Eridani having been practically a temporary star at Ptolemy's epoch? Do Peters and Knobel come to any conclusion as to the magnitude of this star? T. W. BACKHOUSE.

West Hendon House, Sunderland, August 4.

SOUTH AFRICAN UNIVERSITY LEGISLATION.

PUBLIC discussion, extending over many years, in the Press and in Parliament, on higher education in South Africa has at length resulted in legislation. The old University of the Cape of Good Hope, with its offices at Capetown, was merely an "examining" institution, founded on the model of the University of London. The constituent colleges were (the figures give distances in miles from Capetown):—The South African College at Capetown, the Victoria College at Stellenbosch (31), the Huguenot Ladies' College at Wellington (45), the Rhodes University College at Grahamstown (757), the Grey University College at Bloemfontein (750), the Natal University College at Pietermaritzburg (1182), the Transvaal University College at Pretoria (1001), and the South African School of Mines and Technology at Johannesburg (956). There are many objections to a university which is a mere examining body; there are many objections to a university the constituent colleges of which are separated even by such short distances as are Liverpool, Manchester, and Leeds; it has long been felt that all such objections are greatly magnified when a meeting of Senate cannot be held unless many of its members spend six or eight days in travel. It scarcely needs the words of the report of the University Commission (p. 138) to let us know that, in spite of having distinguished, well-paid professors, the only work done by the colleges hitherto has been mere cramming for examinations, and that there is an almost total absence of the university spirit in South Africa.

In 1904 Mr. Alfred Beit gave an estate near Johannesburg to the Government of the Transvaal (this was before the union of the States under one Government) for agricultural and other educational purposes. The estate is probably worth 20,000*l.* now. In 1905 he made a will giving 200,000*l.* to the University of Johannesburg for university buildings on the estate; "but if, at the expiration of ten years after my death, the said 200,000*l.* shall not have been applied in such building and equipment as aforesaid, then this legacy shall lapse and fall into my residuary estate." Even now there is no university at Johannesburg, nor is there any college of university rank except the School of Mines. Mr. Beit died in 1906. In 1910 General Smuts, the Union Minister of Education, suggested to Mr. Otto Beit (his brother's heir) and to Sir Julius Wernher that Mr. A. Beit's bequest ought to be increased to 500,000*l.* for the establishment of a national university on the Rhodes estate at Groote Schuur (at Capetown), which belonged to the Government. Sir Julius promised 250,000*l.*, and Mr. Otto Beit 50,000*l.* The De Beers Company offered also 25,000*l.* In a joint letter Sir Julius Wernher and Mr. Otto Beit said that "the primary condition underlying the gift . . . was that the university to be erected shall and must be a residential teaching university."

There was universal approval all over South Africa of the idea of a residential teaching university at Capetown, but it soon appeared that there was room for divergent opinion as to the nature of such a university. A proposal largely approved of and soon after almost universally condemned was that the new institution should be a "post-graduate" university. Then came a new proposal, so favourably received that it was embodied in a Parliamentary Bill, that entrance to the new university should require "intermediate" qualifications, and not merely the ordinary matriculation. To this proposal, also, opposition became too great, and the Bill was withdrawn. Before 1914 there was a general expression of opinion in favour of two universities—north and south. A University Commission met in January, 1914, and reported just before the war in favour of two universities—a southern university with new buildings on the Rhodes estate at Capetown, incorporating the South African College and the Victoria College, and a northern university incorporating all the other colleges. The committee recommended that 350,000*l.* should be spent in buildings and equipment at Capetown, that Stellenbosch should get 25,000*l.*, and that the rest of the money should be distributed among the more distant colleges.

Prof. John Perry, who was one of the commissioners, agreed to the more important recommendations of the report, only with reservations; he especially wished half a million to be given to a teaching university at Capetown so that South Africa might have at least one real university. He said that no scheme could succeed unless Stellenbosch had some endowment, and he proposed that to the 25,000*l.* there should be added a Government grant of 50,000*l.*, and also that Stellenbosch should be encouraged to gather more money so that she might soon apply for a charter of her own. In that case the Capetown University would consist of the South African College only. Prof. Perry was strongly of opinion that no distant college, such as that of Grahamstown, should be incorporated with Capetown, and in this consisted his greatest difference from his colleagues. This gentleman's recommendations have now been carried out in an Act of Parliament. The South African College is to become "The University of Capetown," with its present buildings and new ones on the Rhodes estate, and with 525,000*l.* The Victoria College is to become "The University of Stellenbosch," a recent bequest of 50,000*l.* by Dr. Marais taking the place of the proposed Government grant. (There ought certainly to be a large additional grant from the Government.) The proposed northern university is to be called "The University of South Africa." It is to be hoped that the Johannesburg School of Mines will soon apply for a charter of its own; it is already nearly as well equipped as any polytechnic in the world.

Now that the scheme has been carried out, the people of Johannesburg make objections, having awakened to the knowledge that, except for their School of Mines, they have no teaching there of a university character nearer than Pretoria, which is forty-five miles distant. On March 28, 1914, their educational authorities said: "The scheme for founding a great residential university at Groote Schuur has our hearty and unanimous support. We are prepared to abandon any local ambitions we may have had in favour of this truly national enterprise, even though it involves our losing the revenue we at present derive from the Beit bequest." It is difficult to see why objections should now be brought to the very university which two years and a half ago had the unanimous approval of the Rand. Public meetings have recently been held at which most of the speakers showed but little knowledge either of the history of the subject or of what is meant by a university. They have suddenly discovered that their rich district is being exploited for the benefit of Capetown, and that their great thirst for university education has been left unslaked, deliberately, by the Union Government. They are greatly mistaken. If these public meetings create such a thirst they will prove a godsend, for such a thirst cannot exist in rich Johannesburg without almost immediately creating a worthy university. We think that the people of South Africa ought to be very well satisfied with the recent university legislation. Some years ago the question was a very vexed one. There were great jealousies between north and south, but still greater were the racial difficulties, both in the north and south, and of all these troubles nothing remains except an apparent grievance at Johannesburg. It is to be hoped that the men who drew up that magnanimous statement of two and a half years ago will take advantage of the present agitation to give Johannesburg a teaching university of its own.

THE NEWCASTLE MEETING OF THE BRITISH ASSOCIATION.

WHEN it was first suggested that the 1916 meeting of the British Association should be held in Newcastle-upon-Tyne the conditions in that city were very different from what they are now. The same might be said of any town in Great Britain; but the war has affected Newcastle itself with no uncertainty; and the Northumberland and Durham miners, as well as the shipyard and engine workers, have contributed handsomely to the ranks of our New Army.

With this war atmosphere thickening as the demands of the Navy and Army became greater, it was natural that considerable discussion should arise as to the wisdom of holding the meeting in Newcastle this year. It was, however, finally decided to hold the meeting on September 5–9, on the understanding that it would be a purely business meeting, shorn of all the festivities, such as garden parties and excursions, to which the members are accustomed. In fact, the meeting will be on similar lines to those on which the Manchester meeting was run last year.

In normal times the meeting would have centred itself round Armstrong College, and in consequence the work of the Sectional Arrangements Committee would have been comparatively light; its spacious halls and lecture-rooms and its well-equipped laboratories would have provided that arrangement which is so eminently suited to a British Association meeting, viz. the reception-room and its adjuncts, as well as a large proportion of the section-rooms, in one building. Armstrong College, however, was taken over by the War Office during the early part of the war, and became, and still is, the 1st Northern General Hospital. Nevertheless, ample and satisfactory accommodation has been obtained; in several instances two or more sections will meet in the same building, and all the section-rooms are in close proximity to one another.

As in 1889, the reception-room will be the library of the College of Medicine, where also several section-rooms, smoke-rooms, writing-rooms, Press and general offices will be provided. The following list shows where the various sections will meet:—A (Mathematical and Physical Science), Trinity Church Rooms; B (Chemistry), College of Medicine; C (Geology), Friends' Meeting House; D (Zoology), Grand Assembly Rooms; E (Geography), Friends' Meeting House; F (Economic Science), Literary and Philosophical Society; G (Engineering), Institute of Mining and Mechanical Engineers; H (Anthropology), Friends' Meeting House; I (Physiology), College of Medicine; K (Botany), Grand Assembly Rooms; L (Educational Science), St. James's Church Rooms; M (Agriculture), Grand Assembly Rooms.

Sir Arthur Evans, F.R.S., the president-elect, will deliver his address on Tuesday evening, September 5, at the inaugural meeting, which will be held in the Town Hall. In the same hall on Thursday evening, September 7, Prof. William A. Bone, F.R.S., will deliver a discourse on "Flame and Flameless Combustion," and on September 8 Dr. P. Chalmers Mitchell, F.R.S., will deliver a discourse on evolution and the war.

Owing to circumstances incident to the war, it has been found to be impossible to arrange this year visits to the armament factories or the great shipbuilding and engineering works on the North-East Coast. A further announcement, however, may be made in the early future with regard to this matter. Nor will there be any excursions of the usual type, although it is understood that a number of the sections are promoting shorter excursions of special interest.

The Literary and Philosophical Society's Library, the Laing Art Gallery, the Hancock Museum of Natural History, and the Black Gate Museum will be open to members of the Association during the meeting. The majority of the clubs of Newcastle have granted temporary membership to those attending the meeting.

Following the course adopted at Manchester, the Association has again offered students and teachers of Newcastle and district associates' tickets at a reduced fee, and it is hoped that a large number will show their appreciation of this encouragement. Lectures to the public will be given in Newcastle, Sunderland, Durham, and Ashington by distinguished men.

SIR WILLIAM RAMSAY, K.C.B., F.R.S.

THE first scientific words, probably, ever printed from the pen of Sir William Ramsay read curiously now that the full chapter of his writings is closed. They served to introduce his career, and may, with an unexpected aptness, be recalled at its close. Though he left early, he left behind much that has already become a permanent part of the common heritage of science, well known to all. On this, once again for a moment, those now mourning his sad and untimely death may linger, loth to say farewell.

The words introduce his thesis for the doctorate at Tübingen under Fittig in 1872: "To determine the constitution of chemical compounds has been the endeavour of chemists ever since the mere discovery of new bodies has ceased to engross their chief attention." Little could the youth of nineteen then have tasted of the joys of discovery that he could so talk of "mere" discovery. Before him the unknown future held a career of discovery which was to raise him to an unchallenged pinnacle among his colleagues, not of new compounds, but of a whole family of new elements, unsuspected even though the Periodic Law had long since called their roll, and utterly different, in the entire negation of their chemical properties, from any kind of matter previously known. Yet fundamentally true the random words have proved themselves, even in connection with so great advances, in that crescendo of scientific accomplishment which heralded the coming of another century. It is no longer these discoveries that engross, but the problems of constitution to which they led up and contributed—no longer, however, the problem of the constitution of chemical compounds, but the key problem of all physical science and of materialistic philosophy, the problem of the constitution of the elements and the structure of the atom.

Ramsay, whatever had been his youth, training, or after circumstances, would never have been content to think the thoughts of others, nor to confine himself to the paths that they had roughhewn. His earlier work in physical chemistry—the determination of the molecular weight of liquids from their surface-tension with Shields, his work on accurate vapour density measurements, and his studies of vapour pressure with Young—already showed his disposition to stray from the well-beaten track. But the clue to the existence of a new gas in the atmosphere, found by Lord Rayleigh in the discrepancy between the density of atmospheric nitrogen and that prepared from compounds, started him off definitely into the trackless wild and gave his exceptional gifts full and free scope. Every faculty is now at its best, and in the field of chemistry so opened up little help is forthcoming from the current methods of experiment and deduction. In such an apparently trivial experimental detail, for example, as the choice of a suitable lubricant for taps and ground joints might lie the difference between mastery and total failure. Pertinacity, too, is called for to pursue a uniform series of negative results in the search for positive chemical properties of the new gases until the sum of the apparent failures should unite in a single satisfying positive conclusion, that the gases were non-valent, not merely exceptionally difficult to bring into combination. Lastly, new methods of reasoning from the physical qualities, in the absence of chemical, must be brought to bear before the atomic weight of these elements can be assigned and they can take their proper place in the scheme of elements.

Novel as it all appeared, fitting place was found for Ramsay's love of the early history of his subject and the delight he took in the work of the early pioneers. After a century's oblivion, the remarkable experiment of Cavendish on the sparking of air over alkalis was re-discovered, and another, and by no means the least, tribute so paid to the foresight of this remarkable man. Since then this same experiment has had on the industrial and practical side, in the fixation of atmospheric nitrogen, as remarkable a sequel as it received at the hands of Lord Rayleigh and Sir William Ramsay in the discovery of argon.

It is customary to regard the next step, which was essentially Ramsay's alone, the discovery of helium, as a very natural and direct development of his earlier work with Lord Rayleigh on argon. This is only partially true. In one sense the discovery of helium was entirely distinct; for, though, like the other inert gases, it exists in the atmosphere, unlike all the others it was not discovered there. The name, of course, recalls the long arm of scientific method and the discovery of the chief of its spectrum lines in the spectrum of the sun's chromosphere by Lockyer and Frankland in 1868. By the way, would it not be a graceful tribute to Ramsay, and also a step in the right direction of a consistent nomenclature, to rechristen this gas "helion," so making it correspond with the other members of the family, argon, neon, krypton, xenon, and, by chance, the three isotopic radioactive emanations?

When Ramsay came upon this gas for the first time, as it were, face to face in the gases from the uranium minerals which Hillebrand had thought to be nitrogen, recognised its signature in the λ of its D_3 line, and found that it was only present in minerals containing uranium and thorium, he broke, unawares, new ground in a field totally unconnected with that hitherto cultivated for argon. His proof that it possessed the same absolute lack of chemical combining power, his immediate recognition of the fact that he had found a second member of what was a new family of elements of which probably more existed, and the successful separation of these, and also helium itself, from the atmosphere in collaboration with Travers, brought back the research into its former course. The significance of the remarkable fact that helium alone of the inert gases existed otherwise than in a free state in the atmosphere, and that, in spite of its total lack of combining power, it was found pent up somehow in uranium and thorium minerals, was grasped only later by others. But it was essentially the starting point of a new departure which in the fullness of time was again to link itself with its source.

It has been well remarked of Ramsay that he stood to the outside world for an essentially British school of chemistry. To describe him as original would be like saying water is wet. He was of the essence of originality, and, during the time the writer knew him, entirely without any apparent sheet-anchor of fixed conviction or established belief in scientific doctrine, which at all times, in a science somewhat prone to let go sheet-anchors, made him a unique and almost incomprehensible personality. It is true that in his later years he suffered from the defects of these qualities, and he failed to criticise sufficiently his own ideas and experimental results before making them public. He seemed to lose something of that sense of the great and terrible responsibility which must at all times rest heavily on the scientific leader, and never more than in the case of the pioneer. All through his work, probably, his collaborators had perforce to assume to an undue extent the *rôle* of "devil's advocate," and much of his best work was done in partnership with those who recognised this. But in the zenith of his powers at University College and in the full swing of his elucidation of the family of inert gases, he trod fearlessly and without an error the difficult path of the pioneer and won a permanent right to something far greater than the title of a successful discoverer. Argon, helium, neon, krypton, and xenon were capital discoveries, but the bringing of this group into harmony with the rest of the elements might have appeared a task almost insuperable in the face of their total lack of chemical properties. The recognition that they were monatomic and non-valent gases occupying a "zero" family of the Periodic Table, preceding that of the monovalent alkali-metal family, from which hitherto the table had seemed to start, was made in spite of the fact that argon itself is an "exception," in the orderly sequence of elements, of the same type as tellurium, which was then a very hotly debated and puzzling question.

This was physical chemistry in a sense as original and bold as the great thermo-dynamical and electro-chemical generalisations of the American and Continental savants, which hitherto had almost monopolised the term. It initiated a widening of the domain that was to grow apace. The human mind seems incapable in its initial processes of grasping thoroughly more than one fundamental point of view at a time. Each has to be grasped separately before both eyes can be opened without the image becoming blurred. The phlogistonists had a single eye for what we now call energy, Lavoisier for what we now call mass. The first physical chemists found the thermodynamical point of view so clear-cut and complete that some of them sought to banish from their conceptions the molecular and atomic viewpoints as unnecessary, unproved, and unprovable hypotheses. Ramsay, confronted with a type of element utterly devoid of chemical properties and forced to rely entirely on their physical properties to put them in their proper relation to the whole, solved the problem completely and correctly by the aid of the molecular and atomic conceptions alone, though it is only lately that opposition to his views has entirely died down. Before he died he had the satisfaction of seeing this his own side of physical chemistry developed, by the discoveries in connection with radio-activity and the Brownian movement, to an amazing extent. The physical reality of atoms and molecules has been demonstrated by methods of great directness and power; and these, incidentally, applied to the case of his own gases, confirmed his earlier interpretation of their monatomic character in a way that made further cavil impossible.

But now we must go back to 1896, to the year of the discovery of helium and to the year that Henri Becquerel in Paris discovered the radioactivity of uranium, but a few months after Röntgen had given to the world a sixth sense. In Becquerel's footsteps M. and Mme. Curie were starting on the quest which led to radium. Rutherford had come from the mirror image of our islands in the Southern Seas to learn at the Cavendish Laboratory under Sir J. J. Thomson, and with him to forge the weapons of measurement and discrimination which, in the new sciences that the dying century had called forth, were to prove their sufficiency. His specific recognition of the α-rays was one of the first-fruits of the new methods, which, a little later, in Canada, at the McGill University, in the fine Macdonald science laboratories, were to play such an important part in the amazing succession of discoveries that followed, and which culminated in the complete and satisfying explanation of radio-active phenomena which is accepted to-day.

Then, by one of the strangest combinations of destiny, the centre of interest shifts again for the moment back to the laboratory where helium was discovered, as the associate of uranium and thorium in minerals, seven years before, to Sir William's private laboratory at University College. Word had passed along the underground corridors below, and the room had swiftly and silently filled with a throng of staff and students, clustering round those fortunate enough to possess a pocket spectroscope, all making the one short remark, "Yes! it's helium." For that was the room where was being put the coping-stone to the arch that in seven short years had sprung up from the twin discoveries of the rare gases and of radio-activity, and Sir William was witnessing with the spectroscope the first ocular proof of the genesis of helium from radium, which had been predicted from the theory of atomic disintegration. Nobody can deny that destiny, so frequently erratic, here made a happy choice, not only because the original discovery of helium was made by Ramsay, but also because in his laboratory had been worked out those delicate methods of gas manipulation which alone were equal to dealing with the minute amounts of helium involved in this investigation.

In another direction there was an intimate connection between the discovery of the inert gases and radio-activity. The "radio-active emanations" discovered by Rutherford were shown to be inert gases of the argon type, and Ramsay, having satisfied himself of this, enthusiastically took up the study of the radium emanation, and made an exhaustive study of its physical properties, largely in conjunction with Whytlaw Gray. In his research on xenon his methods of gas manipulation had had a severe test, two or three cubic centimetres of gas being the total stock available after working up an enormous quantity of air. But in the case of the radium emanation, only a small fraction of a cubic millimetre at most can be obtained at a time, and the methods were tried to the uttermost. The extraordinary amount of information which these workers and also Rutherford were enabled to obtain about the physical constants of the new gas in approximately pure condition is one of the triumphs in the investigation of minute amounts of matter. In this research also the extraordinarily delicate micro-balance, devised by Steele, found something worthy of its powers.

For many of the latter years of his life Ramsay brought forward evidence to show that the energy liberated in radio-active transformations was sufficiently powerful to bring about the transmutation of one element into another. But these and similar attempts to produce artificial transmutation by radio-active and electrical agencies are not yet accepted by the majority. The subject is undermined with pitfalls, and to history must be left the final judgment on this thorny question.

The writer's personal acquaintance with Ramsay dates only from 1898, and his association with him only from the time when his great work on the rare gases of the atmosphere was completed. His views, therefore, can only be partial, and as regards one of the most fruitful periods of his life indirect. In 1898 a group of honours candidates in white ties outside the chemical laboratories at Oxford was joined by the distinguished examiner from London, whose discoveries were upon everyone's lips. We were chaffed at the state of our hands, yellow from a nitrification set upon the previous day's examination, and we were assured that we need not scruple to accept an invitation to dinner, as the stains were quite invisible by artificial light!

The instant popularity of such a man with his juniors and students is not difficult to account for. At University College he was looked up to by them in a way that can scarcely be expressed. He was at once genial, approachable, and great—any of which alone is an infallible passport to the student's heart—and he repaid their trust and affection with a loyalty to them as complete as that of a Scottish chieftain to his clan. But even among those who, at one time or other, may have been sharply in conflict with him—and among contemporary chemists none probably have been the centre of so much controversy—there must be few who did not feel the fascination of his personality, and are not now among the multitude of friends and admirers who feel his loss as personal and irreplaceable. It may be worth recording, seeing the stormy time through which he passed, that one who had known him well all his life could say to the writer that he had never heard a really unkind thing said by Ramsay of any of his colleagues or opponents. Not only his personal friends and whole-hearted admirers are to-day among those who are feeling that "they loved the man and revere his memory."

FREDERICK SODDY.

IT was in 1880 or 1881, very soon after Ramsay had come to the Bristol Chair of Chemistry, that late one very hot and sultry summer evening a newly made friend, tennis-racquet in hand, came to seek him in his private laboratory. "Ah, I'm glad you've come. No, I'd not forgotten, but I've had trouble with this and a long day of it, but it is all right now, and I'll come." Across the window of the narrow make-shift room of the old building that served as the first home of the University College stretched the long length of a complicated system of glass bulbs and tubes and mercury pumps in which he was conducting a distillation for one of his vapour pressure investigations. At that moment some ill-annealed junction, perhaps too near a flame, cracked and gave way; air entered with a hiss and reversed the flow of hot liquid; another crack and then a crash—for, though he sprang to save it, a large mercury receiver broke and discharged its contents over the edge of the table on to the floor, where most of it disappeared between the ill-fitting boards. "Well," thought the friend, "that will be the end of this day's work." But he did not yet know Ramsay, who, looking up with a rueful smile, said: "I'm afraid this means no tennis for me to-day." "What are you going to do?" "Take up the floor and recover the mercury—and a dirty job it will be." And so it proved; but by next morning the mercury had been recovered and the apparatus had been rebuilt and was at work again. That was Ramsay at the age of twenty-eight, this my first glimpse of the indomitable energy which was one of the secrets of his noble career. In the thirty-six years that have elapsed since then it seemed to me that his instinct and practice were always the same: so soon as any demand for action came, to make up his mind what to do and then to act at once. Ask any of the hundreds of friends who have sought and received his help and you will hear from all sides how quickly as well as how generously the help was given.

This energy in action was the outcome of a remarkably healthy and vigorous physique, which he knew how to attend to; and any challenge to which in a feat of skill was accepted as an intentional exercise. A fifty-mile bicycle ride left him quite willing to walk another twenty miles. This tireless physical vigour without doubt contributed to the attainment of his well-known mechanical skill in glass-blowing and to the steadiness of hand and eye which underlay many of his great experimental achievements. So, too, his quickness in picking up foreign languages was partly due to his fine and acute musical ear. Even the sense of smell was for him an instrument of analysis the use of which he had learnt to push far beyond the limits of ordinary expectation, and was the subject of more than one scientific communication.

Such was the happy physical endowment at the command of the eager and affectionate spirit which, wherever he went, made William Ramsay so extraordinarily lovable and acceptable to all classes of men. A man so harmoniously constituted is not often met, and there have been many moments when, watching my friend in the midst of his ideally happy family surroundings, I have said to myself that I have never seen an expression so beautiful and radiant on any human countenance. "Radiant energy" is the phrase that best recalls and summarises his personal characteristics.

No accession of honours or acclamation spoilt for one moment the childlike simplicity of his character. Of course he enjoyed them, but that his friends should rejoice seemed what he cared for most. They brought him new and enlarged intercourse, but the old channels of quiet and tried affection ran deep and full as ever; discussion was as free, as patient, and as fruitful. Genius of any kind he always disclaimed. "It is all pure luck and pegging away," was his phrase; or, as he insisted when revisiting the Scientific Club at the Bristol University, which he had helped to found twenty-one years before, his chief asset in any success he had attained had been a "shocking bad memory," which prevented his recollecting a chemical or physical fact of which he had been told or had merely read, till he had forced himself to rediscover it in some phenomenon within his own experience. Then, indeed, he admitted that he never forgot it. It was, I think, a similarity of instinct for learning by an experimental appeal in which physical sensation should be involved that first drew us together.

Any mistakes he made were those inevitable to an eager and impetuous temperament. Always grateful for help, he sometimes over-estimated the abilities of the friend who gave it. Accustomed to find difficulties yield to his own labour and ingenuity, his sanguine expectation sometimes blinded him to obstacles which were destined to prove insurmountable. Unsuspicious and always approachable, and a little impatient of the limitations of scientific orthodoxy, he found that he had sometimes lent too ready an ear to representations that were to prove untrustworthy; but, being willing to follow ten false clues rather than miss one real one, he was ever more afraid of the consequences of over-caution than of over-confidence.

So wide were his sympathies and interests and so quick his ability to take in new ideas or follow a subtle argument that men of every profession and workers in every branch of science found in him an ideal listener, and were stimulated by his quick grasp and pertinent and suggestive inquiries, and so it came to pass, as it seemed to us who watched him from the ranks, that he moved among the leaders of thought in any sphere and in any country, recognised as intellectually their peer, while behind all his questionings burned continually the passionate desire to help to unravel the mystery of life and the significance of the physical universe. "Most men," he once lamented to me, "have no interest in physical facts of Nature. They pretend interest because they cannot ignore the palpable results of applying science, but the things in themselves are absolutely without interest for them." How this interest might be aroused by education was a matter that he was always ready to discuss.

Of all his most intimate friends who had already passed away, none was more deeply mourned by him than G. F. Fitzgerald, whose suggestion and counsel were ever at his disposal. *Par nobile fratrum!* let us always remember them together.

A. M. WORTHINGTON.

ROLAND TRIMEN, F.R.S.

ROLAND TRIMEN, the third son of Richard and Marianne Esther Trimen, of 3 Park Place Villas, Paddington, was born on October 29, 1840. He was educated at King's College School, which he entered in 1853, having previously been a pupil at a private school at Rottingdean. When about eighteen he took the voyage to Capetown for the benefit of his health, returning to England in 1859. In the following year he again sailed to Capetown and entered the Cape Civil Service. In 1872 he was appointed Curator of the South African Museum in succession to E. L. Layard. In 1881 he was appointed sole commissioner to the Phylloxera Congress at Bordeaux, and in 1886 a member of the Commission for extirpating this pest from the Cape vineyards. In 1892 he became a member of the Cape Fisheries Commission.

In 1883 he married Miss Blanche Bull.

In 1895 Trimen was compelled by the state of his health to resign the curatorship of the Capetown Museum and return to England. He became a Fellow of the Royal Society in 1883, and was awarded the Darwin medal in 1910. The general feeling of naturalists when this award became known was well expressed in the letter of congratulation sent by the Entomological Society of London to their past president of 1897-98:—

"Among living naturalists there are few indeed whose merits as associates and fellow-workers with Darwin can bear comparison with your own; and we feel sure that all alike, in rejoicing at this public recognition of your life-long services to biological science, will agree that the present honour could not have been more worthily bestowed."

Trimen contributed the third of the three great papers which laid the foundations of the study of insect mimicry, and were published by the Linnean Society in 1862, 1865, and 1869. The dates of the two latter are generally quoted as 1866 and 1870, the years of the *volumes* of transactions; but the papers were published in the *parts* issued in the previous years. The first, by Bates, dealt with the Lepidopterous fauna of the Amazon valley; the second, by Wallace, with that of the East; while Trimen completed the survey by extending it to Africa. In this he had perhaps the hardest task in solving the extraordinary problem of *Papilio dardanus*, then known as *merope*, with its train of mimetic females. His sound conclusions were in advance of their time, and were received with incredulity, and indeed ridicule, by entomologists of that day; but he lived to see them confirmed by breeding experiments and universally accepted. The last time the present writer saw him, a few weeks before his death, he found that a new observation on *Papilio dardanus* was the one subject that restored for a moment his failing powers and brought back his old enthusiasm.

Trimen's greatest work is his fine monograph in two volumes on the butterflies of South Africa, the expansion of a smaller book he wrote when a young man. This fine work is a model not only for its high scientific value, but also for a literary grace which was characteristic of all its author's writings.

Roland Trimen was full of humour and a delightful companion, and inspired the warm affection of a wide circle of friends. By his death the world has lost the last of the six naturalists who created the modern study of insect bionomics—Darwin, Bates, Fritz Müller, Wallace, Meldola, and Trimen. E. B. P.

NOTES.

THE American Academy of Arts and Sciences has elected Sir Norman Lockyer a foreign honorary member.

IT is announced that the Daylight Saving Bill has been rejected by the New Zealand House of Representatives.

WE announced in our issue of March 16 last that an Association for the Advancement of Applied Optics had been formed in the city of Rochester, N.Y. We now learn of the recent formation of a national society called the Optical Society of America, of which the association at Rochester referred to by us is a section. It is proposed to hold annual meetings, and that the society shall serve as the parent organisation for local sections holding frequent meetings. It is intended to cover all branches of optics, theoretical and experimental: pure optics, lenses and optical instruments, optical glass and refractometry, colorimetry, vision, photometry, illumination, radiometry, polarimetric analysis, photography and similar related subjects; and to begin the publication of an international optical journal in January next. The officers of the society for the year are:—President, Dr. P. G. Nutting; vice-president, Dr. G. E. Hale; treasurer, Mr. A. Lomb; secretary, Dr. F. E. Ross. The executive council consists of the above-named officers and Dr. F. E. Wright, Dr. C. E. K. Mees, Mr. N. Macbeth, and Prof. J. P. C. Southall.

THE fifth Brazilian Geographical Congress will be held at Bahia on September 7–16. There will be twelve sections, devoted respectively to the following subjects: Mathematical Geography (astronomical geography, topography, geodesy); Physical Geography (aerology, oceanography, geomorphology); Physical Geography (hydrography, potamology, limnology); Vulcanology and Seismology; Climatology and Medical Geography; Biogeography (phytogeography and zoogeography); Human Geography; Political and Social Geography; Economic and Commercial Geography, including Agricultural Geography; Military and Historical Geography; Teaching of Geography, Rules and Nomenclature; Regional Monographs. Papers intended for presentation must not have appeared elsewhere, must be typewritten, and reach the Secretary of the Organising Committee not later than August 30.

WE learn from the *Museums Journal* for August that the present Lord Avebury has handed to the British Museum authorities, for retention in the national collection or distribution among provincial museums, certain portions of the late Lord Avebury's collection of prehistoric and ethnographical specimens from various parts of the world, use of which was made in the writing of "Prehistoric Times." The gift includes a fine series from the early Iron age cemetery at Hallstatt, Upper Austria, which will be kept in the British Museum, but many of the stone implements are available for distribution, and a list of them is given in the journal. Applications for specimens should be made to Sir Hercules Read at the British Museum.

As already announced, Sir William Henry Power, K.C.B., F.R.S., medical officer of the Local Government Board from 1900 to 1908, died on July 28 last, after a lingering illness. Greatly distinguished as an epidemiologist and administrator, his services to hygienic science and practice had extended over a period of more than forty years. Owing to a retiring disposition and a dislike for gatherings of a social nature, he was comparatively little known outside official circles. Nevertheless, during his long connection with the Local Government Board he planned and directed a large part of the work of the Medical Department, and numerous reports dealing with matters concerning the public health issued during that period were either written by him or owed much to his editorial criticism and supervision. His was a charming personality, which endeared him to all his colleagues, many of whom benefited to no small extent from his kindly help and encouragement, always so readily accorded. He was the first (in 1878) to direct attention to the dissemination of diphtheria, and later of scarlet fever, through the consumption of milk; while his classical work on the spread of smallpox from hospitals in which cases of that disease were under treatment formed the basis of legislative action resulting in the removal of smallpox hospitals out of the metropolitan area. While medical officer to the Local Government Board he also served on the General Council of Medical Education, and the Royal Commission on Tuberculosis, of which he afterwards became chairman. He was also appointed a member of the Royal Commission on Sewage Disposal. He received the C.B. in 1902, and the K.C.B. in 1908 on retirement from his official post. He was elected F.R.S. in 1895, and was awarded the Buchanan medal of the Royal Society in 1907. It is not too much to say that no man in this country has done more than Sir William Power to advance the cause of scientific hygiene.

THE many friends and scientific associates of Prof. W. A. Herdman and Mrs. Herdman will sympathise deeply with them in the great grief they are at present suffering through the death in action of their only son, George Andrew Herdman. The young officer was educated at Clifton College, and was a scholar of Trinity College, Cambridge. He entered Clifton College with a mathematical scholarship, was head of his house at Clifton, came out top of the school in physics and chemistry, and won an entrance scholarship at Trinity College, Cambridge, in December, 1913. He early showed a wide and keen interest in scientific problems, and in 1914 went out to Australia with the British Association. On returning, he immediately volunteered for active service, and joined the Cambridge O.T.C. in October, 1914, was gazetted to the Liverpool Regiment in January, 1915, proceeded to the front in the following August, and, after seeing much hard service, was killed in action by a shell-burst whilst gallantly leading in a charge at the battle of the Somme on July 1 last, aged twenty years. The academic career of George A. Herdman was brilliant, but only those scientific friends who knew him personally were able to appreciate his originality of outlook and scientific independence of spirit, and to look forward to the development of a great career, which has been so untimely cut short by the cruel fate of war. Although his university career was only opening when the call to arms came, he was already deeply interested in several original problems, and had been taking physical observations on sea-water at Port Erin Marine Biological Station and on the west coast of Scotland during vacations for several years, as also on the voyage to Australia. He had recently worked assiduously and successfully with Prof. Benjamin Moore upon biochemical problems in nutrition of marine animals and plants, and questions in the physics and chemistry of photosynthesis, and he was joint author of two papers from the Port Erin Laboratory partly recording these observations: (1) "The Nutrition and Metabolism of Marine Animals: the Effects in the Lobster of Prolonged Abstention from Food in Captivity," and (2) "Seasonal Variations in the Reaction of Sea-water in relation to the Activities of Vegetable and Animal Plankton" (Trans. Biol. Soc., Liverpool, 1914 and 1915). While science deplores the early loss of such a promising young votary, those who knew him will agree that he himself would have gloried in the splendid victory won in the charge in which he fell, and counted his personal sacrifice as nothing for the honour of the cause.

IT is with great regret that we record the death of Lieut. Arthur Poynting, who was killed in action in France on July 25. Lieut. Poynting, who was thirty-three years of age, was the only son of the late Prof. J. H. Poynting, F.R.S. After a four-year course in civil engineering, he graduated as B.Sc. of Birmingham University in 1905. On leaving the University he entered the service of the Midland Railway Co., being engaged for a short time at Derby, and afterwards on the construction of Heysham Harbour. For a thesis on his work at Heysham he was awarded the degree of M.Sc. in 1909, and in the same year he was elected an associate member of the Institution of Mechanical Engineers. In 1910 he became assistant-engineer at the London and St. Katharine Docks, and a year later was transferred to the Port of London Authority as assistant to the chief engineer, by whom he was regarded as a man of exceptional ability, with a first-class knowledge of engineering, and, in addition, a special aptitude for the legal aspects of his profession. In his university days he was an enthusiastic Volunteer, and on the outbreak of the present war he obtained a commission in the 6th (Service) Battalion of the Royal Warwickshire Regiment, going to the front early in 1915. At the time of his death he was in command of a machine-gun section, and was shot by a sniper, being killed instantaneously. Energetic and efficient in his work, modest and kindly in his bearing, steadfast of purpose, he was indeed a very gentle, perfect knight.

LIEUT-COL. A. ST. HILL GIBBONS, who has been killed in action, was well known as an African explorer. During the 'nineties he and the men who were associated with him in his travels covered more than 20,000 miles beyond the reach of railways, mainly in remote parts of the continent. On two expeditions in 1895–6 and 1898–1900 he thoroughly explored and mapped Barotseland and other parts of the Upper Zambezi basin, tracing the Zambezi to its most remote source, and providing valuable information about the navigability of the river, the resources of the country, and the customs of its inhabitants. His routes in this region covered at least 8000 miles. His maps were based on numerous astronomical observations, as well as careful compass surveys, and the late Mr. E. G. Ravenstein formed a high opinion of their accuracy. On his second expedition, Col. Gibbons, after completing his work in Barotseland, followed the Congo-Zambezi watershed towards Lake Tanganyika, and then, striking north, made his way to the Nile Valley. Ewart Grogan was the first traveller to complete the transcontinental journey from south to north; Col. Gibbons was a close second. He lectured more than once before the Royal Geographical Society, and in 1906 was awarded by the society the Gill Memorial. After serving through the South African War, Col. Gibbons settled in northern Rhodesia, and took an active interest in the development of that territory, delivering a lecture on its resources and prospects before the Royal Colonial Institute only a few months before the outbreak of the present war.

WE regret to learn of the death, in action, on July 14, of Second Lieut. C. M. Selbie, formerly assistant-naturalist in the National Museum, Dublin. He enlisted as a private in the Royal Scots, and in January, 1915, he received a commission as second lieutenant in the Scottish Rifles, and had been at the front since November. During the two years that Lieut. Selbie spent in the National Museum of Ireland he devoted himself with energy and enthusiasm to the collections of the Myriapoda and Crustacea. He rearranged the exhibition series and also undertook to name a portion of the collections of Crustacea procured on the west coast of Ireland during the Fishery Survey of the Department of Agriculture. The following is a list of the more important notes and papers published by him:—"A New Variety of *Polydesmus coriaceus*, Porat, and Note on a Centipede Monstrosity" (*Annals and Magazine of Natural History*); "Some New Irish Myriapods" (*Irish Naturalist*); "New Records of Irish Myriapods" (*Irish Naturalist*); "The Decapoda Reptantia of the Coasts of Ireland," part i., "Palinura, Astacura, and Anomura (except Paguridea)" (Fisheries, Ireland, Sci. Invest.). In addition, he had prepared but left unpublished "The Paguridea of the Coasts of Ireland."

BY the deaths of Prof. Johannes Ranke, of the University of Munich, and of Prof. Gustav Schwalbe, of the University of Strasburg, Germany has lost two of her most renowned students of the human body. Both died full of years and honours. Their careers were remarkably alike. Ranke, who was born in 1836, did his first research on tetanus, then devoted himself to physiology, and, finally, in the early eighties, took up the study of physical anthropology, and made many and important contributions to our knowledge of that subject. For many years he was editor-in-chief of the *Archiv für Anthropologie.* Schwalbe, somewhat Ranke's junior—he was born in 1844—did his first research on Infusoria, then devoted himself to the study of the microscopic structure of tissues, his chief work being an elaborate and accurate investigation of the finer structure of the sense organs. He taught and researched at Bonn, Amsterdam, Halle, Freiburg, Jena, and Königsberg, being ultimately called to the chair of anatomy in Strasburg in 1883, where he laboured for thirty-six years. He was well known and much respected by anatomists in every country.

The work by which he is best known, his researches into the nature of fossil apes and men, he began relatively late in life. At the end of last century he had accumulated such masses of observation dealing with the anatomical evidence bearing on the origin of man that he founded and issued a journal—the *Zeitschrift für Morphologie und Anthropologie*—for the publication of papers dealing with the evolution of the higher mammals.

AMONG the promising young geologists who have given their lives for their country we regret to note the name of Lieut. Richard Roy Lewer, King's Royal Rifle Corps. He died on July 21 of wounds received a few days previously, at the age of twenty-six. He was the elder son of Mr. H. W. Lewer, of Priors, Loughton, Essex, and was educated at Denstone College, and afterwards at Wren's. On the outbreak of war he was carrying on geological exploration at Calgary, but at once returned to England to take up military duties, and was gazetted second lieutenant on September 24, 1914, and lieutenant on February 22, 1915. He was elected a fellow of the Geological Society in 1911, and joined the Geologists' Association in 1914. His principal geological work had consisted in professional oil exploration, which he had carried out in Burma, Russia, Asia, and Western Canada.

THE death is announced, at the age of sixty-nine years, of Mr. Morton A. Smale, for many years dean of the Royal Dental Hospital, examiner in dental surgery at the Royal College of Surgeons of England, and joint author of "Injuries and Diseases of the Teeth."

AT the annual meeting of the British Pharmaceutical Conference, held on July 12, the president (Dr. David Hooper) devoted his address chiefly to an account of the drug resources of India and the Colonies. India is rich in drugs; our ancestors long ago sailed thither to fetch "spices, precious stones, and drugges for the Poticaries." Amongst the products to which attention was directed are cinchona, senna, strychnine, opium, turpentine, and thymol, not to mention frankincense and myrrh, which are still sold from the godowns of Bombay. Thousands of acres of cinchona are now grown near Darjeeling and in the Nilgiri Hills, and this is noted as "a grand result in acclimatisation," due to the pioneer work of the late Sir Clements Markham. Indian henbane has been found to give a high yield of mydriatic alkaloids, which are now becoming very valuable. Cantharidin, too, is furnished in high proportion by Indian species of Mylabris. In the Malay States ipecacuanha is successfully cultivated, whilst aloes, buchu, belladonna, and monsonia are exported from South Africa. Coriander and caraway are cultivated by farmers' wives in the latter country for the sake of pin-money, and it is suggested that this example might be followed here as an inducement to grow medicinal herbs.

M. CHAMBRELENT has studied statistically the subject of still-births and deaths of infants within three days of birth in France. He finds that the annual mortality from this cause is 4 per cent. of births, that it is much greater in the towns than in the country, and that it is higher the more populous the town. This difference between town and country he considers to be due to the less hygienic conditions obtaining in the towns, to alcoholism, and to chronic maladies, particularly syphilis and tuberculosis, which are more prevalent in towns than in the country. The male sex is more affected by still-birth than the female sex. It is particularly at birth and the few days following birth that this mortality among boys is so marked, and to a considerable degree it is preventable. Illegitimacy, as might be expected, considerably augments this mortality. The older the mother, also, the greater the mortality, while it is much higher at the first pregnancy than in subsequent pregnancies. This mortality is a factor which is by no means negligible in bringing about the depopulation of France (*Revue scientifique*, July 1–8, 1916, p. 391).

THE *Indian Journal of Medical Research* for April (vol. iii., No. 4) contains a number of papers on bacteriology, parasitology, and public health. Capt. Morison discusses the dose of alum necessary for the purification of water by precipitation. He finds that the best dose of alum for the perfect clarification of a soft water is obtained by adding half the equivalent weight of alum necessary to react completely with the alkalinity calculated as calcium carbonate. For a hard water the same rule holds good; but an equally good clarification can be obtained by the use of a smaller dose and a mechanical filter. A watery solution of hæmatoxylin gives a reddish colour when the correct dose has been given.

IN second series, part ii., vol. xvi., of the Journal of the Academy of Natural Sciences, Philadelphia, Mr. C. B. Moore presents an elaborate memoir on the exploration of aboriginal sites in the Tennessee River valley. The report would have been more valuable if it had been accompanied by a summary and some attempt to assign the remains to a particular tribe or group of tribes; but it contains abundant materials for a study of Indian mortuary customs. The district has suffered much from the depredations of curio-hunters, and the trade of "faking" flint implements seems to be a thriving one. The finest thing found is a splendid native pipe, cut in Catlinite or some similar red stone, representing a figure bent on one knee, the bowl and place for the mouthpiece being in the back of the carving. It would be difficult to exaggerate the importance of this admirable specimen, which may be regarded as one of the best examples of the art of the aborigines. He also found specimens of a reel-shaped decoration in copper, which seems to have served as a pendant or breast ornament. Only one other specimen of this type appears to be in existence. We have also the record of the first discovery of cowrie shells in an aboriginal mound. The date and mode of their introduction are questions of some difficulty, and Dr. W. H. Dall, writing to the author, says:—"Your cowries may have come off one of Columbus's own ships!"

IN vol. lxiv., No. 3322, of the Journal of the Royal Society of Arts, Sirdar Daljit Singh, of the India Council, gives a good account of the Sikhs. The sect at present numbers about five millions. It is well to have a description by an expert of the remarkable rite of *pahul*, or initiation. An iron vessel is brought into the assemblage, in which a mixture of water and sugar is placed. This is stirred with the point of a sword while the Japji and a collection of sayings of Guru Govind, who died a martyr in the time of the Emperor Aurangzeb, are recited. Some of the mixture is poured over the heads of the candidates for initiation, and the rest is drunk. The Sirdar rightly directs attention to the fact that Sikhism is a literary religion, and to the beauties of the Granth, or Scripture, of the sect. He also pays a well-deserved tribute to the loyalty and bravery of his brethren in the present war.

THE apparent ease with which the ancient Egyptians cut so stubborn a material as granite has long occupied the attention of Egyptologists. In part iii. of *Ancient*

Egypt for 1916 Mr. Somers Clarke describes how granite boulders from which building stone for the Aswan Dam was procured were dealt with by a party of quarrymen imported from Baveno, in North Italy. A vertical cut was made across the boulder, and it was split by wedges, each group containing two pairs of wedges side by side, driven into holes made with steel points. Dressing was done by means of a heavy metal tool, not unlike an adze, with its sharp end serrated. This was let fall vertically on the face of the stone, and by means of it all inequalities were removed. In the same connection, Mrs. Bertha Broadwood describes the method in use at the granite hills in Mysore. A line of small hollows is worked on the surface of the rock, a little straw is burnt over the hollows, a cupful of water is poured in, and the rock is thus split along the line of hollows to the depth of several inches. It may also be noticed that "feathers," or slips, of sheet metal are in Egypt placed on each side of the wedges to prevent them from crushing and grinding the edges of the grooves, which would waste the force used in merely enlarging the hole. These do not seem to have been used before Roman times.

A RECENT number of the *Bulletin of Entomological Research* (vol. vii., part 1) contains, among other papers, one by Dr. A. E. Cameron describing some experiments on the breeding of the mangold-fly. This student has already identified this common farm pest (*Pegomyia betae,* Curtis) as *P. hyoscyami,* Panz., the maggots of which often mine the leaves of Belladonna and other Solanaceæ. He now shows that flies reared from Belladonna will, in the absence of that plant, lay eggs on mangold leaves, in which the maggots complete their transformations. Curiously, flies reared from mangolds could not be induced to lay eggs on the closely allied sugar-beet. The dock-mining maggots belong to a distinct species of Pegomyia—*P. bicolor,* Wied—which will not lay eggs on either mangold or beet.

ANOTHER destructive dipteran crop pest of the British Islands, the cabbage-root maggot (*Phorbia brassicae*), which is also common and harmful in North America, is described at length by A. Gibson and R. C. Treherne in Bulletin 12 of the Canadian Department of Agriculture (Entomological Branch). The nearly allied *P. fusciceps* and the onion maggot (*Hylemyia antiqua*) are also dealt with. This bulletin is important for the careful records of generations through the yearly cycle and the variation in the numbers of eggs laid in the different months; also for some excellent photographs of the damage caused by the maggots to plants. It is noteworthy that the tarred discs for protecting cabbage plants from egg-laying by the fly are "widely used by market gardeners" in Canada, whereas suggestions to try them in these countries usually give rise to contemptuous amusement. The larvæ of *P. fusciceps* eat a great variety of plants, but occasionally they seek a change of diet by devouring locusts' eggs.

PUBLICATION 253 of the Queensland Geological Survey contains a description by R. J. Tillyard of some Mesozoic and Tertiary insects, mostly collected by the chief Government geologist, B. Dunstan, who contributes notes on the stratigraphical position. Most of the specimens come from a thin bed in the Coal Measures of Ipswich, South Queensland, for which a Triassic age is now claimed. These represent new genera of Blattoidea (1), Protorthoptera (2), Coleoptera (2), Mecoptera (1), Protohemiptera (1), and Hemiptera (1), besides a new and interesting archaic Odonate and the wing of a supposed Lepidopteron (Dunstania, n.g.), which, however, is perhaps more comparable with such a Dipteron as Psychoda. Triassic insects are little known, and we are glad to learn that this is only a foretaste of what may be expected from the Ipswich bed, in which the combination of archaic with more modern specialised types is particularly marked. From the Jurassic Wianamatta shales of St. Peter's, near Sydney, are some new genera of Blattoidea and Coleoptera, as well as a Protorthopteron, Mesotitan, with a forewing estimated to measure 9 in. by 3 in., recalling the huge Titanophasma of the Commentry Coal Measures, and affording yet another instance of the persistence of archaic types in the Australian fauna. The wing of a Neuropteron from the Tertiary shales of Goodna, Queensland, is referred to the Osmylidæ under the new generic name, Euporismites. The poor impressions of a dragon-fly larva from the Tertiary or Cretaceous shale of Duaringa scarcely warrant the introduction of a new generic name, even if it were ever wise to base a new genus on the larva alone.

THE New South Wales Department of Mines is publishing a very elaborate monograph upon the geology and mineral resources of the southern coalfield, of which part i., dealing with the south coastal portion, by Mr. L. F. Harper, has just been issued in the form of a handsome volume of more than 400 pages with numerous illustrations. The Permo-Carboniferous formations within the area described are divided into four series, namely, (1) upper (Bulli-Newcastle) coal measures, (2) middle (East Maitland or Tomago) coal measures, (3) upper marine series, (4) lower (Clyde-Greta) coal measures. The upper marine series has not been found to contain any productive coal seams, and only the first-named series has hitherto been found to be of any value as a coal producer, the seams of the middle coal measures being of poor quality, whilst the areas of the lower coal measures are comparatively small, and the coal in them is of variable quality. The workable area of the upper coal measures is estimated at about 350 square miles; it contains seven coal horizons, of which the uppermost, or Bulli, coal seam is practically the sole source of coal supply. This seam appears to vary from 2 ft. to 9 ft. in thickness, and "rolls" and wash-outs appear to be numerous. The coal is of fair quality, but contains a rather high percentage of ash. The geology of the coal seams as exposed in the various collieries is described in much detail in the memoir.

THE Transactions of the Geological Society of South Africa, vol. xviii. (1916), include a long paper by Mr. E. T. Mellor on the Upper Witwatersrand system, in which a case is made out for a deltaic origin of a large part of the strata. The quartzites, banded iron-ores, and other features interestingly resemble those of the Algonkian beds of North America. In the discussion on this paper (Proc., *ibid.*, p. 42) Prof. Schwarz regards the conglomeratic layers as incompatible with delta-flats, and as produced by temporary floods running from mountain-sides over the accumulations of normally dry plain-lands.

THE term "peneplain" has undergone modification in meaning, and sometimes in spelling, since it was first introduced by Prof. W. M. Davis in 1889. In the *Geographical Review* for June, vol. i., No. 6, Prof. D. W. Johnson, of Columbia University, pleads for an extension, and at the same time precision, in its use. He suggests writing the word "peneplane" and using it for the penultimate stage in any cycle of erosion. The word "plane" he would use for the level erosion surface produced in the ultimate stage, and "plain," as generally used, for a low-relief region of horizontal rocks. The question is, of course, a technical one for geographers to decide, and Prof. Johnson's short paper is worth consideration.

IN recent years the intercorrelation of meteorological data in different parts of the world has suggested important results which promise to have considerable economic value. Dr. G. T. Walker, Director-General of Observatories in India, has published a memorandum regarding the probable amount of monsoon rainfall in 1916 (Simla: Government Press; 8 annas). Data from South America, the Indian Ocean, and Ceylon, as well as from India, are briefly considered, and the result is to lead Dr. Walker to suggest that the outlook for the general monsoon rainfall of India is on the whole unfavourable this year, and that the rainfall is likely to be in slight or moderate defect, at any rate in the earlier part of the season. The deficiency is likely to be most marked in north-west India, while conditions appear to be favourable in Lower Burma, Assam, Malabar, and south-east Madras. Forecasting of this nature is still in its infancy, but Dr. Walker's attempt is most interesting, and promises to grow in value year by year.

THE August "Catalogue of Books in Standard Literature" of Mr. F. Edwards, High Street, Marylebone, contains many works dealing with general natural history, botany, conchology, ornithology, mammalia, entomology, and ichthyology.

OUR ASTRONOMICAL COLUMN.

THE AUGUST METEORS.—Mr. Denning writes:—"There is every indication that the Perseid display of 1916 will be of rather unusual activity. The shower was quite rich on July 31, August 1 and 5, and evidently increasing. Some fine meteors were observed, and especially on July 26, 10h. 7m., August 2, 11h. 41m., August 3, 9h. 44m., and August 5, 9h. 14m. That on the latter date was a fireball, and it formed a brilliant spectacle as seen from Bristol, falling from Cygnus to Ophiuchus.

"The maximum of the shower will probably be attained on Friday, August 11, but there will be many meteors visible also on August 12. The display is one noted for its long duration, but the really active phase of the phenomenon is included within one or two nights.

"The average height of the Perseids is from 81 to 53 miles, and their velocity 38 miles per second. Their flights are directed from the north-eastern sky, the radiant at $44^\circ+57^\circ$ in Perseus being situated in that quarter of the heavens.

"The time of maximum should be carefully determined, and the horary numbers ascertained during the nights of August 11 and 12. The moon, however, being very nearly full, will prevent many of the smaller meteors being observed.

"The more brilliant objects should be especially noted, and their paths among the stars recorded as accurately as possible. The phosphorescent streaks which are generated along the courses enable the direction to be exactly registered on a star map or celestial globe. These Perseids furnish many fine meteors, and fireballs frequently occur among them. In the case of one of the streaks or afterglows remaining visible for several minutes, its drift amongst the neighbouring stars should be noted as precisely as possible."

JULY METEORS.—Mr. Denning writes:—"The very fine summer weather prevailing during the latter half of July enabled a large number of observations to be obtained. The first Perseids were detected on July 8, but the shower was not very prominent until July 31 and August 1. A splendid meteor was seen from it, or possibly from a contemporary display in the same region, on July 26, at 10h. 7m.

"There was a very active radiant of slow and brilliant meteors from the point at about $302^\circ-8^\circ$ from July 7 to the end of the month, and it was still visible on August 2. Twenty of its meteors were recorded at Bristol, and many others were seen by Mrs. Fiammetta Wilson at Totteridge. Six of the meteors were doubly observed, and their real paths have been computed.

"During the last week of the month the Aquarid shower came actively into play from $338^\circ-11^\circ$. This stream has been only scantily visible in the past few years, but its return in 1916 showed it to have recovered its old-time prominence. The chief radiants seen were:—

July 31	$31^\circ+53\frac{1}{2}^\circ$	8 ↕'s	Perseids
August 1	31+55	10 ↕'s	,,
July 25–29	36+47	7 ↕'s	θ Perseids
July 7–August 2	302 − 8	20 ↕'s	α Capricornids
July 23–August 1 ...	302+24	6 ↕'s	Sagittids
July 23–29	333+58	7 ↕'s	ζ Cepheids
July 23–August 1 ...	338 − 11	12 ↕'s	δ Aquarids

"The more interesting real paths were:—

July	G.M.T. h.	m.	Mags.	Height at first. Miles	Height at end. Miles	Path. Miles	Velocity per sec. Miles	Radiant Point ° °
8	11	59	>♃ − ♀	77	51	121	32	22+24
19	10	18½	1 − 1	76	51	60	26	301 − 8
25	10	13½	2 − 2	89	55	40	48	334+57
,,	11	14	>1 − >♃	70	41	61	25	302 − 8½
,,	11	32	>♀ − 2+♀	62	44	37	18	302 − 9
,,	11	39	2 − ♂	61	41	46	23	301 − 10
26	10	7	>♃ − >♀	86	49	91	37	35+51
27	10	34½	>1 − >1	69	60	52	37	338 − 14
,,	10	15½	3 − 2	59	51	18	18	301 − 9
,,	10	45½	4 − 3	69	43	36	54	332+25
29	10	3	>1 − >♃	78	55	49	24	303 − 7
,,	10	10½	2 − >1	84	58	118	48	5+13
31	10	39	5 − 4	61	55	80	40	342 − 16

"Observers—Mrs. Fiammetta Wilson, Totteridge; Miss A. Grace Cook, Stowmarket; and the writer, Bristol."

A SUN-SPOT IN HIGH LATITUDE.—In the course of the heliographic work at Greenwich, it has been found that photographs of the sun taken at the Cape Observatory on December 26, 1915, show a small, but unmistakable, spot in the extraordinary latitude 59·6° S. This is considerably above that of the spot observed by Peters in 1846, the latitude of which was 50·4°, and is apparently the highest yet recorded (Journal B.A.A., vol. xxvi., p. 292).

LOWEST EFFECTIVE POWER OF A TELESCOPE.—It has usually been considered that the lowest power which can be employed on a telescope, while retaining full illumination, is one of five to each inch of aperture, this estimate being based on the assumption that the average diameter of the pupil of the eye is one-fifth of an inch. Mr. W. H. Steavenson has investigated the diameter of the pupil by flashlight photography, and has found that while one-fifth of an inch may be a fair estimate of the aperture in daylight, one-third of an inch is much nearer the aperture at night. An interesting application of this result has been made by Naval Instructor M. A. Ainslie, R.N., in connection with the 72-in. mirror of the Rosse reflector, now included in the collections at the Science Museum. The "original" eyepiece of the great telescope has been found to have an equivalent focal length of 7·7 in., giving a magnifying power of 84 and an emergent pencil of 0·855 in. diameter. It follows that the effective aperture of the speculum, when this eyepiece was used, would be only 25 in., or approximately equal in light-gathering power to a refractor of 20-in. aperture. A power not less than 216 would be necessary to give the full benefit of the large mirror. Although the eyepiece in question was not the only one employed, it may be important to take account of the fact that some of the observations at Parsonstown were not made with the full aperture of the telescope (Journ. B.A.A., vol. xxvi., p. 302).

VENTILATION AND METABOLISM.

The New York State Commission on Ventilation has issued an outline statement of the work done in 1915. In the first report the Commission supported the view of the English physiologists, that the principal factors which make for comfort are temperature humidity and air movement, and that the effects of poor ventilation cannot be explained by the presence of volatile organic poisons in the air or any chemical change in the atmosphere. Even slight differences in temperature produce characteristic physiological responses in the body, affecting the output of physical work and likewise the inclination to do mental work. "In only one respect did the chemical quality of the air breathed show any characteristic effect on the body mechanism, this effect appearing in the slightly diminished appetite for food in a stale, unventilated atmosphere."

The Commission has now sought to find what quality of the stale used air has this effect. Is it the odour present? the increased CO_2? or what? Artificial body odours and excess of CO_2 have been introduced into a room ventilated with fresh air, but these have not produced the effect on the appetite. We do not believe that the Commission has ever properly eliminated the physical conditions. In their experiments they arranged that the temperature (wet and dry bulb) should be kept the same in the ventilated as in the stale-air chamber, and in the latter they placed a table fan to blow air upon the subjects, in order to imitate the current of air which circulated in the chamber ventilated with fresh air. There is no proof that the fan had this effect. It may not have ventilated the clothes of the subjects as effectually as the current of air did in the fresh-air chamber. We would suggest that the rate of cooling be measured with the katathermometer. Until this is done we cannot accept the view that the diminished appetite is due to any chemical alteration of the stale atmosphere. It seems more likely to be caused by a diminution in metabolism resulting from a lessened rate of cooling of the body surface.

The Commission says that for extreme mental concentration, involving an almost entire absence of physical exertion, a temperature of 75° at 50 per cent. relative humidity was preferable to 68° at the same humidity, whereas for tasks involving greater motor effort, such as typewriting, the cooler temperature was coincident with the greater output. Here again data are wanted as to rate of cooling. Was the atmosphere a still one? In this country 63° F. is regarded as a suitable temperature, but the comfort is far more a question of rate of cooling than of temperature. We would point out that mental concentration which demands an entire absence of physical exertion and so warm an atmosphere tells against the health of the body; the metabolism is greatly reduced, and with it the appetite; the digestive organs miss the massage due to bodily exercise and deep breathing; the circulation is not made vigorous by the pumping action of the skeletal muscles and those of respiration; and the lungs are but little expanded by the shallow breathing. Daily open-air exercise is essential to compensate for such intense mental application if the health is to be maintained. Such work, together with high feeding, alcoholic pick-me-ups, and amusements taken in hot atmospheres, leads to the bodily flabbiness and middle-age degeneration of the business man. The scholar requires his "constitutional" or else he will become hypochondriacal.

The Commission has examined the conditions of the nasal mucous membrane in hot and cold atmospheres, and generally confirms conclusions reached by the reviewer (*cf. Lancet,* May 10, 1913). In the majority of subjects examined the reaction from heat is one of increased swelling, moisture, and redness, and the reverse from cold. Air blown upon the face by fans greatly modifies the effect. On going from the cold to the hot room with fans there is a decrease in the size of the inferior turbinates and in the amount of moisture. The characteristic change on passing from the hot to the cold condition with fans is an increase in the turbinates and secretion. The Commission reports that laundry workers show a high percentage of cases of atrophic rhinitis, the result of working in hot humid atmospheres. The changes of the nasal membrane produced by environment must materially affect the incidence of infection by "colds." This subject is dealt with by the reviewer in an article published in the *British Medical Journal* for April 15, 1916.

Mr. Palmer, the chief of the investigating staff of the Commission, has fashioned a new sampling apparatus for the determination of aerial dust. Air is drawn, by means of an electric-driven fan, through a U-tube containing some water. The water is thrown into a spray formation in a conical glass vessel attached to the U-tube, and the air is washed of its suspended dust as it passes through the water shower. One hundred cubic feet of air can be put through in thirty minutes. The water can be evaporated and the dust weighed, or the dust can be estimated by the turbidity of the water against a set of standards, or the particles of dust—in a measured quantity of the water—counted under the microscope. The pernicious effect of dust on the lung is not properly realised by the public. Dust containing free silica is the most potent cause of phthisis prevalent in miners, granite and flint workers, etc. The motor-cars stir up clouds of dust from roads metalled with flint and granite. People dislike the dust on their clothes, but do not realise the damage it causes to their lungs. All dusts diminish the efficiency of the lungs and lead to lessened expansion and shortened breath—the asthma of dusty occupations.

Leonard Hill.

THE AMERICAN PHILOSOPHICAL SOCIETY.

The annual meeting of the American Philosophical Society was held on April 13–15, during which nearly fifty papers were presented on a large variety of topics. The address of welcome was delivered by Dr. W. W. Keen, the president, who, with the vice-presidents, Dr. W. B. Scott and Prof. E. C. Pickering, presided at the various meetings.

We are able, from the material which the secretary, Prof. A. W. Goodspeed, has sent us from Philadelphia, to give brief abstracts of some of the papers which were read.

Dr. R. F. Bacon, "The Work of the Mellon Institute in its Relations to the Industries and to the Universities":—

The first industrial fellowship at the Mellon Institute was founded through a grant from a baking company which desired to improve its product. The sum of money given was used, as has been all the money which has been subscribed to industrial fellowships, with the exception of small sums for the purchase of very special apparatus, to secure the services of a man who had shown a gift for research to devote all his time to certain problems connected with the baking industry. During the five years which have elapsed since the establishment of the first fellowship forty-seven distinct business organisations have endowed one hundred and five one-year fellowships. The total amount of money contributed to the institute for the five years ending March 1, 1916, was 72,000*l.* In addition to this sum 4260*l.* was awarded in bonuses to fellows for the successful completion of problems. During the five years the institute itself expended about 35,000*l.* Besides this amount, the building and permanent equipment of the institute represent an investment of between 60,000*l.* and 70,000*l.* That the results obtained under the industrial fellowship system of the Mellon Institute have justified the expenditure of these sums of money has been shown by the fact that during the first four years seven out of each ten problems assigned to the institute for study were solved to the satisfaction of the donors. A large percentage of the fellowships were renewed, showing the confidence which industrialists have in the institute. Twenty-five patents have been granted to the holders of fellowships, and there are as many more pending. Above all, some twenty new processes developed in the institute are now in actual operation on commercial scales.

Dr. G. F. Atkinson, "The F_2 Generations, and Back- and Inter-crosses of the F_1 Hybrids between *Œnothera nutans* and *pycnocarpa*":—

The result of the observations shows that in the F_1 generation from a cross between two feral, non-mutating species quadruplet hybrids appear in the F_1 generation; one is a blend and self-sterile, but its pollen and egg cells are fertile; two of the degregates are fixed types and breed true, while the fourth hybrid (third segregate) appears to split in the second generation. The back- and inter-crosses show either striking examples of patrocliny, or splitting into two types in some cases, into three types in other cases. But no new types (with a single exception) appear; they all conform to one or other of the six types, the primary parental types, or one or more of the F_1 hybrid types. The single exception is a mutant of the dwarf *gracilis* type.

Prof. J. M. Coulter, "Inheritance through Spores":—

The current work in plant genetics suggests the question of the most favourable material. If sexual forms are desirable, it seems obvious that the most primitive should be included in experimental material, since in such forms the sex act is not involved with other structures, the origin of the sexual cells is observable, and the whole situation lends itself to more complete control and analysis. The sexual cells, however, are genetically related to spores, so that the origin of spores and their behaviour in reproduction are preliminary to the origin of gametes and sexual reproduction. Reproduction by spores, therefore, is a field rich in experimental possibilities. Analysis of the conditions of spore formation furnishes a clue to the additional conditions necessary for gamete formation; experimental modification of the "germ plasm" is more simple and definite than in complex material; and breeding from spores with essentially pure lines is especially favourable for securing more definite data in reference to the possibilities of variation and inheritance.

Prof. W. J. V. Osterhout, "The Dynamics of Antagonism":—

If two toxic substances antagonise each other this is called action antagonism. An accurate measure of antagonism is afforded by determining the electrical resistance of living tissues. Toxic substances cause a fall of resistance, but if in a mixture of two such substances resistance falls less rapidly, it is evident that this is due to antagonism. In the case of the common kelp, Laminaria, NaCl causes a fall of resistance, while $CaCl_2$ causes a rise, followed by a fall, of resistance. In mixtures of NaCl and $CaCl_2$ the resistance rises and then falls; by using the right proportions the fall may be made very gradual. These facts may be explained by assuming that the resistance is due to a substance the production of which is accelerated by $CaCl_2$, while its decomposition is checked by a compound formed by the union of both NaCl and $CaCl_2$ with a substance in the protoplasm. This throws new light on the manner in which salts act in preserving life. It has been found that the electrical resistance is a very delicate and accurate indicator of the vitality of protoplasm, since any kind of injury is at once indicated by a fall of resistance. This permits a quantitative meaning to be given to such terms as vitality, injury, recovery, and death. The mechanism by which changes in resistance are produced by salts is therefore of great importance. The facts here presented give a new insight into this mechanism.

Prof. F. Ehrenfeld, "Jointing as a Fundamental Factor in the Degradation of the Lithosphere":—

In most text-books the question of land surface levelling or degradation is considered more from the view-point of the atmospheric or other surface cause than from that of the construction of the solid portions of the earth itself. This is a somewhat mistaken view to take of the case, as the stony mass of the earth has been shown by many geologists to be subject to a constant fracturing, or jointing, which shows itself in various ways, such as influence on river drainage, repeated groups of islands, bays along sea coasts, and in certain types of volcanic and earthquake appearances. The paper discussed these and also the subject of marine planation to produce a lowering of the land below sea-level. Illustrations of such marine action were shown from the Maine coast and also from the forms and positions of some of the Atlantic Ocean islands. This subject of the action of the sea to produce a general levelling, though much discussed some decades ago, has been neglected by many modern students, but is now becoming prominent under newer ideas, and this paper is in part a study of jointing in the mass of the lands to assist in such action and hasten continental land levelling and destruction by creating in the rock mass through joints great lines of weakness which, under the attack of both the atmosphere and the sea, compel the falling apart of the land. The author proposed a "law of joints" in which the controlling influence of joint lines was more definitely stated.

Prof. W. M. Davis, "Sinking Islands *versus* a Rising Ocean in the Coral-Reef Problem":—

Since Darwin's voyage in the *Beagle*, eighty years ago, nearly all geologists who adopted his theory of coral reefs accepted also his postulate that the reef-bearing islands have subsided with the subsiding ocean bottom. In later years, and largely under the leadership of Suess and Penck, the possible variation of ocean level around fixed islands has been emphasised. When it is seen that a rise of the ocean surface around still-standing islands would produce all the conditions that arise from Darwin's postulate of subsiding islands in an ocean of constant level, search should be made for some means of evaluating these two alternatives. The result of such a search shows that the theory of a changing ocean involves many extravagant complications which have not been sufficiently considered by those who accepted it; while the theory of subsiding islands is relatively simple and economical. Darwin's original theory is to be preferred on those grounds.

Prof. J. P. Iddings, "The Petrology of some South Sea Islands and its Significance":—

The islands of Tahiti, Moorea, Huaheine, Raiatea, Tahaa, Bora Bora, of the Society group, and Hiva-oa and Nukahiva, of the Marquesas, were visited in order to ascertain whether the volcanic rocks composing them are of such a character that they support the theory of isostacy, which demands that the deep portions of the earth's crust, or the lithosphere, under the Pacific Ocean should consist of heavier material than that underlying the continent of North America. It was found that the volcanic rocks of these islands are noticeably heavier on the average than the igneous rocks occurring in various parts of the American continent. Each of the islands visited was found to be an extinct basaltic volcano, considerably eroded, and partly submerged beneath the sea.

Prof. J. J. Stevenson, "Coal Formation":—

The doctrine that the fossil fuels from peat to anthracite are a continuous series has been the subject of renewed discussion within recent years. The author felt compelled to make serious investigation to free himself from doubts aroused by the statements of some authors. The general study has advanced so far as to justify presentation of the first part of his monograph. The plan adopted is to discuss the fuels in order of age, beginning with peat and closing with the Palæozoic coals. The first part considers peat and the Tertiary coals; the second will consider the Mesozoic and the Palæozoic coals. The author hopes to make evident the inherent probability of the doctrine that, in spite of difference in plant materials, the coals throughout form a connected series, not merely in mode of accumulation, but also in physical structure and in chemical composition.

Mr. G. Scatchard and Prof. M. T. Bogert, "A New and very Sensitive Indicator for Acidimetry and Alkalimetry and for Determining Hydrogen Ion Concentrations between the limits of 6 and 8 on the Sorensen Scale":—

The authors have discovered that dinitrobenzoylene urea is an unusually sensitive indicator, and one which can be prepared easily, in any desired amount, from anthranilic acid. It changes from colourless to greenish-yellow with a change in hydrogen ion concentration from 10^{-6} to 10^{-8}, the development of the colour following regularly the decreasing concentration of hydrogen ion. It is very little affected by neutral salts or proteins, and not at all by the ordinary biological preservatives, chloroform and toluene. The colour does not fade perceptibly in two days, and does so but very slightly in a week. It therefore promises to be very useful in the measurement of hydrogen ion concentration of biological or other liquids in this important range, for which the previously known indicators are not very satisfactory.

Dr. F. W. Clarke, "The Inorganic Constituents of Marine Invertebrates":—

It is a commonplace of geology that many limestones are formed from the remains of marine animals, such as corals, molluscs, crinoids, etc. Some of these limestones are magnesian, some are phosphatic, and others are of the ordinary type, consisting chiefly of calcium carbonate. They were originally deposited at the bottom of the sea, and their composition depends upon the composition of the organisms which formed them. The present investigation has for its purpose to determine what each group of organisms contributes to the sediments; and in order to answer this question nearly 250 analyses have been made of the shells or skeletons of marine invertebrates, covering a range from the Foraminifera up to the Crustacea, and including also the coralline algæ. It was already well known that corals and molluscan shells were composed almost entirely of calcium carbonate, and that fact has been verified. The shells of one group of brachiopods, however, consist largely of calcium phosphate, and that substance is also abundant in the Crustacea. These animals, and also vertebrate skeletons, contribute phosphates to the sediments. The Foraminifera, Alcyonaria, sea-fans, echinoderms, and calcareous algæ, with some minor groups or organisms, contain much magnesia, and therefore aid in the formation of magnesian limestones. Curiously enough, the amount of magnesium carbonate in any series of organisms varies with the temperature of the water in which the creatures lived, being small in cold and large in warm waters. A sea-urchin from Greenland, for example, contained 6 per cent. of magnesium carbonate, and one from near the equator contained more than 13 per cent. In certain algæ from the West Indies 25 per cent. was found. Furthermore, some organisms have their calcium carbonate in the form of aragonite, and others consist of calcite. The aragonitic organisms are all non-magnesian, while the magnesian forms are all calcitic. The data obtained in this investigation have been applied to the study of coral reefs, which owe their composition to all the creatures living upon them, and not to the corals alone. In fact, the corals are often of less importance than their associates.

Dr. W. Duane, "Some Relations between Matter and Radiation":—

It is known that the impacts of atoms of electricity against atoms of ordinary matter produce radiation. Mr. Hunt, Dr. Webster, and the author have been investigating the relations between the energy of the atom of electricity and the frequency of the radiation it produces. The most striking facts discovered are that in the case of the so-called *general radiation* the energy required is strictly proportional to that frequency, and in the case of the so-called *characteristic radiation* the energy required is larger than in the preceding case and not always proportional to the frequency. High-frequency vibrations are associated with the central parts of an atom of matter, in which the electromagnetic field is very strong. In order to reach a point in an atom of matter where a given frequency of vibration is produced the atom of electricity must have at least enough energy to overcome a certain force of repulsion acting between them. If we follow out the line of reasoning and apply Maxwell's distribution law and what has been called the fourth power law to the case of the atoms of electricity flying about in a hot body owing to its thermal agitation, we arrive at an equation for the distribution of energy in the spectrum that represents the facts with considerable precision. These laws discovered by experimental investigation have a practical bearing on X-ray phenomena also. They indicate what must be done in order to produce those very high-frequency radiations that hitherto have been obtained from radioactive substances only.

Dr. L. A. Bauer, "Relation between Changes in Solar Activity and the Earth's Magnetic Activity, 1902–14":—

No criterion of solar activity has been found to synchronise precisely with any quantity used as an index of the earth's magnetic activity. Thus, for example, the maximum magnetic activity in 1892 preceded the maximum sun-spot activity of that period by a year. So again the recent minimum magnetic activity of the earth seems to have occurred in 1912, whereas the minimum sun-spot activity did not take place until 1913, or a year later. Then the amount of magnetic activity is not necessarily commensurate with that of solar activity, whatever measure of the latter be used. When the comparisons between the solar data and the magnetic data are made for intervals of less than a year—a month, for example—the lack of exact synchronism and the lack of proportionality between the two sets of changes become especially noticeable. Fortunately, beginning with 1905, we have a new set of figures, the values of the solar constant, determined with high precision at Mount Wilson, California, by Dr. Abbot. Remarkable fluctuations are shown in these values, amounting at times to 10 per cent. of the value. The present paper makes a comparison between the annual changes in the values of the solar constant for the period 1905 to 1914, with the irregularities in the annual changes of the earth's magnetic constant. It is found that the two sets of data, in general, show similar fluctuations. Also, a closer correspondence is found between these two sets of changes than between either set and that of sun-spot frequencies. In brief, the solar-constant values furnish another index of changes in solar activity which may be usefully studied in connection with minor fluctuations in the earth's magnetism.

Dr. W. Patten, "Co-operation as a Factor in Evolution":—

The purpose of this discussion is to show that co-operation, or the summation of power, is the creative and preservative agent in evolution, and that the summation of power depends on co-operation in the conveyance of power. Co-operation in the inner life of the individual is a pre-requisite to co-operation in its external life. The larger physical volume and organic power of the individual are the means by which it finds the larger sources of supplies and the better ways of cosmic and social co-operation. What we call "evil" is that which prevents, or destroys, co-operation. "Good" is that which perpetuates and improves co-operation. The "struggle for existence" is a struggle to find better ways of co-operation, and the "fittest" is the one that co-operates best. The same laws which prevail in the inner and outer life of animals and plants prevail in the social life of man. Man's social progress is measured by the degree to which he has extended the mutually profitable give-and-take of co-operative action beyond himself to the family, tribe, and State, and into the world of life at large. The chief agents of civilisation—language, commerce, science, literature, art, and religion—are the larger and more enduring instruments of conveyance, which better enable the part and the whole to avoid that which is "evil" and to find that which is "good," and which yields a larger surplus for "freedom."

Prof. G. H. Parker, "Types of Neuromuscular Mechanism in Sea-Anemones":—

In the origin of nerve and muscle the sea-anemone has been supposed to represent a step in which a nervous net of very primitive structure could throw into prolonged contraction the general musculature of the animal's body. An examination of the body of the sea-anemone shows that its muscular activities are of a much more diverse kind. They include, first, muscles that act under direct stimulation and without the intervention of nerves; secondly, muscles that are stimulated directly, as well as by nerves; thirdly, muscles that are stimulated only by nerves and exhibit in these circumstances profound tonic contractions; and, finally, muscles that react in the same reflex way that those in the higher animals do. This diversity of muscular response has not been fully appreciated by previous workers.

Prof. E. C. Pickering, "Determination of Stellar Magnitudes by Photography":—

An immense amount of work is being carried on by observatories all over the world in determining the photographic magnitudes of the stars. It is of the utmost importance that all these magnitudes should be reduced to the same scale. Accordingly, in April, 1909, an International Committee was appointed, with members from England, France, Germany, Holland, Russia, and the United States. This committee met in 1910 and 1913, and, after a most amicable discussion, agreed on a system in which all stars were to be referred to a standard sequence of stars near the North Pole. The magnitudes of the latter were determined at Harvard by Miss H. S. Leavitt by six different methods, using eleven different telescopes, having apertures from one-half to sixty inches. All gave accordant results, and were adopted by the committee. A simple method was found for transferring these magnitudes to stars in other parts of the sky, but here extraordinary sources of systematic errors presented themselves. For example, if two equal exposures were made on a plate, the second was found to give fainter images; if, by means of a small prism, exposures were made simultaneously with different apertures, the smaller aperture indicated a brighter magnitude than the larger when the stars were bright, and a fainter magnitude when they were faint. The colour equation was found to vary by different amounts, not only for different instruments, but for different magnitudes.

Miss A. J. Cannon, "A New Catalogue of Variable Stars":—

So great has been the increase in the number of variable stars that a new catalogue now being compiled contains 4641 stars, of which 3397, or nearly three-quarters of the whole, have been found at Harvard, and 1244 elsewhere, by astronomers in nearly all portions of the civilised world. The variable stars are divided into five classes, dependent upon the character of their variation in light. The periods vary from three hours to 698 days. Determination of the periods and light curves of these stars constitutes a large piece of work. Much has been done at Harvard in this field, and many observations have been furnished by other astronomers for such determinations. No more suitable place could be found for the preparation of this catalogue than the Harvard Observatory, for the rich library of a quarter of a million stellar photographs furnishes the only complete material in the world for the study of these stars during the last twenty-five years. By examining the past history of a star on these photographs, the investigator may far more readily find an answer to such perplexing questions as to whether a star is variable or constant, what is the length of the period, is the period changeable, what is the colour or the spectrum of the star, than by waiting months or years to accumulate additional observations.

During the morning of April 15 the following foreign members were elected:—Dr. F. D. Adams, F.R.S., of Montreal; Dr. W. L. Johannsen, of Copenhagen; and Dr. J. D. van der Waals, of Amsterdam.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE sum of 3000*l*. has been bequeathed to the Yale University School of Medicine by Mr. Norman B. Bayley.

PROF. J. J. VAN LOGHEM has been appointed to the newly founded chair of tropical hygiene in the University of Amsterdam.

DR. R. ARMSTRONG-JONES has resigned, as from September next, after twenty-three years' service, the medical superintendency of Claybury Asylum.

THE Gladstone Memorial prize at the London School of Economics and Political Science has been awarded to Mr. Ramchandra Mahadev Joshi, of Bombay.

THE sum of 10,000*l*. in Consols has been given by Mrs. Streatfeild, to be held in trust jointly by the Royal College of Physicians of London and the Royal College of Surgeons of England, for the promotion of research.

THE programme for the session 1916–17 of the Department of Technology of the City and Guilds of London Institute has now been published by Mr. John Murray at the price of 9*d*. net. It contains the regulations for the registration, conduct, and inspection of classes, the examination of candidates in technological subjects, and for the award of teachers' certificates in manual training and domestic subjects. The syllabuses in the following subjects have been revised:—Gasfitting, silversmiths' work, goldsmiths' work, and jewelry, painters' and decorators' work, and heating and ventilating engineering. Other syllabuses have been redrafted, and these include:—Electrical installation work, typography, carpentry and joinery, brickwork, masonry, and plasterers' work.

WORK has been begun upon the building of the Museum of the American Indian, at 155th Street and Broadway, New York, which is to house the ethnological collection made by Mr. George G. Heye during the last twenty-five years. It will be in charge of a group of trustees, of which Mr. Heye himself is chairman. The ground was given by Mr. Archer M. Huntington, and the cost of the building, amounting to 50,000*l*., has been subscribed by other friends of Mr. Heye. The collection will be supplemented by the working library of archæology which has been brought together by Prof. Marshall H. Saville, of Columbia University. In addition to Prof. Saville, Mr. George H. Pepper, who has spent much time among the Navajo and Hopi Indians, will be a member of the staff of the museum.

AT the conference of presidents and other representatives of Canadian universities held at McGill University, Montreal, in May last, the following resolution was unanimously adopted:—"This conference is strongly of the opinion that, to strengthen the unity of the Empire, the universities of Great Britain should be urged to modify and increase their graduate facilities to meet the needs especially of students of the Dominion; and also, to effect this purpose, that a committee be appointed to correspond with the universities of Great Britain, and that the committee also correspond with the universities of France, with the object of increasing the number of students from Canadian colleges." The members of the committee are President Falconer, of Toronto University; Sir W. Peterson, president of McGill University; Abbé E. Chartier, of Laval University; and Dean Cappen, of Queen's University. The next conference will be held in Ottawa in 1917.

A COPY of the prospectus of the university courses in the Manchester Municipal School of Technology for the session 1916–17 has been received. The school offers systematic training in the principles of science and art as applied to mechanical, electrical, and municipal and sanitary engineering; architecture and the building trades; the chemical industries; the textile industries; and photography and the printing crafts. It possesses extensive laboratories and workshops equipped with full-sized modern machinery, tools, and apparatus, including not only machines of the types now in general use, but also machines especially constructed for demonstration, experiment, and original research. Its work includes advanced study and research in science and technology; university courses in the faculty of technology, leading to degrees in applied science; and part-time day and evening courses for a great variety of workers. The present prospectus forms the first part of the calendar of the school, the other activities of which are to be described and explained in later parts of the calendar.

IN his opening address to the vacation course of the Oxford School of Geography on August 3, Dr. J. Scott Keltie reviewed the progress of geography during the last half-century. This included, first, the additions to our knowledge by means of exploration; secondly, progress in the methods of dealing with such results; and thirdly, improvements in geographical education. No period, said Dr. Keltie, had been so prolific in exploration since the half-century following the discovery of America by Columbus. The two poles have been reached, and large additions made to our knowledge of polar regions. The unknown two-thirds of Africa have been provisionally mapped. Great areas of North America have been surveyed and occupied, and much of South America has been explored. The map of Asia has been largely reconstructed, the interior of Australia traversed in all directions, and much of Europe re-surveyed. Lastly, the science of oceanography has been created. Geographical research is now conducted on scientific lines, and the explorer of the future must be differently equipped from the pioneer of the past. Geographical education has made strides in universities and schools, but there is still a dearth of adequately trained teachers to do the subject justice.

THE future of the British chemical industries is so closely bound up with the education of the technical chemist that it is not surprising to find this constantly discussed in the technical and daily Press. In the July Engineering Supplement of the *Times* Prof. F. G. Donnan deals with the relation of the engineer and the chemist from the point of view that it is necessary to bridge the gap which exists between our present chemical and engineering laboratories by "interlinking" laboratories of chemical engineering. He pictures the young chemists and engineers who intend to enter the field of applied chemistry meeting here and learning to work together to the great benefit of the industries. Unfortunately, this development is hindered, if not prevented, by the British examination degree system, which, as Prof. Donnan truly observes, is even more powerful at the newer and supposedly modern universities than at Oxford and Cambridge. The only apparent remedy is for manufacturers to recruit their staff by taking men on the personal recommendation of the university professor, a course which the more enlightened firms have been following for some time. This involves, however, that the professor should have an accurate knowledge of the requirements of industry, so that he may not recommend the wrong type of man. Prof. Donnan lays great stress on the superiority of a training in physical chemistry as the only road to real applied chemistry, and condemns what he terms the molecule-juggling type of chemist usually turned out from the chemical laboratories of the universities and higher technical schools. The training in physical chemistry as sketched by Prof. Donnan appears to be open to the criticism of being too general and not yielding a product of sufficiently high calibre to act in any other capacity than as departmental under-manager in the works. It must not be forgotten that the industry needs also men with a real knowledge of chemistry, above all of organic chemistry, and, though the demand for such men is less than that for under-managers, they alone can act to recreate the industry.

It is within experience also that the plant constructed by the so-called chemical engineer, meaning the chemist with a knowledge of engineering, is likely to result in heavy repair costs. As Prof. Donnan truly indicates, what the industry wants is the association of specialists in both sciences, each understanding enough of the other's profession to enable them to work together with the greatest efficiency.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, July 24.—M. Ed. Perrier in the chair.—The president announced the death of Sir William Ramsay, foreign associate.—G. **Bigourdan**: The propagation of sound to a great distance. The distance at which the sound of firing at the front can be heard, given in a recent note as 250 kilometres, must be extended to 300 kilometres.—C. **Richet**: The time minimum in the psycho-physiological reaction to visual and aural stimulations. Remarking on a note by MM. J. Camus and Nepper (see below), the author agrees that the figures put forward by M. Lahy appear to be too low, and are probably affected by a systematic error.—M. **Petrovitch**: The relations of inequality between arithmetical and geometrical means.—M. **Mesnager**: The displacement of the points of a rectangular plate.—M. de **Broglie**: The K absorption band of the elements for the X-rays, from bromine to bismuth, and the emission of a Coolidge tube for very short wave-lengths. Measurements of the absorption band of elements—that is, indirectly the shortest line of the K group of their spectra—are given for twenty-four elements, ranging in atomic weight from bromine to thorium. A tungsten antikathode was used and the wave-lengths measured, decreasing regularly with the increase in the atomic weight, the only exception being the relative positions of iodine and tellurium.—Mlle. P. **Collet**: The working of galena employed as detectors in wireless telegraphy.—MM. **Massol** and **Faucon**: The absorption of ultra-violet radiations by the bromo-derivatives of methane. Experiments were made on bromine, carbon tetrabromide, tribromomethane, and dibromomethane. The characteristic band of bromine in solution was not found in any of the bromo-derivatives of methane. These compounds increase in transparency for ultra-violet light as the proportion of bromine they contain diminishes, and each bromine derivative is less transparent than the corresponding chlorine derivative, examined under the same conditions of concentration and thickness.—E. **Moles**: The density of hydrogen bromide. Contribution to the revision of the atomic weight of bromine. The mean of thirty-two determinations of the density of hydrobromic acid is 3·64442 grams per normal litre. This leads to the value 79·926 for the atomic weight of bromine.—J. **Eriksson**: The reappearance of mildew (*Phytophtora infestans*) in the potato.—M. **Repelin**: The age of the Oligocene deposits of the basins of Aix and Marseilles, and, in particular, of the clays of Milles and the lignites of Saint-Zacharie.—Mmes. M. **Lapicque** and C. **Veil**: Muscular velocities measured by chronaxy in the different cavities of the heart.—J. **Camus** and M. **Nepper**: The reaction times of the candidates for aviation. A criticism of a recent communication by M. Lahy. The authors find it difficult to explain the reaction times measured by M. Lahy, which appear to be much too small.—L. **Vialleton**: Ontogenic development and the analogous organs.—H. **Bierry**: The detection of tuberculous bacilli in sputa. Details of a method based on the liquefaction and subsequent centrifugation of the sputa, which has given good results in practice.

BOOKS RECEIVED.

Fossil Vertebrates in the American Museum of Natural History. Department of Vertebrate Palæontology. Vol. v., Articles collected from the American Museum Bulletin for the Years 1913–14. (New York.)

Scientific Method in Schools: A Suggestion. By W. H. S. Jones. Pp. 36. (Cambridge: At the University Press.) 1s. net.

Papers from the Geological Department, Glasgow University. Vol. ii., 1915. (Glasgow: J. Maclehose and Sons.)

The Genus Phoradendron: a Monographic Revision. By Prof. W. Trelease. Pp. 224+plates 245. (Urbana, Ill., U.S.A.: The University.)

Concentrating Ores by Flotation. By T. J. Hoover. Third edition. Pp. vi+320. (London: The *Mining Magazine*.)

The Nation of the Future. By L. Haden Guest. Pp. 115. (London: G. Bell and Sons, Ltd.) 2s. net.

An Emperor's Madness or National Aberration? By Prof. E. Lugaro. Translated by Dr. W. N. Robinson. Pp. v+135. (London: G. Routledge and Sons, Ltd.) 2s. 6d. net.

Department of Statistics, India. Agricultural Statistics of India, 1913–14. Vol. ii. Pp. v+116. (Calcutta: Superintendent Government Printing, India.) 1 rupee.

Preliminary Geometry. By F. Rosenberg. Pp. vi+220. (London: W. B. Clive.) 2s.

Commercial Arithmetic and Accounts. By A. R. Palmer and J. Stephenson. Part i., pp. xiv+292+lvi. Part ii., pp. xi+293–514+lvii–cliv. (London: G. Bell and Sons, Ltd.) Each 2s. 6d. net.

Return. British Museum. May, 1916. Pp. 110. (London: H.M.S.O.; Wyman and Sons, Ltd.) 5½d.

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Telegraphic Address: PHUSIS, LONDON.
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