THURSDAY, MAY 9, 1918.

SOCIAL HEREDITY.

The Science of Power. By Benjamin Kidd. Pp. 306. (London: Methuen and Co., Ltd., 1918.) Price 6*s.* net.

THIS posthumous book is a vigorous, sometimes impassioned, statement of convictions, rather than a reasoned argument. In fact, the author did not believe much in reason; he did not find that it led to a knowledge of Truth. The general thesis is that we are at the beginning of a world-revolution; we have reached the limit of a disastrous pagan retrogression; Western knowledge has proved a cultural failure; we have to begin afresh. This time our ideal must be social integration, not individual efficiency as fighting animals; the integrating principle must be found, not in reason, but in collective emotion—"the emotion of the ideal"; we must cease concentrating attention on our "inborn heredity"; we must realise the limitless importance of "social heredity"; we must turn from man to woman as the psychic centre of power in the new social integration; we must seek first, not the kingdom of man, but the kingdom of heaven. There is good counsel here, we think; but the book offends even the sympathetic reader by its extremism.

Mr. Benjamin Kidd, in this sequel to his famous "Social Evolution," endeavoured to formulate human history, and this is a laudable scientific ambition. The difficulty, at this level of complexity, is to find verifiable formulæ and to avoid a false simplicity. There is some point in calling "the male of Western civilisation" the supreme fighting animal, but it is far from being an adequate scientific description. There is some warrant for saying that money-makers and militarists alike found in a vulgarised version of Darwinism (the crudity of which was left by the author unexposed) a theoretical justification of their aims and methods, but that Darwinism has had the blighting and retrograde influence for which Mr. Kidd reproached it seems very problematical.

There is a modicum of sense in the summary, more than once quoted in the book, which Bagehot gave of Darwinism, beginning: "If A was able to kill B before B killed A, then A survived"; but, on the whole, Bagehot's summary was a caricature of Darwin's Darwinism. Again, the impression conveyed by Mr. Kidd's book is that Darwin thought only of the efficiency of the struggling individual organism; in point of fact, Darwin laid emphasis on the importance of endeavours to secure the welfare of offspring and on the survival value of social instincts. It is, as the book insists, a materialism to force biological formulæ on human society, but we are not told that the fallacy of this materialism has been repeatedly exposed by sociologists of eminence, such as Tarde.

"The Science of Power" abounds in fallacious alternatives. There is really no antithesis between what Galton called "natural inheritance" (the author's "inborn heredity," not a felicitous phrase) and the extra-organismal social heritage (the author's "collective heredity" or "social heredity"). Both are big facts. We have not to choose between attaching importance to hereditary "nature" and attaching importance to the influence of "nurture" in the widest sense. The book says that an interruption of the social heritage would leave man without a trace of its age-long operation, but this ignores the fact that there has been all through a selection of the types relatively more susceptible to the integrative influence of the external registration. The social heritage, cumulatively enriched, operates as an evolving sieve, and thus indirectly, yet permanently, affects the racial type. We have not to choose between reason and emotion; we wish more of both. Choose, we are told, between individual self-expression and socialised self-subordination. Choose, we are told, between the psychic and spiritual forces that make for social integration and the biological factors that make for healthy men and women. But we decline to choose between complementary ideals. Eutopias are biological as well as psychological, personal as well as social, and if they are not regional too, they are apt to be Utopian.

The fact is that the lamented author was ever, in his zeal, prone to draw his bow too tightly. Thus, on the strength of his exceedingly interesting experiments with young hares brought up along with rabbits, young wood-pigeons fed along with hawks, and so on, he maintained the relative unimportance of inborn racial characters and an astounding doctrine of equality.

By force of constitution, function, and tradition, it has come about that woman thinks more of the race and more of the future than man does; she has long-range emotions and a far horizon, man has short-range emotions and a pre-occupation with the immediate; woman is permanently endowed with a capacity for self-sacrifice and renunciation which is foreign to the Western male; in fact, "the mind of woman has in reality already outstripped the mind of the male of the race by an entire era of evolution."

We find these "hard sayings." We cannot believe that all the good qualities of women are sex-linked, continued only in the daughters of the house. Much more probable is the view that the fundamentals of a fine character are heritable, to either sex or from either sex, like a sound physical constitution or beautiful features, yet find different expression according as they develop in man or woman. The Germans and Japanese have shown how great changes in a people may come about in less than half a century. Mr. Kidd's counsel is that "the emotion of the ideal"—which is to society like blood to the body—should be "imposed" persistently and systematically on children by wise women. This will bring about a new social integration, a new order of

civilisation. "Give us the young, and we will create a new mind and a new earth in a single generation."

Mr. Kidd died in 1916, and we do not know to what extent he was able to revise what is now published in this book. We must say that we find in it what seem to us examples of exaggeration, false antithesis, and simplicist formulation; nevertheless, it is a rousing book of unmistakable sincerity and earnestness of conviction.

FORESTRY IN CORSICA, ALGERIA, AND TUNISIA.

French Forests and Forestry: Tunisia, Algeria, Corsica. With a Translation of the Algerian Code of 1903. By T. S. Woolsey, jun. Pp. xv+238. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 11*s.* 6*d.* net.

THIS book is provided with a somewhat misleading title, so that the reader expects a description of forests and forestry practice in France; whereas the three dependencies of Corsica, Algeria, and Tunisia are dealt with. The author, who was formerly a forest officer in the United States, visited these three countries and studied them as an expert. His detailed description of the distribution, management, administration, and protection of the forests may be regarded as authoritative. His remarks on sylvicultural methods are of great interest, especially to foresters in the United States and in our own Colonies, where the climatic conditions are often similar to those in the countries here described.

In Tunisia, with 1,600,000 acres of forests, the sole trees of commercial importance are the cork oak, producing cork, and the Zeen oak (*Quercus mirbeckii*), akin to our own species and yielding an excellent timber. The annual receipts of these forests vary from 24,000*l.* to 53,000*l.* The most notable technical achievements of the French foresters in Tunisia have been the protection of the oases in the Djerid and the control of the dunes at Bizerta and Cap Bon. The oasis is usually not a mere spring, but in reality a rich date-palm farm several hundred acres in area and well worth the cost of protection against drifting sand, excessive grazing, and erosion. The descriptions of the ways in which sand fences are built and of the various methods of coping with erosion are interesting. Plantations have not been successful, as the annual rainfall is only a few centimetres, and the species to be grown must, besides, withstand the burning siroccos which blow during summer. The tamarisk has succeeded, but only in a partial degree.

In Algeria there are 7,000,000 acres of forests, which mainly exist on land too poor to be cultivated by the natives. The Government controls 4,800,000 acres, which yielded in 1910 a gross revenue of 150,000*l.* Cork oak contributes the greater part of this total. Cedar, the most remarkable species, yields a small quantity of good timber annually. The Aleppo pine, which covers an immense area estimated at 1,500,000 acres, yielded no revenue until lately. Recent experiments show that it can be tapped for turpentine with some commercial success. The principal methods of regeneration are described, and as a rule sowing in carefully prepared spots is more successful than the planting out of seedlings.

Corsica, with a total area of 2,155,161 acres, has 431,000 acres of so-called forests, of which, however, only 347,000 acres are stocked with trees. The most important species is the Corsican pine, which attains a height of 150 ft. and yields a valuable timber. Its growth is vigorous up to 150 years old. It has been tapped for resin, but the tapping killed many mature trees or considerably slowed their growth. The Corsican pine is now worked on a modification of the selection system by which the trees to be felled are selected in groups. The small openings thus made in the stand give all the light necessary for the development of the seedlings. The areas felled, scattered irregularly over the forest, vary in size from one-tenth to one-fourteenth of an acre. The Corsican peasants are still a lawless set, and very difficult to control. Fire, excessive grazing by goats, trespass, and minor thefts are common; and the actions at law brought by the forest officers, whilst decreasing year by year, are still very numerous. Of 598 actions brought in 1911, no fewer than 314 ended in acquittal by complacent juries. The book concludes with an appendix, being a translation of the Algerian forest code, followed by statistics of Corsica and the clauses usual in a sale of timber in a communal forest.

THE DEVELOPMENT OF SURGERY.

The Edinburgh School of Surgery before Lister. By Alexander Miles. Pp. viii+220. (London: A. and C. Black, Ltd., 1918.) Price 5*s.* net.

THE author, who is one of the surgeons to the Royal Infirmary of Edinburgh, has compressed into 220 pages a great deal of interesting matter concerning the development of surgery in the northern capital from 1505 down to the period preceding Lister. The origin of this famous school may be said to date from the "seil of cause granted be the Towne Counsell of Edinburgh to the Craftes of Surrengenry and Barbouris" whereby they received permission to dissect one condemned criminal each year "quairthrow we may heif experience, ilk ane to instruct utheris." The principles here laid down to base surgery on anatomy and to teach the same pervades the whole history of the Edinburgh school down to the period of Syme, its greatest representative in the middle of last century.

At first the barbers were eliminated from the

surgical craft, which continued for a long period outside the University walls, until in 1726 the University itself established a chair of anatomy, which was first occupied by the race of the Monros, father, son, and grandson. The history of the connection of the Bell family, Benjamin, John, and Sir Charles, is well described, and their creation of a great following, numbering among the flock the representative names of Sir William Fergusson, Robert Liston, and James Syme, a galaxy of practical surgeons of which any medical school might be proud. Lister migrated in early life from University College, London, to become a pupil of Syme, with whom he became intimately associated before returning to London.

It is clearly to be made out in Mr. Miles's book that the path to surgical fame and fortune in Edinburgh was by way of the dissecting-room, and in the pre-anæsthetic times, when rapidity of operation was the order of the day, a very exact knowledge of anatomy was essential. The introduction of anæsthetics altered this, however, although for many years to come surgeons all over the country learned their art as dissectors, and the eminence of our surgeons as practical craftsmen may be referred to this early training in manipulative skill. At the same time, however, English surgery as a science was in a backward state, and there is considerable ground for the belief that part of Lister's great work was due to his training as a pathologist rather than as an anatomist. He became familiar with pathological doctrines and the bacteriology which was then rapidly coming to the front, and most successfully applied the knowledge to the problems of disease which confronted him. In this way he laid the foundations for enormous advances, although he departed from the Edinburgh anatomical traditions.

In comparison with expert craftsmen like Liston, Fergusson, and Syme, Lister was not a brilliant and dashing operator, although his final results have possibly never been surpassed. Under his magic hand the terrors of sepsis disappeared and a new era in medicine was revealed. The preparatory training which Lister went through was not imitated by others to any great extent for a long time, and the great discoveries of bacteriology passed into the hands of pathologists. This must seem strange when it is remembered that the great majority of cases which a surgeon is called upon to treat are the direct or indirect results of infection. The technical developments of operative surgery have tended more and more to make the surgeon an operative craftsman rather than an original investigator. The relative failure of pure surgery apart from science in the present war is a confirmation of this.

As a study of the evolution of operative surgery in Edinburgh Mr. Miles's book is a welcome addition to our knowledge, however. There still is a necessity for a work on the evolution of ideas on surgical diseases as opposed to manipulative skill in their treatment.

OUR BOOKSHELF.

Frontiers: a Study in Political Geography. By C. B. Fawcett. Pp. 107. (Oxford: At the Clarendon Press, 1918.) Price 3*s.* net.

IT would not be easy to say much that is new in a general discussion on frontiers after the works of Sir Thomas Holdich and Prof. L. W. Lyde, one arguing that frontiers should secure protection to the State, the other that they should be chosen rather to facilitate intercourse in the hope of securing peace between adjacent States. Mr. Fawcett has, however, written a very readable essay treating the subject from the viewpoint of geographical evolution. He begins by discussing the value that various features have as frontier zones, and leads on to a consideration of the complexities of the frontiers of modern States. He notes that the strongest force at present working towards the modification of frontiers is a tendency towards the coalescence of national and political boundaries. This implies a subordinate place to economic and strategic considerations, though in the main such frontiers will conform with the latter. The real difficulties arise in the determination of nationality in frontier lands which are well peopled. We are glad to notice that Mr. Fawcett defines his use of the terms "frontier" and "boundary," employing the former for an area and the latter for a line. Loose usage of these terms is not conducive to clear thinking. His suggestion to speak of zones of separation and zones of intercourse (or of pressure), instead of natural and artificial frontiers, has much in its favour. Among his wealth of instances we find no mention of the neutral zone established in the south between Norway and Sweden in 1905. Here is an instance of a frontier of intercourse (short compared with the long zone of separation) which both nations agree to prevent so far as possible developing into a menace to one another, by prohibiting the erection of military works or the establishment of garrisons. R. N. R. B.

Story-lives of Men of Science. By F. J. Rowbotham. With portraits and other illustrations. Pp. 266. (London: Wells Gardner, Darton, and Co., Ltd., n.d.) Price 3*s.* 6*d.*

THESE attractively written biographies of some seventeen workers in science will interest young readers, and probably indirectly foster a love of natural knowledge among them. Among the heroes of science chosen by the biographer may be mentioned Galileo, Newton, Davy, Faraday, Darwin, Pasteur, Kelvin, Lister, and Crookes. The chapters are full of incident, and deal with the domestic lives as well as with the researches of the great men chosen for inclusion in the volume. Mr. Rowbotham shows a wide acquaintance with the literature of his subject, and possesses a happy style. It is unfortunate that throughout the chapter on Lord Kelvin "Thompson" is printed instead of "Thomson," and that Francis Bacon appears in the table of contents as Lord Bacon, instead of Lord Verulam.

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.]*

"Bread-crust" Volcanic Bombs.

IT is easy to identify the writer of the friendly notice of Dr. Tempest Anderson's "Volcanic Studies" (second series) in NATURE of April 18, but, notwithstanding his high authority, I must adhere to my explanation of "bread-crust" bombs (p. 42), viz. that the cracks are results, not of internal expansion, but of contraction. I had the opportunity of studying a large example near the crater of Vulcano, with others of smaller size in the Lipari Islands, and brought away a "hand-specimen," now in the Sedgwick Museum. The former has a compact and rather glassy "rind" about an inch thick, with an interior full of small vesicles. The cracks vary much in size, and the walls of the shallower converge (are rifts, in the strict sense of the term); they appear to be analogous with the cracks in septaria, etc., and I do not see how the formation of numerous vesicles filled with steam is to increase the volume of the "core" within the "rind," for the process is not comparable with one of effervescence. Simple contraction of the crust seems inadequate, since these cracks, so far as I have seen, do not occur in lumps which are homogeneous throughout.

In regard to admitting into the book some photographs which Dr. Anderson had already used as illustrations, I determined to risk the criticism, because I knew them to be those which he preferred; so that if I had excluded them I should have had to select from the less valuable group, and I was anxious to obtain a representative series. T. G. BONNEY.

IT is certainly not without diffidence that any British geologist will venture to question Prof. Bonney's interpretations of volcanic phenomena, but in this case he is clearly in opposition not only to received opinion, but also to well-established facts.

A "bread-crust" bomb has a thin, compact rind broken up into polygonal areas separated by cracks. The interior is usually highly vesicular, and even pumiceous. An important point is that the cracks in the crust frequently gape as if they had been opened out, and into them the spongy matter of the interior has sometimes risen up in such a manner as to suggest that expansion has taken place after the crust solidified.

Prof. Lacroix, in his monograph on "La Montagne Pelée" (p. 523), has given an excellent account of them. "The concentric arrangement of these bombs and the structure of their crust, different from that of their interior, must be explained in the following manner. When a portion of the magma at a very high temperature is projected in a pasty condition the surface rapidly cools, expelling the gases which it contains. Thus the glassy crust is formed; this occupies a smaller volume than when molten, and cracks from contraction, but at the same time the centre of the bomb, cooling more slowly beneath the protecting crust, gives off its gases only gradually. As the solidifying glass becomes more viscous these gases occasion the production of vesicles of varying size, which increase the volume of the bomb. By the conflict between the contraction of the periphery and the expansion of the centre, 'lips' are produced, and the fragments of the carapace are displaced as shown in plate xxiii." On p. 522 he explains the term "lips" as signifying open cracks in "bread-crust" bombs, with the edges more or less everted like the leaves of a book.

Prof. Mercalli, in his text-book of vulcanology, one of the best and most recent ("Volcani Attivi," p.110), gives practically the same explanation, and states that these bombs are sometimes called "bombe gonfiati" (bombs that have swelled). Mercalli does not share Prof. Bonney's unwillingness to admit that the molten material in bombs may effervesce, for he describes "exploding bombs" that are ruptured with violence by the expulsion of the gases in the magma, and cites as authorities Prof. Ricco and Sir William Hamilton.

The name was originally given by Prof. Johnston-Lavis (NATURE, vol. xxxix., p. 110, and Proc. Geol. Assoc., vol. xi., 1890, p.392). He states that "expansion causes cracking of the hardened crust, and in some cases protrusion through the crust." His explanation refers to the bombs of Vulcano (to which Prof. Bonney's description also refers), and was accepted by Prof. Hobbs (*Zeits. Deut. Geol. Gesell.*, vol. xlv., p. 579) and by Prof. Bergeat ("Die Aeolische Inseln," p. 185), both of whom know the island well, and have made careful study of the petrology of these bombs.

References might be multiplied if that were desirable, but sufficient has been said to prove that among English, French, American, Italian, and German geologists who have had every opportunity of observing the facts, the explanation adopted by the reviewer is generally regarded as the only satisfactory one.

J. S. F.

Recovery of Speech through Excitement.

PUBLIC attention has recently been directed to several remarkable examples of recovery of speech by shell-shocked soldiers as the result of unexpected excitement. Your readers may be interested to learn that a very remarkable instance of the loosening of the tongue occurred several thousand years ago, namely, in the case of the afflicted son of Crœsus, King of Lydia. Cyrus, the Persian, besieged and took Sardis 548 B.C., and Herodotus, writing approximately one hundred years after the event, tells us that "when the town was taken one of the Persians was just going to kill Crœsus, not knowing who he was. Crœsus saw the man coming, but under the pressure of his affliction did not care to avoid the blow, not minding whether or no he died beneath the stroke. Then this son of his, who was voiceless, beholding the Persian as he rushed towards Crœsus, in an agony of his fear and grief burst into speech, and said, 'Man, do not kill Crœsus.' This was the first time that he had ever spoken a word, but afterwards he retained the power of speech for the remainder of his life." (Herodotus, book i., chap. lxxxv., translated by Rawlinson.)

J. NEWTON FRIEND.

London, May 6.

THE PROMOTION OF POST-GRADUATE WORK AND RESEARCH.

THE Senate of the University of London has had under consideration proposals which have emanated from the Conference of Canadian Universities held in May, 1916, the Conference of Universities held on May 18, 1917, and the American Association of University Professors. The object in view is to encourage post-graduate work and research and to contrive some means of strengthening the ties between the universities of Britain and her dependencies and those of the

Allied nations, especially the United States of America. The chief proposal consists in the institution of a new doctorate to be attainable by students who have taken a lower degree in some overseas university. The Senate at its meeting on January 23 considered the question of provision for the needs of graduate students from afar, and resolved that the report of the Academic Council be approved and adopted. The first item in the report declares that "it is undesirable to institute a doctoral degree of a lower standard than the existing doctoral degrees."

It may assist those who are not familiar with existing regulations to form an opinion on this subject if they are reminded that the M.A. and M.Sc. already exist intermediate between the first degree of Bachelor and the final degrees of D.Litt. and D.Sc., and that the degree of Master is awarded on the results of research undertaken by the candidate.

It would be impossible in the space here available to set forth all the arguments which might be used for and against the proposed new doctorate. No doubt many of the existing Doctors of the University of London would be opposed to any change of the kind indicated, which would appear to offer easier terms to other students than were imposed on themselves. But those who are intimate with the working of the regulations for the doctorates of the University of London know that these degrees have been awarded in the past on candidates of very unequal merit. In fact, there can be no doubt that there is as much difference among them as would be at all likely to exist between the old and the suggested new doctorates. The D.Sc.'s, for example, include the survivors of the old régime when a stiff examination was the only test, but the list includes some famous names. Since the alteration of the regulations, so as practically to do away with examination and require only the production of a thesis, the quality of the graduates has not appreciably improved, to judge by their average achievements. The reason for this is not far to seek. If in every case the ideas embodied and illustrated in the work set forth in the thesis were those of the candidate himself, the case would perhaps be otherwise. But this is rarely, if ever, true, for the practice has been for the candidate to go to his professor for a subject and to work it out under his supervision. This is the plan long adopted in the German universities with respect to the Ph.D. degree, and the only difference which has grown up since the institution of the degree in London is the extension of the time which is required to elapse between the stage of Bachelor and that of Doctor. The fact is, the attempt to maintain the very high standard originally aimed at has been distinctly a failure. No one can now say exactly what the D.Sc.(Lond.) implies. At Oxford and Cambridge the Doctorates in Science are given under quite different conditions, after the lapse of a much longer interval of time, and on the evidence of published work implying mature study and research and an established reputation. These degrees, therefore, are not comparable with those of London.

The report of the Academic Council referred to above sets forth a summary of reasons for and against the institution of a new doctoral degree. Under the former head it mentions (1) that it would be the means of strengthening the unity of the Empire by increasing the number of students from the universities of the British Empire who pursue their graduate studies in Great Britain, (2) that it would meet a demand preferred by the Canadian and French universities, (3) that it would increase the number of graduate students from Allied countries, and (4) that it would promote research in this country. On the other hand, it is stated (1) that the establishment of such a degree is not in the interests of real university education, (2) that the abler students come to London on account of the facilities for study and not primarily to get an English degree, (3) that the establishment of the doctorate might cause the masterships to disappear altogether, and (4) that the establishment of the degree would affect prejudicially the standard of the existing doctorates and so injure the University.

Of all these considerations it appears to the writer that the first is, at the present time and probably for generations to come, of greatly preponderant importance. And in declining the proposals which come to it from his Majesty's Dominions beyond the seas the Senate has missed a great opportunity for the development of the University.

Students who come to London for the purpose of advanced study and research are attracted doubtless to some extent by the facilities afforded by museums, libraries, and laboratories. But in future, if the lessons of the past have not wholly failed to influence university authorities in this country, university professorships will be filled everywhere by men who have shown by their work and teaching that they are qualified and eager to advance knowledge in their respective subjects, and the abler students will go to the abler teachers. Schools of thought can be created only in this way, and in this way chiefly will research be promoted. Degrees have very little to do with the matter, and the sooner the student desirous of doing research is out of tutelage the better. The old doctorates at Oxford and Cambridge are in the nature of honorary degrees, and it will be better to keep them so.

Meantime, Oxford has already instituted a new degree—namely, Ph.D.—which is to be given to students who have carried out a special course of study or research extending over a period of two to three years at least under the direction of one of the Boards of Faculties, and have satisfied the examiners that their work constitutes an original contribution to knowledge and is of a sufficient standard of merit.

It is within the experience of every man more than forty years of age that the quality of his doctorate, if he is a Doctor in Science or Letters,

matters very little to himself or to the world. If there is anything of value in the man it is already showing itself in the position he has attained or in the quality of the work he is doing, and is due to the endowment of Nature. If it cannot be said that he has accomplished anything, and if it is obvious that he is occupied in an inferior line of work, it seems all the more to cast discredit on the process by which he obtained his degree.

W. A. T.

ANCIENT PLANT-NAMES.[1]

THE antiquity of plant-names needs no proof. We read in Genesis how man, early in his career, came to designate living things, and learn the name of the tree from which he improvised his first raiment. Semitic tradition is corroborated for other regions by Chinese ideographs which admit of comparative study and by Aryan vocables that lend themselves to ethnic generalisation.

The results of the study of ancient plant-names are only satisfactory when the incidence of the names is assured. But assurance is not easily attained. The work calls for the exact knowledge of the scholar, the historian, the ethnologist, and the naturalist. The requisite combination cannot always be secured.

There are, too, certain intrinsic difficulties. Names identical in significance are not always applied to one plant. The *tournesol* of France and the *girasole* of Italy belong to separate natural families, the *heliotrope* of Greece to a third. Words linguistically equivalent may connote distinct species. The *sarson* of Hindustan and the *sarisha* of Bengal are different crops, both equally prevalent in either country; the *sarshaf* of Persia is akin to, but distinct from, each.

The position of classical plant-names was that of plant-names to-day. Theophrastus, oldest in time, yet most modern in method, of Greek botanists, taught his pupils that most cultivated plants had names and were commonly studied, but that most wild kinds were nameless, and few knew about them. Yet European study of ancient plant-names is mainly that of Greek ones. As Sir W. T. Thiselton-Dyer has pointed out in Whibley's "Companion to Greek Studies," the Greek botanist had a name for every conspicuous Greek plant, and most of these names have come down to us, whereas nothing of the kind, if it ever existed, has survived from the Romans.

Renaissance students endeavoured to identify the plants described by Dioscorides. Their texts show great critical acumen; their illustrations are often most faithful. Yet much of their work is obsolete. Their appreciation of the principles of plant-distribution was imperfect. They sought in Central Europe for Mediterranean species, and often were in error when they felt most assured. It took the European naturalist three centuries to realise this; even yet the European scholar does not always appreciate the situation, and standard lexicons sometimes still remain "blind leaders of the blind." Until, two years ago, Sir W. T. Thiselton-Dyer gave us a compact enumeration of those plants actually Greek with which it is possible to wed a Greek name, no scholar and no naturalist in this country had any real assurance as to the accuracy of any accepted identification.

The same author has now, in the paper cited in our footnote, dealt with a special group of ancient plant-names, mostly Greek. With a restricted arable area and an extended seaboard, ancient Greece possessed an adventurous mercantile marine. The list of Greek names for cultivated edible, officinal, and coronary plants, or for wild species of economic interest was supplemented by one of names for plants or plant-products imported from abroad. The resolution of such exotic names is, not unnaturally, often most perplexing.

The aid this new contribution to the subject renders to the scholar and the naturalist cannot well be measured. Both can best repay their obligation by studying it with care. The space at our disposal forbids any attempt at its analysis. The account of ἄμωμον and καρδάμωμον, terse yet complete, carries instant conviction. The problem of the Idæan vine, the solution of which by Dodoens three and a half centuries ago has, as the author explains, been generally overlooked, amply merits restatement. But the other sections equally deserve unstinted praise. It may yet be necessary to modify in detail the conclusions reached regarding ὀποκάλπασον. This cannot, however, lessen the value of a note which manifestly puts the special student on the real track of this elusive bane, and gives the scholar something better than the old lexicographic acceptance of its identity with an innocent gum. The traveller responsible for that self-contradictory conclusion could justify it only by the assumption that Galen had been misled. This note may also spare us the repetition of a contrary suggestion, less consonant with phytogeographical considerations than anything ever hazarded by a Renaissance scholar, that in ὀποκάλπασον the ancients had somehow come into contact with the West African ordeal-tree.

[1] "On Some Ancient Plant-names." III. By Sir W. T. Thiselton-Dyer, K.C.M.G. *Journal of Philology*, vol. xxxiv., pp. 290–312.

WATER-POWER IN GREAT BRITAIN.

THE absence of co-ordination and systematic control in regard to the water resources of this country has frequently been alluded to in the columns of NATURE when reviewing the voluminous reports and statistics issued by hydrological departments on the Continent and in the United States. It is satisfactory to observe that this regrettable indifference to a matter of urgent national importance has at length become the subject of comment and discussion. At a meeting of the Royal Society of Arts on January 23, Mr. Alexander Newlands, engineer-in-chief of the Highland Railway, read a paper reviewing the water-power resources of the United Kingdom (with special reference to Scotland), estimating their extent and

economic value. He pointed out that the situation created by the war had intensified the national interest in questions of economic importance, and that the abuse and neglect of the natural resources of this country were now being closely investigated, as evidenced by the report of the Coal Conservation Committee. Coal is certainly at present, and will probably be for some time to come, our principal source of power, but it should not be overlooked that 1 cubic foot of water per second falling through 11 ft. can supply a horse-power unit to any modern turbine. The past neglect of the water resources of the country is, therefore, an economic waste which should not be tolerated any longer. Of a total of 10½ million horse-power generated in industrial engines in 1907 in Great Britain and Ireland, only about 180,000, or 1·6 per cent., was attributable to water.

Unfortunately, few of the larger English rivers are trustworthy enough in discharge, or possess sufficient intensity of fall, to render them utilisable to any great extent. On the other hand, there are large rivers in the Scottish Highlands which have falls of 14 ft. to 16 ft. per mile, and several Irish rivers have very considerable falls almost at the points where they enter the sea. Scotland, particularly the region which lies north of the Forth and the Clyde, possesses greater potentialities of supply than any other part of Great Britain. Taken as a whole, it has the greatest rainfall, the only localities comparable with it being Seathwaite, in Cumberland, and Snowdon, in Wales. (An annual rainfall of 160 in. has been recorded on Ben Nevis, 182 in. in Cumberland, and 193 in. on Snowdon.)

Mr. Newlands computed that in Scotland—chiefly in the Scottish Highlands—there are about 11,500 sq. miles of country with a rainfall of 50 in. or more, as compared with 3360 sq. miles in England, 3390 sq. miles in Wales, and 5910 sq. miles in Ireland. By impounding the discharge from the lock basins, and assuming an average rainfall of 42 in. (representing a yield from the catchment area of 3 cubic feet a second per sq. mile), of which two-thirds, or 28 in., would be available for power purposes, he estimated that the supply in Scotland would amount to 375,000 horse-power in round figures. This is exclusive of the basins of the Clyde, the Forth, and the Tweed, on account of their other important interests, and of rivers and small streams. By diversions and the linking-up of adjoining catchment areas, and by impounding in excess of the quantity provided for in the estimate, it might be assumed that for, say, 100 days' supply 650,000 horse-power would be available.

According to the figures of Mr. Archibald Page, of Glasgow, the power requirements of Scotland in 1916 were 1,119,000 horse-power units, and it would appear, therefore, that there is sufficient water-power in the Scottish Highlands to meet a large proportion of this demand, though it is doubtful whether, after development and transmission to existing industrial areas, the cost would be less than that of power generated there at the pit-head. One of the most interesting features of this water-power was that it existed in a territory destitute of coal.

In surveying the situation in regard to England, Wales, and Ireland, Mr. Newlands remarked that the absence of large lochs and the lack of sufficient elevation in the country as a whole detracted from the possibilities of any great development of water-power, which, so far as it was available, would have to be derived from river-flow. The paper concluded with a plea for more support and recognition of the work of the British Rainfall Organisation and of the Scottish Meteorological Society than those bodies receive.

BRYSSON CUNNINGHAM.

SOME AMERICAN VIEWS ON AERONAUTICS.

ON April 14, 1917, the American Philosophical Society held at Philadelphia a "Symposium on Aeronautics," of which the papers are now published in the society's Proceedings (vol. lvi., No. 3).

The titles of some of the papers contributed to the conference—namely, "Dynamical Aspects," by Prof. A. G. Webster; "Physical Aspects," by George O. Squier; "Mechanical Aspects," by Dr. W. F. Durand; "Aerology," by William B. Blair; and "Engineering Aspects," by Dr. Jerome C. Hunsaker—show that every attempt was made to ensure a thoroughly representative discussion. But in reviewing the proceedings one cannot help being struck with the opinion that modern aeronautics is too straggling a subject or collection of subjects to be dealt with efficiently in a meeting of this character. Thus, Dr. Webster, the author of a standard treatise on "Rigid Dynamics," reproduces certain familiar diagrams of lines of flow and explains the meaning of lift and drag; Mr. Squier tells us that in the past few years several elements, helium, argon, neon, krypton, and xenon, have been found in the air; Dr. Durand enumerates the problems which have to be solved in the development of the aeroplane—problems more often enumerated than solved; while in Mr. Blair's paper a large amount of space is taken up with twelve diagrams, although he fails to explain what connection these figures have with the mean of wind observations in "Highs" and "Lows," or what the different parts of the diagrams represent. The three pages which Dr. Louis A. Bauer devotes to his subject refer to difficulties attending the use of the compass in aeroplanes arising from deviations of the apparent vertical due to normal and other accelerations.

An original composition to the programme of the meeting is represented by Prof. Edwin B. Wilson's second paper on "The Theory of an Aeroplane Encountering Gusts." The first of these papers was published in 1915 by the American Government Advisory Committee. Together the two constitute a mathematical extension of the theory of small oscillations from free to forced oscillations. Apart

from any questions as to how best to deal with the gust problem, the study of the forced oscillations of an aeroplane is a problem proposed for solution many years ago, which has to be solved sooner or later in the development of the aeroplane, and the sooner the better. Of course, the treatment is limited to the consideration of small disturbances, but we believe it was Mr. Bairstow who, in the earlier days of his experiments, pointed out that a theory so formed might give useful approximations for practical purposes, just as our knowledge of the pendulum was largely based in the first instance on the study of oscillations of small amplitude. It will be seen that both longitudinal and lateral disturbances are considered, although the inconvenient notation renders it a little difficult to know what is longitudinal and what lateral, or even whether the aeroplane is supposed to be flying forwards or backwards. An alternative method of treating gusts has been developed and worked out by Mr. Brodetsky in this country, although only his first paper has yet appeared in print.

The value of mathematical work of this kind has been called in question by certain meteorologists who have claimed that theirs was the proper method of solving the problems of aviation. A study of the present collection of papers, however, shows that while meteorological investigations are required to ascertain the conditions under which flights are made, it is necessary to resort to very long, hard mathematical calculations in order to ascertain *how* these conditions can be met in the construction of a flying machine. Of course, work such as that of Prof. Wilson requires developing from the experimental side, but the mathematics must be done previously. G. H. B.

NOTES.

THE present position of nitrogen fixation in this country was stated in the House of Commons on May 2 by Mr. Kellaway, Parliamentary Secretary to the Ministry of Munitions, in reply to a question by Sir William Beale. The various proposals for fixing nitrogen have been examined in detail by the Nitrogen Products Committee of the Munitions Inventions Department, and, as a result, intensive research has been concentrated upon the Haber process. A research staff composed entirely of young British scientific workers has accumulated the knowledge requisite to the translation of the vague outlines of this process of ammonia synthesis, as revealed in the patents of the German industrial concerns, into a commercially practicable process. This has involved two years of unremitting laboratory research, during which period numerous departmental patents have been taken out for improvements in ammonia synthesis, as well as in the subsidiary branches of the problem, such as hydrogen manufacture. These patents are held in the names of the members of the research staff, and are assigned to the Secretary of State for War. The research work of the staff of the Munitions Inventions Department is now far advanced, so that the results have been placed at the disposal of the Explosives Department for application on a factory scale. The manufacturing operations will be conducted at present for war purposes, the production of synthetic ammonia being applicable to the manufacture of explosives, as well as to the production of ammonium sulphate for agriculture. The results of the research work on synthetic ammonia have not been made public, but may be communicated confidentially to concerns proposing to erect plant under financial arrangements approved by the Treasury. The availability to manufacturers of the general research work of the staff of the Munitions Inventions Department is now being considered by committees representing the several departments concerned.

THE Gas Traction Committee, appointed in November last to consider the employment of coal-gas as a substitute for petrol and petroleum products in motors, its general safety, and conditions for use, has issued an interim report (H.M. Petroleum Executive, price 1*d*.). This deals chiefly with the present use of gas, mainly at low pressures, in suitable fabric bags; the work is to be continued to cover its use under higher compressions when the necessary appliances and plant are obtainable. The Committee is satisfied that gas can be efficiently, safely, and promptly substituted for motor spirit (only two minor accidents have been reported). Two hundred and fifty cubic feet are considered equivalent to one gallon of petrol, so that gas at 4*s*. per 1000 cub. ft. is equivalent in cost to petrol at 1*s*. per gallon. No restrictions, except in so far as the shortage of coal or other war conditions may demand, should be imposed on the use of gas in suitable containers. A specification for the bags is given; the material should be two-ply diagonally doubled, and proofed with 6 oz. per square yard of proofing containing 90 per cent. of high-class rubber, this being vulcanised by the hot process. The permeability of prepared fabric to hydrogen must not be more than 10 litres per square metre per twenty-four hours (0·3 cub. ft. per square yard per twenty-four hours). The working life of such containers would normally be eight months. Top ventilation should be provided in any garage, and a container should be completely deflated after standing idle for two weeks. For use under higher compression it is undesirable that semi-rigid containers of rubbered canvas should at present be charged to a greater gas pressure than 90 lb., or be of greater internal diameter than 4 in. Encouragement should be given to the construction of semi-rigid containers of rubber and woven wire up to a working pressure of 300 lb., and it is considered desirable to encourage experiments with rigid metal cylinders working up to 1800 lb., particularly in connection with their application to motor-omnibus use and for the transport departments of municipal authorities.

A LETTER to the Press on the subject of food crops and the protection of birds, recently issued by the Royal Society for the Protection of Birds, directs attention to the serious diminution in the numbers of our resident insectivorous birds, due to the severe winter of 1916–17, and also to the widespread destruction of birds and eggs, which is a cause of grave anxiety at the present time. That everything possible should be done to protect and preserve such species is beyond dispute. As the signatories of this letter point out, all are agreed that insect-eating and vermin-eating species of wild birds are invaluable to man. Further, the farmer and fruit-grower have everything to gain by responding to the present appeal to take the matter up promptly with the view of checking the destruction of these birds and their nests and eggs. Plagues of various species of injurious insects have already been reported from different parts of the country, and but for the services of our resident and migrant insectivorous birds these would each year grow worse. As it is, they already inflict very serious

losses, and unless there is a large increase in the number of beneficial birds there is always the possibility of their gaining the ascendancy and causing widespread destruction to our home-grown food supplies. At a time like the present, when every acre of food is almost priceless to the country, our agricultural, gardening, and allotment societies and associations might do much to conserve a highly beneficial factor in successful production the importance of which it would be difficult to over-estimate.

BY the death of Dr. Joseph Deniker on March 18, France has lost one of her most distinguished anthropologists. Dr. Deniker, who was in his sixty-seventh year, was born in Russia, and commenced his student's career in Petrograd. Later he went to Paris as a student of anthropology, where his special abilities were quickly recognised, and he was given a permanent place in the school of his adoption. The research which he published in 1885 on "The Anatomy and Embryology of the Anthropoid Apes" is an example of how investigations of that kind should be made. He is best known for the work he did relating to the classification of human races. From 1880 until his death Dr. Deniker gathered data from all trustworthy sources relating to the physical characters of inhabitants of every quarter of the globe, with the view of building up a natural classification of human races. There are few peoples he had not investigated personally. Some of the results of that labour can be seen in "The Races of Man," which he wrote for the Contemporary Scientific Series in 1900. He focussed his attention particularly on the races of Europe, and his various publications dealing with the racial types and the distribution of these types amongst the various nationalities of Europe constitute the most trustworthy sources of information concerning the ethnology of modern Europe. Dr. Deniker also made contributions to our knowledge of the cultural side of anthropology. He held the post of chief librarian to the Natural History Museum in Paris, and did much for the bibliography of scientific literature. He acted as secretary for France in the compilation of the International Catalogue of Scientific Literature. In 1895 the Royal Anthropological Institute of Great Britain and Ireland made Dr. Deniker an honorary fellow, and ten years later invited him to give the Huxley memorial lecture—the highest honour at its disposal.

AT a general meeting of the members of the Royal Institution held on May 6, the following vice-presidents were elected:—Dr. H. E. Armstrong, Sir Wm. Phipson Beale, Bart., the Hon. R. C. Parsons, the Rt. Hon. Lord Wrenbury, the Rt. Hon. Lord Rothschild, Sir James Crichton-Browne (treasurer), and Col. E. H. Hills (secretary).

WE learn from the *British Medical Journal* that the Institute of France has decided to award the Osiris prize this year. The prize is of the value of 4000*l.*, and was founded for the recognition of the most important discovery or work in science, letters, arts, industries, or generally anything for the public benefit. It has been held in abeyance since the beginning of the war.

AN informal meeting of the fellows of the Chemical Society will be held at Burlington House on Thursday, May 16, after the conclusion of the business of the ordinary scientific meeting. Messrs. Adam Hilger, Ltd., will give a demonstration of their method of determining the best temperature at which to anneal glass, and specimens of apparatus will be exhibited by the Dunlop Rubber Co., Messrs. Fuerst Bros., Townson and Mercer, Ltd., and the Scientific Supplies Co.

THE Iron and Steel Institute has awarded 100*l.* from the Carnegie Research Fund to Mr. G. Patchin to enable him to pursue research on "Semi-Steel and its Heat Treatment"; to Mr. J. N. Kilby for research work on "The Basic Open-hearth Process of Steel-making in all its Branches"; to Mr. S. L. Hoyt for the study of "The Foreign Inclusions in Steel, their Occurrence and Identification"; and to Mr. J. A. Vanden Brock for research work on "The Elastic Properties of Steel and Alloys."

THE inaugural meeting of the Gilbert White Fellowship was held on Saturday, April 20. Resolutions proposing the formation of the fellowship and the adoption of its rules were proposed and carried unanimously. Then followed the election of Dr. William Martin as the first president. The list of vice-presidents includes the names of Mr. E. W. Holmes, Mr. W. H. Mullens, Sir David Prain, Prof. G. S. Boulger, Miss Gulielma Lister, Mr. A. W. Oke, and Miss Willmott. The honorary secretary is Mr. W. M. Dunton, 18 Crockerton Road, S.W.17.

THE council of the Royal Society of Edinburgh has awarded the Keith and Neill prizes as follows:—(1) The Keith prize to Mr. R. C. Mossman for his work on the meteorology of the Antarctic regions, which originated with the important series of observations made by him during the voyage of the *Scotia* (1902–4), and has continued to the present time; (2) the Neill prize to Prof. W. H. Lang for his paper, in conjunction with Dr. R. Kidston, on *Rhynia Gwynne-Vaughani*, Kidston and Lang, published in the Transactions of the society, and for his previous investigations on Pteridophytes and Cycads.

AT the annual general meeting of the Institution of Civil Engineers held on April 23, Sir John A. F. Aspinall was elected president for the year 1918–19. The council of the institution has made the following awards for papers read and discussed during the session 1917–18:—Telford gold medals to Sir Robert R. Gales (India) and Mr. E. Sandeman (London); George Stephenson gold medals to the Hon. Sir Francis J. E. Spring and Mr. H. H. G. Mitchell (Madras); and Telford premiums to Mr. W. L. Lowe Brown (London), Mr. G. Blake Walker (Barnsley), and Mr. Alwyne Meade (Blackheath). Indian premiums also have been awarded to Sir Robert Gales and Sir Francis Spring.

THE Secretary of State for the Colonies has appointed a Committee to inquire into and report upon matters relating to research and development in the dependencies of the Falkland Islands, which include South Georgia, the South Shetlands, and Graham Land, with a view to the preservation of the existing whaling industry and the investigation of the economic and scientific possibilities of those regions. The members of the Committee are as follows:—Mr. P. C. Lyon, Department of Scientific and Industrial Research (chairman); Mr. J. O. Borley, Board of Agriculture and Fisheries; Mr. E. R. Darnley, Colonial Office; Dr. S. F. Harmer, British Museum (Natural History), and Capt. C. V. Smith, R.N., Admiralty. Communications may be addressed to the secretary, Mr. H. T. Allen, Colonial Office, Downing Street, S.W.1.

THE Government is offering an award of 2000*l.* to the first person or persons who can obtain on or before August 1 next a fuel-oil deemed by the authorities to be suitable for Admiralty use by admixture of dehydrated coal-tar with mineral petroleum oils. The mineral petroleum oils to be employed must be in accordance with the Admiralty specifications for fuel-

oil, and may be derived from the following sources:—U.S.A. Gulf fields, U.S.A. Northern fields, Mexico, Trinidad, Persia, Borneo, Burma, and the United Kingdom. The necessary samples of tars and mineral oils will be provided free of charge to responsible persons by the Government. All communications respecting the award should be addressed to the Controller, Munitions Mineral Oil Production Department, 8 Northumberland Avenue, W.C.2.

THE Australian Government has published a report (Bulletin No. 6) by its Advisory Committee of Science and Industry on alcohol fuel and engines. A previous report was noticed in NATURE of October 18 last. The present report, which is much fuller, gives the result of a considerable mass of experimental work. The numerous ways of obtaining alcohol from various vegetable products are discussed in relation to Australian climatic conditions. An excellent account is given of the effect on stationary internal-combustion engines of the proposed change of fuel; experiments to determine this were carried out in the engineering laboratory of Melbourne University. The main conclusions reached are that the world-supply of liquid mineral fuels is not sufficient to meet the world demand; enterprises for the production of mineral oils in Australia have not so far proved successful; no crops suitable for the production of alcohol are at present grown in Australia in sufficient quantity to meet existing local liquid-fuel requirements; the most suitable crops would be sorghum stalks, cassava, and sorghum grain; and experiments indicate that petrol at 40·5*d*. per gallon is equivalent to alcohol at 30*d*., so far as fuel costs per b.h.p. are concerned. The Committee decided to recommend that a Government subsidy be granted in order to encourage the proposed new industry.

MAJOR SYDNEY HAROLD BAKER, of the Gloucestershire Regiment, was killed in action on March 23, aged thirty-seven, and by his death natural science loses an earnest student and an experienced teacher. The son of Mr. James Baker, of Clifton, he was educated at Bristol Grammar School and Jesus College, Oxford, where he held an open scholarship. Graduating with honours in 1903, he continued his reading at Charlottenburg. After a short period at Loretto he became science master at Abingdon School, and entered upon the congenial task of developing his subject in new and handsome buildings. To this he devoted himself with much enthusiasm until the outbreak of war, when he offered himself for service. His promotion was rapid. He became captain in February, 1915, intelligence officer in France in the following September, and major in Salonika in August, 1916. Invalided home early in 1917, after a senior course at Aldershot he was placed in temporary command of an entrenching battalion in France. Here he met his end, after holding a redoubt for thirty-six hours. Major Baker was a man of untiring energy, much personal attractiveness, and great range of interests and knowledge. Few men have combined more successfully the gifts of scientific and of literary training.

BY the death of Mr. Donald Salter, on March 22, from wounds received in action, meteorology has lost an earnest worker of great promise. Mr. Salter became a member of the staff of the British Rainfall Organisation in 1908 in his eighteenth year, and, until joining the Royal Engineers early in 1916 under the Derby scheme, was responsible as cartographer for the preparation of the numerous rainfall maps which appeared in the publications of the Organisation. He rendered invaluable assistance to Dr. Mill in the progressive development of the cartographic methods carried on at Camden Square, some of which he himself initiated. Mr. Salter was of an extremely modest and retiring disposition, with a charm of manner that greatly endeared him to his friends. A rapid and efficient worker, he invariably maintained that high standard of accuracy which is a tradition at Camden Square. He had marked artistic tastes, and devoted most of his leisure to their cultivation. After a brief period in the Ordnance Survey Department, Southampton, he saw active service in France until invalided home in October, 1916. Last year he obtained a commission in the Royal Garrison Artillery, and he was mortally wounded while carrying on the duties of section commander near his gun at the beginning of the recent great offensive by the Germans.

MR. ALFRED GORDON SALAMON, who died recently in his sixtieth year, will be remembered chiefly in connection with the chemistry of brewing, to which he made various original contributions. His main service to brewing, however, was rendered less by original research than by the interpretation and direction of the practical applications of chemical knowledge among brewers at a time when the art of brewing was only gradually emerging from conditions mainly empirical. Many members of the Royal Society of Arts will remember his Cantor lectures on yeast, which helped to make known in this country the classical work of Hansen, and he was successful as an early advocate of the use of raw grain as an adjunct to malt in the brewery. Mr. Salamon contributed to the Transactions of the Institute of Brewing (of which he was elected president in 1907) papers on this subject and on experiments in malting, and to the Journal of the Society of Chemical Industry papers on the influence of phosphates in fermenting worts and on the manufacture of caramel. He was joint author of a successful process of gas purification by the removal of sulphur by the use of "Weldon mud," and also of processes connected with the manufacture of cyanides; and he did some technical work in connection with the manufacture of artificial perfumes. He had at one time a large practice as a brewers' analyst and consultant, but during later years he devoted himself more to general technical chemistry, especially in its legal aspects. He possessed a keen forensic instinct, and his advice and help in unravelling chemical puzzles arising in connection with patent-law disputes were valued by leading members of the Bar who were more particularly connected with this branch of litigation. Mr. Salamon was for two years chairman of the London Section of the Society of Chemical Industry, in which he took a very active interest, as he also did in the Institute of Chemistry, of which he had for many years been, and was still up to his death, the honorary treasurer. He was popular in his profession, and will be mourned by a wide circle of chemical friends not only at home, but also on the Continent and in America.

SPRING this year has somewhat resembled that of last year, except that the early days of May this year have been much colder. The reports issued by the Meteorological Office show that the cold spells which have prevailed with such persistence in London have been common over the whole of the British Islands. March was, for the most part, dry, mild, and sunny; the mean temperature at Greenwich was 44°, which is 2° above the average, and 5° warmer than March, 1917. The mean temperature for April this year was 45°, which is 3° below the average, but 2° warmer than April last year. The warmest week since the commencement of spring is the week ending March 23, when at Greenwich the mean temperature was 48·2°, which is 5·4° above the

average. The week with the greatest deficiency of temperature is the week ending April 20, when the mean was 40·4°, with a deficiency of 6·9°; during this week the rainfall at Greenwich measured 1·79 in., which is 0·2 in. more than the average for the whole month. In London, at Tulse Hill, in a Stevenson's screen, the maximum thermometer only rose to 60° or above on three days in April, and the highest temperature was 63°; whilst in March there were seven such warm days, and the highest temperature was 69°. April this year was peculiarly sunless, and this, coupled with the low temperature, kept vegetation throughout the month greatly at a standstill.

THE first of a series of articles descriptive of the machinery of the S.S. *Wulsty Castle* appears in *Engineering* for May 3. This, the first seagoing vessel fitted in this country with steam turbo-electric propelling machinery on the Ljungström system, ran her trials on the North-East Coast last week. In the Ljungström turbine the flow of the steam is radial, and the arrangement differs from other turbines, in which fixed and moving blades alternate, in that both sets of blades revolve in opposite directions. Hence a high relative speed can be obtained without excessive shaft speed. In this ship there are two turbo-alternators, each developing 625-kw. three-phase current at 650 volts, 60 cycles per second, at 3600 revolutions per minute. These supply current for two main induction motors, coupled to the single propeller shaft through double helical gearing. These motors are together capable of delivering 1500 shaft h.p. continuously at sea with a propeller speed of about 76 revolutions per minute, and also of driving the ship ahead or astern at full power. The auxiliary machinery is for the most part electrically driven. The boilers are fitted with Schmidt superheaters, and supply steam at a temperature of 625° F. The Ljungström turbine has been proved to have a high efficiency, and Sir William Beardmore has taken the initiative in this country in its marine applications.

IN Prof. H. C. H. Carpenter's presidential address to the Institute of Metals reference was made to the work of the Corrosion Research Committee, which is investigating the corrosion of brass marine condenser tubes by salt water. A laboratory specially designed and equipped for the work has been installed in the metallurgical department of the Royal School of Mines, and the experimental plant has been removed from Liverpool to the Southwick power station at Brighton, and is being run under strictly practical conditions. It has also been rendered possible for the committee to arrange that the problem should be attacked in the laboratory *ab initio* with pure metals corroding under the simplest conditions, and this should greatly enhance the value of the work being done. Prof. Carpenter also sketched in outline the most suitable educational course for the metallurgical engineer, and emphasised the point that the training cannot be wholly undertaken at a technical school or university. On completing his college course and entering works, it should be the function of the works to find out what special aptitudes the student possesses. He should have sufficient time to become acquainted with the practice of each of the operating departments, to find his feet, and to acquire the works atmosphere. A discerning management will have little difficulty in judging how best to utilise the services of such a man after this probationary period, during which he should be paid, at any rate, a living wage.

AN interesting article appears in the *Fortnightly Review* for May under the combined authorship of Mr. Claude Grahame-White and Mr. Harry Harper. The title is "Sovereignty of the Air and its Relation to Civil Aerial Transport," and the authors discuss the conditions which should be adopted for the regulation of air traffic after the war. Three plans are considered: the air may be completely free to all; it may be under the sovereignty of the country over which it lies; or a combination of these is possible by making the air free to all only above a specified altitude. It is pointed out that if war could be abolished by international consent, a free air would be the best solution. It is, however, fairly obvious that, for at any rate some years after the declaration of peace, the nations will be forced to take strong defensive measures in the air, and the only solution of the problem rendering this possible is a complete sovereignty of the air. The authors are of the opinion that commercial aeronautics will make great advances in the near future, and that the rapid inter-communication possible by the use of aircraft will do much to foster the development of friendly sentiments among the nations, and so to advance progress towards the goal of universal peace. They suggest also the desirability of a universal language to facilitate international relations in general, and this is certainly a point which cannot be overlooked. The whole question of international relations after the war is one of absorbing interest, and the article under discussion is worthy of perusal by those whose thoughts turn to the aeronautical side of such relations.

AT the annual general meeting of the Society of Glass Technology, held at Sheffield University on April 17, Mr. Frank Wood, the president, compared the position of the glass industry to-day with that before the war. Dealing with various sections, Mr. Wood said that the quality of British table and decorative ware is supreme, but owing to competition the output is almost negligible. Given three years' freedom of action, the position of the manufacturers would be unassailable. The plate- and window-glass trade is developing, and the outlook for optical glass is hopeful, but it is very necessary that the country should be rendered independent of foreign supplies of the latter; similarly with chemical glass, electric bulbs, and pressed ware, in which good progress has also been made. The production of bottles and jars—the largest section—is in a very healthy position, due to the introduction of new machinery. The president also stated that with united action amongst masters and men of all sections he has every confidence in the future of the industry. He then referred to the raw materials used by the industry, giving statistics and discussing the degrees of purity required, and concluding with some interesting remarks on devitrification. The contents of tank furnaces are subject to devitrification on a large scale; this is known as "dogging." A certain amount of "dog" serves to protect the tank-bottom, but in excess it gives rise to difficulties which seriously affect output. The formation of "dog" may be checked by increasing the proportion of alkali or of alumina in the batch. However, the addition of alkali, besides increasing the attack on the sides and roof of the tank, reduces the durability of the resultant glass, whereas the addition of alumina, with less attack on the tank, gives a more durable and tougher product.

IN response to the wishes of the American refrigeration industries, the Bureau of Standards at Washington has undertaken to redetermine the thermodynamic properties of ammonia, and three papers have recently appeared in the Bulletin of the Bureau, by Messrs. N. S. Osborne and M. S. Van Dusen, on the specific heat of liquid ammonia, on the heat which must be given to the liquid to keep its temperature constant when the pressure to which it is subjected is changed,

and on the latent heat of vaporisation of the liquid. The heat in each case is supplied electrically, and the change of temperature measured by means of a platinum resistance thermometer. Under saturation conditions the specific heat of the liquid varies from 1·06 calories per gram at −40° C. to 1·10 at 0° C. and to 1·16 at 40° C. The heat measured in joules per gram, which must be abstracted from the liquid, when the pressure is increased by a kilogram per sq. cm. in order to keep the temperature constant varies from 0·06 at −40° C. to 0·09 at 0° C. and to 0·15 at 40° C. The latent heat of vaporisation in calories per gram varies from 332 at −40° C. to 302 at 0° C. and to 263 at 40° C. It is to be hoped that these results will soon be made available to refrigeration engineers in the form of a total heat-entropy chart.

A SIMPLE chart for the conversion of temperatures from the Fahrenheit to the Centigrade scale, or *vice versa*, has recently been issued by the Cambridge Scientific Instrument Co., Ltd. The device consists of the two scales side by side in the form of a spiral, and is printed on a card about 1 ft. square. The effective length of the scales is thus about 6 ft., thereby permitting the divisions, which correspond with 2° each, to be satisfactorily open without at the same time restricting the range. This covers from the absolute zero, −273° C., to 2000° C. Both the Fahrenheit and Centigrade scales are divided to 2° to prevent confusion, and each interval of 10°, 50°, and 100° is clearly marked to facilitate easy reading. The chart should prove of service to all users of pyrometers or other temperature-measuring instruments, as both scales are so generally employed that conversion from one to the other cannot in practice be avoided. In addition to the conversion chart, tables of useful thermometric data are given. The Cambridge Scientific Instrument Co. states that it will be pleased to forward a copy of this chart free of charge to anyone interested on receipt of six penny stamps to cover the cost of postage.

THE report of the National Union of Scientific Workers for the quarter ending March 25 last outlines the progress which has been made with the work of organisation of the society. Eight branches of the union have been definitely formed in various parts of the country, the prospective membership of which appears to be between 300 and 400. An organising sub-committee is being set up to deal with the London area, which, the report says, presents special difficulties. Among the aims of the union specified in the report is the maintenance of the freedom and independence of research. All inquiries respecting the work of the union should be addressed to the secretary, Mr. Norman Campbell, North Lodge, Queen's Road, Teddington.

A NEW series of books on industrial chemistry, edited by Dr. S. Rideal, is announced by Messrs. Baillière, Tindall, and Cox. It is intended to give in it a comprehensive survey of the chemical industries. Two volumes have just been issued. "Industrial Electrometallurgy," by Dr. E. K. Rideal, and "The Application of the Coal Tar Dyestuffs," by C. M. Whittaker, are in the press. Further volumes will deal with "The Industrial Gases," "Silica and the Silicates," "The Rare Earths and Metals," "The Iron Industry," "The Steel Industry," "Gas-works Products," "Animal Proteids," "Organic Medicinal Chemicals," "The Petroleum Industry," "Fats, Waxes, and Essential Oils," "Synthetic Dyes," "Wood and Cellulose," "The Carbohydrates," and "Rubber, Resins, Paints, and Varnishes."

THE April issue (No. 64) of Mr. C. Baker's Classified List of Second-hand Scientific Instruments has just reached us. In consequence of the increasing difficulty in obtaining new apparatus, it should be of especial interest and service to scientific workers. Copies can be had upon written application to 244 High Holborn, W.C.1.

MESSRS. DULAU AND CO., LTD., 37 Soho Square, W.1, have just issued a Catalogue (No. 72) of 764 books—some scarce—on botany and horticulture, anthropology, ethnology, archæology, scientific travel, etc. The list will doubtless be interesting to many readers of NATURE.

OUR ASTRONOMICAL COLUMN.

PHOTOGRAPHS OF THE SPECTRUM OF VENUS.—In a recent report to the Royal Astronomical Society (Monthly Notices, vol. lxxviii., p. 278) Mr. J. Evershed gives a preliminary account of some photographs of the spectrum of Venus which have been obtained with the large grating spectrograph at Kodaikanal. The primary purpose of the investigation was to ascertain whether the general shift of the lines towards the red at all points on the visible disc of the sun affects also a hemisphere turned 90° or more from the earth. If the wave-lengths in the light from Venus, after correction for the motion of the planet as a whole, are found to be identical with those from ordinary sunlight, the solar displacements cannot be attributed solely to motion of the absorbing gases; but if the Venus spectra show a smaller wave-length, a general motion of the solar vapours away from the earth may reasonably be inferred. Five good photographs, with iron arc comparisons, were obtained in October, 1917, which agree with a previous series of plates taken during February, 1917, in showing a distinctly smaller wave-length for iron lines in the spectrum of Venus as compared with the corresponding lines in the control spectrum of daylight. The results thus favour the motion interpretation of the solar shifts, involving an earth effect; but as the February plates were possibly not entirely free from pole effects in the arc, confirmatory evidence will be sought during June and July next. The trustworthiness of the plates for the purpose in view is indicated by the fact that the combined results from the east and west elongations yield a value for the solar parallax which differs only very slightly from that adopted in the Nautical Almanac. Only one plate was obtained when the planet was at half phase or less, but this is of special interest as showing a discrepant velocity, which is difficult to account for except by supposing that Venus rotates in the same direction as the earth and with the same order of velocity. It is further expected that the Venus plates will eventually decide whether the sun's gravitational field is concerned in the solar line-shifts or not.

RADIAL VELOCITIES BY OBJECTIVE PRISM.—The great advantages offered by the objective prism in the photography of stellar spectra have led to numerous attempts to utilise this instrument for the determination of radial velocities. The spectra of stars down to the tenth and eleventh magnitudes can be photographed in this way, and since a great number of spectra appear on a single plate, even an approximate method of deriving radial velocities would clearly be of great value in connection with the problems of stellar motions. One of the most promising methods appears to be that suggested by Prof. R. W. Wood, in which the light from the stars is passed through a filter of

neodymium chloride. In this way each of the stellar spectra is made to show a narrow artificial absorption line at λ 4272, which serves the purpose of a comparison spectrum from a source at rest. An exhaustive test of the accuracy attainable by this method has recently been made by Mr. T. S. H. Graham, making use of a photograph taken at the Harvard College Observatory (Journal R.A.S., Canada, vol. xii., p. 129). Twenty spectra were included in the measures, and four independent sets of measures and reductions were made. The different results obtained from the four series indicate a somewhat greater probable error than the 10 km. per sec. previously estimated by Kapteyn and Campbell. Full and interesting details of the procedure are given in the paper, and attention is directed to the various sources of error, of which even the partial elimination would lead to results of great value.

RECENT MARINE BIOLOGY.

THE December issue of the Journal of the Marine Biological Association contains several papers of exceptional interest. One of these, by Dr. Allen and Mr. Sexton, gives a detailed account of experiments with reference to the inheritance of eye-colour in Amphipods, and in a further paper Dr. Allen presents the general results in a very attractive manner. *Gammarus chevreuxi* had been maintained in the laboratory aquaria for several years, and, quite suddenly, in the third generation of a family of these animals, a striking mutation occurred. Normally the eye possesses black pigment, beneath which is chalk-white matter, but in some individuals of this family the black was replaced by red. A pure black-eyed stock which bred true for three years was mated with a red-eyed stock, which again bred true for five generations. Black behaved as dominant, and red as recessive, and the results of further breeding were in very close correspondence with Mendelian theory. Thus black hybrids carrying red were mated together, giving 4393 offspring, and 3327 of these were black and 1066 red. (The expected results are 3294 and 1098). In the course of the experiments a second mutant appeared in which there was neither black nor red pigment in the eye, but only the deeper-lying chalk-white matter. This albino condition was also transmitted in very close correspondence with expected Mendelian results. Yet a third mutant was observed, a condition in which the chalk-white pigment was absent, and this "no-white" variety behaved as a recessive to dominant white and also closely followed Mendelian laws of numbers. Thus there was a gradual loss of factors, and accompanying the process of albinism there was degeneration of the ommatidia of the eye, a tendency towards the production of such a condition as that exhibited by the various blind species of subterranean Amphipods.

In another paper Dr. Allen gives a general account of experiments with reference to the cultivation of diatoms, describing the methods employed by himself and Mr. Nelson in order to obtain pure cultures. In some of these experiments a normal artificial sea-water was employed, as similar in composition as possible to natural sea-water, and made from pure chemicals. The silica necessary for the growth of the diatom frustules was found to be obtainable from the glass in which the cultures were kept. Sometimes this culture fluid succeeded and sometimes it failed, and it was found that it always succeeded if it was inoculated with from 1 to 4 per cent. of *natural* sea-water. Some growth stimulant was, therefore, present in sea-water, and it was found that this substance could be replaced by a very small amount of an infusion of the green seaweed Ulva. The infusion could be evaporated to dryness and ignited to 200° C. without losing its activity, but if the ash were heated to low red-heat it became inactive. The growth stimulant is therefore some relatively stable, organic substance, and it is compared with those materials known as auxetics or vitamines. Besides these matters of special interest, Dr. Allen's paper deals also, in a very interesting manner, with the general conditions of productivity of food substances in the sea, and is a good summary of our knowledge with regard to this important series of problems.

J. J.

SCIENCE AND TECHNOLOGY IN NEW ZEALAND.

THE quickening of interest in pure and technical science brought about by the war in our Colonies as well as in this country is shown by the action of the New Zealand Government in publishing a journal entitled the *New Zealand Journal of Science and Technology*, to appear quarterly under the general editorship of a group of representative scientific men of New Zealand. This is intended to include a number of the shorter and more popular articles on scientific subjects which are likely to interest the general public, and is supplementary to the more detailed and extended reports of the various scientific departments of the Government. In this way it is hoped to interest and instruct the public in scientific questions, and to cause the growth of a healthy public opinion on the need for the organisation and extension of industrial research in the community.

The first number of the new journal, containing sixty-five pages, covers a very wide range of topics of general interest, including short articles on various biological and geological subjects and several papers dealing with mining matters, while an interesting account is given by E. Best on the Maori system of measurement. Special articles are contributed on the history and geology of the Wakamarina valley and goldfield and of the geology of the Waikato valley. Of particular interest is the account by L. Birks of the utilisation of the waters of Lake Coleridge as a source of electric power for the city of Christchurch, sixty-three miles distant. This is the first comparatively large-scale attempt to utilise the important sources of water power in the New Zealand lakes and rivers. The hydro-electric installation at Lake Coleridge was formally opened in November, 1914, shortly after the outbreak of war, and has run continuously since March 1, 1915. In the first year of its operation about 2000 kilowatts of power were utilised, and this increased to 4000 in the course of the second year. Six thousand kilowatts are now provided, and to meet further extension another installation of 3000 kilowatts is in course of erection, but has been much delayed owing to the war. This enterprise has proved such a success that it is likely to stimulate the public to make further use in the near future of their great natural resources in water power for general industrial purposes. In another article E. Parry discusses the economics of electric-power distribution, and emphasises the importance and economy of a centralised plant for the distribution of electric power for the larger towns.

Altogether the new journal has made an excellent beginning, and is likely to prove a useful asset in interesting and educating the public in the importance of the application of scientific methods to the needs of a young community.

THE CARNEGIE INSTITUTION AND THE "HUMANITIES."

ONE section of the report of the president of the Carnegie Institution of Washington for the year ending October 31, 1917, which appears in the Year Book, No. 16, recently received, deals exhaustively with the relations of the institution and the public. The subjoined extracts from the report are of more than domestic interest.

It is often openly asserted and more often tacitly assumed that an endowed altruistic organisation acting under a State or a national charter may proceed without restrictions in the development of its work. Thus, in accordance with this view, the institution is frequently congratulated on its supposed freedom from governmental control and on its supposed immunity from social restraint. But this view is neither consonant with fact nor consistent with sound public policy. All such organisations are properly subject not only to the literal constraints of their charters, but also to the commonly more narrow, though unwritten, limitations imposed by contemporary opinion. The ideal to be sought by them in any case consists in a reciprocity of relations between the individual endowment on one hand and the vastly larger and more influential public on the other. This ideal, however, like most ideals, is rarely fully attainable. Hence, any new altruistic organisation is apt to find itself oscillating between two extreme dangers: one arising from action on the part of the organisation prejudicial to public interests; the other arising from public expectations impossible of attainment and therefore prejudicial to the organisation.

Happily for the institution, neither of these extreme dangers has been seriously encountered. Its evolution has proceeded without surpassing charter limitations and without permanent hindrance from an aggregate of expectations certainly quite unparalleled in the history of research establishments. But while thus far it has been practicable to steer clear of the rocks and the shoals towards which enthusiastic friends even of the institution would have it head, and to demonstrate the inappropriateness, the futility, or the impossibility of a large number of recurring suggestions for application of the institution's income, there remains a multitude of subjects and objects of omnipresent importunity for which the institution has furnished and apparently can furnish only general disappointment. There are two classes of them presenting widely different aspects, which appear worthy of special mention at the present unusual epoch in the intellectual development of mankind. These two classes find expression respectively in the perennial pleas of humanists for a larger share of the institution's income and in the more persistently perennial pleas of aberrant types of mind for special privileges not asked for, and not expected by, the normal devotees to learning.

Claims of Humanists.

Whenever and wherever the rules of arithmetic are ignored, then and there will develop vagaries, misunderstandings, and errors of fact that only the slow processes of time can correct. Hence it was not simply natural but also necessary that in the evolution of the institution something like conflict surpassing the bounds of generous rivalry should arise between claimants whose aggregate of demands for application of income has constantly exceeded the endowment from which income is derived. It might likewise have been predicted with certainty that the largest share of the resulting disapprobation visited upon the institution should come from the province of the humanists, not because they possess any property of superiority or inferiority, or any other singularity, but, first, for the reason that they are more numerous in the aggregate than the devotees of all other provinces combined; and, secondly, for the less obvious but more important reason that the subjects and objects of their province are more numerous, more varied, more complex, and in general less well defined than the subjects and objects of any other province.

Concerning all these matters humanistic which have agitated academic circles especially for centuries, the administrative office of the institution is naturally called upon to share in an extensive correspondence. Some of this is edifying, most of it is instructive, but a large, if not the greater, part of it appears to have been relatively fruitless in comparison with the time and the effort consumed.

An appeal to that correspondence shows, in the first place, that there is no consensus of opinion amongst professed humanists as to what the humanities are. It is well known, of course, by those who have taken the trouble to reflect a little, that the words "humanistic" and "humanist" are highly technical terms, more so, for example, than the term "moment of inertia," the full mechanical and historical significance of which can be understood only by consulting Euler's "Theoria Motus Corporum Solidorum." Technically, the humanist is not necessarily humane, though fortunately for the rest of us he generally possesses this admirable quality; he needs only to be human.

But these finer shades of verbal distinction which, with more or less elaboration, have come down to plague us from the days of the illustrious Alcuin and Erasmus, but with no such intent on their part, are less disconcerting than other revelations supplied by this expert testimony. It shows, in the second place, the surprising fact that some few humanists would restrict this field of endeavour to literature alone. From this *minimum minimorum* of content the estimates of our esteemed correspondents vary with many fluctuations all the way up to a *maximum maximorum* which would embrace all that is included in the comprehensive definition of anthropology to be found in the Standard Dictionary.

Thus some eminent authorities would exclude from the humanities all the ancient classics even, except their literatures. To such devotees philology, literary or comparative, has no interest; while archæology, classical or cosmopolitan, is of no more concern to them than comparative anatomy, which latter, by the way, is held in certain quarters to comprise the whole of anthropology. Equally confident groups of enthusiasts, on the other hand, animated by visions held essential to prevent our race from perishing, would, each in its own way, have the institution set up boundaries to knowledge within which the humanities, as always hitherto, would play the dominant part, but the appropriateness of fixation of which would be immediately disputed by other groups. There would be, in fact, only one point of agreement between them, namely, that the institution's income is none too large to meet the needs of any group.

It should be observed in passing, however, in fairness to our friends the humanists, that they are not alone in their regressive efforts to establish metes and bounds for advancing knowledge. Contemporary men of science have likewise pursued the same *ignis fatuus* with similarly futile results, as is best shown by the arbitrary and often thought-tight compartments into which science is divided by academies and royal societies. A sense of humour leads us to conclude that these likenesses between groups and assemblages thereof, still more or less hostile at times to one another, serve well to prove that the individuals con-

cerned are human, if not humanistic, and that they all belong to the same genus, if not to the same species.

There is included also in the extensive correspondence on which this section is mainly based a special contribution of letters furnished mostly by university presidents and professors and by men of letters selected with the view of excluding all those who might be suspected of any non-humanistic predilections. These letters were received as replies to a communication issued first during the year 1910, and occasionally since then, soliciting counsel from those well qualified to assist the institution in determining how it may best promote research and progress in the humanities and how it may be relieved of the charge of unfairness towards them in the allotment of its income. The essential paragraphs in this communication are the following:—

"Amongst other suggestions arising naturally in this inquiry is that of the desirability of something like a working definition of the term 'humanities.' To the question, What are the humanities? one finds a variety of answers, some of which seem much narrower than desirable.

"In order to get additional information on this subject, and in order to make this part of the inquiry as concrete and definite as possible, I am sending copies of the enclosed list of publications to a number of friends, requesting them to mark those entries of the list which they, as individuals, would consider works falling properly in the fields of the humanities. I shall esteem it a great favour, therefore, if you will kindly examine this list, indicating by some sort of check-mark what works, if any, may be rightly so classed, and then mail the same in the enclosed stamped envelope. It will be of service also to indicate to me, if you care to do so, the lines of distinction which may be drawn between the humanistic sciences and the physical sciences. I am sure you will agree with me that it will be a decided aid to all of us to secure something like common definitions for these boundaries of knowledge."

About thirty distinguished authors have participated in this symposium; and their frank and generous expressions of opinion would be well worthy of publication if they had not been assured that their responses would not be used for such a purpose. It is believed that no confidence will be violated in stating the two following statistical facts, which not only agree with one another, but strongly confirm also the inductions referred to above, drawn from the more miscellaneous correspondence of the institution:—

(1) The definitions of the term "humanities" vary from the exclusiveness of literature alone to the inclusiveness of the more recent definitions of anthropology, with a noteworthy tendency towards inclusiveness rather than the reverse.

(2) To the concrete question, What works, if any, already published by the institution fall in the humanities? the answers vary from two to thirty-three, the number of publications up to 1910 being 146.

In the meantime, while waiting for a diminution in the diversity of opinion, it appears to be the duty of the institution to proceed, as it has sought to proceed hitherto, in a spirit of sympathy and equity based on merit towards all domains of knowledge, with a full appreciation of the necessary limitations of any single organisation, and with a respectful but untrammelled regard for the views, the sentiments, and the suffrages of our contemporaries.

Aberrant Types of Mind.

If words and phrases drawn out of the past may obscure thought and supplant reason in the domains of the less highly developed sciences, like the humanities, for example, they are by no means free from difficulties when used as media for the communication of ideas in the domains of the more highly developed sciences. The differences between the ambiguities and the obscurities of the two domains are mainly in degree rather than in kind. It is a truism, of course, that in general it is much easier to discover errors and to improve uncertain verbal expression in the definite than in the indefinite sciences. Erroneous statements and interpretations of fact may be often corrected by the facts themselves or by means of a knowledge of their relations to underlying principles. Precision and correctness of language are also greatly increased in any department of learning when it becomes susceptible to the economy of thought and of expression characteristic of the mathematico-physical sciences. The perfection of these latter is, indeed, so great that novices working in them are often carried safely over hazardous ground to sound conclusions without adequate apprehension of the principles involved and with only erroneous verbal terms at command to designate the facts and the phenomena considered.

Nevertheless, it must be admitted that the terminology of what commonly passes for science, as well as the terminology used frequently even by eminent men of science, is sadly in need of reformation in the interests of clear thinking, and hence of unequivocal popular and technical exposition. To realise the vagueness and the inappropriateness in much of the current use of this terminology, one needs only to examine the voluminous literature available in almost any subject called scientific. It is so much easier to appear to write well, or even brilliantly, than it is to think clearly, that facile expression is often mistaken for sound thought. Thus, to illustrate, while in physics the terms force, power, and energy have acquired technical meanings entirely distinct and free from ambiguity, they are commonly used as synonyms, and quite too commonly to designate properties, sentiments, and influences to which their application is meaningless. The "forces," the "powers," and, more recently, the "energies" of "Nature" are frequently appealed to in popular literature; and a familiar bathos consists in equipping them solemnly with the now vanishing stable furniture "for the benefit of mankind." Science is disfigured and hindered also by much inherited antithetical terminology for which reasons once existent have now disappeared or are disappearing. Instances are found in such terms as metaphysics, natural history, and natural science, the two latter of which appear to have come down to us without sensible modification, except for a vast increase in content, since the days of Pliny the Elder. The diversification and the resulting multiplication of meanings of the terms of science are everywhere becoming increasingly noticeable and confusing. One of the most recent manifestations is seen in the phrase "scientific and industrial research," which probably means about the same thing as the equally uncertain phrase "pure and applied science"; while both phrases have been turned to account in setting up invidious distinctions inimical to the progress of all concerned.

This looseness in the use of terminology inherited from our predominantly literary predecessors and the prevailing absence of any exacting standards of excellence in exposition make it easy for that large class here designated as aberrant types to take an unduly prominent part in the evolution of any establishment founded for the promotion of "research and discovery and the application of knowledge for the improvement of mankind." These types are numerous, and

each of them presents all gradations ranging from harmless mental incapacity up to aggressive pseudo-science, which latter often wins popular approval and thus eclipses the demonstrations of saner counsels. The representatives of these types are variously distinguished in common parlance as cranks, quacks, aliens, charlatans, mountebanks, etc. Some of the most persistent types are known as arc-trisectors, circle-squarers, and perpetual-motion men and women. They are not of recent development; they are co-extensive with our race; but they have been little studied except in the cases of extreme divergence from the normal.

It ought to be well known, but evidently is not, that the institution has had to deal with, and must continue to be harassed by, great numbers of these aberrant types. The happy phrase of the founder concerning the "exceptional man" has worked out very unhappily both for them and for the institution, since it has only inevitable disappointment to meet their importunate demands, while they in turn have only inevitable animadversion to visit finally upon the institution. Deluded enthusiasts and designing charlatans entertain alike the illusion that here at last is an establishment that will enable them to realise their wildest dreams of fame and fortune. But in the end the hopes of these people are either rudely shocked or wrecked, not because the institution would disturb them in their fancies, but because they compel the institution to decline to approve their theories and to subsidise their projects. Two illustrations drawn from the older and hence more impersonal sciences may suffice to indicate the nature of the daily experience here in question :—

(1) A teacher of youth in a public school desires assistance in securing letters-patent for a new proof of the Pythagorean theorem. And why not, since we read every day in the public Press and in the debates of legislative bodies of "principles" being patented?

(2) Quite recently it has been "discovered" that the air and the æther contain "free energy." If this is so, if energy, like urbanity, is free, why should it not be rendered available at the expense of the institution for the improvement of mankind?

Study and reflection concerning these aberrant types and an intimate association with them beginning thirty years before the foundation of the institution all point to the conclusion that responsibility for their undue prominence must be attributed in large degree and in the last analysis to a prevalent inadequate development of critical capacity even amongst the best educated classes of contemporary life. Many representatives of these latter regard the eccentric individual as thereby worthy of special attention. He is often referred to as a sprite or as a male witch, but commonly, of course, under the more familiar designations of our day as "a genius" or as "a wizard." Thus it is quite easy for obvious charlatans and ignoramuses, as well as for those in pursuit of Sisyphean paralogisms and anachronisms, to secure letters of introduction and commendation to the institution from distinguished people, who pass the applicants along on the theory apparently that no harm can result from an effort to assist in the laudable work of extending learning. It is assumed that a research establishment must have effective facilities for utilising the necromantic capacities attributed to those in particular to whom the terms "genius" and "wizard" are by common consent applied. Such introductions and commendations are generally held to be equivalent to approvals which may not be lightly set aside. The suggestion of tests of the pretensions and of checks on the deductions of these applicants is repulsive to them. What they desire is not diagnosis, but endorsement.

In dealing with these aberrant types there are encountered certain other fallacies of a more specious, and hence of a more troublesome, character. They arise out of the prevailing innocence of, if not contempt for, the doctrine of probabilities. The simplest of these fallacies is seen in the common belief that one mind is as likely as another to make discoveries and advances in the realms of the unknown. Thus it is assumed that research establishments should maintain experts, or corps of them, for the purpose of promoting the efforts of tyros, amateurs, and dilettanti, or, in other words, perform the functions of elementary schools. A subtler fallacy is expressed in the more common belief that a research organisation should occupy itself chiefly in soliciting and in examining miscellaneous suggestions. It is held that if these are received in large numbers and if they are read long enough and hard enough, the possibilities of knowledge will be completely compassed. The worst of all these fallacies is found in the not unpopular notion that if experts could be set at work under the direction of inexperts great progress could be achieved. This is the fallacy so often used to justify placing technical work under the administration of politicians and promoters rather than under the charge of competent men. It finds frequent expression also in suggestions to the institution that its corps of investigators might avoid the dangers of "respectable mediocrity" by yielding to the requests of the less conservative and more brilliant advocates of advancing knowledge.

But what, it may be asked, are the characteristics which differentiate these pseudo-men of science from normal investigators? They are well defined and not numerous. The pseudo-man of science is in general excessively egoistic, secretive, averse to criticism, and almost always unaware of the works of his predecessors and contemporaries in the same field. He displays little of that caution which is born of adequate knowledge. He is lacking especially in capacity to discover and to correct his own mistakes. He is for ever challenging others to find errors in his work. He has an overweening confidence often in formal logic, but is unable to see that this useful device may play tricks by bringing him, for example, simultaneously to right and to wrong conclusions by reason of wrong premises. His worst defect is manifested in asking for, and in expecting to get, more lenient consideration in the forum of demonstration than that accorded to his more modest but more effective competitors.

How inadequate are the hasty popular estimates of these exceptional individuals is sufficiently witnessed in the extensive experience of the institution. In the brief interval of its existence it has had to deal with about 12,000 of them. Many of these have been commended to the institution in terms well calculated to set aside the laws of biologic continuity and thus to elevate the aspirants abruptly from irreproachable respectability to questionable fame. To some of them have been attributed qualities worthy of the mythological characteristics conceived by the unrestrained imaginations of men in pre-scientific times. Not a few of them have proved to be obvious fakers, schemers, or incompetents masquerading in the name of learning with the confident expectation that the institution would endorse, finance, or otherwise promote their objects under the guise of research. But, as might have been predicted, the history of all this varied experience is a history of futility clouded here and there by manifestations of the baser traits of mankind and lighted up only occasionally by flashes of wit, wisdom, or humour in the prevailing pathologic cast.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—At the last meeting of the council of the University a communication was received from Dr. R. S. Heath stating that owing to ill-health he desired to retire from his appointments as vice-principal, professor of mathematics, and registrar. Dr. Heath was appointed to his chair in Mason College in May, 1884—thirty-four years ago. Appointed chairman of the College Academic Board in 1889 and principal of the college in 1890, he was included in the University charter as the first vice-principal, undertaking in addition the duties of registrar. As a member of council and senate he has rendered splendid service to the University, and ably represented it on many educational bodies.

Dr. Stacey Wilson is resigning his lectureship in medicine to dental students in September next, after upwards of twenty-six years' service.

Dr. Mary Clarke is resigning her post as lecturer in hygiene to students in the Training College for Women owing to a great increase in hospital work.

Upon the nomination of the Dean of the medical faculty, the council has appointed Dr. Thomas Wilson Sub-Dean of the faculty.

Miss B. M. Bristol and Miss N. Carter have been appointed honorary demonstrators in botany for the current term.

THE Dr. Edith Pechey Phipson post-graduate scholarship of the London (Royal Free Hospital) School of Medicine for Women is to be awarded in June. It is of the yearly value of 40*l*. for a period not exceeding three years, and is open to all medical women, preferably coming from India or going to work there, for assistance in post-graduate study. Applications must be received by May 31 by the Warden and Secretary of the School, 8 Hunter Street, Brunswick Square, W.C.1.

IN connection with the Department of Applied Statistics and Eugenics of University College, London, the Crewdson Benington studentship in anthropometry and craniology (value 100*l*.) and a Francis Galton studentship in eugenics (value 130*l*.) are to be filled in July next. Candidates must be post-graduates, and have had training in mathematics, physical measurements, biology, and computing. Applications should be made to the Director of the Biometric and Galton Laboratories, University College, Gower Street, W.C.1.

THE report on educational reform adopted by the conference of the London Teachers' Association in November last has been issued in pamphlet form. It anticipates in some respects the chief provisions of the Education Bill introduced by Mr. Fisher in February last, which is now under consideration in Committee of the House of Commons. It is highly satisfactory to find so important a body of teachers in wholehearted support of the measures of educational reform initiated and so convincingly advocated by Mr. Fisher, and it should have a highly beneficial influence in promoting the ultimate passage of the Bill. Where the aims of the conference go beyond the provisions of the Bill, which are, in effect, in the nature of a practical compromise of conflicting demands, and might well await the results of experience, it would be wise for the great body of teachers to give unwavering support to the measure as it stands, which, if it is to have any chance of success in the present Parliamentary session, will need all the help the friends of education can bring. There has grown up during these nearly four years of calamitous war a strong conviction that the salvation of the nation is to be found in the provision of the means of complete education for all classes of the people, especially with a view to the extended electorate and the grave responsibilities which it implies; that the children are the nation's greatest asset; and that for the comparatively large number of really capable children to be found in all strata of the nation, even the lowest, there should be brought into existence the fullest facilities for their adequate training, alike physical, intellectual, and moral, so as to fit them for the duties of life and for the highest service, according to their capacities and opportunities. The conference demands the most complete university education and training for all classes of teachers in both subject and method, and an unlimited scope for gifts and experience, with adequate reward during service and due provision on retirement, and insists that in all grades of the inspectorate there shall be guarantees of high practical skill as teachers and full knowledge of the best educational theory. Only on such terms can the nation be assured of a corps of efficient public servants in the most important of its many various spheres of national service.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 25.—Sir J. J. Thomson, president, in the chair.—Sir Charles **Parsons**: Bakerian lecture: Experiments on the production of diamond. The paper alludes to some of the results of experiments described in papers by the author to the Royal Society in 1888 and 1907, particularly to those on the decomposition by heat of carbon compounds under high pressure, and on the effect of applying pressure to iron during rapid cooling. A description is given of experiments designed to melt carbon under pressures up to 15,000 atmospheres by resistance heating and by the sudden compression of acetylene oxygen flame, also by the firing of high-velocity steel bullets through incandescent carbon into a cavity in a block of steel. Allusion is made to experiments on chemical reactions under high pressure and their results. The pressures occurring in rapidly cooled ingots of iron, and experiments bearing upon this question, are discussed. Experiments at atmospheric pressure and also *in vacuo* are described. The main conclusions arrived at are:—That graphite cannot be converted into diamond by heat and pressure alone within the limits reached in the experiments; that there is no distinct evidence that any of the chemical reactions under pressure have yielded diamond; that the only undoubted source of diamond is from iron previously heated to high temperature and then cooled; and that diamond is produced, not by bulk pressure, as previously supposed, but by the action of the gases occluded in the metal and condensed into the centre on quick cooling.

Geological Society, April 17.—Mr. G. W. Lamplugh, president, in the chair.—A. E. **Trueman**: The evolution of the Liparoceratidæ. The Ammonites considered include several subparallel series, of which four genera were indicated by Mr. S. S. Buckman in "Yorkshire Type Ammonites." The details of ontogeny and the sutures have been employed in constructing tables showing both the biological and the stratigraphical relations of the various species; a revision of the existing classification is proposed. The early members of each series are similar "capricorn" forms with slender whorls and stout ribs. In somewhat later examples the outer whorl is swollen and has paired tubercles. From this stage the tendency is to shorten

the period with slender capricorn whorls by accelerating the development of bituberculation and prolonging the period of pre-costate globose whorls. The following genera may be recognised; each includes Ammonites of the three types mentioned above:—(1) An earlier group, with tubercles paired in the involute stages; Radstock (Somerset) is the only British locality where these Ammonites have been found. (2) A later group, with unpaired tubercles in the involute stage. These genera are most readily distinguished by sutural characters, namely, the relative depths of the external lobe (EL) and the first lateral lobe (IL), and by the width of the external saddle (ES). (*a*) With narrow ES (not reaching to the outer tubercles). (*b*) With wide ES, reaching to the outer tubercles. These Ammonites generally occur in the upper part of the Lower Lias, where it has been usual to recognise a *capricornus* zone overlying a *striatus* zone. There are several horizons with capricorn Ammonites of different series, and several with the involute forms evolved from them. In no locality examined is the complete sequence shown. The absence of some groups is due to the original distribution of the Ammonites; in other cases it is due to non-sequences. Two groups of Lias Ammonites are recognised, namely: (i) those which were evolved directly from a globose ancestor, and (ii) those which passed through an intermediate broad-ventered (cadicone) stage.

Royal Microscopical Society, April 17.—Mr. J. E. Barnard, president, in the chair.—J. M. **Brown**: *Pyxidicula invisitata*, a Rhizopod new to Britain, and *Hedriocystis spinifera*, a new Helizoon. The first-named appears to be widely distributed in Britain, but has not apparently been referred to by any author since first described by Averintzeff. The second species is related to *H. reticulata*, Penard, but is smaller, has no pedical, and is provided with spines at the angles of the facets of the capsule.—E. **Atkinson**: Hypo-eutectoid steel. Details of a systematic research (R.288) were given, the investigation being conducted to find the cause of failure in a hypo-eutectoid steel of the middle carbon range. In turn each of the following was dealt with:—(1) Mechanical test by laboratory adaptation of the Brinell test; (2) evolution of H_2S for printing; (3) tensile testing; (4) chemical composition; (5) computation of pearlite, MnS, and ferrite to be expected under the microscope; (6) a complete series of photomicrographs showing enclosures of MnS, pearlite, sorbitic pearlite, banded ferrite or "ghost lines." Structural deformation and types of micro-structures were rarely met with. Then followed several illustrations of normal steels with varying percentages of carbon, commencing with an almost pearlite-free iron. The paper also embraced the preparation of specimens, development of structures by "etching," and the lens system used in the author's laboratory for illuminating the specimens. A brief, though very thorough, description of the manufacture of hypo-eutectoid steel concluded the paper.—E. J. **Sheppard**: Two valuable methods of staining in bulk and counter-staining. The author described a new method of staining in bulk with carmalum and counter-staining with light green, and a second method of staining in bulk with iron hæmatoxylin and counter-staining with erythrosine, both of which methods gave excellent results.

Linnean Society, April 18.—Sir David Prain, president, in the chair.—Prof. J. P. **Hill**: An expedition to Brazil in 1913. The expedition was supported by grants from the Government Grant Committee and Council of the Royal Society, and the trustees of the Percy Sladen Fund. The primary object was to obtain material for studying the development of certain American marsupials, the most familiar being the American opossum. When the expedition was organised, our knowledge of the development of Didelphys rested on the incomplete account given by Emil Selenka in 1886; the author's own observations on the Australian native cat, Dasyurus, differed essentially from Selenka's statements, and it was hoped to get the facts concerning them. Another point was to determine the development of those genera regarded on anatomical grounds as nearest the base of the Didelphyd series, namely, Marmosa and Peramys; these are small rat-like creatures, remarkable for the entire absence of the pouch so characteristic of the other members of the order. Summing up the results, the expedition may be regarded as successful, though all its objects were not attained. Besides the material for anatomical investigation, a small collection of rodents was brought back, about eight genera of Muridæ, and an interesting series of frogs, about twenty-two species, two being new.

MANCHESTER.

Literary and Philosophical Society, April 23.—Mr. W. Thomson, president, in the chair.—Dr. E. **Newbery** and H. **Lupton**: Radio-activity and the coloration of minerals. A number of mineral specimens were examined as to their behaviour (*a*) on heating, (*b*) on treatment with radium or cathode rays before or after heating, and (*c*) on heating after treatment (*b*). Several brilliant colour effects were obtained, among which may be mentioned the complete restoration of the original colour to green fluorite, smoky quartz, zircon, topaz, etc., which had been decolorised by heat, the production of a fine deep blue colour in a colourless fluorite from Matlock by radium, an intense purple in colourless fluorite from the Pyrenees by cathode rays, and an indigo blue in transparent barytes by radium. A bright green thermo-luminescence was imparted to all the fluorites used, and their original violet thermo-luminescence was also restored if that had been destroyed by previous heating. A Spanish phosphorite gave a brilliant yellow thermo-luminescence which was restored with increased strength by radium or cathode rays. It was concluded that many minerals owe their colour and thermo-luminescence to the presence of radio-active matter either in the water from which they have been deposited or in the surrounding rock. Traces of certain inorganic impurities are acted upon by α, β, or γ rays and dissociated, the size or density of the resulting particles determining the colour produced. On heating, the dissociated atoms recombine with evolution of light and loss of colour to the mineral.

DUBLIN.

Royal Dublin Society, March 26.—Dr. G. H. Pethybridge in the chair.—R. G. **Allen**: The electrical resistance of porcelain at different temperatures. The results of testing the insulation resistance of eight samples of various forms of porcelain were given for temperatures ranging from about 20° C. to nearly 300° C., and these results showed that for each the simple relation between insulation resistance and absolute temperature previously given by Rasch and Hinrichsen was confirmed. A means of discovering the identity of a sample of unknown porcelain was also pointed out.—J. **Doyle**: Observations on the morphology of *Larix leptolepis* (two papers). The first part deals with the development of the double pollen grains. Owing to the obliquity of the first division spindle, even through a right angle, the first cell cut off may be one-third, or even one-half, the original cell. If one-third is cut off,

this part may divide a little irregularly; the larger part, however, proceeds normally, as if the first division had been a small prothallial cell. If the first division is equal, each half gives rise to one prothallial cell, tube cell, and body cell. In this case the prothallial cell may be cut off at any side, but only one (and always one) is cut off. The whole process is similar to that in Picea. The mature grain has very distinct walls bounding the prothallial cells, and distinct vestiges of a wall surrounding the generative nucleus. Evidence is also adduced against the idea that the cavities in the stamen apex of the Abietineæ are abortive sporangia. In the second part of the paper the development of the female gametophyte is followed out, and, as was to be expected, it agrees accurately with the typical Abietinean plan, including the typical pro-embryo. One marked peculiarity is this: pollen is received by the ovule by a peculiar micropylar development which includes a median constriction and a mass of stigmatic hairs at the opening, exactly as in Pseudotsuga. The pollen in Larix can germinate only on the nucellus, differing in this respect from Pseudotsuga. This is not common, as only one ovule in four has a nucellar grain, and, with few exceptions, one such grain. How the grain reaches the nucellus was not determined. None were so found until June. The main features of the female gametophyte are very similar to Pseudotsuga. In a summary of details it is shown that Pseudotsuga and Larix are very closely allied, though separated in the ordinary classifications. This, however, confirms conclusions already arrived at by Jeffrey and Penhallow from anatomical data only.

April 23.—Dr. G. H. Pethybridge in the chair.—R. G. **Allen**: The insulating properties of erinoid. Results of tests were given for erinoid, an insulator of comparatively recent origin, and also for vulcanised fibre, which was employed for purposes of comparison and tested under the same conditions as the former material. The tests comprised the determination of certain physical properties of erinoid, its absorption and retention of water, the electrical resistance of machined and unmachined samples at different temperatures, and the effects of altering the thickness of the samples, changing the value of the applied voltage, and using different electrodes. It was found that for both erinoid and fibre a simple relation between resistance and temperature obtained; that erinoid, but not fibre, was free from dielectric absorption, and machined erinoid was practically independent of the applied voltage. As an insulator erinoid was found to be more stable than, and generally superior to, vulcanised fibre.—Sir John **Moore**: Solar haloes seen at Greystones, Co. Wicklow, September 22, 1879, and in Texas and Ohio, U.S.A., October 3, 1917. This was a short communication on a remarkable series of solar haloes which were observed at Houston, Texas, U.S.A., in the forenoon of October 3, 1917. Some hours later a modified form of the same phenomenon appeared at Gallia, Ohio, about 1000 miles (as the crow flies) to the north-east of Houston. An illustrated description of these unusual haloes was published in the *Monthly Weather Review*, Washington, October, 1917. Apart from the intrinsic beauty of the American display, much interest attached to it from the fact that a precisely similar phenomenon had been witnessed by the late Sir Robert Ball in the forenoon of September 22, 1879, at Greystones, Co. Wicklow.—Dr. H. H. **Dixon**: Mahogany and the recognition of some of the different kinds by their microscopic characteristics. This paper gives an account of the microscopic structure of some forty different woods usually marketed as mahogany, and contains a key by means of which these woods may be recognised by their microscopic characteristics. The structure of the woods described is illustrated by photomicrographs.

Royal Irish Academy, April 8.—The Most Rev. Dr. Bernard, Archbishop of Dublin, president, in the chair.—J. A. **McClelland** and P. J. **Nolan**: The nature of the ions produced by bubbling air through liquids. Previous papers by the authors and by J. J. Nolan have shown the existence of groups of ions of widely different mobilities in air that has been used in the spraying of water or that has been bubbled through water or mercury. The present paper is an extension of this work, and deals mainly with the results of bubbling air through alcohol. The existence of fourteen groups of ions is established, their mobilities ranging from 1·1 cm. per sec. to 0·00015 cm. per sec. in a field of one volt per cm. The relative amounts of the different ions present depend on the pressure used to force the air through the liquid, and on the time that elapses between the bubbling and the measurement of the mobilities. The nature of these ions is discussed in the paper.

April 22.—The Most Rev. Dr. Bernard, Archbishop of Dublin, president, in the chair.—H. **Ryan**, J. **Algar**, and P. **O'Connell**: Syntheses of some new substantive dyes derived from benzidine-sulphone. The preparation of about fourteen dyes from tetrazotised benzidine-sulphone-disulphonic acid by "coupling" with phenols and amines is described; the influence of the adjunct on the colour is discussed, and the possibility of utilising these substances in medicine indicated.—H. **Ryan** and T. **Glover**: The nitro-derivatives of diphenylamine. The determination of the constitution and the properties of several nitro-derivatives of diphenylamine was undertaken in order to facilitate the study of the action of the oxy-acids of nitrogen on the base. The authors also describe some new substances which they obtained by the action of nitric and nitrous acids on nitro-diphenylamines.—H. **Ryan** and Phyllis **Ryan**: The action of nitric acid and nitrous acid on diphenylamine. Part i.—H. **Ryan** and J. J. **Drumm**: The nitro-derivatives of phenyl-2-naphthylamine.

PARIS.

Academy of Sciences, April 22.—M. P. Painlevé in the chair.—J. **Boussinesq**: Partial differential equations for states of sandy masses capable of flow in the neighbourhood of the Rankine-Levy solution.—L. **Lecornu**: The sign of rotations. In mechanics a rotation is regarded as positive when it is effected from left to right of the observer; astronomers adopt the opposite convention. The author discusses adversely the proposal to reverse the convention in mechanics and to take the same positive sense of rotation as in astronomy.—P. **Sabatier** and G. **Gaudion**: The crotonisation of acetaldehyde, formation of butanol and hexanol starting with ethanol. By the use of copper at 300° C. and uranyl oxide at 360° C. as catalysers, ethyl alcohol can be converted at one operation into crotonic aldehyde, the copper giving hydrogen and aldehyde, and the latter being converted into crotonaldehyde by the oxide of uranium. Better yields are obtained by starting with paraldehyde, the product being crotonaldehyde hexadienal and octatrienal, separable by fractional distillation. The aldehydes, by slow hydrogenation over nickel at 170° to 180° C., can be easily converted into the corresponding saturated alcohols, normal butyl alcohol and normal hexyl alcohol.—Ch. **Depéret**: An attempt at a general chronological co-ordination of Quaternary time.—M. L. Favé was elected a member of the section of geography and navigation in succession

to the late Gen. Bassot.—A. **Véronnet**: Contraction and evolution of the sun.—F. **Roux**: The gold minerals of the Ivory Coast. Analyses of some specimens collected by the author at Kokumbo. The metallic portion of a quartz, without visible gold, gave bismuth 48 per cent., tellurium 37 per cent., gold 8·36 per cent. Two metallic specimens, extracted from the mineral from Poressou and containing 76·78 per cent. and 93·04 per cent. of gold, also contained tellurium and bismuth.—F. **La Marca**: A new hybrid produced by grafting.—A. **Guilliermond**: The nature and signification of the chondriomé.—J. **Amar**: Physiological prothesis of the foot.—L. **Lumière**: A phenomenon of singular appearance relating to the persistence of luminous impressions.

BOOKS RECEIVED.

Organic Compounds of Arsenic and Antimony. By Prof. G. T. Morgan. (Monographs on Industrial Chemistry.) Pp. xx+376. (London: Longmans and Co.) 16*s*. net.

Edible Oils and Fats. By C. A. Mitchell. Pp. xii+159. (Monographs on Industrial Chemistry.) (London: Longmans and Co.) 6*s*. 6*d*. net.

Soil Physics and Management. By Prof. J. G. Mosier and A. F. Gustafson. Pp. xiii+442. (Philadelphia and London: J. B. Lippincott Co.) 8*s*. 6*d*. net.

Veterinary Post-Mortem Technic. By Prof. W. J. Crocker. Pp. xiv+233. (Philadelphia and London: J. B. Lippincott Co.) 16*s*. net.

A Not Impossible Religion. By S. P. Thompson. Pp. xv+335. (London: J. Lane.) 6*s*. net.

Mind and the Nation. By J. H. Parsons. Pp. 154. (London: John Bale, Ltd.) 7*s*. 6*d*. net.

The Photographic Industry of Great Britain, 1918. (London: British Photographic Manufacturers' Association, Ltd.)

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland. Thirty-fourth annual issue. Pp. vii+334. (London: C. Griffin and Co., Ltd.) 9*s*.

Tropic Days. By E. J. Banfield. Pp. 313. (London: T. Fisher Unwin, Ltd.) 16*s*. net.

DIARY OF SOCIETIES.

THURSDAY, MAY 9.

ROYAL SOCIETY, at 4.30.—Contribution to the Theory of Attraction when the Force varies as any Power of the Distance: Major P. A. MacMahon and H. B. C. Darling.—Electromagnetic Integrals: Sir George Greenhill.—Intensity Relations in the Spectrum of Helium: Dr. T. R. Merton and Prof. J. W. Nicholson.—The Outline of a Theory of Magnetic Storms: Dr. S. Chapman.

ROYAL INSTITUTION, at 3.—The Folk Lore of Bells: Sir J. G. Frazer.

ROYAL SOCIETY OF ARTS, at 4.30.—The Freedom of the Sea: Sir F. T. Piggott.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—*Discussion*: A British Electrical Proving House. Opener, C. Turnbull.

OPTICAL SOCIETY (Imperial College of Science and Technology), at 7.—Note on Spherical Aberration: T. Y. Baker and Major L. N. G. Filon.

MATHEMATICAL SOCIETY, at 5.—The Continued Fractions connected with the Hypergeometric Equation: E. Lindsay Ince.

FRIDAY, MAY 10.

ROYAL INSTITUTION, at 5.30.—Human Nutrition: Prof. F. Gowland Hopkins.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Observations of Encke's Comet (1917*c*) made with the 28-in. Equatorial: Royal Observatory, Greenwich.—Absurd Conclusions Derived from Einstein's Gravitation Theory: L. Silberstein.—A New Variable Star in Auriga: A. Stanley Williams.—Baxendell's Observations of Variable Stars; H. H. Turner and Mary A. Blagg.—*Probable Papers*: The Measurement of Time to the Thousandth of a Second: R. A. Sampson.—The Variation of Latitude. Observations of Sirius and Procyon made with the 28-in. Refractor of the Royal Observatory, Greenwich: Sir F. W. Dyson.—The Period of Sirius: R. Jonckheere.—Twelfth Note on the Number of Faint Stars with Large Proper Motions: F. A. Bellamy.

PHYSICAL SOCIETY, at 5.—The Times of Sudden Commencement of Magnetic Storms: Dr. S. Chapman.—The Entropy of a Metal: Dr. H. S. Allen.—Tracing Rays through an Optical System: T. Smith.

MONDAY, MAY 13.

ROYAL SOCIETY OF ARTS, at 4.30.—Recent Developments in Leather Chemistry: Prof. H. R. Procter.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—The Achievements of France in Morocco: J. M. MacLeod.

VICTORIA INSTITUTE, at 4.30.—Terrestrial Magnetism: Dr. S. Chapman.

TUESDAY, MAY 14.

ROYAL INSTITUTION, at 3.—Field-Anthropologists: Prof. A. Keith.

ROYAL SOCIETY OF ARTS, at 4.30.—Recent Developments in Leather Chemistry: Prof. H. R. Procter.

ROYAL STATISTICAL SOCIETY, at 5.15.—The Effect of Trade Fluctuations upon Profits: Dr. J. C. Stamp.

ILLUMINATING ENGINEERING SOCIETY, at 6.30.—*Discussion*: The Lighting, Heating, and Power Order (1918), and the Best Methods of Making Economies.

WEDNESDAY, MAY 15.

ROYAL SOCIETY OF ARTS, at 4.30.—The Timber Industry: Prof. Percy Groom.

ROYAL METEOROLOGICAL SOCIETY, at 5.—Continentality and Temperature. II.: The Effect of Latitude on the Influence of Continentality on Temperature: C. E. P. Brooks.—Report on the Phenological Observations for 1917: J. E. Clark and H. B. Adames.

GEOLOGICAL SOCIETY, at 5.30.—The Geology of the Italian Front: Prof. E. J. Garwood.

SOCIETY OF GLASS TECHNOLOGY (Institute of Chemistry), at 2.30.—Furnace and Factory Operation for Automatic Glass-working Machinery: A. R. Hunter.—The Glass Industry after the War: W. F. J. Wood.

THURSDAY, MAY 16.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: General Factors in Mental Measurements: J. C. M. Garnett.—The Absorption of X-Rays in Copper and Aluminium: C. M. Williams.—The Electrical Resolution and Broadening of Helium Lines: Dr. T. R. Merton.

ROYAL INSTITUTION, at 3.—The Prosecution and Punishment of Animals: Sir J. G. Frazer.

ROYAL SOCIETY OF ARTS, at 4.30.—The Freedom of the Sea: John Leyland.

INSTITUTION OF MINING AND METALLURGY, at 5.30.

FRIDAY, MAY 17.

ROYAL INSTITUTION, at 5.30.—The Story of a Grass: Dr. A. B. Rendle.

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MACMILLAN AND CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

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