THURSDAY, AUGUST 7, 1919.

THE FORESTRY BILL.

WE referred last week to the Forestry Bill, which has passed its third reading in the House of Lords and is now before the House of Commons. The Bill is a Government measure and is largely based upon the Report of the Forestry Sub-Committee appointed by the late Minister of Reconstruction. It creates a Forestry Authority consisting of five Commissioners, three of whom are to be paid, "charged with the general duty of promoting the interests of forestry, the development of afforestation, and the production and supply of timber in the United Kingdom." The Commissioners will have powers to expend 3,500,000*l.* during the next ten years in afforestation. This sum of money is to be at their absolute disposal, and will be subject to no control by Parliament or by any Minister responsible to Parliament. The powers conferred are thus very wide. The Commissioners may acquire land, compulsorily if necessary, and may plant trees themselves, or aid, by loan or grant, owners of land to plant. They may establish and carry on woodland industries. Education in forestry is to be promoted by the establishment of schools and by aid to existing institutions where forestry is taught. The Commissioners may also make inquiries and undertake experiments and research.

It will be obvious from this synopsis that the Commissioners will have the charge of a great national undertaking, which, if it were a business proposition, would need to provide evidence that the men who are to be entrusted with the work possess the qualifications necessary to give confidence in their successful accomplishment of it. In other words, if the Bill represented a company prospectus involving the control and expenditure of three and a half million pounds, little of this amount would be subscribed in the absence of any assurance as to the satisfactory constitution of the directorate. This, however, is exactly what the Bill neglects to supply. There is nothing to ensure that any of the Commissioners—paid or unpaid—shall have any knowledge of forestry; so that, just as we have had a Dyes Commissioner without special knowledge of the subject with which he was concerned, the Forestry Commissioners may similarly become purely political appointments.

We are glad that there is one body which watches national matters of this kind with the view of promoting efficiency and economy by the right use of scientific knowledge and experience. There is no group of men of science in the House of Commons apart from that of the medical members; therefore it must be left to those outside the House to make strong representation of their views when measures demand it. The British Science Guild has done this in the case of the Forestry Bill; and it is to be hoped that the action taken will ensure that the Forestry Authority will not be a purely amateur Board of Commissioners, but will include men who have had a sound scientific training and practical knowledge of forestry conditions—particularly those in the United Kingdom, with which the Commissioners will be concerned. Such men would secure adequate attention to forestry research and education, and would in addition be likely to see that the officers appointed upon the staff are well qualified to perform their duties. But even with a Forestry Authority which included Commissioners with expert knowledge, it would be a decided advantage if all officers were selected by an independent selection board.

In forestry, as in other departments of applied science, it is usual in this country to try to do without the expert, and to call for his advice only when compelled to do so by the failure of amateur administrators. The common attitude towards scientific and technical knowledge was expressed by Lord Ancaster in the House of Lords when he said recently:

"The Government, instead of making up the deficit in timber, seems to be chiefly engaged in questions of research. He did not claim to be a timber expert, but the thing was not so extraordinarily difficult as to require so many scientific gentlemen. There was no particular mystery about how to produce timber. To make the country self-supporting in the matter of timber, the great thing was not to set up commissions and lecturers, but to dig holes and plant the trees." (Laughter.)

The answer to this is that Lord Ancaster and his class have been planting trees on this simple plan for more than a hundred years, with the result that "the annual yield for the 3,000,000 acres under woods in the United Kingdom was only 45,000,000 cubic feet, or about one-third of what it should have been under correct sylvicultural treatment." (Reconstruction Report, p. 4.) So far as it deals with training and research, the Bill is, as Lord Haldane pointed out, Lilliputian. The amount supposed to be spent in research, which is really in a piteous condition in this country, is about 6000*l.* a year! No particular sum is, however, guaranteed by the Bill for this important work.

It is in connection with the planting of new ground, which will be one of the main duties of the Forestry Authority, that a well-planned and necessarily costly scheme of research and investigation is necessary. Lord Clinton, a member of the Interim Forest Authority, stated recently at Exeter that no farms would be taken to increase the woodland area. The new land to be acquired for planting must thus be restricted to lowland heaths and poor mountain pasture. The successful planting of such ground is a difficult problem if it is to be done at a reasonable cost. Research on new lines is imperative. The services of the best men in plant ecology, soil geology, botany, dendrology, etc., must be enlisted, and a proper team gathered together, in order to study the conditions which militate in this class of ground against tree growth, such as acidity of the soil, exposure to wind, etc. Arrangements must also be made for the selection of seed from the best sources.

Foresters in this country now rely on Pacific Coast conifers for the rapid production of timber in great quantity and of good quality. The Douglas fir and Sitka spruce are the main species employed, and so far these wonderful trees have been successful. *Thuya gigantea*, equally lauded and in many places already planted on a considerable scale, has suddenly been attacked by a fungus which threatens the extinction of this species. This untoward event may act as a warning against Lord Ancaster's view that it is only necessary to dig holes and plant trees. Much more knowledge is required of exotic species in regard to their adjustability to the new environment to which they are exposed in this country.

As to the replanting of the vast woodland areas felled during the war, the Forestry Bill appears to adopt the policy of the Report of the Forestry Sub-Committee of the Ministry of Reconstruction, which practically advocated the immediate purchase and planting of new land on a large scale, while it neglected to deal in a satisfactory manner with the question of replanting. The authors of the Forestry Bill, like the framers of the Report, apparently do not wish to antagonise the landowners by providing for compulsory replanting. This, it seems to us, is a needless fear on their part, as all wise landowners will replant. The argument in favour of compulsory replanting is simple. The Reconstruction Sub-Committee concedes the principle that afforestation is essential to national safety, and consequently should be carried out regardless of cost. It is not too much then to ask the landowners, who during the war sold their timber at an increased price, to replant the denuded areas. This they are morally bound to do on patriotic grounds. It is, moreover, the only way of utilising economically the denuded areas. A compulsory replanting clause should be introduced into the Bill. It will be a very easy measure to carry out, as it is analogous to compulsory tillage schemes, which have been very successful. To sum up, it is the business of the Forestry Authority to concentrate during the first five years on replanting, and to proceed cautiously with schemes for afforestation of poor land —the only kind that will be available.

We owe to Lord Lovat's strenuous advocacy the principle adopted in the Bill of a single Forest Authority for the United Kingdom, independent of all control, and subject to no interference from the existing Boards of Agriculture of England and Scotland and the Department of Agriculture for Ireland. Against this principle there is the Haldane policy that forestry should be developed in close association with agriculture both in administration and in the practical working out of schemes for buying suitable land for planting. The main point of view of Lord Lovat's policy as embodied in the Bill is to secure supplies of timber in the country in the interests of national safety, and no regard is to be paid to cost. Forests are a national necessity, and the country must have them, even though the money expended yields less than the current rate of interest on the capital involved. We are in favour of the Bill, which aims at an important national work that has been too long delayed, and for neglect of which in the past we suffered much in pocket during the war. It is devoutly to be hoped, however, that now the Bill is in Committee of the House of Commons the scientific and practical aspects to which we have directed attention will be improved for the sake of ensuring efficiency in this important national enterprise. Great praise should be given to the earnest efforts of Lord Lovat and his coadjutors in preparing the valuable Reconstruction Report, on the basis of which the measure is founded. That they have succeeded in inducing the Government to take up afforestation seriously is due to their energy, and augurs well for their success in carrying out afforestation in this country once the Bill becomes an Act.

HYDROGEN IN WAR AND INDUSTRY.

The Chemistry and Manufacture of Hydrogen. By Major P. Litherland Teed. Pp. vii+152. (London: Edward Arnold, 1919.) Price 10*s.* 6*d.* net.

ONE of the most characteristic phases of modern industrial chemistry is to be seen in the extraordinary and unlooked-for development in the application to utilitarian purposes of the substances collectively known as the gases.

A few decades ago the majority of these bodies then known were regarded in the light of "chemical curiosities" rather than as potentially useful products. They were interesting to the student on account of their theoretical significance, but had little practical value. The present generation has seen all this changed. There is scarcely one of the commoner gases and few even of the rarer ones that have not been turned to a useful account. It is unnecessary to multiply instances of this fact. The examples of oxygen, nitrogen, chlorine, carbonic acid, nitrous oxide, ammonia, acetylene, ethylene, and methane are familiar enough to everybody. Others might be named. And the process goes on. When argon was discovered it seemed inconceivable, from the very nature of its inertness, that it could be of any practical use. But now argon is being extracted from the atmosphere on a manufacturing scale and applied in the electric lighting industry. Attempts are being made to utilise helium, and it is only the extremely limited supply which prevents the application of its extraordinary properties on the large scale. We may yet live to see the widespread use of niton as a therapeutic agent. In fact, he would be rash who would attempt to set any limit to the possible utilitarian application of a chemical product. History teems with examples which should warn us of the unwisdom of indulging in any such restriction.

Among the several gases which have of late years received an extraordinary development of application is hydrogen—the subject of Major Litherland Teed's little book. Although one of the earliest of the gases to have its individuality clearly recognised—namely, by Cavendish, who in 1766 made an approximately accurate estimation of its lightness—it received no application, except as an occasional chemical reagent, until it replaced the expanded air of Montgolfier's fire-balloon, and this remained its chief use until coal-gas became more generally available for aerostatic purposes. In war-time, however, hydrogen, for obvious reasons, was still employed for the inflation of balloons, and much of the development of the technology of hydrogen has resulted from war-time necessities. Many manufacturing processes, in fact, owe their origin entirely to the enormous demand for the hydrogen required to fill kite balloons and airships. The knowledge and experience thus gained are directly available for the ever-growing applications of hydrogen in the chemical arts, as, for example, in the synthesis of ammonia, and in the hardening of oils and fats by catalytic agencies, both of which processes have now become highly important chemical industries. What the future of synthetic ammonia will be remains to be seen. As yet its production has made comparatively little progress in this country, but the "coal question" is bound to affect its prospects, and to what extent, if any, synthetic ammonia will replace by-product ammonia is not wholly clear. On the other hand, the application of M. Sabatier's cardinal discovery of the effect of hydrogen, under the influence of metallic catalysts, in transforming oils and other unsaturated fats into edible products has solved a very pressing problem, which threatened at one time to become acute. It has been the means of adding enormously to the food supply of the world.

Major Teed's monograph consists of five comparatively short chapters. In the first two he gives a concise account of the physical and chemical properties of the gas, the mode of its discovery, the manner of its occurrence in Nature in the free or occluded state, and its reactions with other chemical elements and with certain compounds, particularly with animal and vegetable oils. There is necessarily little of novelty in these chapters; their material is, for the most part, the common property of the text-books. Certain of the physical constants of hydrogen, such as its thermal values, density, solubility in water, transpiration, refractivity, and the relationship between its pressure and volume, are referred to an appendix. These matters are, however, dealt with as briefly as possible; it was doubtless considered necessary to treat them as completing the descriptive history of the subject. The account is generally accurate, and bibliographical references are freely given. We would, however, remark that Sir William Crookes's name is wrongly spelled on p. 7; "Moisson" (p. 19) should be printed "Moissan"; "Neuman" and "Strientz" should be "Neumann" and "Streintz." Moreover, in the table, p. 15, giving the volume of hydrogen adsorbed by finely divided metals, it should be stated that the amounts are *maximum* values; the amounts actually adsorbed are frequently much less in many cases.

The most generally interesting and most valuable section of the work is concerned with the manufacture of hydrogen on the large scale. This is dealt with in the remaining chapters. The processes in use are to some extent affected by local conditions. This is especially true of hydrogen to be used for aviation in war. But when the gas is to be employed for manufacturing purposes, and cost, ease, purity, and uniformity of production are important considerations, war-time methods are not necessarily to be preferred, and as a matter of fact these are seldom or never employed in industry. Manufacturing methods are purely chemical, purely physical, or chemico-physical. The choice of a particular method must depend upon the amount of the gas required, the use to which it is to be put, facility of transport, etc. In certain circumstances it may be better to buy the hydrogen than to make it on the spot. In some established industries, as in the electrolytic production of chlorine and caustic soda, hydrogen is a by-product, and its collection involves little additional cost; hence it can be obtained relatively cheaply. In other cases it may be preferable to establish a plant for its production. This may be electrolytic, or it may depend upon the separation of hydrogen from "blue" water-gas by metallic iron, or by the

Badische Anilin catalytic process, or by the agency of cold and pressure, as in the Linde-Frank-Caro process. All these methods have been carefully worked out, and all are in actual use on the large scale. Major Teed gives a succinct account of them, and of certain other less important processes, with such theoretical explanations as seemed to him necessary. A chemical engineer with actual experience of the working of hydrogen plants will probably find little in the description with which he is not already familiar, but the student and the ordinary chemical manufacturer who are desirous of learning something concerning the mode of producing hydrogen on the large scale for manufacturing purposes will find the book of considerable service. It is simply and concisely written, and well illustrated. The bibliography is fairly full, and the references to patent literature are ample. It would, however, have added to the value of the book as a work of reference if an attempt had been made to give a short analysis of this literature.

ORGANIC READJUSTMENTS.

Man's Supreme Inheritance. Conscious Guidance and Control in Relation to Human Evolution in Civilisation. By F. M. Alexander. Second edition. With an introductory word by Prof. John Dewey. Pp. xxviii+239. (London: Methuen and Co., Ltd., 1918.) Price 7*s.* 6*d.* net.

THIS book, strongly recommended by Prof. John Dewey, philosopher and educationist, will intrigue the reader. It gives the weary traveller a vista of a promised land, in which he may walk with light steps, and breathe freely, and enjoy physical perfection. The particular path into the promised land is not precisely revealed, but one of the sign-posts is "respiratory re-education," and the general idea is that of substituting for carelessly acquired habits and out-of-date instinctive promptings a regimen—or, rather, an art—of conscious control and scientific guidance. Man is hampered by maladjustments to the complex artificial environment which he has evolved around him; return to Nature and to the simple life is impossible and undesirable; to rely on mystical breezes and emotional gusts to give the ship a prosperous voyage is to invite disappointment; what is needed is more intelligent seamanship.

Human evolution has been environmental as well as organismal, and the changes that are enregistered in the social heritage (city life, for instance) imply much that is unnatural for creatures who are zoologically open-air mammals, much to which the human body is far from being well adapted. To lessen the discomfort and hindrances implied in this imperfect adjustment all sorts of palliatives are tried; the author has faith in none. He believes only in a serious discipline, in conscious control. It is in vain to fall back on deeply rooted subconscious or instinctive promptings, for these were wrought out in relation to a very different order of things, and instead of being dependable guides they may be at times positively misleading. Habits of the body, such as ways of walking and breathing, which once served passably well, have to be superseded by something better, and Mr. Alexander's experience has led him to a large faith in man's educability. Well-thought-out discipline in conscious guidance and control will lead to the development of a new subconsciousness—cultivated, not inherited. The discipline indicated "will enable the individual to stand, sit, walk, breathe, digest, and, in fact, live with the least possible expenditure of vital energy. This will ensure the highest standard of resistance to disease." It is claimed that it will do more (and we can well believe it), that it will develop a new sense of bodily freedom and relief from strain, and that it will react on the inner life of thought, feeling, and will.

This is not the place for any discussion of what Mr. Alexander half reveals of his methods of neuro-muscular training in general, and "respiratory re-education" in particular; we must be content with directing attention to what is a very interesting contribution to the old question of "nature" and "nurture." The central idea is that man's supreme inheritance—to wit, a capacity for rational control—should be more deliberately utilised in the education of the body, in saving us from handicapping habits which artificial conditions all too readily induce, and in leading us to the realisation of powers which, in default of appropriate nurture, are all too likely to remain latent or half-developed. We forgive the author his very frequent repetitions and his frank self-advertisement, for we think that he has something very valuable to say. "We must break the chains which have so long held man to that directive mental plane which belongs to the early stages of his evolution. The adoption of conscious guidance and control (man's supreme inheritance) must follow, and the outcome will be a race of men and women who will outstrip their ancestors in every known sphere, and enter new spheres as yet undreamt of by the great majority of the civilised peoples of our time." This is a large order, but if we begin, Mr. Alexander assures us, we shall soon have abundant payment to account.

OUR BOOKSHELF.

A Geography of America. By T. Alford Smith. (Macmillan's Practical Modern Geographies.) Pp. x+329. (London: Macmillan and Co., Ltd., 1919.) Price 4*s.* 6*d.*

THE writing of a short text-book is as much an art as the writing of a short story, and little latitude for self-expression can be allowed to those who work for schools. Mr. T. Alford Smith explains this limitation when he appends selected examination questions to his conscientious treatise. The details on which geography is founded still remain more important in the eyes

of examiners than the scientific outlook. In these circumstances our author goes forward very straightly. If he has to omit the tragedy of Hudson's ending, he inspires us by a good map of Amundsen's North-West passage, which is far less known, because it belongs to recent history. He cannot trifle with examiners by betraying emotion at the "revolutions of the globe," but he gives a good geographic account of the Ice age in America (illustrated by a map of the moraine-front and by an entirely inappropriate one of medial and lateral moraines in Switzerland), and he moves us effectively by his excellent choice of illustrations. The South American section opens an unfamiliar field before the reader. The dangerous dunes on the Mollendo-Arequipa line, and the fascinating glimpse of the Patagonian ranges, may be cited from these interesting pages. The unique nitrate-deposits of Chile (p. 258) might have received fuller mention, since the material is exported, not "for the preparation of various chemicals," but for the increase of the food supply of the nations, and its local refining and foreign distribution are among the romances of geography. G. A. J. C.

Carburettors, Vaporisers, and Distributing Valves used in Internal Combustion Engines. By Edward Butler. Second edition, revised and enlarged. Pp. viii+288. (London: Charles Griffin and Co., Ltd., 1919.) Price 12*s.* 6*d.* net.

IN the hundred or so pages of this work devoted to carburettors the author has scarcely done justice to the modern outlook, although he gives an interesting description of various types. The omission of the double Venturi form is remarkable. No mention is made of aero work, yet it was aviation which opened our eyes to efficiency.

Carburettor design is at last emerging out of the embryo stage, and the rule-of-thumb method of the inventor is giving place to scientific measurement. Instead of a list of carburettor patents, as given in the book, we should prefer some experimental figures establishing the order of merit of the different types and the justification of the claims of the inventors. Thus, if a simple carburettor of the Zenith or Claudel type does all that is claimed for it, why go to the trouble of fitting all sorts of extra air-valves? It would be interesting to know why complicated designs can persist side by side with simple ones.

The remaining pages of the work are devoted to vaporisers and injectors (suitable for stationary engines under fairly constant load), and to the consideration of types of valve gear. In this connection we think that the advantages of the sleeve valve gear are overrated.

Treating of valve gear, we should have expected some reference to the importance of turbulence of the charge for high-speed work. Also the design of induction pipes for multi-cylinder engines, and the vibration of air in such systems (affecting distribution and carburettor characteristics) are matters of importance and deserve some comment. W. J. S.

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.*]

Wild Birds and Distasteful Insect Larvæ.

IN NATURE of July 24 is a letter from Dr. Walter E. Collinge entitled "Wild Birds and Distasteful Insect Larvæ." This letter starts with a statement with regard to the distasteful qualities of the larva and imago of the currant moth (*Abraxas grossulariata*, Steph.), an insect which, of all others, has probably been studied most in this connection. So long ago as 1889 Prof. E. B. Poulton, in his classic work on "The Colours of Animals," states (p. 169):—"All observers agree that birds, lizards, frogs, and spiders either refuse this species altogether, or exhibit signs of the most intense disgust after tasting it."

Experiments of more recent date have done nothing to refute this observation, and, what is more, the larva of this moth differs widely from other Geometrid or "Looper" caterpillars in making itself conspicuous by means of a gregarious habit and of the position which is assumed when at rest, in contradistinction to protective resemblance to twigs of trees, to the eaten edges of leaves, etc., exhibited by most other members of the family.

Further, from his observations upon the case of song-thrushes feeding their young upon the caterpillars of this moth, and from the fact that the latter, after their destruction by the birds had ceased, were found to be parasitised, Dr. Collinge raises a question of the possibility of the parasitised larvæ alone being rejected by birds.

It is true that parasitic insects, when depositing their eggs in the interior of caterpillars, sometimes cause an exudation of blood which dries over the wound and produces a mark which acts as a warning to other parasites not to oviposit in the same larva, but, in the case of a spotted insect like the present one, it is neither probable that such a mark would be noticed by a bird, nor is it likely that all the caterpillars experimented with by entomologists were similarly parasitised, even though insects which enjoy protection through conspicuity of warning colours are naturally subject to great persecution by their parasitic enemies.

A simpler and more logical explanation is applicable to Dr. Collinge's observations. In the first place, no insect, however well protected, is completely immune from attack by enemies, and in times of stress birds have long been known to subsist upon insects with highly distasteful qualities. Of the eight birds mentioned by Dr. Collinge as containing currant-moth larvæ in their gizzards, the great tit, the house-sparrow, and the cuckoo are known to eat bees from hives in winter or in spring, when food is very scarce. The blue tit, flycatcher, and chaffinch are also addicted occasionally to this habit of eating an insect with a powerful sting.

A habit, probably of local origin, is exhibited by the chaffinch when large numbers of humble-bees, and even wasps, are attracted to the fragrant blossom of the weeping white lime-tree (*Tilia petiolata*) in August. These insects are provided both with weapons of defence in the stings of workers and queens, and with warning colours in the shape of yellow and red bands interspersed with black, but all these protections break down when they have sipped the nectar from the flowers.

Queens, workers, and males alike are caught by the chaffinch, which usually, with a peck from its beak, first destroys the tail, dropping the latter to the ground, eats out the contents of the abdomen, then breaks into the thorax, and finally drops the hollow remains of the insect to the ground.

In 1912 young birds of a late brood accompanied their parents to two trees in Hertfordshire, but showed fear of the bees, and would eat them only when caught and offered by their parents.

The blue tit is said to treat hive-bees in much the same manner (Cheshire, "Bees and Bee-keeping," vol. ii., pp. 578–79, 1886).

The shrike, or "butcher-bird," pierces queen humble-bees through the side of the thorax, after catching them on the wing in its beak, apparently with the view of causing general paralysis before impalation upon the thorn during formation of the "larder."

Toads are known to feed voraciously upon hive-bees, swallowing them whole, and it is at present very doubtful if any of the birds mentioned are affected by the stings of bees; but the method of avoidance of being stung cannot be completely overlooked in the cases described for birds.

The cuckoo is especially addicted to feeding upon caterpillars provided with irritant hairs, and with this we have a rough series showing the downfall of distasteful qualities or defensive weapons in face of selective adaptation in enemies, which for generations must have been kept at bay by such protection in their would-be victims.

The currant-moth larva, then, has merely been eaten by the thrush, and possibly by the other birds mentioned by Dr. Collinge (save for the cuckoo, which is now adapted to eating distastful insects), when the stress of having to feed a family has made such a practice a necessity. In the case of the song-thrush and its young, the stress has disappeared after a period of seven days with the arrival on the scene of more palatable food.

The presence of parasites in the caterpillars left after this period can scarcely be more than a coincidence, and there is no proof that the caterpillars which the thrushes ate were not also parasitised. This explanation would seem more acceptable than Dr. Collinge's paradox based on the assumption that the larvæ of the currant moth are not unpalatable to the majority of birds in ordinary times.

EDWARD R. SPEYER.

New College, Oxford, July 29.

Luminous Worms.

THE paper by Dr. Gilchrist published in the Transactions of the Royal Society of South Africa, and referred to in NATURE of July 31, p. 433, should be of service in reviving interest in this country in the question: Do our indigenous Oligochæts display luminosity? So long ago as 1893 I directed attention to the subject in these columns (NATURE, vol. xlvii., p. 462), and in more recent years I have endeavoured to elicit information of a trustworthy nature on the question with but little success. The following worms which have been reported as exhibiting luminosity are common in this country:—Brandling (*Allolobophora* (*Eisenia*) *foetida*), *Enchytraeus albidus*, and *Henlea nasuta*. *Microscolex phosphoreus* or an ally is an importation. Another worm, which is large, common, and easily observed, is Octolasium. It has a steel-blue body, clay-coloured girdle, and yellow tail filled with fat cells which are often attended by gregarines. Various questions await solution. Of what service, for instance, can luminosity be to creatures which have no eyes? *Helodrilus oculatus* is the only Lumbricid found in England possessing organs of vision, and these are rudimentary. They have been reported by Eisen as occurring in Sparganophilus also, two species of which, as I recently showed, occur in this country. Is it possible that light can influence Annelids in some way, and so facilitate sexual processes? It was affirmed by Flaugergues in 1771 that luminosity disappears in certain cases after copulation, and if that observation is trustworthy it is most suggestive. Dr. Gilchrist, in his paper on luminosity referred to above, suggests that luminosity is a protective device so far as South African worms are concerned, and his argument is very plausible. I believe that the yellow extremities of Octolasium serve the purpose of dazzling underground foes by emitting light.

The reports made years ago to the British Association of luminous worms found in Liverpool and in the bogs of Ireland have never led to any satisfactory issue. As I am now writing my monograph of British Oligochæts for the Ray Society, it would greatly interest and help me to receive living specimens of worms which betray phosphorescent properties, or any well-authenticated facts relating to the subject which could be used for purposes of publication or investigation.

HILDERIC FRIEND.

"Cathay," Solihull, July 21.

Protective Coloration of Birds and Eggs.

WHILE collecting information on the use of colour-protection among birds, my attention has been directed to what appears to be a very interesting generalisation, viz. that among birds which nest on the moors, sea-shores, and similar open places, (1) those which have the habit of remaining on their nests when danger threatens generally wear camouflaged uniforms, but their eggs seldom show any signs of colour-protection; while (2) those which are very shy and leave their eggs readily are generally conspicuously coloured, but their eggs are usually camouflaged.

Amongst the first class are capercailzie, nightjar, partridge, wild duck, and bittern; and amongst the shy ones with camouflaged eggs are lapwing, curlew, oyster-catcher, terns, ringed plover, and golden plover.

I do not remember to have seen this point mentioned explicitly in any book or paper, and should be greatly obliged to any reader of NATURE interested in birds who would give me any further information on the subject.

GEO. GRACE.

The Museum, Keighley.

Teeth of Sea-Otter.

IT is commonly stated that the sea-otter (*Latax lutris*) differs from other carnivora in having only two incisor teeth in the lower jaw. Through the kindness of an old Etonian, Mr. Ernest Edwards, our school museum has become possessed of a fine stuffed head of this animal. I was surprised, however, to note that this specimen has three incisors on both sides. In the books of reference to which I have access I can find no such case recorded, and I shall be grateful if any of your readers can give me information on the point.

M. D. HILL.

Eton College, Windsor, July 29.

The Late Sir Edward Stirling.

IN NATURE of April 3, p. 87, the late Sir Edward Stirling is referred to as director of the South Australian Museum. Sir Edward resigned from the directorate in 1913, and was succeeded by Mr. Edgar R.

Waite. On relinquishing control in the museum Sir Edward was appointed honorary curator in ethnology, which position he filled to the time of his death.

L. M. HARWOOD,
Acting General Secretary.

Public Library, Museum, and Art Gallery of South Australia, Adelaide, South Australia, June 4.

LABOUR AND THE HIGHER VALUES.

AFTER the weary and fruitless efforts of the past century by those engaged in enlarging the boundaries of truth to educate their masters to an appreciation of the national importance of such higher values, it is a relief to turn to their frank espousal by the representatives and spokesmen of Labour in this country and in America. To those for whom Labour stands for everything that is evil in the best of all possible worlds and who are content to absorb their judgments on contemporaneous problems with their breakfast, such a view will be bizarre. But scientific men who are accustomed to deal with facts, and form their conclusions therefrom, cannot fail to be interested in the very marked growth of appreciation in the humanitarian value of their work which has occurred in the ranks of organised Labour.

At its recent Atlantic City convention, as announced in last week's issue of NATURE, the American Federation of Labour resolved adequately and generously to support the activities of the Federal Government in pursuing, strengthening, and extending a broad programme of scientific and technical research as being of major importance to the national welfare. The resolution was based on five grounds: That the work forms the fundamental basis of all modern industry; that the increased productivity and well-being of the whole population ensuing therefrom are of far greater value than the cost of the work; that, after all possible methods of re-adjustment, there is a limit to the increase of the average standard of living in the community, which can be raised only by research and the utilisation of research in industry; that it is necessary for the solution of many of the most pressing problems immediately confronting the Governments; and, lastly, that the war has brought home to all the nations engaged in it the overwhelming importance of science and technology in war or peace.

In this country the Labour Party in its Report on Reconstruction last year, entitled "Labour and the New Social Order," insisted on greatly increased public provision being made for scientific investigation and original research in every branch of knowledge, and for the promotion of music, literature, and the fine arts, upon which any real development of civilisation depends. It is humiliating also to note that it should have been a deputation from the Education Committee of the Labour Party who found it necessary to point out to the President of the Board of Education the grave injury done to the cause of education by the exclusion from the older universities of men without money but with brains, and the welcome apparently accorded to men with money but without brains.

So far as the evidence goes, the causes of scientific education and scientific research at least seem to stand to profit enormously by the advent of a Labour Government. The view, of course, may be taken that this is the traditional lip-service to the higher values paid by all political aspirants for power alike, though the political expediency of expressing such sentiments in this country is not obvious. At least, if it be mere vote-hunting demagogy, it is of a startling and original kind!

Labour may be trusted to make one important contribution to government which has been too long lacking, in that it cannot fail to realise the fundamental importance of the productive and creative elements in the community. It is not likely to make the mistake of putting the cart before the horse, an amusing illustration of which is our habit of speaking of commerce and industry. One may expect that if it intends to foster scientific research its efforts, however mistaken, will not be open to the interpretation that the resources of the State will be used for the exploitation rather than the encouragement of the research worker.

Sums, by previous standards munificent, have recently been voted by Parliament for fostering scientific research. What scientific investigators have so far mainly got is a set of rules and conditions that some lawyer had drawn up presumably, by which any investigator who is so hard-up as to accept money from this source puts himself outside the law with regard to any commercial rights that may ensue from his work and vests them in the Government. Willing as scientific men may be that their brains should be exploited for the benefit of the community, it must be remembered that the community is a vague term comprising drones as well as workers. Those to whom the destinies of civilisation have been entrusted during the past century have not shown themselves either very generous or very intelligent in their appreciation of the higher values which make for national well-being and prosperity. Under them, slums and millionaires have been the chief output of creative science, which certainly could not be in worse hands under Labour. The intense appreciation of the higher values that is growing up among the leaders of Labour is perhaps the most hopeful sign of the times, and the education of the workers into the real aims, uses, and aspirations of science now, more than ever, calls for the co-operation and support of scientific men.

F. SODDY.

AUSTRALIAN RAINFALL.[1]

IN the continent of Australia rainfall is by far the most important meteorological element to the agriculturist, there being large tracts of country where the annual precipitation is barely

[1] "The Australian Environment (especially as Controlled by Rainfall)." By Dr. Griffith Taylor. Pp. 188+plates. (Melbourne, 1918.)

sufficient to allow of profitable use of the soil for farming or raising stock. For this reason Dr. Griffith Taylor, who is becoming well known for his work on Australian meteorology, has recently produced a volume devoted entirely to the rainfall of the continent and its control over vegetation. The subject is dealt with in a very thorough manner, and it would be hard to overestimate the value of such a work in the case of a young agricultural country looking to great developments in the near future. To obtain a just appreciation of the meteorological conditions which govern the weather of the continent it is necessary to remember that the southern tropical high-pressure belt crosses the southern part of the country, while the equatorial low-pressure area lies off the northern coast. These systems fluctuate north and south with the sun, causing a very marked annual period in the rainfall. Thus the northern districts receive most of their rainfall in the southern summer, when cyclones from the northern low-pressure area strike the coast. On the other hand, the southern districts at this time of year lie under anticyclonic conditions and receive little rain, but in the winter, when the high-pressure belt has moved northward, the westerly winds of the southern oceans reach this region and the rainy season occurs. This movement to the north and south of the pressure systems and associated phenomena is well illustrated by an ingenious "Solar Control Model" which forms the frontispiece of the present volume.

To the casual student who is acquainted with the desert regions which cover a large part of Western Australia and has been in the habit of regarding the whole district as one of great aridity it may come as a surprise to learn that over a small coastal area running southwards from Perth the annual rainfall amounts to more than 30 in., a quantity which is equalled only in narrow belts along the south-eastern, eastern, and northern coasts. Furthermore, a map which Dr. Taylor has prepared shows that the "rain reliability" from year to year reaches a very high level in this tract of Western Australia, so that the lot of the farmer should be a happy one, at least so far as rainfall is concerned. The most variable and untrustworthy rains are found in the arid centre of the continent, where the annual fall amounts to about 6 in. only, and fluctuates widely from year to year. The chart of "rain reliability" forms a valuable feature of the book, as in regions where the fall is barely sufficient for farming it may make all the difference whether an almost constant fall can be expected from year to year, or whether periods of exceptional rain are likely to be followed by spells of drought through which no farming can be carried on. In a previous publication the author has made use of the "climograph," or temperature-humidity curve, for indicating graphically the suitability of a climate for man. As regards suitability for plant life rainfall is a more important element than humidity, and the "hythergraph" is here introduced to indicate changes of temperature and rainfall throughout the year. Hythergraphs are reproduced for typical extra-Australian wheat-, rice-, and cotton-growing lands, and by comparison with Australian curves indicate the possibilities of the different parts of the country for these crops. Tea and coffee growing is also considered in the same way.

For a detailed discussion the country is divided into fifteen districts, for each of which the conditions are considered very fully. An attempt is made to ascertain the type of pressure distribution which causes rain in the different regions, and each fall in the course of the lustrum 1910–14 is ascribed to one or other of certain pressure types. It may be questioned whether the cause of rainfall suggested on p. 58, the chilling of an air mass by contact with a colder body of air, is really productive of appreciable rain. In most cases of this kind an easier explanation seems to be found in the convection effects which are likely to be set up. The work is very fully illustrated, but one misses a good map of Australia whereon the different towns and districts mentioned could be located without the trouble of turning up an atlas. It is impossible to read a work of this kind without regretting that meteorologists have devoted so little attention in the past to measurements of evaporation. There can be few districts of the world for which any adequate evaporation data are available, and yet in a country like Australia the loss of water by this means must be second only in importance to the supply by rainfall. A very large amount of trouble must have been involved in the preparation of such a comprehensive work as that under notice, and students of Australian meteorology, as well as those responsible for the development of the country, have reason to be grateful to Dr. Griffith Taylor for the result of his labours. J. S. D.

GUSTAV MAGNUS RETZIUS.

PROF. GUSTAV RETZIUS, who died at Stockholm on July 21, aged seventy-seven, did more to enrich anatomical literature than any other man of his time. By his death there comes to an end a line of anatomists that has made Sweden famous for a century and more. Retzius's grandfather was professor of natural history at Lund; his father, Anders Retzius, the intimate friend of Johannes Müller, held the chair of anatomy in the Caroline Medico-Chirurgical Institute, Stockholm, in which he was in due time followed by his son Gustav, who devoted his life to working out, by improved methods, lines of research commenced by his father. In 1842, the year in which Gustav was born, Anders Retzius recognised that the form of the human head was an important mark of race, and initiated the system of describing the shape of heads and skulls by the proportion which their breadth bears to their length. Like his father, Gustav Retzius was an anthropologist

as well as an anatomist; as a young man of twenty-two he collected, edited, and published his father's anthropological researches, and from 1864 until his death devoted much of his time to unravelling the history of the inhabitants of Scandinavia. In 1900 he published a magnificent atlas, giving exact reproductions of ancient Swedish skulls; in 1902 he and his colleague, Prof. Karl Fürst, brought out an exhaustive work on the anthropology of Sweden. He published several papers on the Lapps and on the Finns. In 1909 he was invited by the Royal Anthropological Institute of this country to give the Huxley lecture, which he devoted to "The So-called North European Race of Mankind." He recognised the merits of the race, but took, as we think, an unnecessarily gloomy view of its future.

Great as were Retzius's contributions to anthropology, his extensive researches in anatomy are even more important. His father's first publication, in 1822, was devoted to the anatomy of the Myxine; the son continued that work. In conjunction with his colleague, Prof. Axel Key, who held the chair of pathology, Retzius published in 1875–76 a monograph in two great and splendidly illustrated volumes, which is still the standard work in all that relates to the cerebro-spinal coverings and spaces. Perhaps the main interest of his life was his investigations of the intricate internal ear or labyrinth of vertebrate animals, an account of which he published in 1881–84. His monographs on the structure of the cortex of the brain, on the end-organs of nerves, and on the brains of human races and of anthropoid apes, and his more minute researches on the morphology of spermatozoa and of nuclear structure, will provide biologists for all time with a sure groundwork on which to base their speculations. He was content to gather the facts and leave to others the more pleasant task of interpreting their meaning. He had the fortune to marry a lady who not only was in the deepest sympathy with his life's work, but also made it financially possible for him to place his researches at the disposal of all the world in a form which has earned the envy as well as the gratitude of every anatomist.

A. KEITH.

NOTES.

THE meeting of the International Research Council, which was opened at Brussels on July 18 in the presence of the King of the Belgians, concluded its labours on July 28. Much successful work was accomplished. The statutes of the International Council were finally agreed to, and unions embracing the whole subject of astronomy and the various sections of geophysics were formed. In other branches of pure and applied science proposals for the formation of international associations were discussed and formulated. These will have to be submitted to the authorities concerned in the different countries before they can be formally adopted. A resolution inviting the co-operation of nations that had remained neutral during the war was adopted unanimously. Brussels was selected as the legal domicile of the International Research Council. Its triennial meetings will be held in that city, and gifts or legacies will be administered according to Belgian law. But the associations dealing with special subjects will probably follow the established custom of holding their conferences successively in different countries. The secretariat of the council will be at Burlington House, where the Royal Society has placed a room at the disposal of the general secretary.

SIR ARTHUR BOSCAWEN, Parliamentary Secretary to the Board of Agriculture, moved the second reading of the Forestry Bill on August 5 in the House of Commons. In the discussion reference was made to the large expenditure of between 40,000*l.* and 50,000*l.* which is to be spent in the setting up of the new staff and other outlay; the divorce of agriculture from forestry, with the consequent impossibility of dealing adequately with the small holdings policy; and the friction which may arise between the agricultural and forestry authorities. Sir Philip Magnus pointed out that the chief defect of the Bill lay in its silence on the necessity of having on the central authority a preponderance of fully qualified scientific experts. He warned the supporters of the Bill and the Government of the grave danger of proceeding with this new afforestation scheme without the guidance of scientific advice, the neglect of which in the past had so often resulted in Government schemes ending in disaster. This aspect of the Bill he proposed to insist upon in the Committee stage of the Bill. Mr. Barnes, in replying as a Minister to the criticisms made, said he thoroughly agreed with Sir Philip Magnus as to the need for scientific men among the Commissioners, and that the point would be sympathetically considered

A COMMITTEE has been formed, under the chairmanship of Lord Rothschild, to establish a memorial to the late Frederick Du Cane Godman, in acknowledgment of his lifelong devotion to the interests of natural history and in grateful testimony of the many valuable benefits conferred by him in promoting the study of natural science in this country. At a meeting of the committee held at the Natural History Museum in April last it was resolved that the memorial should take, primarily, the form of a bronze tablet with medallion portraits of Mr. Godman and of the late Mr. Osbert Salvin, Mr. Godman's lifelong friend and collaborator in all his scientific enterprises, and that this tablet, with a suitable inscription, should be offered to the Trustees of the British Museum, to be placed in the Natural History Museum at South Kensington. The committee hopes to be in a position to do something additional to perpetuate the memory of Mr. Godman by helping to establish a less local form of memorial. Dame Alice Godman and her two daughters have offered to found an exploration fund with the sum of 5000*l.*, the proceeds of which are to be devoted to making collections for the advancement of science and for the benefit of the Natural History Museum. The committee, therefore, proposes that any amount received by it over and above that required for the bronze tablet shall be added to the exploration fund. It is hoped that this may form a permanent basis for future donations and bequests for the same purpose. The committee confidently asks for funds to carry out this scheme. Contributions should be sent to Mr. C. E. Fagan, hon. treasurer, Godman Memorial Fund, Natural History Museum, Cromwell Road, London, S.W.7.

THE autumn meeting of the Institute of Metals, under the presidency of Prof. H. C. H. Carpenter, will be held in Sheffield on Wednesday and Thursday,

September 24 and 25. This is the first gathering of the institute since 1913, when a meeting was held in Ghent. Among the communications to be submitted to the Sheffield meeting are:—Prof. P. G. H. Boswell, Moulding Sands for Non-ferrous Foundry Work; Prof. C. H. Desch, Second Beilby Report on the Solidification of Metals from the Liquid State; Miss H. E. Fry and Dr. W. Rosenhain, Observations on a Typical Bearing Metal; Dr. W. H. Hatfield and Capt. G. L. Thirkell, Season Cracking of Brass; R. E. Leader, The Early History of Electro-silver Plating; E. A. Smith and H. Turner, The Properties of Standard or Sterling Silver, with Notes on its Manufacture; Dr. J. E. Stead, The Ternary Alloys of Tin-Antimony-Arsenic; Dr. F. C. Thompson, Graphite and Oxide Inclusions in Nickel Silver; and Dr. F. C. Thompson and F. Orme, Some Notes on the Constitution and Metallurgy of Britannia Metal. It is expected that some hundreds of engineers and metallurgists from all parts of the world will take part in the proceedings, which will include visits to several famous works.

THE seventh annual meeting of the Indian Science Congress will be held at Nagpur on January 13–18, 1920. The Chief Commissioner, Sir Benjamin Robertson, has consented to be patron of the meeting, whilst Sir P. C. Rây will be president. The following sectional presidents have been appointed:—*Agriculture:* D. Clouston. *Physics and Mathematics:* Dr. N. F. Moos. *Chemistry:* B. K. Singh. *Botany:* P. F. Fyson. *Zoology:* E. Vredenburg. *Geology:* P. Sampatiengar. *Medical Research:* Lt.-Col. J. W. Cornwall. The honorary local secretaries are Messrs. M. Owen and V. Bose. Further particulars can be obtained on application to the honorary general secretary, Dr. J. L. Simonsen, Forest Research Institute and College, Dehra Dun.

THE Baly medal of the Royal College of Physicians, awarded on the recommendation of the president and council every alternate year to the person who shall be deemed to have distinguished himself in the science of physiology, especially during the two years immediately preceding the award, has been awarded this year to Dr. Leonard Hill. The Harveian oration of the college will be delivered by Dr. Raymond Crawfurd on St. Luke's Day, October 18; the Bradshaw lecture on November 6 by Dr. A. P. Beddard; and the FitzPatrick lectures on November 11 and 13 by Dr. E. G. Browne.

A GOOD account of that interesting race, the Nayars of Malabar, was much needed, and it has now been provided by a native writer, Mr. K. M. Panikkar, in the Journal of the Royal Anthropological Institute (vol. xlviii., part 2). Among the more important points he describes the strength of their village organisation, the undivided family and descent in the female line, and the classificatory system of relationship. Cross-cousin marriage is the orthodox custom, and the result of the influence of the Nampudiri Brahmans on their social system has produced those complications which render the study of it at once fascinating and difficult. In agreement with other observers, he regards the Talikeltu marriage as the actual and religious form, the girl being allowed after its performance to choose her own suitor; she does not mourn at his death, and is not regarded as a widow; but when the man who actually tied the Tali or symbol of marriage round her neck dies, she undergoes certain formalities of mourning. The existence of actual polyandry is still a matter of debate, but no case of the kind is said to have occurred during the last fifty years.

STUDENTS of fossil botany should not overlook Dr. Walkom's studies on the Mesozoic floras of Queensland, which are appearing as publications of the Queensland Geological Survey (A. J. Cumming, Brisbane).

THE issue of separate papers from the New Zealand *Journal of Science and Technology* renders a number of observations available in a very handy form. Prospectors will be especially interested in Mr. P. G. Morgan's "Magnesite and Dolomite in Australia and New Zealand," which contains numerous analyses of material greatly in demand.

IN two detailed papers on ripple-marks in sedimentary rocks (*Amer. Journ. Sci.*, vol. xlvii., pp. 149 and 241, 1919), Mr. W. H. Bucher lays stress on the production of ripples at rhythmic intervals in road-surfaces under moving loads, and in other cases where a surface is affected by friction, and regards ripple-mark as due to "the tendency of two substances in moving past each other to form a surface of contact which offers a minimum of resistance by substituting a rhythm for uniform motion." A useful bibliography is appended, and a marked addition is made to previous studies of the subject.

A BULLETIN by Mr. E. S. Simpson (Geol. Survey Western Australia, No. 77, 1919) on the sources of industrial potash in Western Australia is opportune in its treatment of glauconite, and it is pointed out that mixture of a greensand with superphosphate renders "much, if not all, of the potash in glauconite water-soluble." The alunite occurring in veins of kaolinised rock at Kanowna is stated to be widely distributed over the belt of weathering, and contains some 9 per cent. of potash. In view, however, of its possible origin in other cases through sulphur-bearing waters, there seems no reason why it should be confined only to weathered masses of rock.

PROF. OMORI'S sixth memoir on the eruptions and earthquakes of the Asama-yama occupies the whole of the last Bulletin (vol. vii., 1919, pp. 327–456) of the Imperial Earthquake Investigation Committee. The greatest eruptive activity of the volcano was manifested during the years 1911–13. The year 1914, with which the present memoir deals, apparently forms the closing stage of the series. Indeed, after the explosion of November 20, 1913, the volcano remained quiet for nearly two months, resuming activity simultaneously with the great outburst of the Sakura-jima in southern Japan in January, 1914. In this year there were twenty-nine prominent eruptions, the last of which occurred on December 16, but from this day until March of the present year the volcano has been free from explosions, though not entirely from earthquakes of volcanic origin. The conclusion of the period of activity has been marked in several ways. The lava-floor of the crater has sunk almost to the level which it maintained before the great upheaval of 1912. The explosions caused strong detonations, but, with two exceptions, the precipitation of ashes was extremely slight. As the explosive activity declined the average duration of the preliminary tremors of the non-eruptive earthquakes increased, showing that their foci were situated either at a greater depth below the crater or at a greater radial distance. At the same time a larger proportion of these earthquakes were sensible without instrumental aid. In the sound-areas of four of the explosions in 1914 the silent zone was developed, the outer sound-area being at about the usual distance from the volcano, but in two cases diverging from the usual south-westerly direction to the south-east and east-north-east.

THE fourth report of the Advisory Committee, associated with the Meteorological Office, on Atmospheric Pollution, dealing with observations in the year 1917–18, is published as a supplement to the *Lancet* for June 14. The first report gave the results obtained for the year 1914–15, and appeared in the *Lancet* of February 26, 1916. Uniformity of system is maintained in publishing the results, which adds much to the value of the observations. The stages of pollution are grouped under the first four letters of the alphabet, A having the smallest, and D the greatest, deposit per square kilometre; this method of classification greatly simplifies comparison. A list of the observing stations in different parts of the British Isles is given, showing in each case the position of the deposit gauge and the nature of the exposure. The Malvern gauge is representative of uncontaminated country air, whilst the gauge at Newcastle-upon-Tyne gives the highest degree of contamination. The air was much contaminated during April, 1917, the total solids at Newcastle-upon-Tyne amounting to 44·28 metric tons per square kilometre, which is more than double the amount in any other month except August, 1917, when the amount was 28·50 metric tons per square kilometre. At Malvern the largest amount of total solids was 5·15 metric tons per square kilometre in May, 1917. The report says:—"While the deposit of soluble matter is not strictly proportionate to the rainfall, it is obvious that there is a general tendency to vary directly with the rainfall." The insoluble matter and the amount of rainfall bear no such relation. Details are given relative to the experimental work carried on in the investigations. The report includes some notes from the Director of Botany in British Guiana; they represent quite different conditions from those holding in the United Kingdom.

METEOROLOGICAL tables and notes are given for Falmouth Observatory for the year 1918 in a report of the Royal Cornwall Polytechnic Society. Observations have been continued for the past forty-eight years, and the average values with which the records are compared are for forty-five years—a period which ensures a great degree of dependence. The mean atmospheric pressure for the year was 1016·4 millibars (30·016 in.), which is 1·3 mb. above the average. In February the barometer attained a maximum of 1047·2 mb. (30·923 in.), and there have only been four higher readings previously, all of which occurred in January. The minimum barometer reading during the year was 976·2 mb. (28·83 in.) in November. September had the lowest mean temperature on record for that month, the mean being 55·9°; the previous lowest mean was 56·4° in 1910. The rainfall and general weather fully account for the abnormally low temperature. The total rain measured for September was 211·9 mm. (8·34 in.), which is the greatest for the month since 1871, and it was 5·24 in. above the mean for the month, and 1·56 in. more than the previous highest total for September. The rainfall for July to December was nearly double that in the first half of the year. Bright sunshine was registered for 1752 hours, which gives a daily average of 4·8 hours. During two severe gales in January and November the wind in gusts attained the velocity of 70 and 78 m.p.h. in the respective gales. A tabular statement is given of the sea temperature near the centre of the harbour for all months, and interesting and valuable comparisons are made with the corresponding air temperatures.

A LECTURE entitled "How the Cotton Plant Provides us with Foodstuffs and other Commodities as well as with Clothing" was delivered at the British Scientific Products Exhibition by Mr. Ed. C. de Segundo on July 23. In the course of his remarks Mr. de Segundo said that, although it had been confidently asserted at a conference held in Atlanta (Georgia) in 1907 that the production of cotton in the United States would be increased in the measure required to keep pace with the home (American) and the world's demands, the United States production had declined on the whole since that year, while the proportion of the crop taken by American spinning mills had risen from about 40 per cent. in 1907 to nearly 60 per cent. in 1918. Further, the world's production had decreased each year for the last four years, whereas, according to Prof. Todd, the world required a *cumulative increase* in the cotton crop of about 800,000 to 1,000,000 bales per annum, and therefore the vital importance of the rapid extension of cotton cultivation within the Empire must be patent even to the least discerning mind. Mr. de Segundo also dealt with the industrial utilisation of the residual cotton fibres retained by cotton-seed considered as a factor in cotton economics, and with the remarkably rapid development of the cotton-seed oil and feeding-cake industry during the past fifty years. Attention was directed to the value of cotton-seed flour which is prepared from the decorticated cake produced under the American system of milling cotton-seed, and contains about five times as much protein and fat as wheat flour. It was stated that the United States Government had officially recommended cotton-seed flour as a diluent for wheat flour. Cotton-seed flour was of a bright yellow colour, and thus the admixture of even a small proportion with wheat flour gave bread baked from the mixture a yellow tinge. Mr. de Segundo stated that if cotton-seed flour could be successfully bleached it might become of great economic value, having regard to the fact that about 80 per cent. of our annual consumption of wheat had to be imported. A number of small rolls made from a mixture of cotton-seed flour and wheat flour were exhibited and distributed among the audience. At the close of the lecture one of Mr. de Segundo's cotton-seed defibrating machines was exhibited in action.

CIRCULAR 79 of the U.S. Bureau of Standards gives an account of the methods of testing and the characteristic behaviour of the various types of dry cells in use in America. It provides a summary of the information at present available on the subject, and with a view to the ultimate standardisation of the manufacture of such cells it gives specifications for the various types, their sizes, cardboard cases, zinc cans, carbons, cloth bags, mixtures, seal, terminals, tests, voltage, and short-circuit currents. Copies of the circular may be obtained from the Bureau.

THE new monthly review *L'Aéronautique*, published by Messrs. Gauthier-Villars et Cie, of Paris, bids fair to become a journal of considerable interest to those interested in aviation. The first number (June) is divided into three sections, viz. general, technical, and historical, the last being a chronicle of current events. The general articles are very well written and excellently illustrated. They are intended to appeal to the average reader and are non-technical. The technical section is independently paged, apparently so that it may afterwards be separately bound for reference. The chief article in this section of the present number is concerned with the determination of the best conditions for obtaining the greatest distance of flight for a given machine—a problem of much importance. The treatment is, however, very elementary, and some doubtful assumptions are made which prevent the attainment of a complete general solution of the

problem. A short note on the equations of similarity as applied to aerial propellers is also unsatisfactory, and indicates a lack of appreciation of the true meaning of the principle of dynamic similarity. Thus, while the general articles are good, the technical section leaves something to be desired, and we hope that in future issues it will more nearly approach the standard of the rest of the production. The quality of paper and letterpress is excellent, but the price of 3.50 francs per copy seems rather high for a publication of this kind, however well produced.

IN a paper published recently in the Philosophical Transactions (vol. ccxviii., A, p. 395), Dr. A. E. H. Tutton gives a further instalment towards the completion of that colossal task to the accomplishment of which he has devoted himself through so many years, viz. the complete crystallographic and physical investigation of the sulphates and selenates of the series

$$R_2M\left(\begin{matrix}S\\Se\end{matrix}O_4\right)_2, 6H_2O.$$

In the investigation of the double ferrous selenates of the alkalis with which this paper deals, special difficulties were encountered owing to the unstable nature, first, of the solution of ferrous selenate and, secondly, of the crystals of potassium ferrous selenate which decompose and become opaque within a few hours of their formation. The first difficulty was overcome by the method of preparation of the ferrous selenate by the action of selenic acid upon ferrous sulphide, and the second by preparing and investigating the crystals of the potassium salt in the depth of winter. The results of the investigation are in complete accordance with those previously obtained in the case of other members of the series, and show the regular progression of crystallographic and optical properties with the increase in atomic number (or weight) of the alkalis, and also the almost perfect isostructure of the ammonium and rubidium salts.

PROF. G. H. BRYAN'S "Tables of Bordered Antilogarithms, Trigonometrical Logarithms to every Two Minutes, Natural Functions on Three Pages, Tables of Exact Squares," which occupy twenty pages of the May issue of the *Mathematical Gazette*, present certain novelties which will commend their use to calculators. The antilogarithms are given to five significant figures up to the antilogarithm of 0·61, thereafter to four figures. This increases the accuracy in the lower figures, whether used directly as an antilogarithmic table or inversely as a logarithmic table. The logarithms of the circular functions are given to every minute from 0° to 5° and from 85° to 90°, and to every two minutes from 5° to 85°. The saving of space by reading up the page for angles between 45° and 90°, although satisfactory for the practised calculator, is not regarded favourably by the school teacher. The table of squares is to five significant figures for numbers lower than 316, and to six significant figures for higher numbers. The chief advantage is that the complete square is given for every integral number up to 999. The square of a number of four digits is obtained by use of the formula $(N+x)^2=N^2+(2N+x)x$. This is a disadvantage in rapid work. For true accuracy Barlow's tables are all-essential; for limited accuracy to four figures (a very useful thing in laboratory work) the table in Chambers's "Four-figure Tables" would probably be found more serviceable. There is not the least doubt, however, that Prof. Bryan has provided us with a convenient compact set of logarithmic tables of greater accuracy than any similar set which has hitherto been devised. For many important kinds of practical work it is amply sufficient.

FROM an article in the *Engineer* of July 18 we extract the information that the Mitta Mitta Dam on the Murray River, the boundary between Victoria and New South Wales, Australia, will have a total length of 3601 ft., divided into three sections:—(*a*) An earthen dam of 2700 ft.; (*b*) a concrete spillway 740 ft. long, including turbine wells; and (*c*) outlet works, 161 ft. long. The object of the dam is to effect the storage of 1,000,000 acre-ft., or 272,250 million gallons, of water, so as to secure a regulated flow of 240,000 acre-ft. per month for irrigation during the dry season. For this purpose a height of 94 ft. from the bed of the river to full supply level will be required. The earthwork, with a core of concrete, is on the Victorian side of the river, the site-formation being alluvial, overlying beds of sand and gravel, below which there is a layer of decomposed granite of varying thickness. The bedrock of grey granite is reached at a depth of 34 ft. below surface-level, and the dam summit is 85 ft. above the same datum, the level of the crest being such as to give a margin of 12 ft. above full supply level. The spillway lies across the bed of the river, and will be constructed entirely in concrete. The cost of the scheme, including contingent works, with a series of locks and weirs from Echuca, in Victoria, to Blanchtown, in South Australia, is estimated at 4,500,000*l.*, and is being met by the States of Victoria, New South Wales, and South Australia, and the Commonwealth.

THE Scientific Instrument, Glassware, and Potash Production Branch of the Board of Trade has been transferred from 117 Piccadilly to 7 Seamore Place, W.1.

A LONG list of second-hand microscopes, spectroscopes, telescopes, and other instruments and accessories has been issued by the firm of Mr. John Browning, 146 Strand, W.C.2. Copies can be obtained upon application.

WE are asked to announce that Messrs. C. F. Casella and Co., Ltd., have removed their factory from Walworth to Walthamstow, and opened offices and showrooms at 49 and 50 Parliament Street, S.W.1, to which address all correspondence for the firm should be sent.

The *University of Chicago Press* has in preparation for appearance in the University of Chicago Nature-Study Series "A Field and Laboratory Guide in Physical Nature-Study" and "A Source Book of Physical Nature-Study." A book of current interest is promised by *Messrs. J. M. Dent and Sons, Ltd.*, for the autumn, viz. one dealing with the British coal industry. It will be the work of Mr. G. Stone, the assistant secretary to the Coal Commission, who is treating the subject from the historical point of view and that of present-day needs. In the latest list of *Messrs. Longmans and Co.* we notice "The Natural History of South Africa," F. W. Fitzsimons, 4 vols., two of which are in the press, viz. vol. i., Mammals, including the Vervet Monkeys, Baboons, Galagos, Fruit Bats, Insectivorous Bats, Lions, Leopards, Serval Cats, Black-footed Cats, African Wild Cats, Caracals, and Hunting Leopards; vol. ii., Mammals, including Civets, Genets, Mungooses, Meerkats, Earth Wolves, Hyenas, Jackals, Foxes, Wild Dogs, Otters, Honey Ratels, Muishonds, and Sea Lions; "Mensuration for Marine and Mechanical Engineers (Second and First Class Board of Trade Examinations)," J. W. Angles; and a new and abridged edition of "Human Personality and its Survival of Bodily Death," the late F. W. H. Myers, with a portrait and biographical sketch of the author.

The new list of announcements of *Mr. John Murray* includes the following:—"Travels in Egypt and Mesopotamia in Search of Antiquities, 1886–1913," Dr. E. A. Wallis Budge, 2 vols., illustrated; "Conifers and their Characteristics," C. C. Rogers; three additions to the Imperial Institute Monographs on Mineral Resources, viz. "Manganese Ores," A. H. Curtis; "Tin Ores," G. M. Davies, and "Tungsten Ores," R. H. Rastall and W. H. Wilcockson; "Industrial Problems and Disputes," Lord Askwith; and new editions of "Hydrographical Surveying: A Description of the Means and Methods Employed in Constructing Marine Charts," the late Rear-Admiral Sir W. J. L. Wharton, revised and brought up to date by Admiral Sir Mostyn Field; "Microscopy: The Construction, Theory, and Use of the Microscope," E. J. Spitta; "Principles and Methods of Taxation," Dr. G. Armitage-Smith; and "Economic Statesmanship: The Great Industrial and Financial Problems Arising from the War," J. Ellis Barker.

OUR ASTRONOMICAL COLUMN.

THE AUGUST PERSEIDS.—Some of the earlier members of this rich annual shower were visible on July 30 and August 2, and, from the numbers seen, it is probable that the return this year will be an unusually abundant one. At Bristol on August 2, during a watch of the heavens extending over $2\frac{3}{4}$ hours, forty-one meteors were seen, of which eighteen belonged to the special display of Perseids. Their radiant point was at 38°+55°, and it was not a sharply defined centre, but an area extending over about 7° in diameter. This marked diffusion is rather greater than what is usually observed, for the shower radiant is often rather small and definite. The maximum of the shower may be expected on August 11 and 12, but it is unfortunate that on these dates the moon will be nearly at the full, and will hide a considerable number of the smaller meteors. The Perseids, however, are a shower yielding a large proportion of brilliant meteors, so that even in strong moonlight the event is likely to present a conspicuous aspect.

KOPFF'S PERIODIC COMET.—The following search ephemeris for comet 1906 IV., period 6·6 years, which was not seen in 1913, is published by M. Ebell.

For Greenwich Midnight.

	R.A.	S. Decl.	Mag.
	h. m.	° ′	
July 20	19 15·2	11 34·6	10·2
August 21 ...	19 17·9	9 3·8	10·7
September 22 ...	19 49·2	8 30·7	11·5
October 24 ...	20 38·4	7 23·9	12·3

An observation by Dr. Wolf on July 30 gives R.A. 11 minutes greater than, and declination 1° 14′ N. of, the place shown by this ephemeris.

MIRA CETI.—Observations of this variable star about the time of its maximum in 1918, made by members of the Société Astronomique de France, are given in the Bulletin of that society for July. The dates estimated by the different observers at or between which the maximum may have occurred are as follows, the magnitude being added in brackets:—October 5 (3·3), September 23 (3·0), September 2–October 11 (about 3·9), September 21 (3·3), and September 25 (3·2); whilst another observer also records a double maximum on September 10 (3·65) and October 5 (3·85). Noting that the observer whose estimate is October 5 made no observation between September 11 and 26, it may be reasonably inferred that Mira Ceti was at maximum about September 23, 1918, when it was at least as bright as magnitude $3\frac{1}{4}$. According to similar observations made in the previous year, the maximum occurred about October 5, 1917. The length of the mean period generally adopted for the variation of this star is 331 days, which, applied to the date September 23, shows that maximum should happen this year about August 20. M. Flammarion's *Annuaire* names August 23 as the date. Mira has been comparatively faint at recent maxima, not having been brighter than third magnitude. It was practically of the second magnitude in 1906.

ROYAL OBSERVATORY, EDINBURGH.—Prof. Sampson's report for the year ending March 31 last has again to record a restriction of work owing to the absence of the two senior assistants on important Admiralty service. In these circumstances the attention of the Astronomer Royal for Scotland appears to have been given largely to the time service and to the study of improvement in clocks. A 24-in. mirror is being made by Mr. George Calver to take the place of one of the same size on an existing telescope, the figure of which is considered imperfect, and with the instrument thus improved it is proposed to determine stellar magnitudes by the photo-electric method, the process of which is being studied.

PATENTS IN RELATION TO INDUSTRY.

AN important conference on "Patents in Relation to Industry" was held, under the presidency of Lord Moulton, in connection with the British Scientific Products Exhibition, organised by the British Science Guild at the Central Hall, Westminster, on July 31, when some of the main features of the Patents and Designs Bill now before the House of Commons came under review. Sir Robert Hadfield, who opened the discussion, mentioned that those who had been trying to get changes introduced into the patent law were, at this juncture, being strongly supported by the Federation of British Industries and the British Commonwealth Union. These two important bodies intended, he said, to press for (*a*) an extension of the present term of fourteen years; (*b*) the introduction of the American file-wrapper system into this country; and (*c*) the appointment of a judge possessing special scientific knowledge as president of the court that had to deal with patent matters. Messrs. W. W. Reid, Hunter Gray, K.C., D. Leechman, and James Swinburne, and Sir G. Croydon Marks also took part in the discussion.

The remarks of the speakers made it evident that there exists a widespread feeling that the patent law of this country is inadequate for the present needs of industry, and, moreover, that it fails to afford the inventor suitable encouragement. Although the modifications of the law proposed in the 1919 Bill will, it is agreed, introduce desirable changes, a feeling appears to exist that in this Bill are repeated many of the weaknesses of the Bill withdrawn last year. Very general agreement exists on the point that renewal fees should be considerably reduced; such reduction, it was pointed out, can be effected at once without any fresh legislation, as the Treasury and the Board of Trade already possess the necessary powers to afford the inventor the relief required by him in this matter.

Lord Moulton, in bringing the discussion to a close, stated that, however excellent may be the case for obtaining a modification of the patent law, no progress will be made in the matter unless and until it is realised that the first thing essential to be done is for those who desire reforms to convince the Press and the people of the country that it is from the point of view of the public interest that questions affecting

patents are looked at and taken up. It is apparent to everyone, he said, that few inventions of the present day are really meritorious; he, therefore, regards the theory of renewal fees as a very excellent means for getting rid of patents that are not valuable. Such patents only put a restraint on invention, since improvements are choked so long as a master-patent remains in force. Lord Moulton expressed his approval of the American file-wrapper system. He pointed out that a patent specification must be drawn up in the utmost good faith in order that the public may have the full advantage of it when the patent in due course lapses; such is not always the case at present, since where the real inventor is a foreign resident abroad complete disclosure of the invention rarely takes place. The 1919 Bill will, in his opinion, constitute a new charter for the inventor. The public is determined, he said, that patents should help the trade of the country, and not strangle it as they have done during the past thirty or forty years.

THE LISTER INSTITUTE OF PREVENTIVE MEDICINE.

THE twenty-fifth annual report of the governing body of the Lister Institute recently issued gives a useful summary of the activities of the Institute during 1918.

Miss Muriel Robertson has continued her researches upon the anaerobic bacteria which infect wounds, with particular reference to the *vibrion septique*, the organism of malignant œdema. The reactions of this organism have been worked out, a toxin has been prepared from it, and with the toxin an antitoxic serum has been prepared and the serum issued to the Army.

Much work has been carried out for the War Office Committee for the Study of Tetanus, presided over by the chairman of the governing body of the institute, Sir David Bruce. Sir David Bruce has continued his analysis of tetanus cases occurring in home military hospitals. During 1918 292 cases of tetanus occurred among 380,000 wounded men, an incidence of 8 cases per 10,000 wounded. During the first three months of the war the incidence was 74 cases per 10,000 wounded. This drop has been chiefly due to the prophylactic use of anti-tetanic serum. The rate of mortality has similarly fallen—from 58 per cent. to 25 per cent.

Mr. Bacot, of the entomological department, has carried out numerous experimental tests of processes and methods aiming at ridding the troops of lice as a result of which a method for the destruction of lice by a moderate degree of dry heat has been devised and has been practically applied in the field on a large scale. Large numbers of lice have also been reared for use in other investigations concerned with the transmission of disease by these pests, particularly typhus fever and trench fever.

A number of researches concerned with food problems have also been carried out at the institute. Dr. Harden and Dr. Zilva, in conjunction with Dr. Still, have prepared a potent extract from lemon-juice for use in cases of infantile scurvy.

An investigation on the effects of cold storage on the fat-soluble accessory factor of butter is in progress.

An experimental investigation on scurvy, commenced in the autumn of 1916 by Dr. H. Chick, has already yielded valuable results. Thus it has been found that West Indian lime-juice is much inferior to lemon-juice in the prevention of scurvy. Yet in the British Navy and mercantile marine and in Arctic exploration last century lime-juice was vaunted as a preventive of scurvy. From an historical inquiry conducted by Mrs. Henderson Smith the important and interesting fact emerges that the "lime"-juice which was employed in these circumstances was actually made from lemons!

When during 1917 and 1918 there was a scarcity of oranges and lemons, experiments were instituted in order to ascertain if a cheap substitute existed containing the anti-scorbutic properties of these fruits, and swede-juice was ascertained to be most effective and not much inferior to orange-juice.

This brief summary surveys only a portion of the activities of the institute, but suffices to indicate the valuable work which has been carried out. The governing body proposes that the institute shall in the future be termed the Lister Institute for Medical Research, and suggests that a research hospital in connection with the institute would add greatly to its usefulness. Steps are being taken to give effect to these proposals.

COLLOIDS AND CHEMICAL INDUSTRY.[1]

ANYONE familiar, even in the least degree, with the general nature of chemical industry, and the applications of chemical science to other sciences, cannot but be impressed with the importance which colloid chemistry has attained within recent years in these two directions. In order that the significance of this branch of chemistry, hitherto very largely neglected, particularly in its scientific aspect, may be more fully appreciated and recognised, a committee of the British Association was formed in 1917 to consider the problem.

Last year (NATURE, March 28, 1918) attention was directed to the publication of the first report of this committee. The object which the committee has in view is to prepare in the form of sectional reports a summary of information respecting the present position of colloid chemistry and its various applications to other sciences, and especially to chemical industry. Each section is written by an authority on the subject treated. The first report dealt with the following technical subjects:—Tanning, dyeing, fermentation industries, rubber, starch, gums, albumin, gelatin, and gluten, cements, nitrocellulose explosives, and celluloid.

The committee has now issued its second report, which appears under the *aegis* of the Department of Scientific and Industrial Research. It may be obtained from H.M. Stationery Office or through any bookseller. The general arrangement adopted in the first report is adhered to in the present one. This consists of (1) classification according to the scientific colloid subject, and (2) classification according to the industrial process and general application of colloid science to other sciences. Under the first head the subjects treated are:—(i) Peptisation and precipitation (W. D. Bancroft); (ii) emulsions (E. Hatschek); (iii) the Liesegang phenomenon (E. Hatschek); and (iv) electrical endosmose (T. R. Briggs). Under the second head are:—(i) Technical applications of electrical endosmose (T. R. Briggs); (ii) colloid chemistry in the textile industries (W. Harrison); (iii) colloids in agriculture (E. J. Russell); (iv) sewage purification (E. Ardern); (v) dairy chemistry (W. Clayton); (vi) colloid chemistry in physiology (W. M. Bayliss); and (vii) administration of colloids in disease (A. B. Searle).

It is only right to point out that the compilation of these sections represents a gratuitous contribution on the part of the compilers for the general benefit of

[1] Second Report of the British Association Committee on Colloid Chemistry and its General and Industrial Applications (1918). (Published for the Department of Scientific and Industrial Research by H.M. Stationery Office, 1919.) Price 1s. 6d. net.

all who may be engaged in pure or applied science or in industrial operations in which colloids play a part.

It is obvious, from the mere enumeration of the subject-headings, that a very valuable amount of material has been collected which, it is hoped, will serve the purpose of emphasising the fundamental importance of colloid chemistry for operations and processes which, at first sight, might appear to be wholly distinct.

A number of sections remain to be dealt with, and it is hoped that these will be included in the third report which is now in preparation.

W. C. McC. LEWIS.

THE BRITISH PHARMACEUTICAL CONFERENCE.

THE papers communicated to the British Pharmaceutical Conference at the annual meeting on July 22–23 attained an exceptionally high standard of pharmaceutical and scientific importance. Summaries of a few papers are subjoined.

K. Samaan, in "An Experimental Study of Strophanthus, Kombé, Seeds," clears up a former point of controversy by showing that the fat extracted from properly dried seeds by petroleum ether is devoid of physiological activity. Comparisons of the determination of strophanthin, physiologically and by various quantitative methods, showed Barclay's, Fromme's (1910), and Lampart and Mueller's processes all to give satisfactory results. For the preparation of strophanthus tincture 65 per cent. of alcohol is recommended.

In a general account of "Recent Advances in Vaccine Therapy," H. E. Annett points out that one of the greatest factors militating against success in vaccine treatment is the difficulty of ensuring that sufficient antigen is introduced into the blood-stream to overcome the effects of the infecting agents. Attention is directed to the importance of David Thompson's method (*Lancet*, June 28, 1919) for removing the toxins from vaccines without damaging the "antigen," so that quantities of such vaccines, ten to one hundred times greater than were possible before, may with safety be employed. The significance of this is illustrated by Dr. Wynn's striking discovery that, by employing what previously would have been regarded as enormous doses of suitable vaccines, cases of acute pneumonia, acute influenza, and acute influenzal bronchiopneumonia can successfully be treated. The doses employed contained, for an adult, 30–50 millions of *B. influenzae* and 50–100 millions each of *Diplococcus pneumoniae* and Streptococcus. By prompt treatment on these lines an attack of influenza can definitely be aborted.

E. Berry contributed an important paper on "A Standardisation of Digitalis Preparations." The disadvantages of the physiological method of standardisation by determination of the minimum lethal dose are that a vivisection licence is necessary, and that a large number of frogs are required for each sample; further, the M.L.D. method records toxicity only. The author puts forward a colorimetric process which is a development of that proposed by Martindale. Alcohol, saponin, and digitoxin are first removed from the tincture to be tested, after which the residue is treated with Frohde's reagent, and the significance of the colour produced read off from a colour-chart. The result records the equivalent M.L.D. values for the *water-soluble* glucosides only, and is termed the "therapeutic value" of the tincture, (A). A second estimation carried out similarly, but in presence of 70 per cent. alcohol, and without removing digitoxin, etc., gives the M.L.D. equivalent of the *total glucosides*, (B). The "toxic value" is given by (B−A), and the comparative toxicity by the expression B−A/A. Comparison of these values with those afforded by a standard tincture gives a trustworthy evaluation of the preparation.

A. J. Jones, in "Purified Ether and the Variations of Commercial Samples," records the examination of nine samples prepared by different manufacturers. He directs attention to certain differences which exist between the "purified ether" of the British Pharmacopœia and "anæsthetic ether," and suggests that both types should receive official recognition, and a distinction drawn as to the special adaptations of the particular ether. This seems called for, as Dr. Cotton, of the McGill University, has recently put forward the view that absolutely pure ether is not anæsthetic in the full sense of the term; that it is narcotic, but not analgesic, the analgesic properties of ethers being due to traces of impurities—ethylene being suggested.

In a paper dealing with the couch-grass of commerce, "*Triticum repens*: A Commercial Rarity," Dr. James Small shows that the majority of a number of commercial samples examined consisted of *Cynoden dactylon*, or dog-grass, and not of the true couch-grass, *Triticum repens*.

T. E. Wallis, in "The Use of Lycopodium in Quantitative Microscopy," directs attention to the great value of this substance, which he shows to contain 94,000 spores per milligram, for determining the quantities of materials present in microscopic preparations.

In "Terebene and its Pharmacopœia Standards" B. F. Howard demonstrates the manufacturer's difficulty in producing a product which complies with the British Pharmacopœia requirement of optical inactivity and specific gravity, owing to the great alteration in recent years in the character of American turpentine. He suggests that main reliance should be placed in a distillation standard.

Miss L. K. Pearson describes "A Comparative Study of the Pungency of Synthetic Aromatic Ketones related to Zingerone." The substances considered are of the type

$$C_6H_5.CH=CH.COOR \text{ and } C_6H_5.CH_2.CH_2.COOR,$$

where one or more hydrogens of the benzene nucleus are substituted by hydroxyl or methoxyl groups, and where R represents a methyl, ethyl, or phenyl radicle. The following are among the generalisations made:—(*a*) The saturated ketones are less pungent than the corresponding unsaturated ones; (*b*) an increase in weight of the side chain materially increases the pungency of the compound; (*c*) the replacement of the hydrogen of the phenolic hydroxyl group by an acyl radicle has very little effect; and (*d*) the replacement of the *meta*hydrogen of the benzene nucleus in *p*-hydroxyphenyl ethyl ketone by a methoxy-group brings about a decided increase in pungency, as does also the replacement by methyl of the hydroxylic hydrogen in the *meta*hydroxy-group of 3 : 4-dihydroxystyryl methyl ketone. The most pungent of all substances examined was *o*-hydroxystyryl methyl ketone.

In "Notes on the Examination of Eosins and Erythrosins," T. T. Cocking, J. D. Kettle, and E. J. Chappel give a method of estimation, and show the inferiority of the best pre-war German samples to those now being produced in England.

S. B. Tallantyre directed attention to the general applicability of the formaldehyde process for estimating bismuth, by which the preparation, after a preliminary decomposition with hydrochloric acid, is reduced by formaldehyde and sodium hydroxide to metallic bismuth.

C. K. Hampshire and C. E. G. Hawker, in "A Note on Vitamines: A Suet Emulsion for Infant-feeding," describe the preparation of a substitute for cream, which proved to be palatable and well-tolerated by infants.

Other papers contributed were "A Note on Japanese Chiretta," by V. Cofman; "Note on Tinctures of Iodine," by F. Burrows and H. Droop Richmond; and "The Examination of Valerianates," by H. Droop Richmond and W. T. T. Ainsworth.

A MODEL OF THE VOLCANO KILAUEA, HAWAII.

MODELS of land-forms are not new, but the art of reproducing the features in a naturalistic way without exaggeration of the vertical scale has not been attempted until recent years. A. Heim, of Zurich, was a pioneer in this work about twenty years ago. Mr. George C. Curtis was a student of Heim. Before attempting the difficult task of making a naturalistic reproduction of Kilauea, Mr. Curtis had made many models of note. Among the most important of these are the models of the cities of Boston and Washington, and the models of Bora Bora and Funafuti, coral atolls of the Pacific.

In February, 1913, the present writer engaged Mr. Curtis to make a model of the volcano Kilauea, on the Island of Hawaii, for the Geological Museum at Harvard University. Mr. Curtis went to Hawaii in March, and spent three months at the volcano, making a supplementary survey and taking panoramic photographs and colour sketches of the ground. The staff of the Kilauea Observatory, Prof. T. A. Jaggar and Mr. H. O. Wood, aided Mr. Curtis in every way possible. After the actual work of modelling had been started at Boston, Mr. Curtis found it almost impossible to reproduce the frozen lavas of the great sink of the volcano with the photographs that he had. Mr. J. Fred Haworth, a merchant of Pittsburgh, had become a master in kite-photography. He was glad of the opportunity to go to Kilauea and take kite views of the volcano, and this he finally did at his own expense. Without these views from the air it is very doubtful whether Mr. Curtis could have perfected the work undertaken. With these kite views, however, the modelling of the frozen lavas became much simplified. In waiting for the kite views the work on the model was delayed. If these views had been available when the modelling was started, the work would have taken only a year and a half instead of forty months, as was actually the case. In the future the naturalistic modelling of land-forms will depend largely on kite or aeroplane views for its accurate and speedy accomplishment.

The model of Kilauea is circular in form, 14 ft. in diameter, and has an area of modelling representing about 13 sq. miles. The scale is 1:1500, or 1 in. = 125 ft. The sizes of the men on the edge of the Halemaumau crater, the buildings, trees, and automobiles on the roads, give a good idea of the scale. This model, like the other naturalistic models of Mr. Curtis, has no exaggeration of the vertical scale. For the first time in model-making a cycloramic background has been used. It gives the feeling of vastness that we should naturally have if looking from a balloon on the country below. As the observer looks downward on this model he is virtually half a mile high in the air. Those who are familiar with Kilauea assert that the reproduction is as faithful to the actual ground as it is possible to make it. Although it has been impossible to represent every tree on the ground, many thousands of trees have been made by hand and each one placed in the plaster. The details of the lavas are remarkably true to nature.

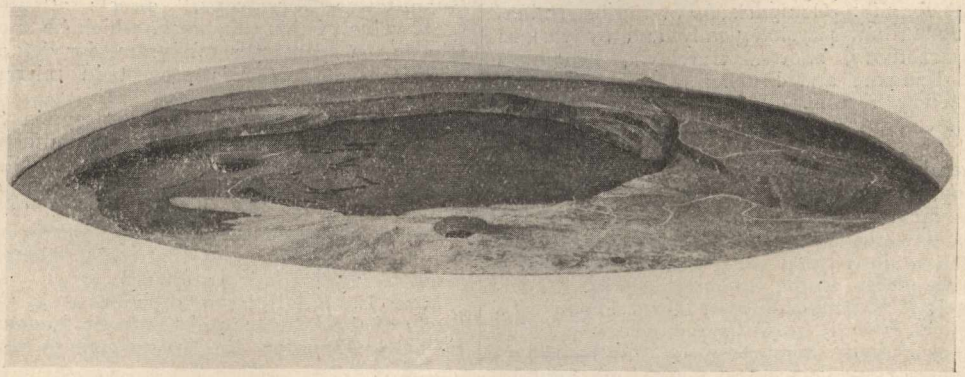

FIG. 1.—General View of the Model. The observer looks northward across the great lava sink. In the middle foreground are the extinct pit crater of Keanakakoi and the border of the Kau desert; to the right a small extinct pit crater. In the left middle distance is the active crater of Halemaumau (House of Eternal Fire). On the right of the main sink some down-faulted blocks may be seen. The Volcano House with its group of buildings is situated behind these. Note the dense forest on the left. On the right is the extinct crater of Kilauea Iki separated from the main sink by the down-faulted block of Byron's Ledge. On the left and on the cycloramic background rises Mauna Loa, 10,000 ft. above Kilauea and twenty-five miles away.

In addition to the many features of interest to the vulcanologist and the student of structural and dynamical geology, the model shows very well the effects of climatic control on the vegetation, due to trade winds and altitude. To the east and north-east of the Volcano House the forest is of a tropical nature in its luxuriance. To the west and south-west the vegetation disappears rapidly, so that on the western part of the model there appears nothing but a desert of volcanic ash. Three types of climate are shown: the top of Mauna Kea is frequently snow-covered; near the north and east coast and as far as the Volcano House is a tropical forest where the rainfall reaches the large amount of 300 in. a year; and west of the Volcano House is a desert where the rainfall may not reach 15 in. a year.

A model of this kind is expensive, and such models will never be cheap. With the use of kite or aeroplane photographs, however, the cost should be cut down by half. Museum staffs will ask the important question: Is the work worth while? Those who are qualified to answer this question have answered in the affirmative. The advantages of a good naturalistic

model are many. (1) Such a model of a volcano or of any land-form which changes during a generation of men is a scientific record of that locality, of great value to students of the present and future. (2) Such

FIG. 2.—In this figure the extinct pit crater of Kilauea Iki is seen. At the bottom is a sheet of frozen lava which shows black in the figure. The level of this lava is several hundreds of feet below the lava of the great pit. There has been a flow of lava from a point midway between the great pit and Kilauea Iki within historic times which flowed into Kilauea Iki. The sides of Kilauea Iki are very steep, but partly covered with vegetation. The road may be seen winding about the rim of the crater. With a reading-glass several automobiles may be seen, which give an idea of the scale of the model.

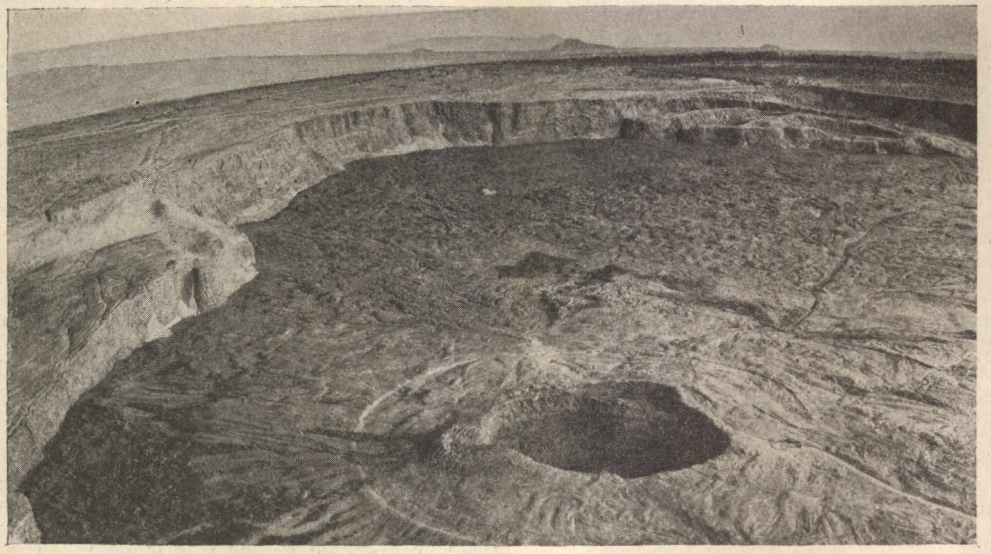

FIG. 3.—Photograph of the Kilauea model looking north-east across the pit of Halemaumau, the molten lake with its fiery fountains being just visible. The liquid lava is 350 ft. below the rim of the crater. The observation hut maintained by the Massachusetts Institute of Technology is on the left just back from the rim. Sometimes the molten lava rises nearly to the top of the pit, and again it will sink away so as to make the crater about a thousand feet deep. The dark grey lava field reaches to the base of the encircling caldera walls, in which the old bedded structures of ancient lava-flows, ash beds, and a laccolith may be observed. Taluses are seen in several localities at the base of the escarpment. In the left foreground is the summit point Uwekahuna, under which lies a stairway of great down-faulted blocks. Note the Volcano House group of buildings in the right distance, to the left of which are the brilliantly coloured Sulphur Bank and, behind, the dark forested slopes of the Kilauea cone.

models are of great value in research work. Several discoveries have been made by means of this Kilauea model. The volcanic bomb craters were practically unknown before the model was made. A young drainage system in the ash desert was also unknown previously. Prof. R. A. Daly has discovered that the land about Kilauea Iki slopes away from the crater in all directions, thus making of the Kilauea Iki area a dome similar to the area about Halemaumau. (3) The bird's-eye view of an area which can be studied at leisure reveals many relations between various features of the country which could not be well seen and studied in any other way. On account of the atmospheric conditions, no balloon or aeroplane observation or photograph could give at once such an ideal view as one obtains from the model. (4) The model can be used to teach students facts in geology, geography, and meteorology. The important things which a locality has to offer can be taught at home. (5) Such naturalistic models may be used in the teaching of landscape sketching and painting, and even in the teaching of map-making.

Although such models are worth while, the men who can make them are not easy to find. This is the real difficulty at present. Let us hope, however, that the revolution which kite or aeroplane views have made in this new art will encourage more men to undertake it. On account of the difficulty of obtaining orders for expensive models, Mr. Curtis has given up the work, and at present is farming at Willits, California. In order that the methods and technique which Heim and Curtis have gained after years of patient labour and study may not be lost, they should be described and published for the benefit of those who will continue from the point where these masters left off.

ROBERT W. SAYLES.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. S. CHAPMAN has been appointed to the second chair of mathematics recently instituted in the University of Manchester.

DR. SAMUEL SMILES has been appointed to the newly created chair of organic chemistry at Armstrong College, Newcastle-upon-Tyne.

MR. J. W. THOMAS has been appointed lecturer in the electrical engineering department of the Birmingham Municipal Technical School.

MR. E. RAWSON, recently head of the Newcastle-upon-Tyne Training Centre, has been appointed head of the mechanical and civil engineering department of the Portsmouth Municipal College.

THE following appointments have been made at the London (Royal Free Hospital) School of Medicine for Women:—Mary Lucas Keene, lecturer in anatomy, and head of the anatomy department; John W. Ebden, Lawrence Abel, Mary Hounsfield, Mary Joll, demonstrators of anatomy; Bernard H. Spilsbury, lecturer in forensic medicine and toxicology; Eleanor Scarborough, demonstrator in pharmacology; M. Ross-Johnson and D. Woodman, demonstrators of physiology.

AN announcement has been received from the Technical Optics Department of the Imperial College of Science, South Kensington, that, subject to a sufficient response, Prof. Conrady will give a vacation course of sixteen lectures on "Optical Designing and Computing." For the convenience of students living at a distance two lectures will be given on each Tuesday and Thursday from August 26 to September 18 at 11 a.m. and 2.30 p.m. The syllabus includes methods of exact ray-tracing for axial and oblique pencils and approximate methods of treating aberration problems, together with the application of these methods to a number of typical optical instruments. Full lecture notes will be supplied to students a few days in advance of the lectures, leaving the greater part of the time free for a fuller discussion of the more practical aspect of the problems than would otherwise be possible. The fee for the complete course, including an optional computing course following the morning lectures, is 2*l.*, payable to the Registrar of the Imperial College. In the case of students who have taken certain previous courses the fee is reduced by one-half. It is particularly desired that names should be entered well in advance.

THE *Times* correspondent at Cape Town, in a message dated July 31, states that the Development Committee of the University of Cape Town is issuing a scheme of development which involves an expenditure of 525,000*l.*, of which 200,000*l.* is for buildings at Groote Schuur, 100,000*l.* for scholarships, 25,000*l.* for a library, and 200,000*l.* for general endowments. We learn from the same source that the Prince of Wales, as Chancellor of the University, has sent the following letter to the Vice-Chancellor:—"I wish, as Chancellor of the University of Cape Town, to assure you of my cordial support in the movement to improve the financial position of the University. The coming generation is called on to restore and rebuild the world. Failure in that task would imply that the sacrifice of those who fell in the war had been fruitless, and failure cannot be contemplated. Success depends on energy, goodwill, and, above all, on the spread of knowledge and of right thinking. The universities of the world can exercise a most potent influence on this great work of reconstruction, and it is because I feel convinced that a sacred duty to help in this work rests upon our University that I appeal confidently to its friends in South Africa and elsewhere to equip it, of their generosity, with the means worthily to do its part."

THE province of the engineer has in modern times become so amplified that the great majority of young men educated for that profession are, from the earliest days of their active professional career, now brought into immediate contact with the business side of engineering practice. For this reason a widening of the basis of the education provided at our universities for engineering students has been strongly advocated in recent times. To meet the needs of this situation it has been decided by the Senate of the University of Bristol to introduce commercial courses in the faculty of engineering. Syllabuses of these courses, which are now to be compulsory, have been prepared, and are available for distribution. The scheme outlined in the syllabuses comprises instruction in four groups of subjects, namely:—(*a*) Book-keeping and accountancy, (*b*) works administration and organisation, (*c*) commercial law, and (*d*) estimating and specification writing. Two courses are to be provided in each of the subjects (*a*) and (*c*), whilst subjects (*b*) and (*d*) are to be included in both the first- and second-year courses for engineering students. The main aim to be kept in view in courses of this kind should be to bring home clearly to engineering students the real importance of the business aspects of their profession, and at the same time to stimulate their interest in this side of engineering work. The syllabuses of the commercial courses to be introduced into

the engineering curriculum at the University of Bristol cover eminently suitable ground, and appear to be well designed successfully to achieve the purposes mentioned above.

ON Thursday, July 31, the King received at Buckingham Palace three deputations from public bodies, viz. the London County Council, the Body of English Presbyterian Ministers in London and the neighbourhood, and the General Body of Protestant Dissenting Ministers, who each presented an address of congratulation on the signing of peace after the terrible four years' struggle in which the nations of the world have been engaged, expressing the hope that we may now embark upon measures having for their object the continuous improvement of social conditions and the raising of higher ideals of life. In his replies to the several addresses the King expressed his strong conviction that nothing is more essential to national prosperity and happiness than education, and that the potentialities, physical, mental, and spiritual, of every member of the community should be developed to the fullest extent. If this were done, the life of the nation would be transformed within a generation. His Majesty alluded in terms of keen sympathy to the necessity for the care of the weak and helpless, for the protection of our infant life, and for the guardianship and training of the physically and mentally defective. New powers are being bestowed upon the public authorities, and the responsibility for their effective use rests with them. It is essential to raise the ideals of life throughout all classes. This implies due nurture and care of infant life, so that when the child comes of school-age it shall enter upon its formal education healthy in mind and body. To achieve this, better housing and more ample surroundings for light and air and healthy outdoor enjoyment are essential. If these conditions are established there will no longer be, as Sir George Newman recently reported, a million children out of six millions on the rolls of the elementary schools totally unfit, by reason of physical or mental defects, to make effective use of their educational opportunities. The King's sympathy and encouragement, so earnestly expressed to these deputations, ought to stimulate the zeal and the efforts of the local authorities to provide the facilities so necessary to the national well-being.

SOCIETIES AND ACADEMIES.

LONDON.

Faraday Society, July 14.—Prof. A. W. Porter, vice-president, in the chair.—L. A. **Wild**: A method of measuring the magnetic hardness of ferrous metals and its utility for carrying out research work on thermal treatment. The coercive force forms a very convenient criterion for judging the physical condition of steel, as a small change in the heat-treatment conditions or composition of the steel results in the production of a much larger change in the coercive force. The method has been used for the investigation of many problems relating to the properties of steel.—F. H. **Jeffery**: The electrolysis of solutions of sodium nitrate, using a silver anode.—W. E. **Forsythe**: The disappearing-filament type of optical pyrometer. The paper discusses fully the principles that determine the accuracy and use of this type of pyrometer. The instrument is practically a telescope with a lamp filament at the focus of the objective, in series with a battery resistance and ammeter. The instrument is lighted in the hot body in such a manner that the image of the filament crosses that of the body. The current is then adjusted until the filament is just as bright as the body sighted. A red glass in the eye-piece eliminates difficulties due to colour differences.—E. A. **Ashcroft**: Some chemically reactive alloys. An alloy of 15 per cent. of pure magnesium with 85 per cent. of pure lead has the remarkable property that upon exposure to moist air oxidation of both the magnesium and the lead proceeds so rapidly that a lump of alloy so exposed swells up and falls to a black powder in a single night, or in some instances even in an hour or two. The experiment suggests a ready means of producing nitrogen or nitrogen and hydrogen mixtures from these alloys, or of removing remainders of oxygen from various mixtures in the cold.—Prof. H. **Honda** and H. **Takagi**: A theory of invar.—Prof. A. W. **Porter**: The equation for the chemical equilibrium of homogeneous mixtures. Part i.: Equilibrium at constant temperature. The general equation for chemical equilibrium is obtained in a way which is so much less abstract than the method depending upon the thermodynamic potential that no dubiety need exist of the meaning of the result and the conditions under which any particular form of it applies. The result is expressed in terms of the pressures of the constituents when isolated and in osmotic equilibrium with the mixture through membranes each permeable to one alone of the constituents.—Irving **Langmuir**: The mechanism of the surface phenomena of flotation. The paper directs attention to a theory of adsorption and surface tension which greatly aids in understanding the phenomena of flotation. The necessity for further researches is urged.

PARIS.

Academy of Sciences, July 15.—M. Léon Guignard in the chair.—G. **Bigourdan**: The pupils and temporary observers of the Observatoire de la Marine.—E. **Kogbetliantz**: The summation of ultra-spherical series.—J. **Guillaume**: Observations of the sun made at the Lyons Observatory during the first quarter of 1919. Observations were possible on seventy-two days, and the results are given in tables showing the number of spots, their distribution in latitude, and the distribution of the faculæ in latitude.—A. **Muguet**: A fluorometer. This instrument is based on the use of a number of superposed absorbent screens, and comparisons are made with a luminescent standard containing 1 mg. of elementary radium per square centimetre of surface, acting upon a barium platinocyanide screen.—H. **Abraham**, E. **Bloch**, and L. **Bloch**: Sensitive apparatus for the measurement of alternating currents.—F. **Taboury** and M. **Godchot**: A new method for the preparation of bicyclic ketones. Calcium hydride is used as the condensing agent, and it is noteworthy that the ketones resulting from the reaction are unsaturated, as the hydrogen from the calcium hydride is not taken up.—MM. **Vavon** and **Faillebin**: The hydrogenation of piperonal ketone and dipiperonal ketone.—E. **Léger**: Contribution to the study of cinchonidine.—G. **Chavanne** and L. J. **Simon**: The use of the critical solution temperature ("T.C.D.") in aniline for the rapid analysis of petrol. The method proposed gives the percentages of aromatic and naphthenic hydrocarbons.—A. **Duffour**: The hexahydrated potassium magnesium double chromate.—C. **Dauzère**: The formation of basaltic columns.—L. **Dunoyer** and G. **Reboul**: The prediction of barometric variations. A reply to M. Gabriel Guilbert.—Ch. **Maurain**: The velocity of the wind in the upper atmosphere in bright weather.—J. **Rouch**: The ascensional velocity of pilot balloons. From 168 measurements of velocity of pilot balloons it is concluded that the velocity of ascent is practically constant, and this holds for heights up to 10,000 metres For balloons weighing between 50 and

91 grams the velocity can be expressed by the formula $V=\frac{42F}{(F+P)^3}$, where V is velocity in metres per minute, P is the weight of the balloon, and F the initial ascensional force.—R. **Régnier**: The bacterial nodule of the poplar (*Micrococcus populi*). Observations on the development of the disease on the tree, and suggested means of preventing its spread.—P. **Carnot** and P. **Gérard**: Mechanism of the toxic action of urease. The injection of urease into the blood causes death by ammonia poisoning; the urea in the blood completely disappears and is replaced by ammonia.—R. **Fosse**: The formation of cyanic acid by the oxidation of organic substances. Its identification based on quantitative analysis. Aqueous solutions of glucose, glycerin, or glycocoll, oxidised by potassium permanganate in presence of ammonia, give cyanic acid as one of the oxidation products. This was identified by precipitating as the silver salt. The silver in this salt was determined by addition of ammonium chloride, and the urea formed from the ammonium cyanate separately estimated.—P. **Woog**: The variable persistence of luminous impressions on the various regions of the retina. Reply to an objection.—P. **Girard**: Relation between the electrical state of the cell-wall and its permeability to a given ion.—R. **de la Vaulx**: Intersexuality in *Daphne atkinsoni*.—J. **Pellegrin**: The Eleotris of the fresh-waters of Madagascar.—M. **Lienhart**: The possibility of chicken-breeders obtaining at pleasure male or female chickens. For a given strain of bird, the heavier eggs produce a higher proportion of males.—J. **Danysz**: The life of a micro-organism, individual and species.—P. **Delbet**: Researches on the toxicity of crushed muscles from the point of view of the pathogeny of shock.

CAPE TOWN.

Royal Society of South Africa, May 21.—Dr. J. D. F. Gilchrist, president, in the chair.—B. de St. J. v. d. **Riet**: Note on coloration produced in clay by injured roots of *Pinus pinea*. Instances were described in which vapours from injured roots of the stone pine produced, in warm sunshine, blue, green, and occasionally purple stains on soil and subsoil on occasions when excavations were made close to the tree. The author ascribed the phenomenon to (1) oxidation of volatile matter given off by roots of *Pinus pinea*; (2) the resulting oxidation products, or product, under favourable conditions reacting with iron salts in the clay (the well-known reaction between many phenolic carbon compounds and ferric salts); and (3) the production of a kind of lake with aluminium compounds in the clay.—Dr. J. D. F. **Gilchrist**: Note on the shells of *Schizoderma spengleri*. Shells of the bivalve Schizoderma are found in abundance on the Muizenberg sands, and present the peculiarity that they are either whole or broken up into small fragments. This seems to be due to the fact that, when the living animal is cast up on the beach, it is seized by the gull (*Larus dominicanus*) and dropped from a height of 20–30 ft. on the wet sand. This has the effect of causing both shells to open without injury, or one shell only is broken, rarely both. It was shown by experiment that this depends on how the shells fall.—Dr. **Dru-Drury**: An extreme case of microcephaly. The author describes the skull of a Basuto woman aged thirty-two which is preserved in the Port Alfred Mental Hospital. The type of skull is long-headed and narrow, with ape-like protrusion of the jaws (thick-lipped in life). The nose was of medium breadth and the orbits were unusually high. The cranial capacity is 340 c.c., which is much smaller than an average case of microcephaly.

BOOKS RECEIVED.

The British Freshwater Rhizopoda and Heliozoa. By J. Cash and G. H. Wailes, assisted by J. Hopkinson. Vol. iv.: Supplement to the Rhizopoda. By G. H. Wailes. Bibliography by John Hopkinson. Pp. xii+130+plates lviii.–lxiii. (London: The Ray Society, 1919.)

Camping Out for All. A Complete Handbook for All who Love the Out-of-Doors. By J. Gibson. Pp. x+81. (London: Gale and Polden, Ltd., 1919.) 2*s*. net.

Training for Young England. By F. G. Cooke. Pp. xiv+98. (London: Gale and Polden, Ltd., 1919.) 2*s*. net.

The Boys' Own Book of Great Inventions. By Floyd L. Darrow. Pp. ix+385. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1918.) 12*s*. 6*d*. net.

Education for the Needs of Life: A Text-book in the Principles of Education. By Dr. I. E. Miller. Pp. vii+353. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) 7*s*. net.

The Sugar-Beet in America. By Prof. F. S. Harris. (The Rural Science Series.) Pp. xviii+342+xxxii. plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) 2.25 dollars.

British Science Guild: British Scientific Products Exhibition, Central Hall, Westminster, July 3 to August 5, 1919. Descriptive Catalogue. Edited by Sir Richard Gregory. Pp. xxiii+358. (London: British Science Guild, 1919.) 2*s*. 6*d*.

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