THURSDAY, NOVEMBER 1, 1917.

STONE WORSHIP IN THE NEAR EAST.

The Annual of the British School at Athens. No. xxi. Sessions 1914–15, 1915–16. Pp. viii + 238 + plates xv. (London: Macmillan and Co., Ltd., n.d.) Price 21s. net.

THE ranks of scholars and archæologists trained in the British School at Athens have been sadly thinned by the war. It will be difficult to replace G. L. Cheesman, Guy Dickins, R. M. Heath, and W. Loring. To the present volume Mr. Cheesman contributes a translation of a pathetic Greek folk-song, and Mr. Dickins a learned study of Greek art as represented in the so-called "school" of Praxiteles.

The most interesting article is that by Mr. F. W. Hasluck on "Stone Cults and Venerated Stones in the Græco-Turkish Area," which strikes new ground and brings together much useful information for the study of primitive beliefs in the Ægean and its hinterlands. Over the Semitic area stone worship survived later and more generally than among races more prone to anthropomorphism. Here and elsewhere the faiths which succeeded the primitive animism tacitly adopted this form of worship. Islam sanctioned it by allowing the reverence paid by the pagan Arabs to the Black Stone of the Kaaba to be perpetuated on the rather far-fetched hypothesis that the Angel Gabriel had brought it to Mecca. In the same way Christianity has permitted or encouraged it in the case of the Stone of Unction at Jerusalem, and by associating the cult of sacred stones with sacred personages or events. Many stones, again, are valued in a secular way, not necessarily more ancient chronologically, though more openly primitive in spirit, as magic and witchcraft to which this reverence is due are more primitive than religion.

These sacred stones fall into certain well-defined classes.

First we have those selected for their natural qualities, such as the Black Stone of the Kaaba, supposed to be an aerolite. The selection of such stones as objects of veneration often depends upon the unusual material of which they are composed. But in some instances colour is an important factor, as in the case of the Yellow Stones at Constantinople used for the cure of jaundice, or the white stones from Melos or Crete used as milk charms. The principles of sympathetic or homœopathic magic regulate their use.

Next come the pierced stones used in a superstitious way all over the Near East. Mr. Hasluck, with some probability, suggests that their virtue is bound up with the conception of holes as "entrances" or "new starts." All entrances or beginnings mark a new departure, a "change of luck," and the mere act of passage may change the luck of the patient for the better. To this is added the fact that the sanctity attributed to the stone surrounds the sick person with beneficent influences as he makes his passage through it. When the passage itself is too narrow to admit the patient, the difficulty is got over by passing some small object through the orifice. This, by absorbing the virtue of the holy stone, may by juxtaposition transfer it to the sufferer. Thus, at a saints' grave in Monastir, women who desire children pass two eggs through the orifice, and by eating them gain their desire.

Stones with external markings, such as the footprints of a god or of a saint, are naturally revered. Abraham left his footprints at Mecca, the Prophet at Constantinople and Jerusalem. In such cases, also, the dominant faith has taken over the objects venerated by its predecessors. A footprint in Georgia is attributed to a legendary Queen Tamar, to a Christian priest flying from persecution, to a Musalman saint who converted the district to Islam.

Worked stones, again, are often utilised for religious purposes. Islam, of course, has no place for reliefs or statues, and if they are venerated by its adherents it is as the abode of Djinns possessed of power, but this power is evoked by secular magic. The Eastern Church has been to some extent influenced by the Moslem view of graven or molten images, but reliefs of the Thracian horseman are used as eikons of St. George in Thrace. The so-called Demeter statue is worshipped at Eleusis to secure good crops, on the supposition that the headdress of the figure represents ears of corn. "In all probability," says Mr. Hasluck, "the finding of the statue chanced to coincide with an abundant harvest, and the inference was that the talisman was 'white' or favourable." Columns are everywhere objects of veneration, the isolation or conspicuousness of the object, and in some cases phallic associations, contributing to secure its sanctity. Stones with inscriptions in an unknown tongue are believed to possess magical powers.

Stones of many kinds have sometimes been treated as survivals of some ancient cult. But the chance of finding a stone venerated by different faiths from ancient times to our own is so slight as to be negligible. Where the evidence adduced in support of such survivals can be properly tested it usually breaks down. Sir W. M. Ramsay describes the worship paid to a stone or altar dedicated to Hermes, and assumes that the worship paid to it was continuous from the Greek period. But the real fact seems to be that it was removed in comparatively recent times to a Turkish cemetery, and its potency arises from its use as a tombstone, and from the fact that it bears an inscription in a tongue not "understanded of the people"; therefore it was assumed to possess magical qualities. A case even stronger than this is that of the Black Stone which used to be preserved at the tomb of Daniel at Susa. It was found about 120 years ago, and was rolled down the river bank by the Dervish who kept the tomb some sixty years ago; then a Frank is said to have blown it to pieces in

search of treasure. Associations such as these were held sufficient to prove that it possessed magical power, and this belief was reinforced when after its destruction a visitation of plague occurred, the bridge at Shuster collapsed, and the Hawizah dam was breached. This was all obviously the result of the desecration of the talisman, so the fragments were collected and buried in the precincts of the tomb. The story, as a whole, is singularly instructive to those in quest of the origins of popular beliefs.

OCEAN DRIFT FRUITS.

Plants, Seeds, and Currents in the West Indies and Azores. The Results of Investigations carried out in those Regions between 1906 *and* 1914. By H. B. Guppy. Pp. xi+531. (London: Williams and Norgate, 1917.) Price 25*s.* net.

THE author of this important work is a well-known authority on ocean currents and the geographical distribution of plants. His earlier writings on the geology and natural history of the Solomon Islands and the Cocos Keeling Islands, and his more recent work on "Plant Dispersal," contain the results of many years' patient and exhaustive investigations in the Pacific region. In the present volume he deals in an equally thorough and careful manner with the numerous problems connected with plant distribution in the Atlantic region and embodies results of great scientific interest.

The dispersal of plants by ocean currents is by no means a new subject of inquiry. Hemsley ("*Challenger* Report: Botany," vol. i.) gives an interesting summary of the literature to 1885. The present author acknowledges that the reopening of the subject by Hemsley was the means of stimulating the activities of himself and later investigators. Clusius first figured some of the West Indian drift seeds and fruits in 1605, though at the time he was ignorant of their origin. Hans Sloane in 1695–97 gave an account of four drift seeds cast ashore in the Orkney Isles. Three of these he recognised as having been seen by him in Jamaica. After the lapse of two centuries the mystery in regard to the origin of the fourth drift fruit (*Sacoglottis amazonica*) was only cleared up about twenty years ago (see NATURE, November 21, 1895). The numerous writers who have dealt with drift fruits on European shores since Sloane are fully enumerated in the third, possibly the most interesting, chapter in the book. The tracks of drift seeds and fruits and the "fan-shaped" distribution of bottle drift are admirably illustrated by a chart of ocean currents (p. 46). The fact is established that the drift brought by the north and main equatorial currents and mingled in the Caribbean Sea is captured by what ultimately becomes the Gulf Stream and conveyed to the western shores of Europe. Careful observation has shown that at least one-third of the drift seeds and fruits floating in the neighbourhood of the Turks Islands, in the Caribbean Sea, have been found on the coasts of Europe. Incidental mention is made of the transport of logs of mahogany and even of live turtles to European shores.

In the fourth chapter the similarity between the West Indian and West African littoral floras is discussed. This may be accounted for by the fact that of fifty-three plants occurring in both worlds 62 per cent. respond to the current test for transport by the main equatorial current.

A detailed account of the large foreign drift seeds and fruits, first of the Turks Islands and secondly of other portions of the West Indies, occupies several chapters. The distribution of each is given and its relative capacity for dispersal by ocean currents.

Interesting observations are made on Rhizophora in the West Indies. In the appendix (p. 502) it is suggested that vivipary of the mangroves might be regarded as due to their endeavour to accommodate themselves to climatic conditions cooler than those that once prevailed in their present habitat.

The chapters on the general character and geological structure and the flora of the Turks Islands embody the most complete account yet published of the natural history of that interesting group, and in the detailed study of the altitudinal range of the indigenous plants of the Azores we have two scientific memoirs of great interest.

It is not possible to devote adequate attention to the chapter on Mr. Guppy's theory of differentiation based on the facts presented in this and previous publications. In regard to the general topic of the geographical distribution of plants, he fully accepts the views of Bentham, Hooker, and Asa Gray so clearly re-stated by Thiselton-Dyer in his contribution to "Darwin and Modern Science." Mr. Guppy admits that distribution becomes purely a problem of the northern hemisphere, and that this removes more difficulties in the study of distribution than any other hypothesis. It is a pleasure to add that the great value of Mr. Guppy's researches during the last thirty years has been authoritatively recognised by the recent award of the gold medal of the Linnean Society. D. M.

OBSERVATION, PHILOSOPHY, AND TEACHING.

(1) *The Combination of Observations.* By D. Brunt. Pp. x+219. (Cambridge: At the University Press, 1917.) Price 8*s.* net.

(2) *Fundamental Conceptions of Modern Mathematics. Variables and Quantities. With a Discussion of the General Conception of Functional Relation.* By R. P. Richardson and E. H. Landis. Pp. xxii+216. (Chicago and London: The Open Court Publishing Company, 1916.) Price 1.25 dollars or 5*s.* net.

(3) *Revision Papers in Arithmetic.* By W. G. Borchardt. Pp. viii+156+answers xxxii. (London: Rivingtons, 1917.) Price 2*s.*

(4) *Differential Calculus.* By Dr. H. B. Phillips. Pp. vi+162. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1916.) Price 5*s.* 6*d.* net.

(1) MR. BRUNT gives an account of the method of least squares, without entering into elaborate descriptions of instruments or experimental methods. The book is not easy reading, but this is principally because the material is chosen from a rather difficult branch of applied mathematics, and modern work is discussed very thoroughly. The proof of the law of error is based on Hagen's hypothesis regarding errors of observation, and a generalised form of it, due to Prof. Eddington, is given on p. 15. Other chapters deal with the case of one unknown, observations of different weight, observations involving several unknowns, conditioned observations, the rejection of observations, and alternatives to the normal law of errors. The three last chapters deal with correlation, harmonic analysis from the point of view of least squares, and the periodogram. This last part is of great interest in connection with the modern work of Sir Ronald Ross and Dr. Brownlee, and a recent paper by Sir Joseph Larmor on what may be called "practical harmonic analysis." There are a great number of valuable references in the book, which is much to be commended.

(2) This volume is the first part of a projected work in thirteen parts, of which a synopsis is given at the end of the book. Judging by the synopsis, the future parts may very possibly be interesting, but, on the whole, this first part cannot be said to be a useful contribution to our knowledge of the fundamental conceptions of mathematics. "It is, we believe," say the authors (p. iii), "the first attempt made on any extensive scale to examine critically the fundamental conceptions of mathematics as embodied in the current definitions." After this extraordinary statement we are not unprepared to find that the contributions of Frege, Russell, and Whitehead are judged merely from a very small part of them, and that a part which, on account of its popular character, does not make any pretensions to finality. Further, the remarks about Frege and Russell (pp. 152–53) are quite superficial and valueless, as well as scarcely true or polite. Apart from this, there are some good features in the book. Thus, the criticism of the usual mathematicians' confusion of sign with things signified, and so on (pp. 2–3, 97–110, 180), is quite good, though it is unnecessarily lengthy and rather superfluous after the weighty and witty remarks of Frege, which Messrs. Richardson and Landis do not mention. Also the remarks on Dirichlet's "definition" of a function (pp. 182–90) are correct, but much too long-winded. There are many other true things, but also many mistaken ones which do not even strike us as honest attempts to get at the truth.

(3) Mr. Borchardt's book is a very useful graduated set of one hundred papers of examples on the usual course of arithmetic from the first four rules up to logarithms and compound interest, and including the measurement of areas and volumes. It is always interesting for a student to come across problems which bear some relation to practical life—housekeeping, the profits or otherwise arising from publishing books, the value of the time of a man of business who finds it pays him to take taxicabs. A suggestion that may be offered is that there might be some problems on the calculation of the amount of income-tax reclaimable on a dividend when the dividend is paid "free of tax." This problem is of great practical importance nowadays. Though the book was published quite recently, we have, so far as we can see, problems about income-tax at pre-war figures (*cf.* pp. 126, 150), but possibly a sign of the times is the problem (p. 154) on British and German rifles.

(4) Dr. Phillips has the very laudable purpose of making of the differential calculus "only a brief text suitable for a term's work," so as to leave "for the integral calculus, which in many respects is far more important, a greater proportion of time than is ordinarily devoted to it." We should have expected, then, a suggestive and "intuitional" introduction to the calculus. We find, however, a treatment rather late in the course of rates of change, velocity, and acceleration in straight and curved paths, which seem by far the most stimulating subjects to anyone approaching the calculus for the first time. It is not strictness of logic that banishes what we would call suggestiveness and pedants would call "rough-and-ready methods." For example, in the treatment of Rolle's theorem (p. 94) we have two pictures pretending to show what may happen if the first derivative of $f(x)$ is discontinuous. In both pictures the points in question are points for which this derivative does not *exist*. Other defects in logic are the way in which "the limit of a function" is treated (pp. 5–6): it should, we think, be pointed out that the value of a function at a definite point need not necessarily be the limit of neighbouring function-values at this point. Also the difficulty about higher differentials when a variable is changed is not satisfactorily put (p. 30). This book should be stringently revised before it is put into a student's hands, and then its shortness might combine with accuracy towards making it a good text-book. ϕ

OUR BOOKSHELF.

An Introduction to the Physiology and Psychology of Sex. By Dr. S. Herbert. Pp. xii+136. (London: A. and C. Black, Ltd., 1917.) Price 3*s.* 6*d.* net.

KNOWLEDGE, it has been said, is not virtue, but it is often on the way to it; and we agree with Dr. Herbert that the time has come for franker and fuller sex-instruction. In regard to sex, it cannot be said that ignorance is bliss; it often leads quite gratuitously to vice and to discoloured views of one of the great facts of life. As a medical man, Dr. Herbert is able to deal with difficult subjects in a very matter-of-fact way, and

while his book will shock a few righteous who need no repentance, and afford erotic stimulus to a few abnormal people to whom even the lilies of the field are "suggestive," it will, we think, be welcomed by teachers, by parents, and by the quite naturally curious adolescents who find in all our highly evolved educational system nothing corresponding with the ancient initiation into the mysteries of sex, and very little corresponding with the ancient disciplines correlated with these.

Dr. Herbert's account of ovum-maturation is no longer quite correct; his reference to Loeb's method of artificial parthenogenesis is not up to date; to call the female organism or sex-cell anabolic and the male katabolic is a false simplicity, for it is a question of ratio, as when Riddle says of pigeons that the ova which show a relatively greater storing capacity and relatively lower intensity of metabolism develop into female organisms. But these are minor points; the bulk of the book is thoroughly competent and sound, and this has been wisely restrained. Its particular excellences are in calling a spade a spade, in considering sex in mankind as the outcome of a long evolution, and in insisting on treating the problems not merely physiologically, but also as problems of psycho-biology.

Insetti delle Case e dell' Uomo e Malattie che diffondono. By Prof. Antonio Berlese. Pp. xii + 293. (Milano: Ulrico Hoepli, 1917.) Price 4.50 lire.

PROF. BERLESE'S interesting manual deals with the insects and arachnids found in Europe attacking man or damaging his food and belongings. After considering those—lice, bugs, fleas, mosquitoes, Phlebotomus, Stomoxys, and ticks—which suck the blood of man, he proceeds in the two following chapters to give an account of house-flies, blowflies, etc., and of such household pests as cockroaches, psocids, Lepisma, moths, and mites. Under most of the species there is a short description of the adult and of the life-history and habits, and suggestions for the application of deterrents and destructive agents. In several cases, *e.g.* the plague flea, the characters are too briefly given to be of much service.

The fullest accounts are those of mosquitoes and house-flies. The author describes his successful attacks on house-flies by means of a solution of sodium arsenite (2 per cent.) and molasses (10 per cent.) in water, and recommends, as the result of his experience, that this solution should be sprayed, every eight or ten days during the fly season, on plants near houses and on manure-heaps, and that bunches of straw or twigs should be dipped in the solution and hung up outside houses near the doors and windows.

A short final chapter is devoted to spiders, scorpions, pseudoscorpions, and acari, which attack some of the pests before-mentioned.

There are a hundred figures in the text. The legend of Fig. 24 is misleading; the figure represents the head of a larval Simulium, not, as stated, the head of a larval mosquito.

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.*]

On an Appearance of Colour Spectra to the Aged.

DURING the latter months of my eighty-ninth year my attention became directed to a circular colour spectrum which appeared to surround any bright light to which my eyes were directed. The condition was new to me. I had never read of its occurrence, and had never heard it complained of by a patient; but on making inquiry of two distinguished ophthalmologists of large experience I found that they had been consulted in similar cases, one of them only by octogenarians, while both mentioned examples in which the appearance had excited grave apprehension and distress. But nothing, so far as I can ascertain, has appeared in print upon the subject; and I am inclined to attribute my own lack of experience with regard to it to the fact that I retired from practice fifteen years ago, and that domestic lighting by electricity, which supplies conditions very favourable to the production of the appearance in question, has in the meantime become increasingly prevalent. I will endeavour to describe what I see.

If I look steadily at an ordinary electric filament light, about 10 ft. distant from my eyes, it appears to be surrounded by a vivid colour circle about 2 ft. in diameter, with the red band external, the blue internal, the yellow intermediate. The band appears to be about 6 in. in width, so as to be quite clear of the light itself, from which its inner margin appears to be about 6 in. distant. If I light a wax match and hold it in my hand, the colour circle around the flame appears to be about as large as a florin, while that around a full moon is very large and of very brilliant colours. The appearance is most striking when the light is near enough to be vivid, and yet distant enough to fall upon the eye in a slightly divergent pencil, a result well obtained by seeing in a mirror, at 10 ft. from my eyes, the reflection of an electric lamp 10 ft. from the mirror. This arrangement furnishes a circle about 3 ft. in diameter, both larger and better coloured than if I look directly at the lamp itself.

I do not think that the optical condition of my own eyes has any bearing upon the matter, as the presence or absence of spectacles makes no appreciable difference of luminosity or of colour; but the facts are that my right eye has a total H. of 2 D., with 1 D. more in a nearly horizontal diameter, and my left a total H. of 2·50 D., with 1·50 more in a similar diameter. For the last forty years I have constantly worn fully correcting spectacles, with an increase in the lower halves of the lenses for presbyopia, as it gradually became established, and my vision is, and always has been, perfect. I watch with pleasure the evolutions of distant and lofty aeroplanes, and I read "brilliant" type with facility.

If a strong light is brought sufficiently near my eyes to produce active contraction of the pupils the colour circle does not appear, but it springs into existence as the light is moved a few feet away and the pupils are suffered to expand. In like manner, the colour circle is obliterated when I look at the moderately distant light through a pinhole opening in a card or thin metal disc. The facts appear to be that when the eye receives only a small pencil of nearly parallel rays these are sufficiently refracted in the ocular media to be united in a focus upon the yellow spot. When it receives a larger pencil, the outer portions of which will be

more or less divergent, these portions are not sufficiently refracted to unite upon the centre, but reach the surrounding parts of the retina in the order of their refrangibility, red external, blue internal, yellow intermediate.

The cause of the colour phenomena, therefore, is diminished refracting power of some of the ocular media, and in this relation it is natural to think first of the crystalline lens, on account both of the complexity of its structure and of the well-known fact that it is liable not only to lose its transparency and elasticity in old age, but also to acquire a yellowish or brownish tint. It has been assumed, but, so far as I know, without evidence, that such colour changes are of almost normal occurrence in old age; and, some eighty years ago, an ingenious quack traded upon the suggestion that they were not only normal, but also useful, and placed upon the market, at a high price, spectacle lenses professedly made of clear amber and supposed to be highly advantageous to old people. More recently Dr. Liebreich amused the Royal Institution by a lecture in which he maintained that the peculiarities of Turner's later colouring were due to the gradually deepening yellow of his crystalline lenses. I have, of course, removed many yellow or brown lenses in cases of senile cataract; but I know of no evidence that the healthy lens of an accurately seeing eye changes its colour with age, and I believe that my own perception of all shades of colour remains entirely accurate, and affords satisfactory evidence of complete lenticular colourlessness and transparency.

The vitreous body does not, I think, either display any change of colour as an incident of advancing life, or take any active part in refraction, and my observations lead me, at least in my own case, to dismiss the corneæ from consideration. My spectrum rings are too constant, and too uniform in size, constitution, and colour, to be due to a structure liable to be affected by atmospheric, secretory, or compressive changes. I have kept my eyes open as long as possible, have compressed them with and through my eyelids, have rubbed the eyelids themselves, but, whatever I do, the colour rings remain unaltered. In a word, I have fallen back upon the lenses themselves as the immediate causes of the phenomena, and the question that next arises is whether these phenomena justify any apprehension of diminution or loss of lenticular transparency—in other words, of cataract. I think not. I have carefully examined my own eyes by looking at various sources of light, and at white clouds, through minute slits or minute circular openings in metal discs, and I do not discover any traces of striæ of opacity. The usual shadows are cast upon the retina by minute cells or particles in the ocular media—the shadows so minutely described by the late Dr. Jago in his book on "Entoptics"—but beyond these there is nothing.

I have come to regard the colour rings mainly as an accidental result of unimportant lenticular conditions, the effects of which are intensified by the use of electric light, and which may be dismissed from consideration so far as the quality or the maintenance of vision is concerned. They appear only when the gaze is directed towards the luminosity furnishing them; and they may, I think, be wholly disregarded. I shall be happy if my experience can afford relief from anxiety to any contemporary or other person to whom such rings may have caused uneasiness. R. BRUDENELL CARTER.

An Optical Phenomenon.

THE phenomenon described by Capt. C. J. P. Cave (NATURE, October 18, p. 126) is one of the many instances which support Hering's "Theory of the Processes in Living Substance." According to this theory every kind of living substance is subject to two reciprocal forms of change, the one constructive or "assimilative," the other destructive or "dissimilative." (These terms are nearly synonymous with Gaskell's more characteristic, though not quite classical terms, "anabolic" and "katabolic.") Every effective stimulus causes one or other of these changes, and at any given instant the living substance is in a state of unstable balance between the two, like a flying animal or machine between the force of gravity and the lifting force. *On the cessation or diminution of any stimulus, the living substance tends to return towards the state of balance from which that stimulus changed it.*

The theory applies especially to the very unstable substances of muscle, nerve, and sense-organ. Now, if an effective stimulus be removed from a sense-organ, the return of the sensitive substance towards the former state of balance, being a reciprocal change, produces a reciprocal sensation if such be possible, as when the removal of a hot body from the skin causes a sensation of cold, or the removal of a coloured object from the field of vision causes an after-image of the complementary colour. So the cessation of the stimulus of a moving image on the field of vision causes reciprocal changes (of complex character, no doubt) in the nerve-tissues concerned, which are interpreted at headquarters as reciprocal motion.

An English translation (by Miss F. A. Welby) of Hering's paper describing this most interesting and important theory may be found in *Brain*, 1897, p. 232.

F. J. ALLEN.

Cambridge, October 20.

Native Grasses of Australia.

I REGRET that in my "Age of Mammals," published in 1910, the statement is erroneously made that native grasses are absent from Australia. I am unable to find my authority for this statement, and I regret that it has been quoted in a recent text-book of geology by my friend, Prof. H. F. Cleland.

Prof. E. W. Berry, botanist at Johns Hopkins University, informs me as follows:—"There are certainly plenty of native grasses in Australia; in fact, there is quite a large number of genera confined to that country or to Australia and New Zealand, which is unusual for this group, since grasses, as shown by their present distribution, are an old stock, and enjoyed a nearly world-wide radiation probably as early as the Upper Cretaceous. Possibly the multiplication of turf-forming species was not accomplished until the progressive desiccation of the climate in certain areas at a later time, and I think that this distinction has been more or less overlooked. Some of the genera of grasses confined to Australia are:—Neurachne, Plagiosetum, Xerochloa, Potamophila, Microlæna, Tetrarrhena, Amphipogon, Echinopogon, Dichelachne, Diplopogon, Pentapogon, etc."

HENRY FAIRFIELD OSBORN.

The American Museum of Natural History,
New York, September 27.

Vegetable Pathology and the Vicious Circle.

IN animal pathology disease is frequently complicated by reactions which aggravate the primary morbid process, and so establish what is known as a "vicious circle." This process *vires acquirit eundo*, and may lead to the perpetuation of disease, to the destruction of an organ, or even to the termination of life. I should be glad to know whether any examples of such "vicious circles" are met with in vegetable pathology.

JAMIESON B. HURRY.

Westfield, Reading, October 26.

COAL-GAS FOR MOTOR TRACTION.

ONE of the results of the scarcity of petrol has been that inquiry has been stimulated into other possible fuels for power purposes on motor vehicles. Benzol, being a home-produced fuel, would have been an admirable alternative, but the entire output is already required for other more urgent purposes. Alcohol, too, could have been used, had it been available, but too little is produced in this country to meet the demand, even if other difficulties had not stood in the way. The only available alternatives are paraffin and illuminating gas. Paraffin can be used quite well on slow-moving vehicles, provided that the load is reasonably steady, and that a small quantity of petrol is available for starting the engine with reasonable dispatch; but this, again, is not home-produced.

The problem is essentially a war one, and it arises from the present limitation of ocean transport. The alternative fuel must, therefore, be one which not only can be, but actually is now being, produced in these islands. Coal or its derivatives is clearly indicated. Benzol is not available for the reason already given; coal could be used in some form of "suction producer," thus affording a supply of "suction gas"; but a satisfactory producer capable of attachment to a car has yet to be developed. Coke has been satisfactorily employed on heavy vehicles, but the process, being one of external combustion, is not adaptable to the great majority of vehicles. Hence, by a process of exhaustion, illuminating gas is arrived at as the only possible present alternative. It has, however, to be remembered that any such alternative fuel must be used in a way that does not require additional equipment making any substantial demand on raw materials. For this reason it is scarcely worth while to adopt any plan which requires the gas to be stored at pressure, since this would need storage cylinders of steel. The scheme must be one for carrying the gas at atmospheric pressure, or at best at pressures but little higher.

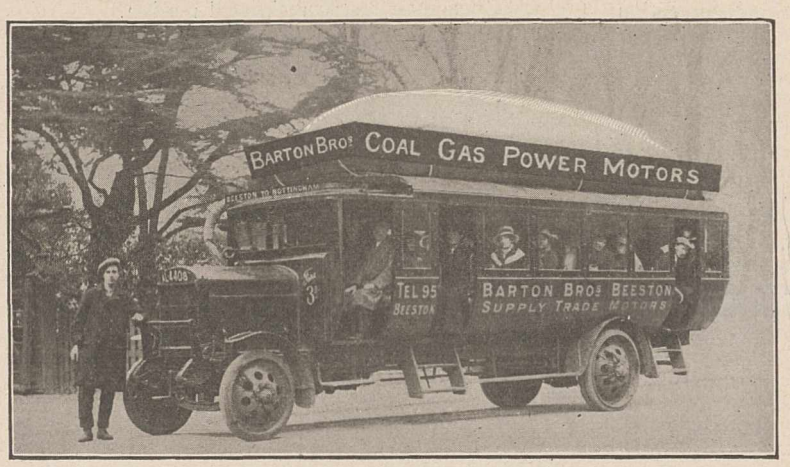

FIG. 1.—A petrol vehicle adapted for coal-gas propulsion.

Such a scheme is practicable, and has already been applied to some hundreds of vehicles. The main drawback is the bulk of the storage bags. A gallon of petrol has a net calorific value of 79,000 pound-calories, and the mean calorific value per cubic foot of petrol vapour with enough air for complete combustion is 56 pound-calories. Coal-gas has a calorific value of about 350 per cubic foot, and the mean calorific value per cubic foot of gas and air for complete combustion is 58. It will be seen from these figures that an engine of given dimensions should yield the same power on either fuel, assuming the thermal efficiencies to be the same (as they probably would be); and that 1000 cub. ft. of coal-gas would contain the same calorific value as about 4½ gallons of petrol. If, therefore, the gas costs, say, 3*s*. per 1000 cub. ft., the equivalent cost of petrol would be 8*d*. per gallon. This serves to show that a very large financial economy arises from the substitution.

The remaining consideration is the bulk of the storage chamber. Now, 1000 cub. ft. are seen to be equivalent to 4½ gallons of petrol, and although the road tests so far made give a rather larger gas consumption, there is no reason why an equivalence to 4 gallons of petrol should not be attained. On this basis a car running twelve miles to the gallon of petrol would run forty-eight miles to 1000 cub. ft. of gas. A Ford car can carry about 250 cub. ft. of gas on the roof, and as this is equal to exactly 1 gallon of petrol, the distance run between fillings would be about twenty miles. If the gas could be contained in strong bags capable of withstanding 15 lb. per square inch (gauge pressure), this distance would be doubled.

The method is seen to be useful only for running short distances out and home, or for use on roadways having supply stations about every ten miles. Repairs to the engine would be minimised rather than increased by the use of gas instead of petrol; the sparking plugs would need less attention, and the cylinders would not require to be cleaned out so frequently. Moreover, the change over from the one fuel to the other is of the simplest; a pipe is taken from the holder to a tap near the driver, and from that point direct to the engine side of the existing carburettor.

As is well known, it is now customary at some engineering works for automobile and aircraft engines to be "run in" with coal-gas as fuel; moreover, it is within the writer's recollection that on the breakdown of a power station in the very early days of petrol-engine construction the whole machinery of a workshop was run by a petrol engine fed from the gas mains. This instance afforded an insight into not only the adaptability of the engine, but also, on comparing the size

of the shop engine and its temporary substitute, the intense concentration of considerable power into very small space which the introduction of this engine brought about.

Although in a recent report by the British Commercial Gas Association there is given information as to the weight of steel cylinders for containing gas at pressures at 20, 25, and 120 atmospheres, there is little reason to expect supplies of these containers to be available in any quantity likely to affect the problem; even if they were, these figures show that the storage capacity for the equivalent of 4 gallons of petrol would weigh between 1000 lb. and 2000 lb. (depending on the pressure). So that on dead weight alone they would be at a great disadvantage compared with the atmospheric pressure, or "Beeston," system.

The illustration shows the vehicle which is stated to have been the first to be run on this system. The movement has since spread very rapidly, and reference to the technical Press shows more than a dozen firms making the fabric containers and above a hundred firms offering to fit them. H. E. WIMPERIS.

A NATIONAL FOOD POLICY.[1]

THE greatest war of all time is slowly but surely having a bound set to its ravages by the limitations of the productive effort of the world's agriculture. The steady drain of man-power, increasing difficulties of transport, and unfavourable climatic conditions have all combined to curtail the world's food supplies, whilst in many countries the spectre of famine begins to loom ominously in the distance. Few nations have fared better in this respect than ours, but our difficulties are steadily increasing, and there is widespread anxiety as to the exact position at the moment and our prospects for the near future. What is our normal margin of safety? How do we stand to-day? How can we best avoid a worse condition? Such are the questions to which all would have an answer, though few realise how difficult it must be to provide. It demands the combined skill of the statistician, the physiologist, and the agricultural expert, and the fortunate combination of these qualities in his person thus confers upon the estimates and conclusions of Prof. Wood a title to consideration which probably none other could claim.

The report of the Food (War) Committee of the Royal Society (Command Paper, Cd. 8421) has previously indicated that our pre-war average food consumption, as measured by its work-producing power, was about 15 per cent. above the level commonly accepted by physiologists as adequate for the maintenance of complete efficiency. In view of the increased proportion of the population now engaged in strenuous work, this margin would doubtless be no more than 5 to 10 per cent. to-day, even were supplies of food no less. The report further showed the predominating position of cereals and meat in the national dietary. Cereals alone contribute more than one-third of the work-producing power of the diet of the average "man," whilst in the diet of the manual labourer the proportion will often be nearer two-thirds. Bread and meat together account for more than one-half of the work-producing power of the nation as a whole.

If our margin of possibility in food economy is but this 5 to 10 per cent., it is obvious that our war food policy must embrace more than an anti-waste campaign, urgently desirable though that may be. The main problem is to secure the bread supply. Unfortunately, the two most obvious solutions, increased importation and greater home production of wheat, are not easy of attainment and become progressively more difficult as the war continues. It does not seem likely that the utmost effort in these directions will produce any very considerable immediate result. Prof. Wood sees a more practicable solution in the diversion of large quantities of bread-corn and other food-stuffs from animals and industry to human consumption. Of our pre-war annual supply of seventeen million tons of grain of all kinds, little more than five millions served directly for human food, whilst animals consumed above nine millions, the rest going for seed, for brewing, distilling, and other industries. Basing his argument upon the fundamental wastefulness in times of scarcity of the conversion of bread-corn into meat, as illustrated by the fact that the most efficient of meat-producing animals, the pig, produces no more than 1 lb. of dry human food for 12 lb. of dry grain consumed, and after reviewing carefully the significance of each of the cereals for animal feeding, Prof. Wood concludes that fully three and a half million tons of cereals might be transferred from animal fodder to human food, with a resultant net gain of two and three-quarter million tons of dry human food, and a reduction in the necessary import of grain for the year 1917–18 of three million tons below the pre-war figure.

After a detailed estimate of the fodder of all kinds likely to be available for live stock, Prof. Wood concludes that, broadly speaking, despite the diversion of fodder suggested, it will be possible to maintain our live stock, but it will not be possible to produce so large a total output of growth, meat, milk, and work. Full provision for work and milk must, however, be regarded as indispensable, so that the brunt of the shortage must be borne by the meat-producing stock. Pigs and poultry are the most economical converters of fodder into animal food, but, unfortunately, their diet consists largely of grain or grain products which can no longer be spared. Sheep are fairly economical food-producers, consume mainly grass, hay, and roots, and produce wool as well as food, so that they may certainly be encouraged. Beef production, however, as normally carried on, is a very wasteful process, owing partly to the slowness with which ordinary cattle mature, and partly to the extreme to which the fattening process is commonly carried. By extending the use

[1] "The National Food Supply in Peace and War." By Prof. T. B. Wood. Pp. 43. (Cambridge University Press.) Price 6*d.* net.

of early maturing breeds and killing off at an earlier stage of fattening than has been customary, the result will be a great economy in concentrated feeding-stuffs, and such a reduction of the head of cattle can be effected as will equalise the demand for feeding-stuffs and the supply. When the total reduction in live stock becomes such that the normal meat supply can no longer be maintained, recourse must be had to increased importation. Should this step prove necessary, it will obviously save tonnage to import meat rather than fodder.

Agriculturists will find many points for criticism in the details of Prof. Wood's estimates, which are admittedly and of necessity only rough approximations in many particulars, but such criticism can scarcely shake the soundness of his general conclusions.

Too much importance cannot be attached to Prof. Wood's appeal for a careful examination of the results of the methods which have been used in Germany for carrying out a policy framed on similar lines, so that we may avoid the mistakes which have been in a great measure the cause of the food troubles of Germany. It is suggested that the essential features of a successful policy must comprise, first, the prohibition of the use of sound potatoes and cereals for any purpose other than human food, with certain limited exceptions; secondly, the setting up of maximum prices, rather than fixed prices, for all agricultural commodities, such prices to be fixed in due relation to one another to ensure maximum production of indispensable products; and lastly, the rigid enforcement of such regulations by the infliction of penalties which none could afford to risk. Prof. Wood is to be congratulated on the clearest exposition of the food situation that has yet been submitted to the lay public, and the widest possible circulation of his views is eminently to be desired.

C. C.

UNIVERSITY REPRESENTATION IN PARLIAMENT.

THE provisions of the Franchise Bill as regards the representation of Universities are based on the recommendations of the Speaker's Conference on Electoral Reform, issued early in the present year, under which Oxford and Cambridge retain two members each, London is grouped with Durham, Manchester, Birmingham, Liverpool, Leeds, Sheffield, Bristol, and Wales to form a constituency returning three members, and the Scottish Universities are to form a single constituency returning three members. The degree is to be the basis for electoral qualification. In view of the attacks to which the University franchise has been subject in recent years, this full recognition of the principle of University representation will be gratifying to those who believe that it constitutes a valuable element in our electoral system. As Mr. Balfour said in the House of Commons in July, 1913, the representation of Universities is an honour paid by the country to the cause of higher education, which gives the power of getting into the House of Commons men of science, men of scholarship, men of special and peculiar gifts quite alien from the ordinary working politician. It is, both in theory and practice, a form of proportional representation, enabling men and women of special training and experience to form themselves into constituencies and to return to Parliament representatives qualified to promote higher education and the advancement of science and learning, aspects of our public life which are least likely to secure representation through the ordinary channels.

The recommendations of the Speaker's Conference, while extending the University franchise to the newer Universities, articulate well with the present system of University representation, save in one particular, viz. the proposal to deprive the University of London of the separate representation which it has enjoyed since 1867. NATURE is not concerned with party politics, but there can be no doubt that the reason for this proposal —though no explanation is offered in the report of the Conference—was to form a large University constituency (by grouping London with the newer Universities), which might confidently be expected to return one, or possibly two Liberal members. In the earlier years of its Parliamentary representation London returned three Liberal members —Robert Lowe, Sir John Lubbock, and Sir Michael Foster. At the present time, however, all the University members in Parliament are Conservative or Liberal Unionist, a state of things which is probably responsible for the proposed adjustment. It is most unfortunate, however, that for party reasons the University of London should be victimised by being deprived of its right of separate representation, and this at a time when thousands of its graduates on active service are unable to make their influence felt on the question. If the principle of grouping is sound, it should have been applied to Oxford and Cambridge, which not only retain separate representation, but are also to return two members each.

On the basis of the number of their graduates, neither Oxford nor Cambridge has a stronger claim for two members than London. To secure the representation of the smaller Universities some method of grouping is inevitable; but the result of joining London, with its roll of graduates many times longer than that of any of the other Universities of the group, will be to form an unwieldy and heterogeneous constituency, dominated by the London vote.

The *Times Educational Supplement* has suggested in a leading article that, "had the history of the University [of London] been less chequered, it may be that it would have retained separate representation." Those who know anything about the University of London will be disposed to think, on the contrary, that the University would be held in higher respect if its history had been *more* chequered, if it could show more of the scars of battle against ignorance and obscurantism. However that may be, the English system is to build on tradition, and to preserve principles and institutions which, as

colleges + universities — England /

Mr. Balfour has said, have "slowly grown up under the moulding influence of circumstances, acting from generation to generation"; and the surest way of disheartening a University, and "chequering" its future history, is to exacerbate the feelings of its graduates by depriving them of a cherished privilege.

The immediate question is whether some modification of the proposals of the Speaker's Conference is practicable which would not break down the compromise accepted by both political parties. Sir Philip Magnus, Sir William Collins, and Mr. M'Kinnon Wood (all of whom are London graduates), Sir James Yoxall, Mr. Fell, and Mr. George Faber, have put down an amendment to the Bill providing that the University of London shall return one member, and that the other Universities of the proposed group shall form a constituency returning three members. If accepted, this arrangement would mean an increase of one in the total number of University representatives, eleven instead of ten contemplated by the Speaker's Conference. It is expected that the amendment will be moved in the course of a few days. We hope the amendment will be adopted, thus repeating the history of fifty years ago, when a proposal to join London to another University to form a constituency was defeated against the Government, and London obtained the privilege of separate representation which it has since enjoyed. T. LL. HUMBERSTONE.

THE EDUCATION BILL.

THE history of the measures for reform and improvement in the means and methods of education introduced into the House of Commons since the passing of the Education Act of 1902, which did so much for advanced education and to increase the public responsibility for all forms of education, has been one long tale of disaster; and Minister after Minister has succumbed to the opposition his measures have provoked.

It would seem, judging by the announcement made by Mr. Bonar Law in the House of Commons on October 19, that the same doleful fate awaits the Bill brought in by Mr. Fisher on August 13 last with such favourable omens. The personality of Mr. Fisher, his known deep interest in the subject, the sound knowledge and experience he has brought to bear upon it, together with the lucid and interesting exposition of the details of his measure, have won for it wide and favourable recognition and a strong body of support, due no doubt to those clauses of the Bill which have for their object the welfare of the child, whether in the condition of infancy or throughout the years of adolescence, so as to secure for the child the fullest opportunity of effective moral, intellectual, and physical training.

The advent and circumstances of the war have awakened amongst all classes of the people, employers and employed alike, a deeper sense of the value of education and of the responsibility of the nation for the adequate preparation of the children for the duties that await them. It has at last been brought home to those engaged in industry and commerce that Germany's position as a formidable rival is wholly due to the splendid facilities she has provided for the due training of her people, and that successful competition with her can be assured only by the adoption of a similar policy. Grave questions of reconstruction are under consideration, but they can be assured of their desired effect only in so far as they appeal to an educated people. The increasing industrial applications of scientific discovery demand a higher range of intelligence amongst all classes, and it is no less important for the well-being of the nation that the ampler leisure now urgently sought should be wisely used and enjoyed—a condition possible only where the means and opportunity of an efficient education exist. The ravages of the war, which has taken so huge a toll of educated young life, furnish another admittedly grave reason why we should at once make provision for the adequate education of all our youth.

Let it be remembered that Mr. Fisher was called from a position of high educational distinction in order that he might bring the ripe fruit of his knowledge and experience to bear upon the problem of ensuring the means of a more efficient education for the people of this country, and that it is little short of a cruel irony to refuse him the necessary time for the full consideration of his proposals. It is true that there are grave objections to some of the administrative clauses of the Bill, especially those which tend to increase the bureaucratic power of the Board of Education, but they are not of the essence of the measure, and may with advantage be taken out of the Bill. As to the threatened opposition of the textile industry, the only answer there can be is that the interests of the child are paramount. It should be possible to arrange upon an agreed measure, so far as the educational clauses are concerned, and so satisfy the ardent desire of the great majority of the people that such a measure should pass into law. There are strong reasons why further time should not be lost, since before the educational proposals embodied in the Bill can have their desired effect there is much to be done in the provision of teachers, equipment, and suitable buildings.

PROF. EDWARD HULL, F.R.S.

PROF. EDWARD HULL, who died in London on October 18, was born at Antrim, where his father was rector, on May 21, 1829, and had thus reached his eighty-ninth year. Like many of those whose work has lain in the open air, he retained considerable vigour, and he revisited at the age of eighty some of the scenes of his early observations. His father proposed for him a career in the Church of Ireland, and his early literary and biblical studies no doubt left an impression on his life. Attracted, however, by

experimental science, Hull entered Dublin University as a student of engineering, and the lectures of Thomas Oldham determined his career. Oldham recommended him to De la Beche, and he was appointed to the English Geological Survey as assistant to J. Beete Jukes.

These names serve to link Hull with the pioneers of British stratigraphy, and it was Murchison who nominated him in 1869 to succeed Jukes as director of the Geological Survey of Ireland. In his "Reminiscences of a Strenuous Life" (1910), reviewed in NATURE, vol. lxxxiii., p. 395, interesting details are given of scientific life in Dublin when he entered on his new duties. In the same year he became professor of geology in the Royal College of Science for Ireland.

The series of sheets of the one-inch geological map of Ireland, already well advanced by Jukes for the southern area, was pushed forward by Hull with such prevision that the first issue was completed by the date of his retirement in 1890. Some of the revisions made in Jukes's work may be regarded as unfortunate; but the northern sheets, with their admirable choice of colouring, remain as a monument to Hull's powers of organisation. He was probably the first to utilise the petrological microscope as an aid to research in an official survey ("Memoir to Sheet 48," Ireland, 1872), and thus laid the foundation for much memorable work.

Hull's first published paper was on the Cotswold Hills in 1855, and was succeeded by more than 150 others. Much of his time on the survey of England and of Scotland was spent on Carboniferous areas, and his book on "The Coalfields of Great Britain" reached a fifth edition in 1905. He was a member of the Royal Commissions on Coal Supplies in 1871 and 1901. As the result of a journey on behalf of the Palestine Exploration Fund, he published a narrative volume (1884) and a geological memoir on Palestine (1886). His "Physical Geology and Geography of Ireland" (1878; 2nd ed. 1891) and "The Building and Ornamental Stones of Great Britain, etc.," are well-known treatises. A good portrait of Hull occurs in the "Reminiscences" above mentioned.

NOTES.

THE late Mr. Cawthron left 250,000*l.* to the city of Nelson, New Zealand, for scientific research. The trustees are the Bishop of the diocese, the member for the district, the Mayor of Nelson, two chairmen of local bodies, and a personal friend of the deceased. The site of the proposed institute has been purchased, and the appointment of a director and staff is under consideration. The object of the institute is, primarily, scientific research work for the benefit of the province of Nelson and the Dominion of New Zealand. The province of Nelson is mostly concerned with fruit, agriculture, and minerals.

UNDER the title of "Science and Industry," the *Evening Standard* has recently published a series of five articles discussing the bearing of applied chemistry in its various branches on the welfare and safety of the nation. The national importance of chemical manufacture lies in the circumstance that so many undertakings included in this category are key industries, representing vulnerable points in the commercial armour of a nation. For instance, in a country deprived of its supply of sulphur, the manufacture of sulphuric acid would at once cease. This stoppage would react immediately on the production of alkalis, and these in turn would affect the output of soap and glycerine, which would not be obtainable. Without sulphuric acid, the manufacture of nitric acid from nitre could not be continued, and the production of explosives would be brought to a standstill. In this way whole sections of commercial activity would be completely dislocated, and the nation would be left practically defenceless. A similar line of reasoning shows that the manufacture of synthetic dyes is also a key industry. These chemical industries have all developed from researches often carried out, in the first instance, merely out of scientific curiosity. In fact, nearly all the more important and revolutionary advances in industrial chemistry have sprung from pure research, although utilitarian researches carried out on special lines have contributed minor improvements. The former type of research should be subsidised by the State, whereas the latter should be maintained by the manufacturers. Scientific men, who have shown undoubted aptitude for the all-important pure research, have often to pretend that their investigations have a quasi-industrial bent in order to justify their activities in the eyes of departmental donors. The writer of the articles in our contemporary asserts that in the difference between England and Germany as regards the development of science and industry "there is no question of superior intellect or greater technical skill or a more suitable national temperament," but he also blames the nation as a whole for the lack of progress in industry based on chemical science. Surely what is lacking in the nation is the inspiration of a lofty ideal. In actual practice honour and public esteem come to him who acquires most wealth, and the choice of a profession is regarded merely as a means to this end. As the German scientific industrialist, von Rathenau, has recently pointed out, this is not the sole end in view of the many hundreds of chemists and other investigators who discover and improve the scientific processes of manufacture which are the most valuable assets of the German chemical monopolies.

DR. OTTO KLOTZ has been appointed Chief Astronomer and Director of the Dominion Astronomical Observatory at Ottawa.

THE death is announced, on October 27, of Mr. Worthington G. Smith, of Dunstable, fellow of the Linnean and other societies, at eighty-two years of age.

WE notice with regret the announcement of the death on October 24, at fifty-four years of age, of Mr. George T. Holloway, vice-president of the Institution of Mining and Metallurgy, and widely known as a consultant metallurgist and assayer.

A COURSE of twelve Swiney lectures on geology will be delivered by Dr. J. S. Flett at the Royal Society of Arts on Tuesdays, Thursdays, and Fridays, beginning on Tuesday, November 13. The subject will be "The Mineral Resources of the British Empire." No charge for admission will be made.

WE notice with much regret the announcement that Baron Dairoku Kikuchi died suddenly at his villa at Chigasaki, Japan, on August 19. Baron Kikuchi was formerly professor of mathematics in the Imperial University at Tokyo, and afterwards its president. He was the author of many contributions to scientific

journals and several books, including a notable volume on "Japanese Education," consisting of a series of lectures delivered at the University of London in 1907.

AT the meeting of the Optical Society to be held on November 8 at the Imperial College of Science and Technology, South Kensington, Lt.-Col. A. C. Williams will describe certain optical stores which have been captured from the enemy. Among the instruments to be shown will be a one-man range-finder, director for field artillery, director for heavy artillery, dial sights, clinometer, sight clinometer, gun-sights or sighting arcs, stereoscopic telescopes, periscopes, Galilean binocular, and sighting telescopes for machine-guns.

PROF. E. S. REYNOLDS will deliver the Bradshaw lecture of the Royal College of Physicians of London on Thursday, November 8. The subject will be "The Causes of Disease." On the same day the Bradshaw lecture of the Royal College of Surgeons of England will be given by Sir John Bland-Sutton, who will take as his subject "Misplaced and Missing Organs." The FitzPatrick lectures of the Royal College of Physicians of London will be delivered on November 13–15 by Dr. A. Chaplin. The subject chosen is "Medicine in England during the Reign of George III."

DR. T. BRAILSFORD ROBERTSON, professor of biochemistry and pharmacology in the University of California, has executed a deed giving to the University of California all his patent rights in the growth-controlling substance, "Tethelin," isolated by him from the anterior lobe of the pituitary body, and employed to accelerate repair in slowly healing wounds. All profits from this discovery are to constitute an endowment, the income to be applied to medical research. It is felt by the University of California that one especial value of the establishment of this foundation is the example which it sets for a procedure by which other investigators may dedicate the results of their scientific discoveries to the benefit of mankind as a whole.

WE regret to announce the death of Sir W. J. Herschel, Bart., grandson of the famous discoverer of Uranus, and son of the no less distinguished Sir John Herschel. In 1823 Purkinje, the eminent physiologist of Breslau, had directed attention to the subject of finger impressions. There has been some controversy on the part taken by Sir William Herschel in utilising this discovery for the practical purpose of the identification of criminals, but the history of the subject is given by him in "The Origin of Finger-Printing," published last year (see NATURE, vol. xcviii., pp. 268, 388). In 1859 Sir William directed the attention of the Indian Government to the importance of the question. His advice was neglected, and it was not until 1897, nearly twenty years after he had left India, that the matter was investigated by a committee of experts, and Mr. (now Sir Edward) Henry, then Inspector of Police in Bengal, was associated with the introduction of the system into that province. Under him, as Commissioner of the London Police, the invention has been fully and scientifically applied to the investigation of crime. It is remarkable that Herschel was overlooked in the distribution of Indian honours. On his retirement from India he settled at Oxford, where he took a useful part in local affairs.

A CONFERENCE of representatives of provincial museums was held in the Town Hall, Sheffield, on October 16 and 17. Alderman W. H. Brittain, chairman of the Library and Museums Committee, presided. The first day was devoted to papers and discussions on the relation of museums to all grades of schools and education generally, an account being given of the work done in that direction by various museums, with practical suggestions as to its extension and more direct co-ordination. Mr. H. A. L. Fisher, who was unable to be present, expressed his interest in the conference, and arranged for four of the chief divisional inspectors for the Board of Education to attend, representing art, technical, elementary, and secondary schools. The exchange of views which took place should help towards a more vital connection between the museums and the schools. The second day was devoted to war museums, the proceedings being opened with a letter from Sir Whitworth Wallis on the subject, his absence being due to indisposition. Mr. Herbert Bolton read a paper outlining the purposes of war museums, and Mr. R. F. Martin, of the Victoria and Albert Museum, followed with a practicable scheme for their establishment in country villages. A full report was taken of the proceedings, and a committee, with Mr. E. Howarth as editor, was appointed to arrange for its publication *in extenso*.

ONE of the consequences of the increasing shortage of shipping, caused not only by actual losses due to submarine attacks, but also by still expanding war requirements which monopolise more and more of the depleted fleets of merchant shipping, has been to stimulate the production of pig-iron in this country from ore won in its own mines. The product of the smelting of this ore is known as basic pig-iron, because it requires to be treated by the basic, as contrasted with the acid, process for its conversion to steel. The Ministry of Munitions has been charged by the Government with the duty of increasing the supply of this iron, and has called upon various firms to co-operate. On one hand increased supplies of ore have been mined. On the other existing furnaces have been adapted to the new requirements and new blast-furnaces have been built. One of these was "blown in" on October 20 at the Stanton Ironworks, near Ilkeston, Derbyshire, and Mr. G. H. Roberts, M.P., Minister of Labour, was present at the ceremony. Before the war the nine furnaces of this company were engaged in making foundry pig-iron. To-day two of these have been diverted from this purpose and are making basic pig for steel sheets. To these must be added the new furnace which has been erected by the company. In this way the necessity of importing ores from abroad is being reduced in a highly satisfactory manner.

ANOTHER, the eighth, set of public lectures during the war has been arranged by the Chadwick trustees. The course began on October 29 at the Hampstead Central Library, when Dr. Charles Porter lectured on the prevention of the common infectious ailments. The programme also includes the following forthcoming lectures:—During the current quarter, at Gretna, Prof. H. J. Spooner on fatigue and the worker—causes, effects, and reliefs, and Sir John Stirling Maxwell, Bart., on forestry as an after-the-war employment. During November, Dr. Woods Hutchinson will lecture at the Robert Barnes Hall, Royal Society of Medicine, Cavendish Square, W.1, on the part of hygiene in the European war. At Leicester, in November and December, Mr. H. T. Davidge will lecture on electricity and national welfare. In February next Prof. Spooner will discourse at Huddersfield on the powers of man as a worker. On October 26 Prof. D. Noel Paton lectured at Gretna on food in war-time. He pointed out that a man doing an average day's work requires about 3000 Calories supplied in his food. The food as purchased must contain about 15 per cent. more than this because there is loss in distribution and cooking and in the process of digestion. Women and children at different ages require proportionately less energy and therefore less food.

The requirements of all groups constituting the population may be calculated, and it is found that the minimum requirement of the nation is something like 43¾ million million energy units per year. To find how far the food supply in pre-war time was adequate to yield this, statistics have been collected and the energy yielded by the food has been determined, and has been found sufficient to yield 51 million million energy units—about 15 per cent. above the calculated minimum requirement. Of this food more than half was imported. Further particulars of Chadwick lectures may be obtained from the secretary, offices of the Chadwick Trust, 40 (6th) Queen Anne's Chambers, Westminster.

In *Man* for October Dr. W. L. Hildburgh describes an interesting example of disease transference witnessed by him at Benares. When an attack of disease is attributed to the malevolence of the spirit of a woman who has died in childbirth, known as *churel*, a little palanquin, a doll, and some other articles are placed at night at a spot where four roads meet. Dr. Hildburgh regards this device as a kind of trap to outwit the evil spirit, the idea being that anyone treading on these articles will carry the dangerous influence away with him. The cross-roads are naturally selected as the place at which such dangerous influences may be most readily dispersed.

Sir James Frazer has published, as an instalment of his forthcoming work on the folklore of the Old Testament, a paper read before the British Academy (Proceedings, vol. viii.) entitled "Jacob and the Mandrakes," in which he discusses, with an abundant quotation of examples, the belief that this plant (*Mandragora officinarum*) is regarded as a potent agent in magic, particularly as a means of promoting fertility. "Such beliefs and practices illustrate the primitive tendency to personify Nature, to view it as an assemblage of living, sensitive, and passionate beings rather than a system of impersonal forces. That tendency has played a great part in the evolution of religion, and even when it has been checked or suppressed by the general mass of educated society, it lingers still among the representatives of an earlier mode of thought, the peasant on one hand and the poet on the other."

The potato tuber moth (*Phthorimaea operculella*)—a well-nigh cosmopolitan pest—forms the subject of Bulletin 427 of the U.S. Dept. of Agric., written by Mr. J. E. Graf. A special feature of this paper is seen in the attention paid to parasitic Hymenoptera and other insect enemies of the caterpillars.

A new species of Lima from the English chalk is described by Mr. T. Sheppard in the *Naturalist* for October. Differing very markedly in shape from any other of the Cretaceous Limidæ, the author proposes to name his specimen *Lima* (*Plagiostoma*) *middletonensis*. It most nearly resembles *Lima hoperi*, which has a wide range in the south of England, and is found in the same quarry as that from which the new species was obtained. The distribution of *L. middletonensis* is given as the "base of the *Micrastur coranguinem* zone, Middleton-on-the-Wolds, East Riding of Yorkshire."

A paper by Mr. A. Busck in the *Journal of Agricultural Research* (vol. ix., No. 10) on the pink bollworm (*Pectinophora gossypiella*)—a well-known cotton pest with a very wide range—is noteworthy for the extreme care devoted to structural details of the insect in its various stages, which are illustrated by exceptionally good drawings. These minute details are not without economic importance, as the scavenging caterpillar of *Pyroderces rileyi*, often found in open cotton bolls, is, at times, mistaken for the true "bollworm." The imago, larva, and pupa of Pyroderces are also most carefully described and figured for purposes of comparison.

Coleopterists will be glad to know that a fine specimen of the rare Curculionid beetle, *Tapinotus sellatus*, has been found in the Norfolk fens, since it is just seventy-one years ago that the last specimen was taken. This capture, announced in the *Entomologist's Magazine* for October, was made by Mr. O. E. Jason, who, in June last, made a very thorough search for this insect in the neighbourhood of Horning. It is to be noted that it was not found in association with its reputed food-plant, *Lysimachia vulgaris*. Only two other specimens of this beetle have been taken in Great Britain, the first at Horning in 1836, the second at Whittlesea Mere in 1846.

Under the title "Some Museums of Old London" Mr. W. H. Mullens, in the *Museums Journal* for October, gives a most interesting account of William Bullock's Museum. This was removed in 1809 from Liverpool to London, where it was housed, first at No. 22 Piccadilly, and three years later at the Egyptian Hall, Piccadilly, which was pulled down a few years ago. Mr. Mullens, however, does not confine his survey entirely to the museum, but brings together some interesting details of Bullock himself, including an account of his chase of the last living specimen of the great auk, which was later killed and placed in his museum, and now rests in the British Museum. In a later contribution the author promises to give a detailed description of the museum itself, its contents, and the story of its dispersal.

Considerable interest was aroused during the summer months by somewhat sensational newspaper accounts of a plague of caterpillars of the "antler" moth (*Charaeas graminis*) in the north of England. Two short articles in the *Entomologist's Monthly Magazine* for August (vol. liii., No. 639), by Mr. G. T. Porritt and Dr. A. D. Imms, contain trustworthy information on the subject. From the latter we learn that "in point of numbers and area affected the present year has probably exceeded all previous records, at any rate so far as the United Kingdom is concerned." The larvæ swarmed in hill pastures from Cumberland to Cheshire and Derbyshire, feeding, however, only on "bent grass" (*Nardus stricta*), and not attacking either good meadow grass or corn crops.

An exceptionally interesting contribution to our knowledge of the insects of the Carboniferous period is made by Mr. Herbert Bolton in a paper (Mem. Manchester Lit. and Phil. Soc., vol. lxi., part 1) on the "Mark Stirrup" collection of fossil insects from the Coal Measures of Commentry—that famous locality in central France whence came the 1300 specimens described in Ch. Brongniart's classical "Récherches" (1894). Most of the species now brought to light by Mr. Bolton are blattoids. Of special importance are two specimens made types of new genera, one of which—Megagnatha—is referred to the Perlidæ (stone-flies), with which it agrees in nervuration, though it differs in the possession of elongate and formidable mandibles, while the other—Sycopteron—is regarded as an ally of the Panorpidæ (scorpion-flies). To have established the existence of such a comparatively specialised type among the Palæozoic fauna is a noteworthy achievement. The illustrations are admirably reproduced from enlarged photographs. Another paper on Palæozoic insects has been published by Mr. H. Bolton in the Quart. Journ. Geol. Soc. (vol. lxxii., 1916, part 1); this contribution deals with insects from the British Coal Measures. Several wings and wing frag-

ments are described, most of them being referable to the well-known generalised group of the Palæodictyoptera.

THE sixth volume of the "Icones Plantarum Formosanarum," by Bunzō Hayata, has recently been published, and, like its predecessors, is a valuable contribution to our knowledge of the flora of the island. There are 168 pages of text, containing studies of 212 species, belonging to a large number of natural families, 126 of which are new to science. One genus, Parasitipomæa, is described for the first time, and there are nine genera recorded which hitherto have been unknown in Formosa. The new genus, belonging to the Convolvulaceæ, is interesting in having flowers like those of Ipomæa, but the plant is a leafless parasite. A large number of new orchids, sedges, and grasses are among the plants described and figured. Throughout the text there are numerous excellent figures, and the volume is further enriched by twenty well-drawn plates.

THE recently received report of the Ceylon Agricultural Department for 1916 gives indication of activity and sound work under the new director, Mr. F. A. Stockdale. A welcome sign of the new administration is the issue of practical leaflets, intended for the use of planters, on plant and insect pests and other agricultural matters. Three of these have recently been published. No. 3 deals with the beautiful fluted scale which attacks Acacia trees, and in California is a serious pest on Citrus. In Australia, whence the pest seems to have come, it is held in check by parasitic flies, etc. The leaflet is issued as a warning to prevent, if possible, the spread of the insect. The second leaflet is concerned with the black-rot disease of tea, a sterile fungus of the genus Hypochnus, which attacks the leaves, and may prove to be a serious menace to the tea industry of the island unless kept under control.

AN account of observations made during the past three or four years on the cause of the common dry-rot of the potato tuber in the British Isles is communicated by Dr. G. H. Pethybridge and Mr. H. A. Lafferty to the Scientific Proceedings of the Royal Dublin Society (vol. xv. (N.S.), No. 21, June, 1917). In confirmation of previous work, it is established that the dry-rot of the potato tuber which commonly occurs in the British Isles is due to the attacks of a parasitic species of Fusarium, which is now definitely identified, however, as *F. coeruleum* (Lib.), Sacc., rather than *F. Solani,* Sacc., as was previously believed. *F. coeruleum* does not produce hadromycosis of the potato plant, nor does it kill the plant by attacking the roots. It can destroy tomato fruits, but does not attack onions, mangels, carrots, parsnips, or apples. Infection takes place through wounds, but can also be effected through the lenticels, eyes, or young sprouts of uninjured tubers. Some varieties of potatoes are more resistant to infection than others. Potatoes become more susceptible to infection as they become more mature, hence the rot is more prevalent during the later than during the earlier period of storage. No effective preventive measure or cure has yet been devised.

SOME geological problems regarding the valley of the Isonzo form the subject of a paper by Prof. Torquato Taramelli in the *Rendiconti del R. Istituto Lombardo* (vol. xlix.). Our knowledge of the geological structure of this valley was first made known by D. Stur, of whose work Taramelli gives a brief abstract. About 1870, when on the staff of the Technical Institute at Udine, Taramelli published a paper on glacial action in the valleys of the Drava, the Sava, and the Isonzo, and this work was continued in 1874, in which year Lipold published a geological map of the Isonzo valley. At Idria are mines of cinnabar, discovered in 1490. More recently a new tunnel on the line to Tolmino has been the subject of a paper by Franz Kossma. The works of Brückner and Penck on this district are discussed in considerable detail, and the paper is illustrated by a map showing the course of the principal rivers and the peri-Adriatic fracture.

THE "Report on the Building and Ornamental Stones of Canada," vol. iv. (Manitoba, Saskatchewan, and Alberta), issued by the Canadian Department of Mines, contains characteristic and excellent coloured plates showing the texture of the principal rocks described. The modes of testing are stated, among them being a corrosion test, in which cubes of stone are suspended for four weeks in a vessel containing water into which carbonic acid gas and oxygen pass. The loss or gain in weight is calculated to the square inch of exposed surface, and in no case is a gain in weight recorded. Arrangements are made for securing that the pressure in the liquid remains uniform, since this factor largely affects the solution of limestone. It is important to note colour-changes resulting from this test; thus bluish sedimentary rocks may become distinctly yellow. The porosity test is conducted by filling the pores with water under a pressure of 2000 lb. to the square inch, continued for twenty-four hours. The limestones vary in pore-space from 0·292 up to 12·72 per cent., while one of the granites, which shows considerable fracturing in the field, has a porosity as high as 0·606.

A REPORT of the Liverpool Observatory at Bidston by the director, W. E. Plummer, published by the Mersey Docks and Harbour Board, gives detailed seismological and meteorological observations for the year 1916. In the course of the year 184 earthquakes were registered, and a table is given showing the time and amplitude of each. Tables are given of the total amount of sunshine and the maximum wind velocity recorded on a Dines anemometer for each day, and there are daily results of the barometer, temperature, rain amount and duration, velocity and pressure of wind, with the points of the compass from which the wind blew. The old units of measurement are still adhered to, although in the summary of results for the year the barometric measurements and the rainfall are given in inches and millimetres, and the air temperature in Fahrenheit and Centigrade. Thermometers are exposed in Stevenson's screens, both on the north and south sides of the observatory, and the comparison is said to show that the past records, made entirely on the south side, are too high, owing to radiation from the southern front. No failure occurred throughout the year in the firing of the gun as a time-signal for the shipping in the neighbourhood.

Symons's Meteorological Magazine for October shows the weather conditions for September to have varied considerably in different parts of the British Islands. The rainfall tables afford a fairly good representation, for so early a date, of the relative dryness of September in most parts of the country, although there was an excess of rain in places. In the English midlands the rainfall was mostly slight, and at Worksop, Nottinghamshire, the total measurement was only 31 per cent. of the average. At Borrowdale, Cumberland, the rainfall was 18·04 in., which is 6·76 in. more than the average. In parts of Cumberland and Westmorland the September rains are said to be as much as 20–25 in. in places. For England and Wales the rainfall for the month is given as 88 per cent. of the average, Scotland 95 per cent., and Ireland 77 per cent. The mean temperature was above the average in most parts of the United Kingdom, and there was generally

a deficiency of sunshine. An examination of the details given in the issues for the last six months shows that for the whole summer from April to September inclusive the rainfall for England and Wales was 109 per cent. of the average, in Scotland 91 per cent., in Ireland 106 per cent., and for the British Islands as a whole 104 per cent. The wettest month was August over the entire kingdom, and the driest July in Great Britain, whilst September was the driest in Ireland. In London, according to the observations at Camden Square, the rainfall for the six months was 19·90 in., 144 per cent. of the average, and every month was wet except April.

THE September number of *Terrestrial Magnetism and Atmospheric Electricity* contains the preliminary report of the magnetic survey work of the *Carnegie* during her four months' voyage from San Francisco to Easter Island and Buenos Aires last winter. Throughout the whole region traversed the compass deviates to the east of north by amounts between 3° and 30°. The errors of the British Admiralty chart at points on the course—almost directly south—from San Francisco to Easter Island, rarely exceed half a degree, the deviations given in the chart being in excess in the northern and in defect in the southern portion. From Easter Island round Cape Horn to Buenos Aires the errors of the Admiralty chart are on the average greater, but for the region near Cape Horn itself the chart is practically correct. In general over this part of the ocean the deviations given are smaller than those found by the *Carnegie*.

IN view of the public interest in the Mesopotamian Report, an article in *Engineering* for October 19 calls for special notice. This article gives a complete account, with many illustrations from photographs, of the new hospital ships for the Mesopotamian Expedition. These ships have been designed by Sir J. H. Biles and Co., who have embodied in the plans the requirements which the experience and foresight of Brevet Lt.-Col. Marham Carter have shown to be essential. The vessels are 160 ft. in length and 30 ft. in breadth, and the draught is limited to 3 ft. 6 in. The hospital accommodation is arranged on three decks, covered by a sun deck. The flying deck, immediately beneath the sun deck, is used exclusively for convalescents, and the upper and main decks for more serious cases. The vessels are driven by oil engines, but a steam boiler is fitted and is available for heating purposes during the cold Mesopotamian winter. Ventilation and cooling arrangements of very complete character have been provided. A carbon dioxide refrigerating machine of capacity 5 cwt. of ice per day is fitted; also a soda-water machine capable of turning out three gross of soda-water, lemonade, or ginger beer per day. It is impossible in a brief note adequately to deal with the arrangements of the hospital wards, cots, operating-room, infectious cases ward, bathrooms, etc. Those interested should refer to the article in our contemporary. Lt.-Col. Carter is to be congratulated upon the completeness of the arrangements which have resulted from his courage and pertinacity.

AMONG forthcoming books of science we notice the following:—"Telegraph Practice," J. Lee; "A Text-book of Laying Off, or the Geometry of Shipbuilding," E. L. Attwood and J. C. G. Cooper (*Longmans and Co.*); "The Resistance of Air," Col. R. de Villamil; "Aluminium: Production and Use," J. T. Pattison (*E. and F. N. Spon, Ltd.*); "The Nature of Solution," Prof. H. C. Jones, with a sketch of the author's career by Prof. E. Emmet-Reid (*Constable and Co., Ltd.*); "Ship Stability and Trim," P. A. Hillhouse (*The Grieves Publishing Co.*); "Strength of Ships," J. B. Thomas (*Scott, Greenwood and Co.*).

THE Cambridge University Press has in preparation for appearance in the "Cambridge Farm Institute" Series:—"Plant Life in Farm and Garden," Prof. R. H. Biffen, and "The Feeding of Farm Animals," Prof. T. B. Wood.

OUR ASTRONOMICAL COLUMN.

THE PLANETS IN NOVEMBER.—During the present month Venus will be a conspicuous object low down in the south-western sky for a short time after sunset, Jupiter may be observed practically throughout the night, while Mars and Saturn come into view during later hours. Particulars as to their rising, southing, and setting, together with their stellar magnitudes, at the beginning and end of the month, are given in the following table:—

	Rises	Souths	Sets	Stellar mag.
Venus	Nov. 1,	2.51 P.M.	6 24 P.M.	−3·8
	,, 30,	3·15 ,,	7. 4 ,,	−4·0
Mars	Nov. 1, 0.15 A.M.	7.28 A.M.		+1·4
	,, 30, 11.45 P.M.	6.31 ,,		+1·1
Jupiter	Nov. 1, 5.56 P.M.	1.55 A.M.	9.54 A.M.	−2·3
	,, 30, 3.46 ,,	11.41 P.M.	7.36 ,,	−2·4
Saturn	Nov. 1, 10.51 P.M.	6.27 A.M.		
	,, 30, 9. 0 ,,	4·35 ,,		

Venus will be at greatest easterly elongation of 47° on November 30, when half the disc will be illuminated. Mars is near α Leonis (Regulus) on November 1, and afterwards moves eastwards towards Virgo.

Jupiter will be in opposition on November 29; on the 1st the planet will be 4½° north of Aldebaran, and will have a retrograde motion of nearly 4° during the month.

Saturn is in the eastern part of Cancer, and will be at a stationary point on November 26.

NEW ZEALAND STANDARD TIME.—The present arrangement whereby the standard civil time in New Zealand differs from Greenwich Mean Time by 11h. 30m. was adopted on the suggestion of Sir James Hector in 1868, before the general system of zone time was introduced. The council of the Wellington Philosophical Society has recently taken the matter into consideration, and has resolved to urge upon the Government the desirability of making New Zealand time exactly twelve hours in advance of Greenwich. New Zealand is so happily situated that it would be possible by this simple alteration to secure the advantages of a time system moderately in advance of solar time, and to bring the time into conformity with the international arrangement. As there is no extreme variation in the length of the day at different seasons it is proposed to put the clock forward by half an hour, once for all.

NEW STARS IN SPIRAL NEBULÆ.—Two new stars have been found in the spiral nebula N.G.C. 4321 by Dr. H. D. Curtis, of the Lick Observatory (Journ. R.A.S., Canada, vol. xi., p. 311). The first appeared at some time prior to March 17, 1901, and was then of about magnitude 13·5; it was a magnitude fainter in April, and has now completely disappeared. It was 110″ west, and 4″ north, of the nucleus. The second nova appeared at some time before March 2, 1914, and was then about magnitude 14; it was 24″ east, and 111″ south, of the nucleus. The position of the nebula for 1900 is R.A. 12h. 17·9m., declination +16° 23′.

Mr. Adams reports that Ritchey's nova in N.G.C. 6946 was rapidly growing fainter at the end of July; the colour-index shows that the star cannot be a long-period variable.

THE UTILISATION OF CONDEMNED ARMY BOOTS.

THE London Section of the Society of Chemical Industry has recently established what for lack of a better term we must call a club—that is, a society of its members and their friends, who seek to combine a chastened conviviality with an interest in technical chemistry. At a meeting of the club, held on May 21, Mr. M. C. Lamb, by permission of the Director of Army Contracts, brought to the knowledge of the members the various methods that have been suggested in order to utilise the leather in condemned Army boots, and which, in the absence of proper organisation, might lead, when we have regard to the present magnitude of our Army, to an enormous waste of material of considerable intrinsic value, even after it has served its primary purpose as footwear.

Mr. Lamb's paper appears in the issue of the Journal of the society for September 29, and as it affords a good illustration of what may be accomplished by the intelligent co-operation of experts and officials in dealing with a problem of special importance at the present time, a short summary of its contents may be of general interest. War is so terribly wasteful that any efforts to minimise its effects, even if they are only concerned with discarded boots, merit attention and appreciation.

It is not to be supposed that this particular problem has only just arisen. Even in peace-time the worn-out boots of "a contemptible little Army" had to be condemned. They were sold to contractors, who doubtless found means to turn them to more or less profitable account. But with millions of men under arms and in active service, the whole matter had to be dealt with in a very different fashion from that in pre-war periods, and the object of Mr. Lamb's communication was to show the results which have followed from attempts to discover means for the better utilisation of discarded footwear.

It will doubtless surprise many people to learn that waste boot leather has been found to be a good material for road-making, the scrap leather, preferably of soles (since a more profitable use can be found for the uppers), being mixed to the extent of from 5 to 10 per cent., depending upon the character of the road, with slag, granite, or limestone, in conjunction with asphalt and bitumen. It is claimed for this mixed material, which is known as "Broughite," from the name of the patentee, that it possesses the hardness and rigidity of the ordinary tar macadam road, with reduced attrition and dust and greater resilience. The method employed is to mix the scrap leather with the asphalt, bitumen, limestone, etc., lay the surface of the road with the composition, and give a top facing of slag, granite, or limestone. One ton of the tarred material is needed to cover six square yards with an application 4 in. thick, or some 89,000 pairs of discarded boots to each mile of a roadway eight yards wide. It seems a just and fitting retribution—a sort of poetical justice—that boots in their old age should be condemned to make good the roads they have trodden and worn down.

Experience has shown that "Broughite" is a cheap and satisfactory substitute for wood-paving; it possesses greater wearing qualities, and is equally silent; it costs much less than wood and no more than bituminous macadam. It affords a good grip for rubber tyres and an excellent foothold for horses. The Roads Board is making trials of its value, and several pieces of roadway have been laid down under its direction.

Waste leather makes an admirable form of *animal charcoal*. When subjected to destructive distillation leather yields about a fourth of its weight of a comparatively pure charcoal, which has a decolorising power, as tested on sugar syrups and gelatin, in nowise inferior to bone-char. At the same time, the distillation products afford from 23 to 25 per cent. of crude *ammonium sulphate*, suitable as a fertiliser.

The leather of boot uppers contains on an average about 15 per cent. of extractable *grease and fatty matter*, melting at about 38° C., and quite suitable for currying leather, and for other purposes in which a moderately hard low-grade grease suffices. The approximate present value of these products to be obtained from a ton, or 560 pairs, of condemned boots is rather more than 16*l*. 11*s*., of which the charcoal and ammonium sulphate are by far the more important items.

On account of its nitrogen content leather waste is regarded as possessing considerable potential value as a manure. It, however, decomposes very slowly, and requires special treatment to make it effective. Chrome-tanned material is found to be hurtful to plant-life.

Other uses for condemned military boots are in the manufacture of leather board, leather pulp and powder, clogs, washers for screw-down water-taps, mats, cyanides and prussiates, glue and size.

Evidently, as the time-honoured adage says, "there is nothing like leather," even from old boots.

THE ORGANISATION OF ENGINEERING TRAINING.

A CONFERENCE on the above subject was held at the Institution of Civil Engineers on October 25, delegates representing the chief engineering institutions and educational bodies, various Government departments, and a number of universities and technical colleges being present. Sir Maurice Fitzmaurice, president of the Institution of Civil Engineers, took the chair.

Sir Maurice Fitzmaurice, in opening the proceedings, remarked that there was a great gap between the period when a boy decided to become an engineer and when he actually entered on his training. There was general recognition that youths entering the engineering industry should receive uniformly sound training, and the proposals to be brought before the meeting related to the establishment of a central representative committee to secure better co-ordination in this matter. The council of the Institution of Civil Engineers felt that nothing but good could come of this meeting, in which all interests, educational, professional, and manufacturing, were represented.

A letter was read from Mr. H. A. L. Fisher, the President of the Board of Education, regretting his unavoidable absence from the meeting, and stating that the Board of Education would be glad to co-operate in any well-considered scheme which the engineering industry might adopt.

Mr. A. E. Berriman, one of the honorary organisers of the meeting, then gave a brief account of the origin of the movement, which was also the subject of a memorandum placed in the hands of those present. The proposal to form a central organisation for improvement in and better co-ordination of engineering training originated at an informal conference of engineers and educationists, which held several meetings at the Board of Education during the early months of 1917. It was considered desirable that in its initial stages the proposed organisation should be free from the need of Government finance, while co-operating with the Board of Education and other educational bodies. Mr. Fisher had concurred in this view. The chief objects of the organisation would include:—(1) Co-ordination in engineering training, the fostering of apprenticeship as a national institution, and promo-

tion of a wider appreciation of the value in industry of education of university rank; (2) the maintenance of a central bureau where parents and educationists can obtain accurate and comprehensive information relating to the industry, and the proper course to be pursued by boys entering it; and (3) the promotion of scholarships and other means by which the best talent may receive adequate educational opportunity.

In the ensuing discussion general approval of the proposals was expressed.

Among those who took part were Sir Dugald Clerk, Mr. Michael Longbridge (president of the Institution of Mechanical Engineers), Mr. C. H. Wordingham (president of the Institution of Electrical Engineers), Mr. W. H. Ellis (the Master Cutler), Mr. H. B. Rowell (president of the North-East Coast Institution of Engineers and Shipbuilders), Mr. R. T. Nugent (Federation of British Industries), Prof. W. E. Dalby, Lieut.-Commander C. F. Jenkin (Oxford University), Sir A. Selby Bigge (Board of Education), and Sir Wilfred Stokes (British Engineers' Association).

Finally, the following resolution was proposed by Sir John Wolfe-Barry, seconded by Dr. W. H. Hadow (principal of Armstrong College, Newcastle-upon-Tyne), supported by Mr. Arthur Dyke Acland, and carried unanimously:—"That this meeting of engineers and educationists is of the opinion that a need exists for improvement in and better co-ordination of engineering training, and considers that some form of central organisation is a desirable means to this end. It is therefore resolved that a representative committee, with powers to add to its numbers, be appointed to initiate means that will give effect to this principle of a central organisation." The first members of this committee are to be representative of twenty-six institutions and other bodies named.

Pending further developments, communications should be sent to Mr. A. Berriman (chief engineer, Daimler Co., Ltd., Coventry) or Mr. A. P. M. Fleming (British Westinghouse Electric and Manufacturing Co., Ltd., Trafford Park, Manchester), who were appointed to act as hon. organisers of the meeting.

THE OFFSPRING OF DEAF PARENTS.

WE have received from Dr. Alexander Graham Bell an interesting publication by the Volta Bureau, Washington, entitled "Graphical Studies of Marriages of the Deaf." Under Dr. Bell's direction, Mr. A. W. Clime has prepared about a hundred pages of graphical index to the marriages reported in Dr. E. A. Fay's well-known work on "Marriages of the Deaf in America," and likewise 301 pedigree charts of the marriages of the deaf that resulted in deaf offspring. Mr. F. De Land contributes two pages of introduction, which might have been expanded to great advantage. From Fay's 4471 marriages Dr. Bell has eliminated 974 in regard to which there was no information as to offspring, 419 where the marriage had taken place within a year of the date of report to Dr. Fay, and 434 that were childless when reported. The removal of these 1827 marriages left 2644 marriages of a year's standing or more, and with children.

The number of children recorded was 6782, of which 588, or 8·66 per cent., were deaf. These 588 deaf children were the offspring of only 302 of the marriages. After deducting two marriages (which resulted in three deaf children and "several" hearing children) because the total number of children born was not stated, Dr. Bell was left with 300 marriages the offspring of which were in varying proportions affected by deafness. The total number of children born was 1044; the number of deaf children among these was 585. The proportion of deaf is thus more than half, 56 per cent.

Another result worthy of note is that of the 2642 marriages considered the average number of children per marriage in the 300 marriages that resulted in deaf offspring was 3·48, while an average of only 2·44 per marriage was reported in the 2342 marriages resulting in no reported deaf offspring.

It may be recalled that in 1883 Dr. Bell presented a memoir to the National Academy of Sciences entitled "Upon the Formation of a Deaf Variety of the Human Race." His recent graphical studies clearly show that although the total percentage of families with deaf children, out of 2642 marriages where deafness marked one or both parents, was not extremely high, being about 12 per cent., the proportion of affected members of the 300 families with deaf offspring was very high, about 56 per cent.

That all the children of two deaf parents are not deaf is probably because the two parents are deaf in different ways, but Dr. Bell has in this publication refrained from any interpretations. In looking over individual cases, one is struck to see some where there was deafness in the husband and wife and in the relatives of both, but none in the children; other cases where there was deafness on both sides of the house, but only in half of the offspring; others in which there was deafness in one parent and none in the offspring; and others again in which the defect was in one parent only, but in all the offspring, or, say, in six out of seven.

One would have liked some discussion of the very interesting variety of results, which must surely mean that even after we have set aside deafness due to otosclerosis and to catarrhal weakness, the kind of deafness called deaf-mutism is not a homogeneous physiological condition. But some discussion would have been very welcome. As one looks over the charts one is struck by the rarity of the symbol which stands for "partially deaf," and the suspicion arises that it has not been sufficiently differentiated in the printing from the symbol for "deaf."

There is much obscurity in regard to the inheritance of deafness, and Dr. Bell's painstaking presentation of different family histories will enable experts to study individual cases. It must be impossible in many cases recorded to get medical opinion as to the nature of the deafness, but in the present-day accumulation of more data like Fay's an endeavour should be made to sift out varieties of deafness more radically than is involved in merely distinguishing between adventitious and congenital.

THE UTILITY OF THE USELESS.[1]

FOR several reasons it is a profitable exercise to trace back a modern invention, or commercial appliance, to the fundamental discoveries from which it sprang. In the first place, the debt of commerce to pure science is thus demonstrated; for it is safe to say that none of the numerous inventions and devices which are of such immense commercial importance at the present day could have come into existence had it not been preceded by one, or possibly many discoveries arising out of research pursued in a purely academic spirit. But, as being of far more importance from the point of view of the ardent beginner in scientific research, the tracing of the germinal discoveries upon which an invention is based is of value as showing how all academic research, remote though it may appear from the service of mankind, may contain

[1] Presidential address delivered to the Royal Physical Society, Edinburgh, by Dr. O. Charnock Bradley. Reprinted from the Proceedings of the Society for March, 1917.

within it the germ from which is to develop an influence capable of tincturing the whole fabric of a nation's existence. A moving pebble may start an avalanche. . . .

Moreover, the history of scientific discoveries serves to remind us of those complex factors underlying our daily life and the research, remote or recent, from which they have originated. The detailed processes of every day are so familiar that few spare the time to remember that upon scientific discovery depend all the contrivances and appliances which make modern life what it is. Indeed, one is tempted to pen the paradox that it is of the most familiar we have least knowledge. In contemplating the lordly oak, or in enjoying its shade, we forget its origin; and, assuredly, the timber merchant wastes no thought on the acorn.

An interesting chapter in the history of science could be written on the opposition against which discoveries of fundamental importance and ultimate great commercial value have had to fight for general approval and acceptance. Galileo's telescope, the Darwinian hypothesis, the clinical thermometer, anæsthetics, and a host of other revolutionising introductions have been opposed with a greater or less degree of acerbity. In the light of its modern development, it is scarcely conceivable that the electric telegraph was neglected for years until its possibilities were foreshadowed in a dramatic fashion in connection with the arrest of a murderer. On the introduction of the electric telegraph the "practical man" would have none of it, and yet in the short space of about half a century the telegraph, and its young relative the telephone, have completely revolutionised everyday commercial and national life. However great their value may be in times of peace, in time of war it is infinitely greater. Regard for a moment the influence exerted by the wireless form of telegraphy on

> This precious stone set in the silver sea,
> Which serves it in the office of a wall,

and something of the power of applied science, the offspring of pure science, becomes apparent. No text could better serve for a thesis on the small and neglected scientific beginnings of great things.

Search for the reason for resistance to new ideas and new speculations is not without interest to the biologist and sociologist. The first reason which suggests itself is that matter-of-fact, rule-of-thumb people are always in the majority, and, therefore, anything out of the ordinary is bound to meet with opposition in excess of approval. Or we might agree with George Eliot in saying that the practical mind and the narrow imagination go together, and with H. G. Wells in asserting that few have been accustomed to respond to the call of a creative imagination. There are few—and these not men of action—who are capable of looking forward into the future. We might also point to the fact that the pursuit of knowledge does not follow a straight line. It zigzags hither and thither, frequently halts, and indeed often has to hark back. Such erratic progress cannot make a very urgent appeal to the practical mind.

But these explanations are probably not entirely just to that necessary member of the community, the "practical man." It must always be remembered that only those of the future shall see the present—see it steadily and see it whole. The ultimate goal of a scientific discovery is hidden from those who were present at its birth. Moreover, a truth new-wrested from Nature seldom carries with it an indication of future possibilities. In most cases, and especially if it is a germinal truth, it possesses few attractive features to the eye of him who seeks for signs of future utility. "Truth new-born looks a mis-shapen and untimely birth."

In all probability what the sociologist has come to call the "herd instinct" is an important factor in producing resistance to the reception of the new and unusual. The "herd instinct" may be briefly explained as follows:—Man being a gregarious animal and leading the communal life, it is essential that his actions should be co-operative. The homogeneity necessary for co-operative action results from an inherent impulse on the part of each individual to think and act in conformity with the thought and action of his fellows. There seems good reason for concluding that homogeneity is the result of natural selection. There appears to have been an accumulation of experiences which, unconsciously so far as the individual is concerned, have demonstrated the necessity for following custom if the safety of the community, or herd, is to be ensured.

Admitting the operation of the "herd instinct," it is not difficult to appreciate the reason of that opposition to innovation which is so well and so frequently illustrated in the history of scientific discovery. For our present purpose, however, it is not so much necessary to explain the cause of opposition as to recognise its reality. Realisation of its occurrence and effect in the past renders more easily borne its encounter in the present.

No department of science contains more mysteries for the layman than does electricity. And no department of physical science contains more striking examples of pure academic research paving the way for the introduction of enormously important instruments of applied science.

The discovery of the deflection of a magnet by the passage of an electric current along a wire in its vicinity—a discovery which, as Faraday expressed it, "burst open the gates of a domain in science, dark till now, and filled it with a flood of light"—could not have been made had not Volta devised the means whereby a constant and steady current could be produced. Nor, without the same means, could François Arago have discovered that a bar of iron becomes a magnet when surrounded by a coil of wire through which an electric current is flowing.

If Volta's investigations made possible research capable of revealing the industrial applicability of electricity, it may be claimed that Volta, in his turn, was indebted to the old frictional machine for a basis upon which to found his inquiries. Tracing the chain of research still farther back, all the earlier discoveries depended upon an observation made by William Gilbert, of Colchester, one of the lesser sons of the Renaissance. If it is true to say that none of these inquiries was made in the utilitarian spirit, it is equally true to assert that Faraday's discovery of electro-magnetic induction was the product of research undertaken from purely academic motives. When Faraday's sacrifices to science are remembered, it is not difficult to realise that his work was not stimulated by a desire for personal profit. That mankind in general has profited, and that the wealth of nations has been augmented, are abundantly evident.

When Sir Anthony Carlisle and Mr. Nicholson made their extemporised Voltaic pile, and observed the decomposition of water by the current produced, they could not possibly have foreseen that by their speculative laboratory experiments they were laying the foundation of those enormous commercial industries which depend upon electrolysis. Much less is it conceivable that an enthusiastic youth of eighteen, endeavouring to make artificial quinine by the oxidation of aniline, could have foreseen that his accidental discovery would lead to the utilisation of what was formerly a wholly disagreeable nuisance in the shape of coal-tar, and thereby form the germ of the now more than ever famous aniline dyes industry.

Fascinating though it is to follow the fortunes of small discoveries in the physical sciences and see how they ultimately develop into great instruments of human service, it is, if anything, even more fascinating to trace the history of small discoveries in the biological sciences. And this is so, no doubt, because the contact of biology with daily existence is not so obvious and self-assertive as is that of physics or chemistry; consequently the ramifications of influence of biological research are more subtle, but none the less real.

Modern medicine—using the term to include surgery—it is safe to say, is that phase of biological science which has the most obvious effect upon daily human existence. Examined closely, it is clear that modern medicine is based upon a multiplicity of scientific discoveries; some of them of outstanding magnitude, many of them of minor consequence.

Fed upon descriptions of marvellous operations served up by a sensational Press, the layman is not slow to admit the wonders of modern surgery. Wonderful though the surgical stories of the lay Press may be, they are not really more marvellous than many of those stated in the cool, calculated, and technical language of the medical and surgical periodicals. Regard for a moment an operation recently described by an Army surgeon. "Somewhere in France" a soldier was shot. The bullet was located in the cavity of the left ventricle of the heart, and removed therefrom by operation. This feat was rendered possible by a long series of discoveries leading away back into regions far from the utilitarian. The determination of the position of the bullet depended upon the studies of Sir William Crookes on high vacua—a thing of yesterday—combined with the discovery of cathode-rays about two hundred years ago. The operation was rendered free from danger of sepsis by the development of the "germ theory"—now so familiar that we have almost forgotten that it originally bore this name—which reposed upon a long line of arduous research, including Pasteur's inquiries into fermentation, and, still more remotely, the peculiarities of tartrate crystals. These and many more academic inquiries placed the surgeon in possession of the means to perform an operation which, not many years ago, would have been regarded as daring in the extreme.

Frankly, this particular operation was chosen as an example of the triumphs of modern surgery because it was both sensational and topical. But equally wonderful work is done daily and far distant from the grim romance of the battlefield.

Instances of the application of scientific discovery to everyday problems and everyday needs might be multiplied almost without limit. But the foregoing must suffice to justify the contention that the fruits of academic research are not difficult to find in the appliances and contrivances which make the day's work what it is, and that the commercial wealth and prosperity of the world are in no small measure dependent upon discoveries of seemingly small and trifling moment, and nearly always of little utilitarian complexion. He who wishes to demonstrate to the man of commerce that it is in his own interest to encourage and aid the man of science need experience no difficulty in adducing facts in support of his argument. It is easily possible to prove the benefits that accrue to commercial undertakings out of the employment of a scientific staff. The proof is perhaps not so necessary now as it was not many years ago; but the necessity still exists, though in a modified degree.

But, while science is of service to commerce, the complete subjection of science to commerce or the requirements of the State would not be productive of entirely good results. The bending of research to purely utilitarian ends would be fraught with grave danger in several directions, and not least in that it would discourage investigations instigated by a thirst for knowledge for its own sake—investigations which history has shown may develop into discoveries of surpassing moment.

After all, the business of the man of science is to discover truth regardless of possible monetary profit either to himself or to humanity at large. Let the inventor use the knowledge if he cares and can. "Your business, your especial business," said Pasteur once to his students, "must be to have nothing in common with those narrow minds which despise everything in science which has no immediate application." And Pasteur, apart from the inestimable work he did leading to modern surgery, taught the vinegar-makers of Orleans how to increase their output, instructed France how to prevent the souring of her wines, and helped the brewers of London by instructing them concerning the importance of the purity of their yeast.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. J. E. Marr, University lecturer in geology, has been elected to the Woodwardian professorship of geology in succession to the late Prof. McKenny Hughes.

EDINBURGH.—The Lord Rectorship of the University, vacant since Lord Kitchener met his tragic fate, falls to be filled up next month. As on the last occasion, the students have determined to have no contested election, but have invited Sir David Beatty, Admiral of the Fleet, to be their Lord Rector. The invitation was forwarded by Mr. J. A. Stirling, president, and Miss Helen I. Walker, secretary, of the Students' Representative Council, and Admiral Beatty replied in these words:—"I should be proud to become the Lord Rector of Edinburgh University, and greatly appreciate the honour which the students of the University confer on me in offering to elect me to that high office."

LONDON.—The cordial thanks of the Senate have been voted to the London County Council for the grant of 600*l.* a year for the salary of the holder of the professorship of Russian to be instituted for tenure at King's College, and to the Worshipful Company of Drapers for the renewal for a further year of the annual grant of 500*l.* for the biometric laboratory at University College.

The following doctorates have been conferred:—*D.Sc. in Chemistry:* Mr. Nilratan Dhar, an internal student, of the Imperial College (Royal College of Science), for a thesis entitled "Catalysis: Some Induced Reactions and Temperature Coefficients of Catalysed Reactions." *D.Sc. in Psychology:* Mr. Shepherd Dawson, an external student, for a thesis entitled "The Experimental Study of Binocular Colour Mixture."

SHEFFIELD.—On October 25 General Smuts and Sir John Jellicoe visited the applied science department of the University to inspect work being carried on there in connection with the Ministry of Munitions. The distinguished visitors and party inspected the physical and metallurgical laboratories and alloys foundries, where many objects of interest were shown. The visit also included inspection of the shell shops and gauge and tool-room department. After inspection of the buildings, a conference was held with members of the Sheffield Committee on Munitions of War and other gentlemen.

THE Maria Mitchell Memorial Fellowship at Harvard Observatory, value 100*l.*, is offered to a woman for the year beginning September 15, 1918. A competitive

examination will not be held, but the candidate must present evidence of previous educational opportunities and training, and give plans for future work, as well as examples of work already accomplished. Applications for the year beginning September 15, 1918, have to be in the hands of the secretary of the committee, Mrs. Charles S. Hinchman, 3635 Chestnut Street, Philadelphia, Pennsylvania, on or before April 1, 1918.

IN reply to questions asked in the House of Commons on October 29, the Chancellor of the Exchequer said that the Government recognised the urgency of the Education Bill, but the grounds on which he believed it was impossible to proceed with the Bill were substantial—want of time. He had discussed with the Minister of Education the possibility of dealing with the non-controversial clauses of the Bill this session. He thought the Minister of Education agreed with him that if the Bill could not be got through this session, it was not worth while to attempt to deal with part of it.—It will be remembered that in making his statement on the Education Bill in the House of Commons on August 10, Mr. Fisher said it was proposed:—(1) To improve the administrative organisation of education; (2) to secure for every boy and girl in this country an elementary-school life up to the age of fourteen unimpeded by the competing claims of industry; (3) to establish part-time day continuation schools which every young person in the country shall be compelled to attend unless he or she is undergoing some suitable form of alternative instruction; (4) to develop the higher forms of elementary education and improve the physical condition of the children and young persons under instruction; (5) to consolidate the elementary-school grants; (6) to make an effective survey of the whole educational provision in the country and to bring private educational institutions into closer and more convenient relations to the national system. These proposals have been welcomed by all who believe in education as a national asset of supreme importance. At its meeting on October 24, the Education Committee of the London County Council recommended:—"That the council do express generally its strong approval of the main educational provisions of the Bill, introduced into Parliament by the President of the Board of Education on August 10, 1917, which, in the opinion of the council, constitute an educational reform of great magnitude and value, not only for London, but for the rest of the country." The Essex Education Committee has also resolved to urge the Government to pass a measure on the lines of the new Education Bill at the earliest possible moment. It was stated at the meeting of the committee that a great feeling of dismay was experienced all over the country at the news that the passage of the Bill would be delayed.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Microscopical Society, October 17.—Mr. Heron-Allen, president, in the chair.—H. **Sidebottom**: Recent Foraminifera dredged by H.M.S. *Dart* off the east coast of Australia in 465 fathoms. The locality lies off the coast of New South Wales, about 250 miles north of Sydney, and more than fifty miles from the coast-line. In this area the coast slopes rapidly down to Thomson Basin, an isolated deep (maximum 3000 fathoms) area between 24° and 52° S. and 149° and 165° E. Pteropods are found only in tropical and subtropical areas, and are of extremely limited occurrence in the Pacific. A great number of specimens are recorded, but few of more than local interest, the principal feature being a great variety of certain modifications of the genus Discorbina.—F. M. **Duncan**: Mounting and preserving marine biological specimens. The author described the methods adopted and standardised by him for the microscopical investigation of marine Algæ, Protozoa, general Plankton, Hydromedusæ, Ecninodermata, larval and adult Crustaceans, Ascidians, etc. The importance of standard percentage solutions of formaldehyde, value of menthol as a general narcotic, advantages of turpineol as a clearing media for Crustacea, and the disadvantages of fixing with chromic acid or bichromic salts were also fully discussed.

PARIS.

Academy of Sciences, October 15.—M. Camille Jordan in the chair.—A. **Lacroix**: The leucitic lavas of the Somma. A comparison of six complete analyses of these Vesuvian leucitic rocks leads the author to classify them under the name of vesuvites. Their characteristic is their richness in leucite and in the value of the ratio of the alkalis to the felspathic lime. The leucitic rocks of the Somma are of a different type; nine complete analyses of the latter are given.—G. **Bigourdan**: Observations of nebulæ made at the Observatory of Paris. A summary of the last volume published in 1913.—H. **Le Chatelier** and B. **Bogitch**: The refractory properties of magnesia. A comparison of magnesia bricks either made in the laboratory from pure magnesia or commercial specimens. The resistance to crushing was measured at 15°, 1000°, 1300°, 1500°, and 1600° C. for two bricks, and at 15°, 1500°, and 1600° C. for the remainder. All the magnesia bricks show a sudden fall of resistance to crushing at a temperature depending on their degree of purity, and this explains why in practice it has been found that magnesia bricks stand less well in furnaces than silica bricks, although their fusing points, observed in the ordinary way without regard to resistance to crushing, are higher than the silica bricks.—Ch. **Richet** and H. **Cardot**: Regular and irregular antiseptics. The variation of effect from the mean of a large number of observations is taken as a measure of the regularity of action of antiseptics. Data are given for sixteen antiseptics, and the results summarised in four classes, very regular, fairly regular, irregular, and very irregular antiseptics. Types of each of these classes in the above order are fluoride of sodium, creosote, phenol, and mercury salts.—G. **Scorza**: Abelian functions.—N. **Lusin** and W. **Sierpinski**: A property of the *continu*.—E. **Belot**: The exchange of solid material between stellar systems by meteorites with hyperbolic trajectory.—Mlle. A. **Hure** and M. G. F. **Dollfus**: The discovery of Lutecian millstone débris to the east of Sens (Yonne).—L. **Gentil** and L. **Joleaud**: The discovery of a small coal deposit in Tunis. This occurs in the neighbourhood of Medjez and Bab. The analyses given show it to be of high purity (average ash under one per cent.). Its stratigraphical surroundings are not those of the Coal Measures.—E. **Saillard**: The seeds of the sugar-beet. Before the war about four-fifths of the beet seed came from abroad, mainly from Germany. The sugar-beets of 1916 and 1917 have been practically as rich in sugar as in the ten years which preceded the war, although the production of sugar per hectare has been slightly less; the conditions of culture, however, have been less favourable. Without having recourse to German seed, results with the sugar-beet have been kept nearly the same as in the years preceding the war.—G. **Foucher**: The appearance of *Carausius morosus* ♂ and its longevity.—W. **Kopaczewski**: The poison of *Muraena helena*. A dose of 1·5 milligrams of this venom is fatal to a guinea-pig weighing 400 to 500 grams. It is remarkably thermostable, preserving its toxic properties after fifteen minutes' heating to 75° C.—Ch. **Dhéré**, L. **Baudoux**, and A. **Schneider**: The crystallisation of the acid hæmochromogen.—MM. **Heitz-Boyer** and **Scheikevitch**: The process of osseous regeneration in the adult.

BOOKS RECEIVED.

Trattato di Chimica Generale et Applicata all' Industria. Vol. i., Chimica Inorganica. By Prof. E. Molinari. Parte Prima. Pp. xiv+560. (Milano: U. Hoepli.) 12.50 lire.

The Cambridge Pocket Diary, 1917–18. Pp. xv+261. (Cambridge: At the University Press.)

With the French Flying Corps. By C. D. Winslow. Pp. 190. (London: Constable and Co., Ltd.) 3*s.* 6*d.* net.

Plant Materials of Decorative Gardening: The Woody Plants. By Prof. W. Trelease. Pp. 204. (Urbana: The Author.)

The Museum: A Manual of the Housing and Care of Art Collections. By M. T. Jackson. Pp. xi+280. (London: Longmans and Co.) 6*s.* 6*d.* net.

A Treatise on the Elements of Electrical Engineering. Vol. i., Direct and Alternating Current Machines and Systems. By W. S. Franklin. Pp. x+465. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 4.50 dollars.

The R.P.A. Annual for 1918. (London: Watts and Co.) 1*s.* net.

Charles Blount, Gent.: His Life and Opinions, to which is added the Second Apparition of Mrs. Veal. By Mysticus. Pp. 40. (London: Watts and Co.) 6*d.* net.

Memoirs of the Geological Survey. Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology for 1916. Pp. iv+56. Explanation of Sheet 248. The Geology of the South Wales Coalfield. Part iv., The Country around Pontypridd. By Dr. A. Strahan, R. H. Tiddeman, and Dr. W. Gibson. Second edition. Revised by Dr. W. Gibson and T. C. Cantrill. Pp. ix+160. (London: H.M.S.O.; E. Stanford, Ltd.) 1*s.* 6*d.* net and 3*s.* 6*d.* net respectively.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 1.

ROYAL SOCIETY, at 4.30.—The Reflexion of Light from a Regularly Stratified Medium: Lord Rayleigh.—Two Cases of Congenital Night-blindness: Sir William Abney.—Duration of Luminosity of Electric Discharge in Gases and Vapours. Further Studies: Hon. R. J. Strutt.—Surface Reflexion of Earthquake Waves: G. W. Walker.—Characteristic Frequency and Atomic Number: Dr. H. S. Allen.

CHEMICAL SOCIETY, at 8.—*pp*-2: 4-Dinitrotetraphenylfuran: A. G. Francis.—Studies in Catalysis. VIII. Thermochemical Data and the Quantum Theory. High Temperature Reactions: W. C. McC. Lewis.—Studies in the Phenylsuccinic Acid Series. V. The Interconversion of the Esters of *r*- and *meso*-diphenylsuccinic acid: H. Wren and C. J. Still.—Metal-analogues of Carbon (deduced from solubility relationships). I.: S. S. Sahni.—"Uniform Movement" during the Propagation of Flame: W. Mason and R. V. Wheeler.—Studies upon the Sulphonation of Beta-naphthylamine: A. G. Green and K. H. Vakil.—The Limitations of the Balance: B. Blount.

MATHEMATICAL SOCIETY, at 5.—Annual General Meeting.—Tetrahedra in Relation to Spheres and Quadrics: J. H. Grace.—The Continuation of the Hypergeometric Series: Prof. M. J. M. Hill.—Restricted Fourier Series and the Convergence of Power-series: Prof. W. H. Young.—Invariants and Covariants of Linear Homogeneous Differential Equations: Prof. E. B. Stouffer.—The Simultaneous System of Two Quaternary Quadratic Forms: H. W. Turnbull.

MONDAY, NOVEMBER 5.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Patent Law in Relation to British Chemical Industry: Dr. F. W. Hay.

TUESDAY, NOVEMBER 6.

MINERALOGICAL SOCIETY (Anniversary Meeting), at 5.30.—Etched Crystals of Gypsum: Miss E. Smith.—The Mesosiderite-Grahamite Group of Meteorites: Dr. G. T. Prior.—Changing the Plane of a Gnomonic or Stereographic Projection: Prof. H. Hilton.—Cleavage Angles in a Random Section of a Crystal: Prof. H. Hilton.

ZOOLOGICAL SOCIETY, at 5.30.—Lantern Exhibition of Photographs of Mammals and Reptiles from the Society's Gardens: D. Seth-Smith.—Some Additions to the known Dragonfly Fauna of Borneo, with an account of New Species of the Genus Cœliccia: Lieut. F. F. Laidlaw.—The Use of the Names Plesiosauria and Sauropterygia: G. A. Boulenger.—Some Observations upon Concealment by the Apparent Disruption of Surface in a Plane at Right Angles to the Surface: J. C. Mottram.

RÖNTGEN SOCIETY, at 8.15.—Presidential Address: The Part Played by X-rays in the War: Captain G. W. C. Kaye.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.—Presidential Address: H. E. Jones.

WEDNESDAY, NOVEMBER 7.

GEOPHYSICS COMMITTEE, at 5.—Magnetic Surveys and Charts: Dr. S. Chapman.—Magnetic Survey of the United Kingdom: Dr. G. W. Walker.

FARADAY SOCIETY, at 8.—General Discussion on Pyrometers and Pyrometry: Introductory Address: Sir Richard Glazebrook.—High Temperature Production and its Measurement: Dr. E. F. Northrup (Trenton, N.J.).—Pyrometer Standardisation: Dr. Ezer Griffiths and F. H. Schofield.—The Advantage of Burying the Cold Junction of a Thermocouple as a means of Maintaining it at a Constant Temperature: R. S. Whipple.—The Automatic Control Measurement of High Temperatures: Richard P. Brown (Philadelphia).—Pyrometry applied to the Hardening of High-speed Steel: Prof. J. O. Arnold.—Determining the Temperature of Liquid Metals by means of Optical Pyrometers: Cosmo Johns.—Pyrometry from the Standpoint of Ferrous Metallurgy: Dr. W. H. Hatfield.—The Measurement of High Temperature by means of Pottery Materials: H. Watkin.—Base-metal Thermo-electric Pyrometers: C. R. Darling.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Reductase Test for Milk: Paul S. Arup.—Note on Jets for Burettes: J. H. Coste.—Analytical Examination of Acorns and Chestnuts: Julian L. Baker and H. F. E. Hulton.

INSTITUTION OF CIVIL ENGINEERS, at 5.30.

GEOLOGICAL SOCIETY, at 5.30.—The Nimrud Crater in Turkish Armenia: Dr. Felix Oswald.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, NOVEMBER 8.

ROYAL SOCIETY, at 4.30.—*Probable Papers:* The Structure, Evolution, and Origin of the Amphibia. I. The "Orders" Rachitomi and Stereospondyli: D. M. S. Watson.—The Enzymes concerned in the Decomposition of Glucose and Mannitol by *Bacillus coli communis*. II. Experiments of Short Duration with an Emulsion of the Organisms. III. Various Phases in the Decomposition of Glucose by an Emulsion of the Organisms: E. C. Grey.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—President's Address: C. H. Wordingham.

OPTICAL SOCIETY, at 8.—Certain Optical Stores Captured from the Enemy: Lt.-Col. A. C. Williams.

FRIDAY, NOVEMBER 9.

ROYAL ASTRONOMICAL SOCIETY, at 5.

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Editorial and Publishing Offices:
MACMILLAN AND CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Advertisements and business letters to be addressed to the Publishers.

Editorial Communications to the Editor.

Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.